Abdeslam EL KHAMLICHI M.D.

EMERGING NEUROSURGERY IN AFRICA

WFNS Rabat Reference Center for Training
African Neurosurgeons

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To my professors, who taught me neurosurgery, and made me love it;

To my patients, who have enabled me to perfect my work and teach it to others.

To my dearest wife Jaouhara; to our children, Youssef, Leila and Zeineb, for the happiness they bring me, their unconditional love and permanent support.

In memory of

Late Dr **Didier Mudjir Balanda**

first African trainee at the WFNS-RTC, 2002-2007, who unfortunately passed away on September, 27th 2012, five years only after his return to his home country, the Democratic Republic of Congo

Dr. Didier Mudjir Balanda went back to his country after he completed his training at the WFNS-RTC. He was the second neurosurgeon in a country of sixty million inhabitants.

He started working very hard, building neurosurgery and taking care of hundreds of patients. Unfortunately, he will pass away prematurely, by heart attack, on September 27th 2012.

"*He was the symbol for future for Africa and cannot be replaced by anybody. He was an exceptional individual, with high level of humanity and generosity to all other people...*»

Condolences email, Dr. M Samii

May he rest in peace

"Therefore, African neurosurgery will have evolved through three stages: (i) a stage of information and awareness (1993-2005) through the results of the first survey on the status of African neurosurgery and the enthusiasm aroused by the promotion and organization of the first world congress in Africa (Marrakesh, 2005); (ii) a takeoff stage (2002-2018), thanks to the WFNS initiatives, especially the WFNS-RTC, and Africa 100; (iii) a stage of development (2018-2030) to achieve an acceptable level and meet the needs of African populations in relation to the 2030 strategy.

To succeed in this strategy, African neurosurgeons and the WFNS, have to encourage and support the national and regional training centers, to increase to 20-30% their current training capacity. The target of this strategy is to increase the current number of neurosurgeons in Sub-Saharan Africa, by seven times by 2030, knowing this number has increased by 4.6 times over the last sixteen years."

Abdeslam El Khamlichi, page 201 of this book.

ACRONYMS

AANS	American Association of Neurological Surgeons
AC	Administrative Council
AFNS	African Federation of Neurosurgical Societies
AMCI	Moroccan Agency for International Cooperation
ANSA	African Neurological Surgeons Association
CAANS	Continental African Association of Neurosurgical Societies
CDS	Scientific and Director Committee
UHC	University Hospital Center
NCRNS	National Center for Rehabilitation and Neurosciences
COSECSA	College of Surgeons of East, Central and South Africa
EANS	European Association of Neurosurgical Societies
EC	Executive Committee
IBRO	International Brain Research Organization
OMS/WHO	World Health Organization
PAANS	Panafrican Association of Neurological sciences
PANS	Panarab Society of Neurosurgery
SMNC	Moroccan Society of Neurosurgery
SNCLF	French Speaking Society of Neurosurgery
UFR	Research and Education Unit
M5U	Mohammed V University
WACS	West African College of Surgeons
WFNS	World Federation of Neurosurgical Societies
WFNS-RTC	World Federation of Neurosurgical Societies-Rabat Training Center

FOREWORDS

Prof. Madjid SAMII

Hannover, Germany

The medical development particularly of neurosurgery of the African continent compared to the other continents has not been introduced in the same time.

As a matter of fact that neurosurgery is one of the most difficult and risky surgical field and needs advanced technical standard, the African medical students were all afraid to be educated for neurosurgery in the past.

According to this fact, neurosurgery, among all other medical disciplines, was not a field of interest during a long time in Africa.

Just in colonial times some European neurosurgeons have started to perform and educate neurosurgeons in Africa, and a few African neurosurgeons who have been studied neurosurgery in Europe or North America came back to introduce neurosurgery only in a few countries of Africa.

Unfortunately many top intelligent African students who have been educated in Europe or North America didn't go back to their home countries in Africa, mostly because of not having the proper technologies to perform neurosurgery with which they have learned.

Beside of very few countries in Sub Sahara, South African as well as North African countries have started to create neurosurgical departments with education in neurosurgery.

Prof. Abdeslam El Khamlichi who has been educated in Rabat, Morocco, is witness of neurosurgical development in Africa over the last four decades.

I am very thankful to him for taking the time to write this book, which is a documentary about the history from the beginning. It includes all the details of events and circumstances in relation to neurosurgery during colonization of Africa and the contribution of few European neurosurgeons who introduced neurosurgery in Africa.

This book is giving much well documented information about development of neurosurgery in Africa but in the same time about

the history of Moroccan neurosurgery and its contribution for education of African young medical doctors from different countries in neurosurgery and the involvement of WFNS for supporting the development of neurosurgery particularly in Sub Saharan African countries.

The major highlight for Morocco was the organization of the 13th Neurosurgical World Congress under the presidency of Prof. El Khamlichi.

My personal serious experience with Africa has started as I became President of the WFNS in 1997 and I have asked all my 2nd Vice Presidents to give me a report on neurosurgical condition and statistic of each continent.

I wanted to start a global effort to create a neurosurgery for all over the world with at least minimal standard. In 1998, I was really shocked as I have received the report of Prof. El Khamlichi who was the 2nd Vice President for Africa.

I found that in many Sub-Saharan countries there is not even one neurosurgeon to take care of the neurosurgical patients.

With 79 neurosurgeons in total there was a relation of one neurosurgeon to between 10 to 20 million populations in some African countries.

This was for me reason enough to start a campaign for more education of neurosurgeons in Africa. For that reason, I have created the WFNS Foundation with which we could sponsor education of young African medical doctors for Neurosurgery.

In order to avoid brain drain after such an education, we decided to do this education not in Europe and not in North America but in Africa itself.

Prof. El Khamlichi was the first person who has accepted to take care of such an education in Rabat and we have created the WFNS-Rabat-Training-Center (RTC).

During these five years of education in Rabat we have realized that after complete education of neurosurgeons the candidates need further support at home.

For that reason I have created with the company Aesculap an instrumental neurosurgical set for the price of USD 3,000 as well as an operating microscope from ZEISS company for US$ 10,000.

Additionally, Prof. El Khamlichi has organized every year workshops and symposia with international lecturers to evaluate the horizon of the young African neurosurgeons during and after their residency.

Despite of all this commitment in Rabat I found the number of young African medical doctors which we tried to educate in Rabat was not enough in order to make a great change of neurosurgical services in Africa.

In 2011, as I have discussed in official AC meeting of WFNS how we should accelerate this education program for Africa, the President of WFNS has asked me to be Ambassador of WFNS for Africa to organize more activity for this continent.

My first idea was the project "Africa 100" and I have accepted to take over the financial responsibility for education of 100 young African medical students, particular from those countries in Sub Sahara in which there were no neurosurgeons or only a few.

We have organized a committee of Africa100-Project. The members were selected from different parts of Africa.

They have created guidelines for accreditation both candidates and reference centers of neurosurgical education in Africa.

With this program the number of candidates in Morocco has been increased and other neurosurgical centers in Morocco have joined this program. I am very thankful to Prof. Sidi Said who has also started to educate candidates in Algiers.

In 2016 according to Prof. El Khamlichi's report, the number of 79 neurosurgeons in 1998 has been increased to 369 neurosurgeons, which is a relation of one neurosurgeon for two million inhabitants.

As a matter of the fact that the number of Neurosurgeons in Africa, particularly in Sub-Sahara, was not large enough, there have only been regional neurosurgical associations together with neurologists,

who were representing Africa in all over the world. With an increasing number of Neurosurgeons, there was the need to integrate all African countries in one united community.

As WFNS ambassador for Africa I was convinced that the unification of all existing societies – national or regional – can better represent Africa in all over the world and become member of WFNS.

I am very thankful to all representatives of leading neurosurgeons cross over Africa to have accepted my invitation to come in February 2012 to Nairobi. In this meeting I have suggested to create a strong voice of united Africa under the name "Continental African Association of Neurosurgical Societies" (CAANS).

I will never forget this historical day in Nairobi, where all my colleagues followed my suggestion and decided to create a bylaw for CAANS.

In the meantime CAANS is representing Africa in WFNS and is organizing every two years its own continental congresses in which at least 45 countries are represented.

The progress of neurosurgery in Africa is continuing permanently and I am full of hope that in close future Africa will participate in all aspects of neurosurgery within the international neurosurgical community.

The book of Prof. El Khamlichi "Emerging Neurosurgery in Africa" is a very precise document of all details about neurosurgical development in Africa as well as history of Moroccan neurosurgery and contribution of Moroccan neurosurgery in relation to development of neurosurgery in Africa.

I believe that the commitment of Abdeslam El Khamlichi for the development of Neurosurgery in Morocco and the involvement of Morocco for the further development of Neurosurgery in Africa is without any doubt unique and deserves a special recognition.

Prof. Madjid SAMII
Professor of Neurosurgery
President of the International Neuroscience Institute
Hannover, Germany
WFNS Honorary President
WFNS Ambassador in Africa

Prof. Abdelkader TOUNSI

Rabat, Morocco *

The first lines of this newly-written book by Professor El Khamlichi bring me back into the environment of Ibn Sina Hospital in Rabat during the years 1950-1960, before the UHC was set up. There were one thousand beds at the hospital, and a very extensive operating theater, but there were no neurosurgeons.

However, every day, patients were brought with skull and brain trauma, which were severe, sometimes.

The management of these patients was imperatively handed over to the surgeon on call.

Therefore, when the first neurosurgeon began practicing at the hospital, we all felt relieved and happy!

The more we read into the book, the more we feel as if the plot of a play unfolded in front of us.

First, we witness the setup of Hassan II Foundation for the Prevention and Cure of Nervous System Diseases. The first MRI device in Rabat was installed through this foundation, with its technical, scientific and educational inputs.

Later, along the plot, we discover the surprising account of the world congress of neurosurgery in Marrakesh! Such an important congress being held in Marrakesh, in 2005, was not only a performance but more of a challenge.

Therefore, we would like to pay tribute to the strong will and selflessness of the team of neurosurgeons who relentlessly supported the Moroccan bid.

As a conclusion, we advise all our colleagues to visit the National Center for Rehabilitation and Neurosciences. They will certainly be surprised by such a beautiful site where patients have access to the most advanced healthcare through Gamma Knife radiosurgery.

* Translated from the French.

Through these infrastructures and, of course, to competent teachers working at the center, neurosurgical education of African trainees was entrusted to the Medical School and the UHC of Rabat by international bodies.

In order for the readers to understand how competent the teams of teachers are at the center, they can read the academic curriculum over five years.

A detail has especially caught my attention. It relates to the practical examination in the operating room for residents to achieve the degree in neurosurgery.

I have always wished this examination be applied to all surgical specialties, because it is the one and only way to allow the board of examiners to assess both the theoretical knowledge and the level of command of surgical techniques by the residents.

Doctor Abdelkader Tounsi
Professor Emeritus of Surgery at the UHC of Rabat
Associate Member of the French Academy of Surgery

Prof. Armando BASSO

Buenos Aires, Argentina

«Emerging Neurosurgery in Africa» is an exceptional book written by Professor Abdeslam El Khamlichi that describes in detail the problem of Neurosurgery in the African continent, pointing out that until well into the twentieth century, with the exception of the countries of the Maghreb, Egypt and South Africa, neurosurgery practically did not exist, and thousands of patients died due to a lack of attention.

Prof. El Khamlichi throughout the pages tells us how to solve it, based on his own experience and the results he has obtained.

He starts with a wonderful historical introduction referring to tribal neurosurgery in ancient times and the Middle Ages, then entering deeply into the colonial period, reaching the period of independence from the European powers into the 20th century, where Neurosurgery was reduced to the effort of some isolated pioneers in general originating from Europe installed in the Sub-Saharan countries.

The author informs us about the lack of a coherent corporate representation of Africa that could highlight the regional problems because the PAANS (Pan African Association of Neurological sciences) evidently was not active enough to awaken international solidarity.

He writes in a direct and at the same time enjoyable way how he, with an effort without rest and without wavering obtained for Africa in the WFNS election in San Francisco, April 2000, the first World Congress of Neurosurgery in Marrakesh 2005, which was an unprecedented achievement, after having failed in the 1995 vote, a fact that did not prevent him from continuing to fight until he achieved his goal.

Prof. El Khamlichi informs us in detail in this book about the creation process of the first WFNS Reference Center in Rabat, a masterpiece for the education and training of young neurosurgeons coming from several countries in Africa. To date, more than 60 young colleagues have become neurosurgeons, and have returned to their countries of origin. They are monitored permanently, after having benefited from five years training at the WFNS Reference Center in Rabat with a full residency program.

This achievement was possible after an agreement was signed with the WFNS and Mohammed V University of Rabat, and the participation of the WHO through the Working Group on Neurosurgery.

The book reminds me of part of my own history, because in 1997, Madjid Samii set up the WFNS Foundation, with the collaboration of Prof. J.-G. Martin-Rodriguez, and I accompanied Prof. Samii as Secretary until 2005, before I succeeded him as President until 2015.

Finally, the author projects himself into the future and relates how, with a decisive and active national, regional and international participation, Africa will have a significant and hopeful vision of Neurosurgery, because if in 2000, there was 1 neurosurgeon to 8 million inhabitants, the goal is to reach the year 2030 with a ratio of 1 neurosurgeon to 470,000.

Once again, I want to congratulate my dear colleague and friend, Prof. Abdeslam El Khamlichi, not only for having written this admirable and detailed document, but also for his efforts and demonstrated commitment to the education and training of young colleagues, which are finally in favour of patients and people of all the African continent.

Prof. Armando Basso
WFNS Honorary President
Past President of the WFNS Foundation

Prof. Edward R. LAWS

Boston, USA

This extraordinary book records the astonishing story of the emergence of the specialty of neurosurgery in the continent of Africa. It is beautifully written by one of the true pioneers of a complex international effort to provide important and lifesaving neurosurgical expertise to Africa, and its enormous number of citizens, many of whom will benefit from doctors who are skilled in both basic and sophisticated aspects of neurosurgical practice. Although neurosurgery may be viewed as a narrow and focused specialty, its relevance to public health issues includes the management of head and spine trauma, hydrocephalus, epilepsy, stroke and other forms of cerebrovascular disease, and brain tumors, both benign and malignant.

This book records the evolving elements of progress, led in large part by the unyielding and comprehensive efforts of the author, Professor Abdeslam El Khamlichi. It was he who visualized the possibility of an educational program designed to provide to all of Africa expertly trained young doctors who would become neurosurgical specialists, working effectively to deal with the ever- increasing numbers of needy patients. Beginning as a delegate and officer of the World Federation of Neurosurgical Societies, he was tireless in his representation of Africa, and the need for neurosurgical education and increasing the numbers of neurosurgeons for all of the continent. His struggle began with many years of effort to organize a World Federation of Neurosurgical Societies World Congress in Africa, and this finally occurred when he organized and presided over a marvellous meeting of nearly 3000 neurosurgeons in Marrakesh, Morocco in 2005.

After this auspicious beginning, a highly effective, WFNS accredited training center for African Neurosurgeons was established as the Rabat Reference Center. The trainees have come from 18 different African countries, and have provided care to literally millions of underserved people in their home countries. The amazing example of this accomplishment has spawned similar centers in other underserved areas of the world.

This inspiring altruistic story of medical progress in Africa serves as a model for all of us to study, and to applaud and support.

Edward R. LAWS, MD, FACS
Former President, World Federation of Neurosurgical Societies
Professor of Neurosurgery, Harvard Medical School, Boston, Massachusetts, USA

Prof. Franco SERVADEI

Milan, Italy

JI read with interest the book of Professor Abdeslam El Khamlichi entitled «Emerging African neurosurgery: WFNS-RTC for African Neurosurgeons».

The vision of Professor El Khamlichi, together with the WFNS vision, allowed for a dream to become reality.

A programme of training supported by the WFNS Foundation and by the Africa 100 project from Professor Samii was established in Africa first in Morocco and then in other countries with enthusiastic support from many African Neurosurgeons.

Through this passion for training engendered by the WFNS initiative, the number of neurosurgeons in Sub-Saharan Africa increased 5 times over a period of 18 years (79 in 1998, 369 in 2016), and the ratio decreased from 1 to 8 million (1998) to 1 to 2 million (2016).

The WFNS programme not only helped to establish Neurosurgical Training Centers but also helps deliver neurosurgical equipment to LMICs. Up to December 2016, the WFNS Foundation had dispatched 56 units of neurosurgical equipment to Asia and Australasia, 11 to the Middle East, 24 to Europe, 17 to Latin America, and 106 to Africa.

So, again, Africa has been the target of our instruments donations.

This book records the remarkable history of the improvement of African Neurosurgery in the last two decades, which is an example of how the WFNS can act to increase the Neurosurgical capacity in countries in need.

Franco SERVADEI
WFNS President

Prof. Bello Bala SHEHU

Birnin Kebbi, Nigeria

In 2001, at the WFNS Congress in Australia, as I went Round the trade exhibition, I came across Aesculap trade representatives who introduced me to a special instrument set, that contained instruments for laminectomy, craniotomy but particularly at a special price of US$3000 for Neurosurgeon from low income countries. At the time I had been nearly three years back in Nigeria after Neurosurgical training in the United Kingdom and Republic of Ireland. My hospital in Nigeria then, had only a Hudson brace, a burr and a perforator as far as Neurological instrumentation was concerned.

1 purchased the instrument set straight away from Sydney, Australia, through the assistance of the WFNS Executive Secretary then, Mrs. Jan Joseph. This set made huge difference in my practice – at the time I had no idea how the set came about. Much later in Rabat, Professor Abdeslam El Khamlichi mentioned something about WFNS Foundation and the arrangement between the then President. Professor M. Sami and Aesculap..

My first contact with Professor Abdeslam El Khamlichi was in Egypt 2002. At our hotel reception where he met me with my then resident, Dr. Nasiru J. Ismail. After a brief introduction, I asked him if he could assist me with a short period of clinical attachment for Dr. Nasiru, having tried many enters without much success. Unknown to me, he had just commenced an Africa-wide hunt for residents to train, particularly for sub-Saharan African Countries. I never knew then, that the man had five years earlier studied and published a survey of African Neurosurgical manpower which, in 1998, was presented to WFNS executive council to highlight the serious Neurosurgical manpower shortage confronting the African continent, especially the sub-Saharan Africa.

The presentation became a kind of (wakeup call) turning point for WFNS as a whole to the unacceptable disparity of Neurosurgeon: population density in Africa compared with the rest of the world. This, I believe, led to the establishment of the foundation, and subsequent events from special Neurosurgical equipment to the establishment of WFNS-Rabat Training Center (WFNS-RTC).

Through the zeal of this one man for African Neurosurgery, the African situation was understood, and targeted, meaningful strategies were planned and implemented between himself and WFNS.

Dr. Nasiru, finally made his way to Rabat, from where he was sponsored for Six Months to the United States by the Rabat training center, for Gamma knife fellowship and six weeks training in INI Hanover. He returned to join me and prepare for his West African College of Surgeons' Fellowship Examination in 2004. His presence now meant we could start a more meaningful training within the West African College of Surgeons.

Since Dr. Nasiru, I was also to get three more residents to Rabat Training Center, including Drs Abdullahi Onimisi Jimoh, Ali Lasseini, and Usman Babagana, and each of them are back to Nigeria, and practicing in University Teaching Hospitals today.

The Rabat Training Center was not only for training of young Neurosurgeons but became a hub of African Neurosurgical activity, that brings the North and South of Africa together annually.

Close to the WFNS congress in Marrakesh, there was hardly any African Neurosurgeon that has not been invited to present a paper along with some distinguished Neurological Surgeons from other parts of the World. These exchanges and the social events that accompanied them, including all the dinner receptions in the author's residence, brought a lot of discussions and understanding amongst us, much more than you can get from an association's meeting.

The Marrakesh WFNS congress, put us all out on the world stage, and some thoughts about the inability for PAANS to represent African Neurosurgery really began in Marrakesh and continued to develop to the current day body of Continental Association of African Neurological Societies(CAANS).

The young African Neurosurgeon will forever be grateful to the Author, not only for documenting these events as they happened, but his zeal and commitment, in not only diagnosing the problem and proposing solutions, but also in really doing it all by himself with his team in Rabat, Morocco.

I read this book with pride for our continent, that one of us can accomplish this and by so doing, has energized us all and called us to action. Today, we are communicating with each other and exchanging residents. Be it on a small scale but, with the exemplary initiatives and work done by the author, most Sub Saharan African countries, especially in West Africa, with few or no Neurosurgeons, now have improved Neurosurgeons: Population density.

We all must read this book, for there is still a lot to do. The model used by the Author, of engaging his Government, WFNS and local society is one that can help in our African setting.

Nelson Mandela said, "it always seems impossible until it's done"!

The Author has proved that.

Professor B. B. Shehu
Vice Chancellor,Federal University
Birnin Kebbi, Kebbi State, Nigeria
President Elect, Continental Association of Neurosurgical Societies (CAANS)
President, Nigerian Association of Neurological Surgeons (NANS)

Prof. Abderrahim EL OUARZAZI

Rabat, Morocco *

The book that you are about to read gives an account of historical events regarding neurosurgery. Neurosurgery keeps evolving and depending on the advances of neurosciences. As to the emergence and evolution of African neurosurgery, the succession of events reported summarizes the author's experience which remains, as any other experience, the sum of encouraging success and sometimes of failures with a significant impact (Berlin, 1995).

The task of a teacher is pure devotion. It requires from the teacher some virtues that belong to humankind and others relating to the task itself.

In a momentum of scientific generosity, Professor El Khamlichi decided to open the horizon of Moroccan neurosurgery through the organization of the first world congress of neurosurgery that was held in 2005 in Africa. In front of 3,000 participants, a commitment was taken to bridge the gap in neurosurgery, and eventually deal with the issue of training young Afrian neurosurgeons. The results reached regarding the status of neurosurgery in Africa was alarming and true, but a man was needed to negotiate with international bodies and, from then on, to define the path of Moroccan neurosurgeons, and therefore, of African neurosurgeons. The scientific methodology of the curriculum was initially suggested by El Khamlichi, under the auspices of the Moroccan Society of Neurosurgery. It could only be approved by the WHO, the WFNS, and the Moroccan university authorities.

The world congress of neurosurgery was successfully held in Marrakesh, and put an end to the concept of "indigenous" Africa. To widen even more the horizons of Moroccan neurosurgery that was still at that time restrained by technological advances, the setup of a National Center for Rehabilitation and Neurosciences with the most advanced equipment would define it as a temple for knowledge and research at the reach of teachers and doctors. At the Center, young neurosurgeons under training can try all

* Translated from the French.

the chapters in the specialty, from theory to the operating room, including radiosurgery and functional neurosurgery. Therefore, the setup of the center as Rabat Training Center allows for a constant upgrade of basic training of neurosurgeons from all countries.

The sincere and grateful testimonials coming from the hearts of young Sub-Saharan neurosurgeons convey the feelings and hopes of Professor El Khamlichi. Their message proves that language, be it French or others, can never hinder the spread of medicine for the benefit of patients. Through this newly-established panafrican network, the strategy for the development of neurosurgery by the year 2030 has acquired an additional asset towards success, because as we neurosurgeons say, "A master is always proud of his pupils who outperform him".

Doctor Abderrahim El Ouarzazi
Professor of Neurosurgery
UHC of Rabat, Morocco

Prof. Sherif EZZAT

Cairo, Egypt

Although neurosurgery has been one of the earliest practices thousands years ago, and despite the fact that it has been documented in the black continent namely in Egypt, modern neurosurgery would not make its way into the northern and the southern parts of Africa until the late fifties of the 20th century.

The long years of colonization together with the high expenses required for training abroad and purchasing the technology needed for practice, made it difficult for practitioners to obtain specialization in neurosurgery in sufficiently high numbers. However, with the effort of dedicated pioneers in the above-mentioned areas, well trained generations are now practicing advanced neurosurgery with all its subspecialties, almost covering the needs in northern and southern Africa.

The main problem remains with sub-Saharan Africa which is almost deprived of any neurosurgical facilities. During the last two decades, much effort has been done by the WFNS, the WFNS–RTC and the local neurosurgical societies in North Africa to establish training programs for practitioners from sub-Saharan areas to start practicing neurosurgery.

In this must-read documentary book, Professor El Khamlichi, who is one of the pioneers of neurosurgery in Africa, has spent a long time in his life working for the uprise of neurosurgical practice in Africa both in the continental and international levels. He has documented the history of neurosurgery in Africa and described thoroughly how the training program was established, and the great effort to recruit trainees from sub-Saharan areas, as well as the encouraging good number of those who have finished training and returned back home to start practicing.

The enthusiasm, perseverance and strong will of Professor El Khamlichi are quite evident and so much appreciated throughout the long way he has taken to establish the WFNS–RTC, and to maintain it as one of the most eminent training centers. He gives

a great example to our new generations on how to set an aim and work to reach it.

I recommend this book to every neurosurgeon in Africa to know how much effort has been and is still being done towards the progress of neurosurgery in Africa, and also to neurosurgeons from other developing countries all over the world to learn how to make benefit out of this outstanding African experience.

Prof. Dr. Sherif Ezzat
Professor of Neurosurgery
Al Azhar University - Cairo

INTRODUCTION

My first connection to African neurosurgery dates back to 1975, when I attended the second meeting of the Pan African Association of Neurological Sciences (PAANS) held in Dakar from March 17th to 20th in 1975.

My commitment to African Neurosurgery development would happen two decades later, between 1993 and 2000, thanks to four events: (i) the bid for Marrakesh (1993) to host the first world congress of neurosurgery to be held in Africa; (ii); election of Dr. M. Samii as President of the World Federation of Neurosurgical Societies (WFNS) in 1997, who showed, since the beginning of his mandate, his willpower to support neurosurgery in developing countries, and ended up setting up a foundation for this purpose, the WFNS Foundation; (iii) my election as WFNS Second Vice-President (1997); (iv) the conduction of the first survey on the status of neurosurgery in Africa (1995-98), which has shown for the first time, the historical delay of neurosurgery in Sub-Saharan Africa. The upcoming chapters will show the role of these four events in promoting and advancing African neurosurgery.

The results of the first survey on the status of African neurosurgery were published (1,2,3,4) and presented in different international meetings to keep the neurosurgical community worldwide informed about the alarming ratio of neurosurgeons in Sub-Saharan Africa. These results were reviewed with a group of African neurosurgeons and summarized in a report we presented to the WFNS AC (Administrative Council), on February 20, 1999 (29). This report depicts the first development plan of African neurosurgery established by African neurosurgeons.

The vote on the occasion of the WFNS EC (Executive Committee) in San Francisco, April 9, 2000, in favor of Marrakesh to host the 13th World Congress of Neurosurgery, its promotion during five years and its organization in a magical African city, marked a turning point in the relationship between the WFNS and African neurosurgeons. The spirit of the promotion and organization of this first world congress aroused enthusiasm among African neurosurgeons, who have become aware that the historical delay of neurosurgery in Africa was not inevitable, and that its development goes essentially through encouraging young neurosurgeons training. African neurosurgeons also understood that they have to be unified into a continental neurosurgical organization to be heard at the international level.

Consequently, the publication of the first survey on the status of African neurosurgery and the organization of the first world congress of neurosurgery, in Africa, would drive African neurosurgery out of the shadow. The abovementioned report presented to the WFNS AC, would remain behind all historical initiatives taken by the WFNS in favor of African neurosurgery. Among these initiatives, there is an innovative project, the accreditation of regional training centers to train young African neurosurgeons in their area with scholarships granted by the WFNS Foundation. The main objective of the project is to increase the ratio of neurosurgeons in Sub-Saharan Africa and train these young doctors in their environment, avoiding therefore brain drain.

The first regional center accredited by the WFNS in 2002 is located in Rabat, Kingdom of Morocco, called the «WFNS Rabat Reference Center for training African neurosurgeons» or WFNS-RTC (WFNS-Rabat Training Center). The setup of this center had the privilege to be supported by His Majesty Mohammed VI, King of Morocco. This support allowed the involvement of all neurosurgeons, medical schools and Moroccan University Hospital Centers. Thanks to the local commitment and permanent support of the WFNS, this first regional training center has achieved remarkable results during its first 16 years of activity (2002-2018), either in its basic training program to

obtain a certificate of specialization in neurosurgery, or in Continuing Medical Education (CME), which is the reason why the WFNS-RTC receives the support of many international institutions as a model of North-South and South-South cooperation in the field of training and education.

The aim of this book is to bring a testimony of an exemplary collaboration between African neurosurgery and the WFNS, which results in the emergence of neurosurgery in the continent. I have been privileged to participate actively in this collaboration with enthusiasm and determination, and to witness its results on the evolution of African neurosurgery, for more than twenty-five years. I deemed it necessary to provide such a testimony, to pay a tribute to those who initiated the events mentioned above and to push the young generations, at the level of the WFNS and Africa, to have the benefit of hindsight when they are delighted today to witness the achievements of the WFNS, and the progress of African neurosurgery.

This book is an advocacy to encourage local training in national and regional centers in Africa. This training model has demonstrated its value in bringing a solution to the shortage of neurosurgeons and to establish a sustainable development of neurosurgery. The reader will find out that the inequality in the development of neurosurgery in different African regions depends on local training, whether it is omitted by some or supported by others. However, the success of this national or regional training requires some conditions, which is the reason why we point out in this book, not only the training program of the WFNS-RTC, but also the huge work made by Moroccan neurosurgeons with the support of Moroccan authorities, in creating a favorable environment to this first WFNS regional training program for young African neurosurgeons.

The field-based results, in other words, the future of young African neurosurgeons, when they are back home after finishing their training at the WFNS-RTC, remain the main criterion to assess the quality of their training. Consequently, the results of the survey we conducted

among the first trainees who are already back home are also presented; we have also added at the end of the book some papers written by these trainees, which highlight their contribution to neurosurgery and their desire to advance it in their respective countries.

Writing a book on the success of the WFNS-RTC, which is a result of years of collaborative efforts between two international institutions, the WFNS and its Foundation and a southern country, the Kingdom of Morocco, can serve as an example to advance other medical disciplines in developing countries. Three years ago, the World Health Organization (WHO) pointed out (Resolution 68/15) the great need in surgical care worldwide, especially in emergency surgery. The WFNS-RTC can be taken as a model to support the development of other surgical disciplines in Africa and other parts of the world. Therefore, I hope that the distribution of this book will push the WHO to support the development of surgery and the WFNS and African neurosurgeons to succeed, to set up the suggested plan on «neurosurgical development strategy for 2030» (chap.4).

The contents of the book begin with a historical outline of African neurosurgery, then attempt to show how the Marrakesh World Congress and 16 years activity of the WFNS-RTC, have contributed in the take-off of African neurosurgery, with an unprecedented enthusiasm from African neurosurgeons for education and training of young generations. This awareness of African neurosurgeons engendered a remarkable evolution of African neurosurgery over the last three decades, which explains the title of the book: Emerging neurosurgery in Africa. The last part of the book deals with the means to set up, especially the criteria to reach a coherent training system towards a development plan of neurosurgery in sub-Saharan Africa by 2030.

After the successful experience of the WFNS-RTC, the WFNS accredited three other regional training centers in Africa, one in 2010 and two in 2014. Two coordinators have accepted to write an article where they give an overview of the training program taught in their centers. These articles can be found at the end of the book.

I would like to conclude this introduction by expressing my gratitude and recognition to King Mohammed VI for the support of His Majesty to the WFNS-RTC. My deep thanks to those who have contributed in the setup and success of the WFNS-RTC, either at the level of the WFNS and its Foundation or the Moroccan University Hospital authorities, especially the medical schools, the university hospital centers with their departments of neurosurgery in Rabat, Casablanca, Fez, and Marrakesh, Hassan II Foundation for the Prevention and Cure of Nervous System Diseases, the Moroccan Agency for International Cooperation, and the Moroccan Society of Neurosurgery (MSNS). Thanks to the strong rallying of all these institutions, their collaboration and their sustainable efforts, the WFNS-RTC has succeeded in its mission, and has achieved the remarkable results we will expose in this book.

Chapter 1

HISTORICAL OUTLINE OF AFRICAN NEUROSURGERY

1.1- Historical background

Africa seems to have been the cradle of humankind. Ancient history teaches us that during Antiquity and the Middle Ages, a number of civilizations have developed in many areas of Africa, and have enabled the continent to greatly contribute in the genesis of the history of mankind. This historical advantage deeply conflicts with the current lateness of the continent. In fact, since the 11th and 12th centuries, Africa has fallen into a deep slump that lasted for more than eight centuries, and therefore has remained aside from the great cultural, technological and economic advances that would be witnessed since the 15th century. When Africa wakes up at the beginning of the 20th century, it is entirely broken up and colonized by European powers (fig. 1).

Figure 1: Map of Africa showing the territories colonized by European powers by 1914

If the key reason invoked by European powers in support of colonization was to civilize and push forward the African people towards development, reality on the field was totally different. knowledge, technology and business, were kept for European people, whereas the local people, (called indigenous population), were left aside, except for a limited number of public figures who were needed to ensure the stability of the colonial power. When African countries began to achieve independence in the middle of the 20th century, the majority of these countries had illiteracy rates exceeding 90%, and local executives were not in sufficiently high numbers to set up social and economic development. Moreover, the borders set up and left behind by European powers, beside the game of influence of these same powers (which is a new form of colonization of independent Africa), alongside with the immaturity of the leadership and the population who had no experience of democracy, engendered many coups d'état and wars over the borders, and even ethnic conflicts that would delay even more the development of the continent.

Consequently, African countries witnessed, without taking part in, the great advances that revolutionized everyday life during the 20th century. These countries were often blinded by the brightness of these advances that were relayed by the local media. At the same time, these countries were unable to bring together the most appropriate conditions to enable these advances on the African soil.

With regard to the medical development in Africa in the second half of the 20th century, the struggle went on for setting up vaccination plans against epidemic diseases, such as plague, cholera, tuberculosis, malaria, AIDS, … etc., while on the other hand, other continents witnessed great advances in both preventive and curative medicine, with an unprecedented development in diagnosis and treatment. The lack of medical professionals and the endless needs in basic healthcare urged African states to deliver only primary healthcare to their citizens, therefore marginalizing neurosurgery and neurology, considered wrongly as "luxury specialties".

1.2- Contribution of Africa in the ancient history of neurosurgery

Several anthropologists have stated that the greatest evolution in human prehistory has taken place in Africa, and that the first civilization in humankind takes roots around the Nile valley. In the

papyrus documents of Pharaonic Egypt, descriptions are made of the way head trauma were treated, endonasal brain aspiration (before mummification), and trephination that pharaohs underwent just before death, in order to allow for their souls to find their way to paradise (5,6). Several papers have been published recently, stating that trephination has been widely practiced by healers in Africa between the Middle Ages and the middle of the 20th century (3). These papers summarize the history of trephination in Africa, and describe how different the technique can be from one area to another. It is also rightly pointed out in these papers that this technique has been most traditionally practiced in Africa. Its traditional form mixes up both prehistory trephination and trephination in its "modern" form, which is based on the concepts of Arab-Islamic medicine in the Middle Ages, namely: +shaped incision of the skin, trephination of the bone, keeping the dura matter intact, and removal of fragments of broken bones. The technique was mainly used in cases of headache or suppuration secondary to head trauma.

Among the tribes in Africa whose healers have practiced and taught the basic rules of trephination for centuries, we can mention Chaouia and Kabyle tribes (respectively in Morocco and Algeria), the Gouache in the South of Morocco, and the Tuareg in Sub-Saharan Africa and Libya (fig. 2 a, b).

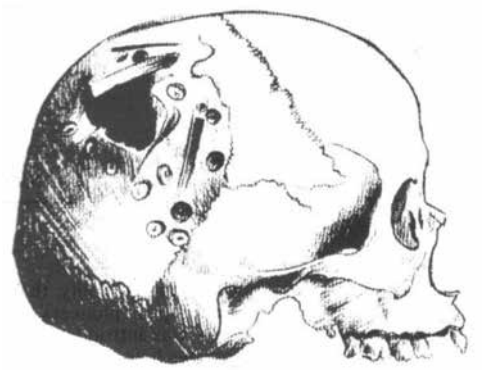

Figure 2 (a): Sketch of a skull discovered in 1887 by Dr. H. Malbot in Teberdega (Aures, Algeria). The skull belonged to a patient who had undergone several trephinations with the aim of treating skull injuries, but who eventually died of smallpox (7)

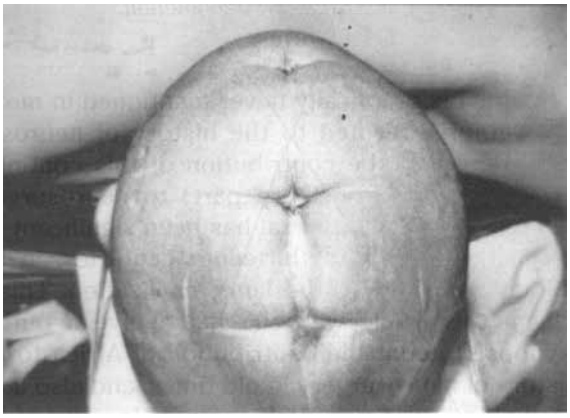

Figure 2 (b): Traces of trephination on the skull of a patient living in the South of Morocco (Laâyoune). I examined the patient more than 40 years ago (in 1973), at the Department of Neurosurgery in Rabat. He had undergone trephination 20 years before. You may notice the morphology, the spots, the incision limits, and the trephination limited to the external bone

It should be mentioned that Arab-Islamic medicine has greatly contributed to the development of medicine during the Middle Ages, as it flourished in North Africa, and later allowed for medicine to develop in Europe in the 13th century: Hussein Ibn Sina (Avicenna) (980-1037), Abubakr Ar-Razi (Rhazes) (830-923), Ibn El Haytham (952-1038), Ibn Tofail (1100-1183), Ibn Zohr (Avenzoar) (1101-1161), Ibn Rochd (Averroes) (1126-1198), Ibn Maymon (Maimonide) (1135-1204), and many others (5, 13, 17, 18), have all marked the Golden Age of Arab-Islamic medicine. The knowledge and practice of those Hakims (Arabic translation of "doctor", literally meaning "wise man") have later spread around the Mediterranean, and have been taught in medicine schools (School of Cordoba, Spain, Karaouiyine University in Fez, Morocco; Schola Medica Salernitana in Italy, Ecole de Montpellier in France). Further to this spread of knowledge, the first care facilities were built (also called Maristan, Arabic word meaning "hospital" in that period).

It is Abulqassim Al Zahrawi (Abulcasis) (936-1013) who is mainly considered to be the pioneer of neurosurgery. His book "Kitab Al Tasrif Liman Ajaza an Al Talif" (12) included 30 treatises. It has been

translated into Latin, Hebrew, and French. This book would later be considered as the basis for teaching both medicine and surgery in various schools in Europe during the Renaissance. Abulqassim Al Zahrawi would make up, together with Galen and Hippocrates, the references of medical sciences of that period.

Abulcasis was the first to design surgical instruments. His monography contains 190 sketches of surgical instruments; many of them are similar to those used nowadays by surgeons in different forms (fig. 3).

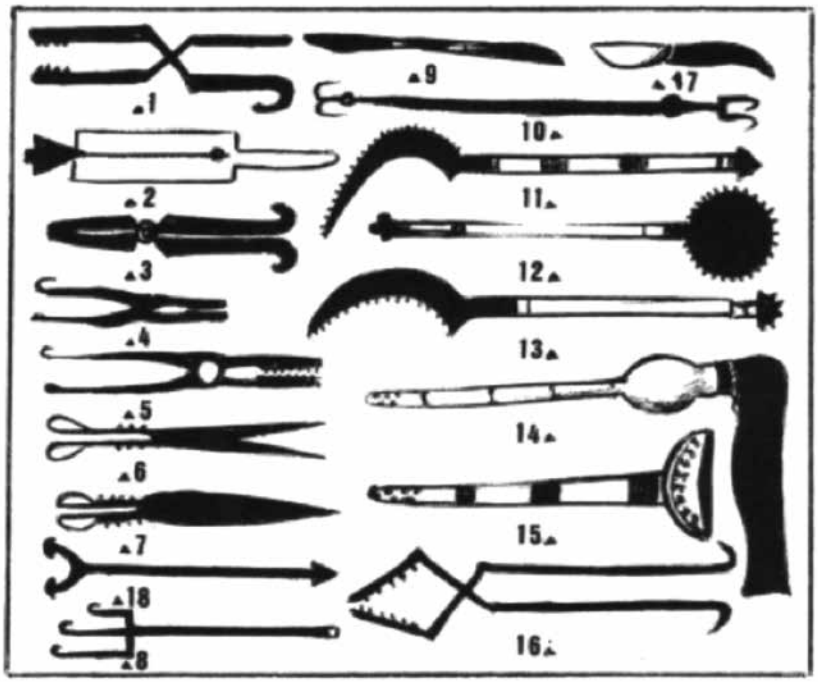

Figure 3: Sketch of surgical instruments used by Abulcasis. Similar instruments are used nowadays by neurosurgeons: the trephine (12, 14, 15), syringe (2), scissors (6, 7), hook (10), and retractor (1, 8, 16)

Beside writing his book and listing instruments, Abulcasis also sets up the modern basis of surgery teaching and practice, which are still referred to nowadays, namely: knowledge of anatomy, asepsis, (use of wine and alcohol for sterilization), and use of opium and derivatives for anesthesia.

This knowledge in medicine has spread through North Africa between the 9th and 13th centuries. It would spread to Europe later where it is taught since the 15th century. Unfortunately, the more this knowledge spreads to Europe between the 13th and 14th centuries, the more Africa would fall into a slump. Africans would only keep from Abulqassim (Abulcasis) the trephination technique, which has been used by medicine men in African tribes until the middle of the 20th Century.

1.3- The birth of modern neurosurgery in Africa

Modern neurosurgery has developed in Europe and North America in the first half of the 20th century, based on the great advances made in neuroanatomy and neurophysiology between the 17th and 19th centuries. Neurosurgery benefited from the advent of the first cerebral imaging techniques such as ventriculography (1917), pneumoencephalography (1919), and angiography (1927). However, all African countries were colonized during the first half of the 20th century. European powers therefore introduced the first modern healthcare system along with neurosurgery in Africa. Colonization of the various African countries brought a great colonial medical diaspora community to the continent. This community organized the healthcare system at the same time as military conquests were carried out; this for two main reasons: in order to help the colonizing troops pacify local communities, but also with the aim of protecting the people and settlers against epidemics (smallpox, cholera, typhus fever, plague, malaria…). Therefore, the credit of this colonial medical diaspora, was the setup of the first basic healthcare system in Africa, which played a crucial role in fighting against epidemics, also helping introduce the modern basis of preventive and curative medicine.

African Neurosurgery was born in departments of general surgery, and was practiced by foreign general surgeons, all citizens of European colonizing countries (French, British, Portuguese, Spanish, Italian, …). Several articles dealing with neurosurgical pathologies must have been published in medical journals at that time all over Africa. Unfortunately, those journals were not circulated and stopped being published in the 1950s and 1960s, when African countries began taking their independence.

In Morocco, since the first decade of the French and Spanish Protectorate that lasted 44 years (1912-1956), the French physicians who lived in Morocco began to publish, in 1920, Maroc Médical, a medical journal. The journal is still published today (fig. 4) after being taken over by the first Moroccan physicians; it remains an excellent reference with regards the history of medicine in Morocco and North Africa in the 20th Century. The first articles related to infectious neurosurgical pathologies were published since 1929 (13). Later, between 1930 and 1950, other articles were published dealing with trauma, tumors, malformations, and vascular neurosurgical pathologies (14,15,16). The first papers related to functional neurosurgery were published since 1950 (17,18,19). The first issues of the journal dedicated to neurosurgery date back to 1957 and 1960 (fig. 5, a and b).

Figure 4: Cover page of the magazine *Maroc Médical*
(a) A copy dating back to 1922


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المغرب الطبي

MAROC MEDICAL

FONDÉ EN 1920

SOMMAIRE	CONTENT
PARTIE SCIENTIFIQUE	SCIENTIFIC PART
* Articles originaux	* Original articles
* Faits cliniques	* Cases report
* Mise au point	* Set point

PUBLICATION TRIMESTRIELLE TOME 35, N°3, SEPTEMBRE 2013

Figure 4: Cover page of the magazine *Maroc Médical*
(b) A copy from 2013

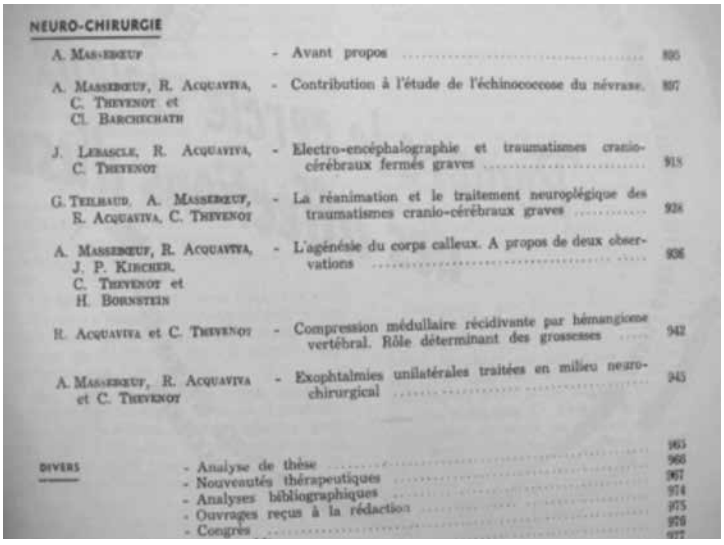
NEURO-CHIRURGIE

Figure 5 (a): First issue of *Maroc Médical* dedicated to Neurosurgery (1957)

NEURO - CHIRURGIE

SOMMAIRE

GÉNÉRALITÉS

Figure 5 (b): Second issue of the journal dedicated to Neurosurgery (1960)

Neurosurgery, as a specialty carried out independently from general surgery in dedicated units or departments, began in some African countries between 1940 and 1960, when these countries started taking back their independence. The first departments of neurosurgery were set up and managed for many years by European neurosurgeons before local African neurosurgeons were trained in neurosurgery.

In North Africa, the first units of neurosurgery were set up in Algiers, Algeria, in 1942; and in Casablanca, Morocco, in 1948, respectively by Doctors P. Goignard and A. Masseboeuf; both were French neurosurgeons. These two units would become departments in 1954 in Algiers and in 1960 in Casablanca. A second department would be created in Rabat, Morocco, in 1960. These two first departments in Morocco (namely in Casablanca and Rabat) were first chaired by Doctors R. Aquaviva (Casablanca) and Tourneaux and J. Hermo

(Rabat). The first local neurosurgeons in north Africa would take over between 1960 and 1975: those are Doctors H. El Kerdoudi, D. Bouchareb, A. El Ouarzazi and A. El Khamlichi in Morocco; M. Abada, A. Abdelmoumen, A. Bousalah and Boutmene in Algeria; and M. Betteyeb in Tunisia. The latter set up the first operational department of neurosurgery in Tunisia in 1964.

In Egypt, the first neurosurgeons to set up neurosurgery between 1950 and 1960 were Drs. A. Abu Zikri, O. Sorour, I. Higazi, A. Benhawy and S. El Guindi in Cairo, and S. Boctor and G. Azab in Alexandria (20).

In South Africa, the practice of neurosurgery began with Doctors R.A. Krynauw in Johannesburg in 1940, and H.L. de Villiers Hammann in Cape Town in 1946, both born in South Africa and trained respectively in Oxford (United Kingdom) and Munich (Germany). These pioneers would set up the first two departments of neurosurgery in South Africa. They would soon be joined up by other pioneers like J. Erasmus, A. Gonski, P.C. Keet and later by J. de Villiers. Thanks to those pioneers and to economic development, neurosurgery in South Africa soon made a great step forward, following the steps of European countries in their evolution during the second half of the 20th century.

In Sub-Saharan Africa, neurosurgery would be set up as a specialty later than in North Africa and South Africa. It would be a hard task to define the beginning of neurosurgery and the names of pioneers in the field in each African Sub-Saharan country. In his book "Neurosurgery in Africa", Dr. A. Adeloye (20) gives the following account:

In West Africa, the first neurosurgery unit has been set up in Dakar, Senegal, in 1967, by French neurosurgeon B. Courson. Two other French neurosurgeons joined him, namely Drs. C. Cournil in 1972 and B. Alliez in 1975, before the first Senegalese resident joined up, Dr. M. Gueye, in 1977, and became the first Senegalese Professor and Neurosurgery Department Chairman. In the Ivory Coast, the first neurosurgical unit was set up by C. Cournil in Abidjan in 1976, after he left Dakar. The first Ivorian neurosurgeon, Dr. K. Kanga, had already started practicing neurosurgery in 1974. In Ghana, the first Ghanaian neurosurgeon, Dr. J.F. Osman Mustaffah, set up the first neurosurgery department in 1969. In Nigeria, neurosurgery was introduced in the country by local neurosurgeons. The first department was set up in

Ibadan in 1962 by Dr. E.L. Odeku. He would later be joined by two other local pioneer neurosurgeons, Dr. A. Adeloye in 1967 and Dr. A. Olumide in 1974. A second department was created in Lagos in 1968 by Dr. C.D. de Silva and Dr. N. Ojikutu. A third department was set up in Enugu, in 1974, by Dr. S.C. Ohaegbulam.

In East Africa, neurosurgery was set up by English-speaking neurosurgeons from Europe. In Kenya, it was introduced by Dr. P. Cliffort, before an Italian neurosurgeon joined him in 1967, Dr. R. Ruberti, who would work in the private sector then later in hospitals on a part-time basis. In 1972, an Indian neurosurgeon, Dr. Jawaher Dar, would join and dedicate himself to neurosurgery in public hospitals. In Uganda, following the advice of renowned British neurosurgeon V. Logue invited as Visiting Professor at the end of the 1960s, an Irish neurosurgeon, Dr. I. Baily, set up the first neurosurgical unit in 1969. In 1971, Dr. J. Kiryabwire, the first Ugandan neurosurgeon would join him, after training in London.

Among the English-speaking neurosurgeons from Europe who played an important role in introducing neurosurgery in Sub-Saharan Africa, it is worth mentioning Dr. L. Levy*, a British neurosurgeon who reached Zimbabwe (former Rhodesia) in 1956. In 1959, he noted, according to Dr. A. Adeloye (20), "that there were 20 neurosurgeons all over Africa, most of them practicing in South Africa". Dr. L. Levy was named Professor and Chairman of the Neurosurgery Department at the Central Hospital of Harare in 1971. In 1972, Dr. W.C. Auchtertonie joined him, who was responsible of a second Department of Neurosurgery at the European Hospital in Harare. These two neurosurgeons treated patients from Zimbabwe, but also patients from the neighboring countries such as Malawi, Zambia, and others.

This overview of the birth of neurosurgery in Africa helps us draw the following observations:

- African neurosurgery is young. It was born 60 years ago in South Africa and in some countries in North Africa. However, in the majority of countries, neurosurgery has been introduced as a specialty for one to two decades only.

* Dr. Levy was awarded the WFNS Medal of Honor during the 13th World Congress in Marrakesh.

- Neurosurgery was introduced in the majority of African countries by European neurosurgeons, citizens of the colonizing power. Upon reaching independence, no African country had local neurosurgeons. Moreover, the number of native physicians was very limited, mostly less than five. Therefore, all African countries, having reached independence, confronted a very bad healthcare situation. They all needed to keep European physicians already in place, and looked for a way to bring more physicians in order to meet the needs of the local population. This is the main reason behind neurosurgery being practiced by Europeans far beyond independence, as was the case for other medical specialties.

This shortage in native physicians, beside a lack of neurosurgeons in African countries post independence, was a result of the limited number of African students in medical schools during colonization, even though colonizing powers seemed aware of the importance of healthcare professional training and worked towards setting up medical schools and Faculties in many areas of colonized Africa.

In North Africa, l'École Préparatoire de Médecine et de Pharmacie d'Alger (Medical and Pharmacy Preparatory School of Algiers) was founded in 1857; la Faculté de Médecine et de Pharmacie d'Alger (Faculty of Medicine and Pharmacy of Algiers) in 1909; the Cairo Medical School in Egypt, in 1881; in East Africa, the Kitchener School of Medicine in Khartoum, Sudan, in 1924, and the Medical School of Uganda in Kampala, in 1924; in West Africa, the Medical School for French-Speaking Countries of Western Africa (*Ecole de Médecine de l'Afrique Occidentale Française*) was set up in Dakar in 1918. In 1953, it became the Medical School of Dakar (*École de Médecine et de Pharmacie de Dakar*).

All these schools were managed by directors from European countries and hired teachers from European universities. Most of these schools trained physicians to obtain medical degrees in compliance with medical degrees from European schools. However, access to African medical schools was restricted to European citizens living in Africa. African students began enrolling in these schools only after World War II.

Other schools, for native students, like the aforementioned School for French-Speaking Countries of Western Africa (*École de Médecine de l'Afrique Occidentale Française*), trained assistant physicians (over

a period of 4 years), and assistant pharmacists (3 years), intended to assist European physicians, to ensure the Local Medical Assistance (*Assistance Médicale Indigène*). Mainly local students were admitted in these schools. This type of schools were founded in many colonized French-speaking countries (Cameroon, Togo, Congo Brazzaville, Mali, Madagascar, …). These schools did not issue a medical degree but a local administrative certificate for "Assistant Physicians" or "Assistant Pharmacists". In 1944, the term "assistant" became "African" ("African Pharmacists" and "African physician"(21).

We can conclude this overview on the birth of modern neurosurgery and modern medicine in Africa, during the colonial period with two observations: (i) the colonial medical diaspora succeeded to set up the basic healthcare system in Africa, alongside neurosurgery, and in fighting epidemic diseases, but (ii) this diaspora failed in training local physicians and health care professionals, leaving all African countries achieve independence with a deeply precarious healthcare system.

1.4- Evolution of African neurosurgery during the second half of the 20th century

In the 1950-1960s, the majority of African countries began reaching independence from European powers. Consequently, all these countries faced many social and economic challenges. Among these issues, there were healthcare and education. The need to solve these issues was urgent, as the majority of the population was young (50 to 60% were less than 20 years old), and the illiteracy rate around 80 to 90%. Such situation can engender lack of hygiene and poverty, which can be considered as the breeding ground to infectious and parasitic transmissible diseases.

The need for healthcare with the lack of physicians and other professionals, have pushed newly-independent African countries to set up a medical training program, and hospitals to provide the countries with executives, in order to meet the basic needs of the people for preventive and curative healthcare. Consequently, each newly independent country has striven to set up a national school of medicine and a university hospital in order to implement a national medical training program. When these schools and hospitals first opened, they were supervised by European teachers from the local diaspora, or by teachers coming from Europe as part of cultural cooperation with the previously occupying power. This power having later became the first provider of technical assistance of the freshly independent country.

It is in this context that the first generations of locally trained physicians have developed neurosurgery and other medical specialties in Africa.

When neurosurgery was first born in Africa, it was practiced by European specialists, while native neurosurgeons were being trained locally, as was the case for the rest of medical specialties, for more or less longer periods depending on the country. It is important to learn, however, that during the second half of the 20th century, neurosurgery was almost at the same level in most African countries having reached independence in the 1950s and 1960s: one or two European neurosurgeons who already introduced neurosurgery, or general surgeons managing emergency neurosurgical cases, like intracranial hematomas, intracranial abscess, or CNS abnormalities in children. But forty years later, towards the end of the 20th century, neurosurgery would reach different levels according to the area with a significant difference between North African countries and South Africa on the one hand, where the level of neurosurgery and number of neurosurgeons were significantly high, and Sub-Saharan African countries on the other, where the number of neurosurgeons was very low.

This discrepancy resulted from the training systems followed by each of these countries after their independence. Most North African countries (Morocco, Algeria, Tunisia, and Egypt) have organized exams to select applicants in order to train them as specialists (in neurosurgery or other) since the first generation of students, in their first national medical school, reached the sixth year.

As an example, the first Medical School was officially open in 1962 in Rabat, meaning six years after reaching independence in 1956. Six years later, in 1967, a University Hospital Center internship examination was organized, in order to select seventeen interns among the first generation of students who would orient towards various specialties to complete their training in foreign countries, and who would later become national teachers in medicine. In the same year (1967), examinations were organized for the selection of associate and Assistant Professors among the first Moroccans physicians, who were trained outside Morocco (in France) during the protectorate period. These doctors would become the first Moroccan professors of medicine. As the number of students increased from one year to the next, the number of University Hospital Center interns also

increased, alongside the number of associate and assistant professors. Therefore, the French professors who began teaching medicine in 1962 were gradually replaced by Moroccan professors. After twenty years (1962-1982), more than eighty percent of the training program was taught by Moroccan teachers. With an increasing number of local teachers, other medical schools opened in the country.

Other medical and surgical specialties also developed at the same time as neurosurgery and ended up with a training program. As already mentioned, the first two neurosurgery departments in Morocco were set up in Rabat and Casablanca in 1960, respectively chaired by Prof. J. Tourneaux and Dr. R. Aquaviva, both French neurosurgeons; each of them was assisted by two or three European neurosurgeons. After the first medical school opened in Rabat in 1962, a training program in neurosurgery was set up in 1968. Ever since, under the pressure of the first trained Moroccan neurosurgeons, neurosurgery has been recorded as a priority specialty by the Ministry of Health, with the following instructions:

- Encourage local training, with additional training in foreign countries, as it increases the number of neurosurgeons meeting the patients' needs in the country, and trains neurosurgeons adapted to local conditions. Local training pushes healthcare planners to develop neurosurgery in the country; it also has limited costs when compared to a full training in a foreign country;
- Promote clinical research with the aim of assessing the number of patients with neurosurgical diseases at the national level, which invariably leads to the development of neurosurgery in the country;
- Encourage the organization of neurosurgeons and the promotion of neurosurgery in the country;
- Include neurosurgery in the pyramidal structure of Moroccan healthcare system, with an upgrade of the specialty in all university hospitals, and later in all regional hospitals, according to the number of patients treated in these hospitals.

By supporting local training, Morocco ended up, at the end of the 20th century (1998), with eighty native neurosurgeons, while there were none in 1956. It also ended up with nine neurosurgical departments, with four of these being inside university hospitals, a national society

of neurosurgery being member of the WFNS (World Federation of Neurosurgical Societies), and ready candidate to host a world congress of neurosurgery.

The evolution of neurosurgery in the remaining countries of North Africa (Algeria, Egypt and Tunisia) took place approximately in the same way as in Morocco. Soon after reaching independence, these four countries set up national schools of medicine. Local training of neurosurgeons has been encouraged, which helped them meet the needs of their respective populations. Towards the end of the 20thcentury, all these countries had a fair number of neurosurgeons and also a society of neurosurgeons.

The training system in sub-Saharan African countries seems to have been very different, even though neurosurgery was set up as a specialty in most of these countries between 1960 and 1970, and even if national medical schools were open soon after independence. Indeed, most of these countries chose to train neurosurgeons outside, either in Europe or in North America. The aims of this training system would be reached over a longer period of time, and has therefore proved to be inefficient to train a sufficient number of neurosurgeons to meet the needs of the population. These countries ended up at the end of the 20th Century with a significant lack of neurosurgeons.

This situation depended closely on the following reasons: (i) the number of young neurosurgeons sent outside the country was very limited, as it depended on the number of scholarships awarded by international institutions, or by the host countries,. (ii) a full training in neurosurgery in Europe takes six to eight years. This gives the trainee enough time to adapt to the country and to the working conditions, to everyday life, and may even marry, which leads the trainee to stay in the host country instead of going back home. (iii) those who choose to go back to their home country eventually face many issues: they had working conditions that cannot be compared to those in the host country, harmful social conditions (limited freedom, human rights not being respected) and lack of reaction from the authorities towards the development of neurosurgery in some countries, … etc. All these factors would restrain young African trainees from going back home, and would finally push them to settle in the host country, or emigrate to another country located either in Europe or in North America, but would never lead them to emigrate to an African country.

A high number of African neurosurgeons would never return to their home countries, because of the abovementioned conditions. This is the reason why Sub-Saharan African countries would reach the end of the 20th century with a rate of one neurosurgeon to 7 or 10 million inhabitants. Instead of promoting local training, some of these countries would try to develop neurosurgery by inviting foreign neurosurgeons who would come as missionaries for a limited period of time to operate patients and/or to train general surgeons into medical procedures to treat emergency cases. This certainly helped save some patients, but has not changed the development of neurosurgery in the country.

1.5- Organization of African neurosurgery during the second half of the 20th century

During the second half of the 20th century, only South Africa and North African countries had a sufficient number of neurosurgeons enabling them to set up neurosurgical societies. The first African national neurosurgical society was created in Egypt in 1967, Egyptian Society of Neurological Surgeons; the second was created in South Africa in 1970, The Society of Neurosurgeons of South Africa. Towards the end of the century, three additional societies were born in Africa: The Algerian Society of Neurosurgery, in 1983; the Moroccan Society of Neurosurgery, in 1984; and the Tunisian Society of Neurosurgery, in 1991. No other African countries among the remaining 45 had enough neurosurgeons that would enable them to set up neurosurgical societies.

At the continental level, African neurosurgeons soon had a society to represent them at the international level. The PAANS (Pan African Association of Neurological Sciences) was set up in 1972 by the first African neurosurgeons, neurologists, and also by some Europeans who went on practicing neurosurgery and neurology in Sub-Saharan countries, as mentioned before.

When the PAANS was first set up in 1972, the number of neurosurgeons and neurologists was very limited in Africa. This limited number in specialists, disseminated all over a huge continent, beside scarce financial means, would not enable the organization of regional or continental meetings in Africa. For thirty years, the mission of the PAANS was to organize a biannual meeting to gather up some African neurosurgeons and neurologists. The PAANS adopted both French

and English as official languages. Through this choice, English-speaking countries on one side, and French-speaking countries on the other were brought up together, while they never united before independence. By organizing a meeting every two years in turns in French-speaking countries and English-speaking countries, the PAANS brought together the two communities and enabled them to exchange experience in neurosurgery and training systems.

The PAANS also had the mission of representing African neurosurgeons at the international level. Indeed, one year after being set up, the PAANS was accepted as member in the WFNS (World Federation of Neurosurgical Societies) during its 5th World Congress in Tokyo, in October 1973. Since then, the PAANS represented African neurosurgeons in the WFNS for forty years to come. Moreover, the PAANS would not let other societies represent Africa in its stead, such as the ANSA (African of Neurological Surgeons Association) set up in 2007 or the AFNS (African Federation of Neurological Societies) set up in 2009. When the CAANS (Continental African Association of Neurosurgical Societies) was set up in 2012, all African neurosurgeons left the PAANS to join it. Since then, the CAANS has been representing African neurosurgeons at the WFNS.

Chapter 2

MARRAKESH WORLD CONGRESS HAS SHED LIGHTS ON AFRICAN NEUROSURGERY

Since the WFNS was created in 1955, it held a world congress every four years. According to its bylaws, all member societies can bid to host a world congress of neurosurgery. The hosting country is chosen after the members of the Executive Committee have casted their votes. This Executive Committee is made up of delegates from all member societies. As the number of African neurosurgeons and African member societies is limited, all neurosurgical congresses that had been organized between 1955 and the end of the 20th century, had been hosted by countries outside Africa, mainly in Europe and North America (table 1).

Table 1 : WFNS Congresses, Dates, City, Presidents' Names

Congress	Year	City	Congress President
1st World Congress of Neurological Surgery	1957	Brussels	Sir Geoffrey Jefferson
2nd World Congress of Neurological Surgery	1961	Washington	Paul Bucy
3rd World Congress of Neurological Surgery	1965	Copenhagen	E. Busch
4th World Congress of Neurological Surgery	1969	New York	A. Earl Walker
5 th World Congress of Neurological Surgery	1973	Tokyo	K. Sano
6 th World Congress of Neurological Surgery	1977	Sao Paulo	Aloysio de Mattos Pimenta
7 th World Congress of Neurological Surgery	1981	Munich	Karl-August Bushe
8 th World Congress of Neurological Surgery	1985	Toronto	Alan R. Hudson
9 th World Congress of Neurological Surgery	1989	New Delhi	Brigadier Ramamurthi
10 th World Congress of Neurological Surgery	1993	Acapulco	Mauro Loyo-Varela
11 th World Congress of Neurological Surgery	1997	Amsterdam	H. August van Alphen
12 th World Congress of Neurological Surgery	2001	Sydney	Noel G. Dan
13 th World Congress of Neurological Surgery	2005	Marrakesh	Abdeslam El Khamlichi
14 th World Congress of Neurological Surgery	2009	Boston	Roberto Heros
15 th World Congress of Neurological Surgery	2013	Seoul	Hee-Won Jung
16 th World Congress of Neurological Surgery	2017	Istanbul	Ugur Ture

The idea for an African country to bid and host a world congress may have seemed both tempting and unrealistic, taking into consideration the reduced number of African neurosurgeons and their weak influence at the international level. In addition, majority of colleagues in the WFNS had limited knowledge on the state of neurosurgery in Africa.

2.1- The birth of the project of Marrakesh hosting a world congress of neurological surgery

Between 1990 and 1993, I often thought of Marrakesh hosting the first world congress of neurosurgery in Africa. The favorable conditions to support the project, were as follows:

- The outstanding evolution of neurosurgery in Morocco between 1970 and 1990. Many advances have been witnessed during these two decades. Firstly, four neurosurgical university departments had been set up (three in Rabat, and one in Casablanca), chaired by Moroccan professors assisted by young assistants and residents under training, all sharing the ambition of developing Moroccan neurosurgery and bringing it to a top international level.

In 1983, *Hôpital des Spécialités* opened its doors in Rabat. It was a 400-bed facility dedicated to head specialties (neurosurgery, neurology, neuroradiology, neurophysiology, ophthalmology, and otorhinolaryngology). This facility was initially equipped with modern technologies required for nervous system exploration. It played a crucial role in developing neurosurgery, introducing cerebrovascular microsurgery in 1983-84, along with transsphenoidal pituitary adenoma surgery, and stereotactic surgery. Beside these improvements in healthcare, gathering all clinical neurosciences specialties in the same facility helped train young doctors and build up multidisciplinary teams dealing with clinical neurosciences.

- A beginning of exchange at the regional and international levels. Immediately after Maghrebian countries took their independence, three national medical societies were born: The Moroccan Society of Medical Sciences, the Algerian and the Tunisian one. The main objective of these three societies was to ensure continuing medical education; this would later be carried out through a yearly Maghrebian medical congress.

The First Maghrebian Medical Congress was held in Casablanca in Morocco in 1965. Since then, a yearly congress would be held in turns in one of the Maghrebian countries. These yearly congresses were the opportunity for the first Maghrebian neurosurgeons, alone or with neurologists, to meet and hold scientific sessions dedicated to neurosurgery and/or to neurosciences. Later, when national societies of neurosurgery were set up in each Maghrebian country, their neurosurgeons would host more scientific meetings, and eventually set up the Maghrebian Federation of Neurosurgical Societies in 1994 (photo 1). I was honored to be a founding member and president of this federation, whose members keep holding a Maghrebian neurosurgical meeting every two years.

Photo 1: First Maghrebian Congress of Neurosurgery, held by the Maghrebian Federation of Neurosurgical Societies, Rabat, November 9-14, 1994

While Moroccan neurosurgeons were in the process of strengthening their relationships with Maghrebian neurosurgeons, they also opened to French-speaking and French neurosurgeons. I have already exposed in the previous chapter the role of French neurosurgeons in introducing modern neurosurgery into Maghrebian countries during

colonization, and in setting it up as a specialty after these countries gained independence. It was therefore a normal consequence that the more Moroccan and Maghrebian neurosurgeons developed their specialty in their respective countries, the more they would interact with French neurosurgeons, and follow both their practical and technical advice when teaching it as a discipline.

These interactions with French neurosurgeons were made possible through the already-existing French-Speaking Society of Neurosurgeons (SNCLF), founded in 1948. This society gathers up neurosurgeons from all French-speaking countries. The first neurosurgeons from Morocco and the Maghreb were all members of this society. Moreover, as the number of neurosurgeons from this area increased by the 1980-90s, Maghrebian countries would become the area with the highest number of French speaking neurosurgeons from outside Europe, beside Canada, and would be represented at the Scientific and Steering Committee (*Comité Directeur et Scientifique*, CDS) of the SNCLF since 1984.

I have had the privilege to be the first representative of Maghrebian countries in the CDS between 1985 and 1991. This position enabled me to help manage this international neurosurgical society. The SNCLF held two scientific meetings every year: a winter meeting in Paris since the birth of the society, and a spring meeting that would be hosted once in a French city and once in a city located in a French-speaking country.

As a representative of Maghreb countries in the CDS, I was invited in 1986 to give an "extrinsic" lecture held during the yearly meeting of the society in Paris, related to the topic «Evolution of the arterial circle of Willis in Moroccan population and incidence of cerebral aneurysms in Morocco». This lecture summarized the conclusions of the first research project I have initiated, between 1982 and 1983, as I took over the Neurosurgery Department at *Hôpital des Spécialités* in Rabat. This project constituted a medical thesis subject for three of my first residents in the department, Doctors M. El Azouzi, F. Amrani, and R. Agdach (22,23,24). It deals with a series of 200 post mortem removed and injected brains, to study the morphology of the arterial circle of Willis in Moroccan population, and searching for cerebral aneurysms.

With this work, we confirmed for the first time that the incidence of cerebral aneurysms in autopsy series in Morocco was the same compared to other regions around the world (1%). With the publication

of these data, supported by our first clinical series of cerebral aneurysms (25,26), we succeeded to put an end to the common believe on rarity or inexistence of cerebral aneurysms in Africa and Middle East, widely reported, between 1960-1980, by the first neurosurgeons who worked in these regions (32).

The interaction of Maghrebian neurosurgeons with their French-speaking colleagues in the SNCLF during the last two decades of the 20th century, would lead the society to hold three congresses in Maghrebian countries, namely the 23rd in Tunis in 1973, the 33rd and the 47th in Marrakesh in 1983 and 1997 respectively. This indicates the active participation of Maghrebian neurosurgeons in congresses held by the SNCLF.

The first Moroccan neurosurgeons were also very active at the African level, especially in the PAANS (Pan African Association of Neurological Sciences) when it first began. A high number of Moroccan neurosurgeons represented by Drs. T. Chkili (neurologist), and J. Hermo, R. Aquaviva, A. El Ouarzazi, A. El Khamlichi, F. Bellakhdar (neurosurgeons) took part in the second PAANS Congress in Dakar, 1975 (photo 2).

Photo 2: Group of participants in the Second PAANS Congress Dakar, March 17-20, 1975, among them three Moroccans : Doctors A. Chkili, A. El Khamlichi, A. El Ouarzazi, respectively 4th, 5th and 6th from left to right

They all presented outstanding papers, namely : (i) an exhaustive report dealing with head injuries, which was distributed to all participants ; (ii) the results of the first survey related to the epidemiology of epilepsy in Morocco. The survey had been conducted over two years (1973-74) at Ar-razi Neuropsychiatric Hospital, University Hospital Center of Rabat; (iii) a series of lectures dealing with cerebral and spinal hydatid cysts. The paper pointed out the risks of these parasitic diseases, and their high frequency at the time, along with the rules for their surgical management; (iv) a unique and innovative series including 125 cases of cervical discectomy-graft, known at the time as Cloward's technique. This technique was introduced in Rabat by Dr. J. Hermo, three years following his training in Geneva, in 1968, after it had been described in 1965 by its author.

Moroccan and Maghrebian neurosurgeons kept on being active within the PAANS for two decades, when they organized three PAANS congresses: Algiers (1979), Tunis (1983), and Marrakesh (1992).

- The birth of the Moroccan Society of Neurosurgery (*Société Marocaine de Neurochirurgie*, SMNC) has been a historical step in the way Moroccan neurosurgeons evolved, and in their emancipation at the international level. After having been members of the Moroccan Society of Neurological Sciences for nine years, Moroccan neurosurgeons, as their number grew (50 neurosurgeons) decided to set up their own society of neurosurgery in 1984, which would join the WFNS (World Federation of Neurosurgical Societies) in 1987.

As I was both the President and Senior Delegate of the Moroccan Society of Neurosurgery, I was able to participate in the WFNS Executive Committee meeting held in Moscow on June 22-23, 1991, held jointly with the 9th European Congress of Neurosurgery. I took part in the vote for the city to host the World Congress in 1997. Four cities took part in the bid: Paris (France), Amsterdam (Netherlands), Istanbul (Turkey) and Madrid (Spain). Madrid withdrew its bid before the vote. Competition was very tight between Paris and Amsterdam; the final vote was for Amsterdam. I would keep in mind this experience for the following ten years, during the bid for Marrakesh to host the world congress.

My second participation in the WFNS Executive Committee meeting, was during the 10th World Congress of Neurosurgery in Acapulco (Mexico), October 17-22, 1993. During the meeting, I became aware of the various steps that make up a world congress, and of the WFNS activities and mission. The congress in Acapulco was the second WFNS congress held in Latin America, after Sao Paulo in 1977, and many others held in Europe, North America and Asia. Since then, I started thinking more and more of the idea that Africa (through Marrakesh and Morocco) could bid to host a WFNS World Congress.

- Setting up Hassan II Foundation for the Prevention and Cure of Nervous System Diseases.

These first ten years (1980-1990) of regional and international exchanges, helped me point out the gaps and shortcomings to be rectified in order to enhance the level of Moroccan neurosurgery, and therefore allow my colleagues and myself to meet the needs of patients for healthcare, and present pertinent papers at the international congresses. Among these shortcomings, we lacked important equipment like MRI (magnetic resonance imaging), radiosurgery, the renewal of material used inside the operating theater (operating microscope, ultrasonic aspirator, and stereotactic equipment) that had served for more than ten years.

Beside this shortage in equipment, there was a lack in continuing training in some subspecialties like skull base surgery and functional neurosurgery. However, this technical and technological upgrade in neurosurgery would not be sufficient if there is a lack in neighboring specialties like neuropathology, neuroradiology, neuro-anesthesiology and intensive care.

It was clear in my mind that this upgrading of neurosurgery and complementary clinical neuroscience specialties requires two actions: encourage short-term training in foreign countries in some subspecialties and invite international experts to visit for 2-5 days in our hospital. During their stay in Rabat, those experts would give lectures and take part in clinical and/or surgical activities, and would conduct workshops for the benefit of young neurosurgeons. To set up these solutions, funds were needed and the hospital and university

budgets would not afford these funds. In order to solve for this issue, we have looked at a funding that would further complete the hospital budget, through the setting up of a non-profit foundation: "Hassan II Foundation for the Prevention and Cure of Nervous System Diseases", on February 13, 1989 (figure 6).

Figure 6: Logo of Hassan II Foundation for the Prevention and Cure of Nervous System Diseases

Setting up this Foundation has had an exceptional impact on the development of neurosurgery in Morocco. It donated equipment and funds, which allowed us to act at four levels:

a) **Equipment:** three years after its establishment (1992), the foundation enabled the purchase of a complete equipment required in the neurosurgical operating rooms, a 1.5 Tesla MRI machine, intensive care unit equipment and surgical equipment for the emergency unit;

b) **Promotion of neurosurgery in the country:** health education campaigns have been organized for ten years by the Foundation, in various areas of Morocco. Each health campaign was run

by ten to fifteen physicians (neurosurgeons, neurologists, and ophthalmologists) that would examine patients in local hospitals of the area, and would take part in scientific meetings organized locally. The physicians would explain to local general practitioners how important the impact of nervous system diseases might be, and the way patients should be managed. Those campaigns were a very efficient means to promote neurosurgery to practitioners and the population, especially when supported by the media;

c) **Training and Continuingl Medical Education (CME):** the foundation covered the travel expenses of young neurosurgeons to allow them attend scientific meetings organized outside of Morocco, or to be trained for short periods of time. Between 1989 and 1999, the foundation would cover every year, the expenses of 10 to 15 young neurosurgeons to attend meetings or 1-3 months training abroad (27).

As for CME, the Foundation sponsored a yearly program of seminars and workshops organized by the department of neurosurgery and conducted by international experts from different countries. Every year, the foundation supported two to three seminars and/or workshops. Beside the seminars and workshops, the Foundation also helped organize scientific meetings jointly with the Moroccan Society of Neurosurgery.

We should mention as examples, the First WFNS Course in Africa, held in Rabat on October 2-4, 1991, the European-Arab Course held with the support of the European Association of Neurosurgical Societies (EANS), held in Rabat on March 9-13, 1990, the 3rd meeting of golf-playing neurosurgeons, Rabat, March 7-8, 1990, and the First Maghrebian Congress of Neurosurgery, already mentioned, in Rabat, November 9-14, 1994. All these international scientific meetings have opened the doors of international neurosurgery to the SMNC, and pushed it to interact and link up with the WFNS and the EANS, thanks to renowned officers of these institutions, who have accepted to attend the abovementioned meetings (photo 3).

Photo 3: First WFNS Course in Africa
Hôtel Safir, Rabat, October 2-4, 1991
The course was chaired by Drs. Late Phanor Perot (5th from left),
Chairman of the WFNS Education Committee,
and A. El Khamlichi (4th from left), Director of the Course

d) **Support of poor patients:** the Foundation would cover the expenses of some medical and or surgical devices for patients who have no health care insurance and cannot afford to cover themselves the cost of such devices.

Beside these financial contributions to the development and promotion of neurosurgery, we will later see that the contribution of the Foundation would be crucial in the bid for Marrakesh to host the first world congress of neurosurgery in Africa.

These are the main changing factors in the evolution of Moroccan neurosurgery by the end of the last century, which encouraged us to put forward the candidature of Marrakesh to host the first world congress in Africa. However, a special event would later help accelerate the project: Dr. F. Isamat's visit to Rabat. At that time, he chaired the Department of Neurosurgery in Barcelona in Spain, and was Past President of the EANS, and had just been elected Chairman

of the WFNS Nominating Committee, during the 10th World Congress of Neurosurgery, in Acapulco, October 17-22, 1993. I had known Dr. Isamat for many years, as we were both members of the SNCLF, and regular attendees of the Winter meeting of the society in Paris. He had honored me by inviting me to attend the 8th EANS Congress he had organized with great professionalism in Barcelona, in 1987. In my turn, I invited him to visit Rabat when he was Chairman of the WFNS Nominating Committee.

It was an opportunity for me to discuss the idea to host the WFNS World Congress in 2001 in Marrakesh. During his visit, we met the Advisor to Late His Majesty King Hassan II, Mr. André Azoulay who encouraged us to submit the bid for Marrakesh, and assured us of the Royal support and consequently of the support of all Moroccan authorities. Dr. Isamat, in his turn, urged us to submit the bid. He assured me of his support, knowing the evolution of neurosurgery in Morocco since the 1980s, and being an admirer of the city of Marrakesh. He also knew of the support of the Moroccan authorities, and he thought it was time for the WFNS to hold a congress in Africa. "Marrakesh would be an ideal African city to host the event," he added.

Since then, the Moroccan Society of Neurosurgery and all Moroccan neurosurgeons mobilized themselves around the project. They worked on making the bid for Marrakesh both a Moroccan and African commitment. An official letter dated April 24th 1994 was sent to Dr. E. Laws, at the time Secretary of the WFNS, suggesting Marrakesh bid to host the 12th World Congress of Neurosurgery in 2001. The preparation of the bid would begin immediately after, as it would be presented in Berlin, during the meeting of the WFNS Executive Committee on May 9th, 1995, held jointly with the 10th European Congress of Neurosurgery.

2.2- Failure of the first bid for Marrakesh to host the World Congress

The Moroccan Society of Neurosurgery began working on the project since the receipt of two answers, one from Dr. E. Laws confirming the bid had been accepted, and the second from Mrs. J. Joseph, Director of the WFNS Central Office in Geneva mentioning the documents to include in the bid and the modes of submission. We were being assisted in the process by two agencies, l'Événementiel and ABF

Congrès, both used to organizing medical events. We contacted the Moroccan authorities for their support, and then went to Marrakesh to get in touch with the representatives of the Congress Palace, hotel owners, and the city authorities. We have been supported by politics, especially with a Royal Recommendation Letter from Late His Majesty King Hassan II, and also letters from several ministers (Education, Health, Transportation, Foreign Affairs, Ministry of the Interior), and from the Wali (Mayor of the city) of Marrakesh. Both *l'Événementiel* and *ABF Congrès* assisted us in the process of collecting technical information related to the bid, all put together in a brochure.

To make sure the bid for Marrakesh would succeed, the brochure should mention five ideas: (i) the recent evolution of neurosurgery in Morocco, its opening to regional and international exchanges ; (ii) a full support from Moroccan authorities who would ensure access to Marrakesh to all neurosurgeons whatever their nationality ; (iii) facilities, advantages and charms of the city of Marrakesh where the GATT conference (General Agreement on Tariffs and Trade) had been held in April 1994, which would later give birth to the WTO (World Trade Organization) ; (iv) The congress budget that should ensure the WFNS a minimum amount of proceeds following the congress, along with the consent of the Moroccan Exchange Office that the amount be remitted into the bank account of the Federation in Geneva: this point had just been added to the list of requirements by the WFNS, as following the 9th World Congress of Neurosurgery in 1989 in New Delhi, Indian authorities did not authorize remittance of proceeds towards bank accounts in foreign countries. Consequently, the US$ 264,000 proceeds of the WFNS out of the congress in New Delhi remained within the Indian boundaries.

A fifth advantage was required for Marrakesh to bid for the congress: the city geographically belongs in Africa, and the WFNS had never organized a world congress in Africa. In order to make this possible, a letter of support had to be sent from the PAANS. By chance, the PAANS was to hold its congress in Addis Ababa, Ethiopia, on May 1-4, 1994. That was the opportunity to submit the project to the PAANS Committee, so the letter of support would be sent to the WFNS. The Secretary of the PAANS at that time was Dr. Adelola Adeloye, who encouraged the project, and reminded the PAANS Executive Committee members

how the 10th Congress of the PAANS had been a success, when held in Marrakesh in 1992. He wrote a letter in the name of the organization that he handed over to me, in order to include it in the bid.

However, even though the PAANS supported the bid with an official letter, the majority of African neurosurgeons I had discussed with or to whom I had sent letters to, in order to obtain their point of view, would not be enthusiastic enough to believe in the success of a world congress held in Africa. I will always remember when I asked a senior African colleague renowned internationally about his viewpoint regarding the bid for Marrakesh to hold the 12th World Congress in 2001, he said, "Oh, Abdeslam! You are dreaming! Africa is not for the coming years! We have to wait for at least thirty years!"

The brochure for the bid was finalized and sent to the Secretary of the WFNS in due time, before the end of June 1994. The following step consisted in promoting the bid. A copy of the bid brochure was sent along with a letter from the President and the Secretary of the Moroccan Society of Neurosurgery to all members of the WFNS Executive Committee (delegates of member societies and officers of the Federation). A second reminder letter was sent to the same persons during March-April, 1995, just before the vote that was to take place in Berlin, during the European Congress of Neurosurgery on May, 9th 1995.

Along with the documents to be sent, the promotion for the bid was to be supported by interactions with the said persons, and through lobby discussions with the delegates during scientific meetings. The Maghrebian Congress of Neurosurgery, November 9-14, 1994, was an opportunity to invite lecturers among the WFNS officers, and also members of regional and continental societies such as the PAANS, the EANS and the SNCLF. The creation of the Maghrebian Federation of Neurosurgical Societies during this congress was well timed to show these guests that African neurosurgeons had begun to gather up regionally. We have also tried to promote the event in Asia, Latin America and North America, by attending congresses held locally. But actually, promoting the bid during international congresses was not efficient enough, because African neurosurgeons would not attend these events, and neurosurgeons from these continents would only have very limited information regarding the status of African neurosurgery.

Despite these obstacles, we kept on promoting Marrakesh with enthusiasm and energy, and kept sending reminder letters to delegates and officers of national and continental societies who answered our invitations to visit the site of the congress. While the meeting in Berlin drew close (May 1995), when we had to present our bid, we were very optimistic and convinced that Marrakesh could win, through our discussions with delegates where we agreed that it was time for the WFNS to hold its first congress in Africa.

We left for Berlin with a delegation of 12 Moroccan neurosurgeons and the representatives of both organizing agencies. The organizers of the 10th European Congress had booked us a booth on the exhibition area. The booth would measure 9m², with the colors of the Moroccan flag, a video on Marrakesh projected in a loop, two staff members from the Moroccan Tourism Office in Berlin wearing traditional clothes preparing Moroccan mint tea, and offering it with Moroccan cookies to visitors. This hospitality made the booth the most visited space in the exhibition area.

The presentation of the bid to the WFNS Executive Committee members took place on May 9th 1995. There were six bidding cities: Boston (USA), Jerusalem (Israel), Istanbul (Turkey), Marrakesh (Morocco), Orlando (USA) and Sydney (Australia). The presentations took place in alphabetical order. Marrakesh was therefore presented in fourth position. The presentation for Marrakesh included two parts: a four-minute movie on Morocco and the city of Marrakesh on the one hand, and on the second hand an oral presentation with slides, related to the scientific, financial, and organizational aspects of the congress. The presentation took place in very good conditions, and it was the only one to be applauded by the delegates. I was both happy and proud when the presentation ended.

When the six presentations were made, the results of the first round of voting of the 120 delegates and WFNS officers gave Marrakesh 45 counts, Sydney 39, Jerusalem 15, Boston 14, Istanbul 4 and Orlando 3. The first round showed that the final vote would confront Sydney and Marrakesh, with probably more chances for Marrakesh to win. Before going on with the remaining rounds of voting and eliminating after each round the city that had had the least number of votes, two events occurred that were not in favor for Marrakesh: Dr. L. Symon, Past President of the WFNS, took the floor to express his concern about

security in North Africa, reminding the audience about the events in Algeria (repeated attacks of islamists following the suspension of the election process by the army in 1991). However, Morocco remains one of the most stable countries with the highest level of security in the world. In addition, more than one thousand kilometers separate Marrakesh from Algiers. Following the comments of Dr. Symon, the WFNS President at that time, Dr. A. Basso, allowed for a break to be taken to allow the delegates to discuss with one another before going on with the votes.

Following these events, the votes went on. At the third round of voting, Marrakesh was eliminated with 52 votes, while Sydney had obtained 61 votes.

Even though we felt disappointed, this failure of the bid for Marrakesh had a very positive impact on me and on many Moroccan and African colleagues, because they did not expect that a bid for an African city would be that well-prepared and well-presented to obtain the highest number of votes in the first round even if it had finally been eliminated over Sydney.

The failure of the Marrakesh bid was a turning point in my relationship to African neurosurgery. It was at that very moment that I took the decision not to give up any efforts to push African neurosurgery out of the shade, while committing myself towards its development.

The day that followed the WFNS Executive Committee meeting, we remained in Berlin, and kept on discussing with our friends and colleagues on what had happened the day before.

I still remember a discussion I have had with Dr. M. Samii, who relieved me from the disappointment following the failure of the bid for Marrakesh. Dr. Samii told me that he was going to run for the presidency of the WFNS at the Congress in Amsterdam (1997). If he succeeded, he would support neurosurgery in developing countries. He insisted that I submit the bid for Marrakesh again, because he was convinced that after the Congress in Sydney, the following world congress should be held in Africa.

I came back home from Berlin with two decisions: (i) to submit the bid for Marrakesh after four years, because I was convinced that a world congress in Africa was a requirement to motivate neurosurgeons,

and to urge the WFNS to become aware of the historical lateness of African neurosurgery, and of its duty to help develop it. (ii) The second decision I took was to analyze the reasons lying behind the failure, after correcting the mistakes made during the first bid.

2.3- How the failure of the first bid has enhanced my commitments and favored the relationships with the WFNS

During the year when running for the bid for Marrakesh, and following the vote, I realized that African neurosurgery was not known internationally, despite the efforts developed by the pioneers in the PAANS. I also realized that the status of neurosurgery in Africa was not a major concern in the WFNS. I therefore needed to act at two different levels towards improvement: to collect information on the status of African neurosurgery, and attract the attention of WFNS officers to it.

In order to reach this goal, I sent a letter to the WFNS President at that time, Dr. A. Basso, to inform him of my commitment to work towards supporting African neurosurgery, and asking his help to make the WFNS officers more involved in the project. The letter was written in French (Dr. Basso is fluent in French, and a fan of the language). I sent it to him on July 13, 1995 (two months after the congress in Berlin). Following is the translation of the letter :

Rabat, July 13, 1995

To: Professor Armando Basso
President of the World Federation of Neurosurgical Societies
Ayacucho, 1342-111 Buenos Aires
Argentina

Dear President and friend,

A few weeks after coming back from Berlin, and after having thought over the events, I would like to share my thoughts with you following the WFNS Executive Committee meeting that took place on May 9, 1995 in Berlin, and the results of the vote for the congress venue.

Following the meeting, I realized more than ever that neurosurgery in developing countries, especially African neurosurgery, is very far from holding a place in international neurosurgery, and therefore at the WFNS. There are several reasons lying behind the situation:

- *historical reasons for the lateness of neurosurgery in most developing countries, especially in Africa;*
- *a lack of awareness on the part of neurosurgeons in developed countries to push them into being more interested in the status of neurosurgery in developing countries. This awareness should be engendered by ethics and interest in our specialty.*

The current status and operation mode of the WFNS is an instance of the consequences achieved from both reasons. Therefore, it is our duty, on the one hand, to work more on bringing neurosurgery in developing countries to be known more and, on the other hand, on convincing influential neurosurgeons in developed countries into having a more objective look at the evolution of neurosurgery all over the world. As far as I am concerned, I have decided, jointly with the Board members of the Moroccan Society of Neurosurgery:

- *to maintain the bid for Marrakesh to hold the World Congress of 2005. Consequently, I will submit the bid in four years, meaning in 1999, as I am convinced that a WFNS world congress should be held in Africa, and that Marrakesh allows for that.*
- *to conduct a survey on the status of neurosurgery in Africa, and publish the results in an English neurosurgical journal and in the WFNS Newsletter, with the aim of making African neurosurgery known all over the world.*

Your help and support as WFNS President and as a leader of neurosurgery in developing countries remain crucial in changing the current mindset at the WFNS, and in helping African neurosurgery out. I would like to ask you to share your thoughts with me in this regard.

Looking forward to your answer and to meeting you in Buenos Aires.

Sincerely.
Dr. A. El Khamlichi

After sending the letter to Dr. A. Basso, I set up a form that I sent to African neurosurgeons to request information regarding the status of neurosurgery in their respective countries. The first survey related to the status of neurosurgery in Africa: the results of the survey were alarming. In 1995-96, there were 500 neurosurgeons serving the whole continent, with a population of 750 million inhabitants (1 neurosurgeon for 1.5 million inhabitants). The majority of these neurosurgeons worked in North Africa and South Africa (85%). Regarding Sub-Saharan African countries, the ratio was one neurosurgeon to six or ten million inhabitants. That meant there were no neurosurgeons in most African countries. Five articles were written following this survey: two were published in a French journal (1,2), and three in English-speaking journals (3,4,28).

Some positive circumstances would help me go on with my fight for African neurosurgery. In 1997, I was elected Second WFNS Vice President during the 11th World Congress of Neurosurgery in Amsterdam, July 6-11, 1997. Dr. M. Samii was elected President. In his first speech after being elected, he announced to the audience that he reached the WFNS presidency with one aim: "to create a WFNS Foundation to help develop neurosurgery in developing countries". It was the right time for me to make of my membership in the WFNS Administrative Council an opportunity to involve the WFNS in African neurosurgery, working by the side of a president who was ready to support the upgrade of neurosurgery in developing countries.

In my first report to the WFNS Administrative Council as Second Vice President in Geneva (February 1998), I talked for a long time about the lateness witnessed by neurosurgery in most African countries, displaying the results of the survey I conducted in 1996, and I therefore asked for support from the WFNS. Dr. M. Samii voiced his commitment to help develop neurosurgery in Africa, which he considered a duty of the WFNS. But in order to plan how the WFNS could help Africa, he wanted to know what African neurosurgeons expected from the WFNS.

So, I launched again the survey I had conducted two years earlier by setting up a more detailed form (figure 7), in order to have more detailed information regarding already-existing training systems, and the biomedical equipment available, the types of pathologies that were treated … but also with the aim of collecting the viewpoints of neurosurgeons on the type of help they wished from the WFNS.

World Health Organization (WHO)
World Federation of Neurosurgical Societies (WFNS)

Country: …… Area (sq.meters):……. Number of inhabitants: ….……

Faculties of medicine : Yes ☐ No ☐ Number : ……..

Number of physicians in the country* …….. Number of surgeons:……..

Number of neurosurgeons in the country: …….. Number of neurologists in the country : ……..

Number of neurosurgical departments …….. other …….. total…….

Total number of CT Scan in the country: ……Number of MOR……..

Predominant Neurosurgical Pathology : 1. Trauma ……. Infections…….

Hydrocephalus…….Tumors……Stroke……

Priority Needs for the practice of neurosurgery in the country:

Training seminars for neurosurgeons: Yes ☐ No ☐

- Complete education of neurosurgeons: Yes ☐ No ☐

Needs in equipment: 2. Shunts (…) Set of instruments for cranial surgery (….) for spinal surgery (….); bipolar coagulator (…..), operating microscope (…..); spinal instrumentation (…….); CT Scan (……).

Figure 7: Form used for the second survey

During the same time span (1996-98), thanks to the efforts developed by Dr. A. Basso, the collaboration between the WFNS and the WHO (World Health Organization) had become so tight that the latter decided to set up a group linked to the Mental Health Department with neurosurgeons from the WFNS. The group would gather up experts in neurosurgery, and would be called the «WHO Working Group in Neurosurgery».

The group was made up of the following neurosurgeons: Chairman: A. Basso; Vice Chairman: J. Brotchi; Secretary: J.-G. Martin-Rodriguez ; Members : L. Bassuri, N. Bhagwati; P. Black, M. Choux, F. Diaz, N. Dorsch, A. El Khamlichi, P. Niemeier, A. Raimondi, I.A. Raja, K. Takakura, F. Umansky. Executive Secretary, Dr. L. Prilipko from the Department of Mental Health at the WHO. The aim of the WHO through setting up this group of experts was to bring together both institutions through the promotion of the role and importance of neurosurgery in public health.

Therefore, the members of the "WHO Working Group in Neurosurgery" would be very active during the Conference in Madrid (Spain), organized by Dr. J.-G. Martín-Rodríguez, March 19-23, 1996, on the topic "Neurosurgery and Public Health". The conference was organized successfully and enabled the organizers to raise the awareness of the WHO representatives, but also medical attendees, on how important it is to educate neurosurgeons to deal with pathologies that were considered as public health priorities throughout the world, like head and brain trauma, cerebrovascular strokes, epilepsy, nervous system malformations, and so on. However, these pathologies are more frequent in developing countries.

I had the chance to be invited to the conference in Madrid. It was an honor for me to expose the high frequency of the abovementioned pathologies in Africa, and to make it an advocacy to raise the attention of attendees from the WFNS and the WHO regarding the lack of neurosurgeons in Africa.

The managers of the Department of Mental Health at the WHO, Doctors Costa Y. Silva and L. Prilipko had suggested to the members of the group to set up subcommittees in various areas of the world, because the aim of the WHO and WFNS was to push neurosurgeons around the world to identify more the great issues of public health so they could assess the importance of neurosurgery in the healthcare systems of their respective countries.

Therefore, I acted very quickly to set up the African subcommittee, later called the "WHO African Sub-committee working group in Neurosurgery". After discussing and exchanging letters with African colleagues, we set up the WHO African Subcommittee as follows: President, A. El Khamlichi (Morocco); Vice-President, M. Gueye (Senegal); Secretary, K. Kalangu (Zimbabwe); Members : A. Adeloye (Malawi), A. El-Hakim (Egypt), M.A.R. Barri (Sudan), V. Bazeze (Ivory Coast), M.T. Couto (Mozambique), A. Olumide (Nigeria), S. Nadvi (South Africa), R. Ruberti (Kenya). All members of the group were invited to hold a first meeting, scheduled on May 24, 1997, on the occasion of the 47th Congress of the SNCLF, organized by the Moroccan Society of Neurosurgery in Marrakesh, May 25-28, 1997. I had also invited Dr. A. Basso, WFNS President and Chairman of the WHO Working Group in Neurosurgery, Costa Y Silva and L. Prilipko from

the Department of Mental Health at the WHO, and the representative of the WHO in Morocco. Invitations had also been sent to the regional directors of the WHO in Africa, located in Brazzaville and Alexandria.

No representative from the headquarters of the WHO in Geneva or the African regional representations answered the invitations. Equally, no African colleagues from English-speaking countries answered the call either. An informal meeting of the WHO African subcommittee has still taken place. Some information has been exchanged regarding the objectives of the WHO and WFNS through this working group. The members present decided to postpone the meeting of the WHO African Subcommittee to a year later, to be held during the PAANS Congress in Dakar, Senegal, May 25-28, 1998.

When the WFNS President, Dr. M. Samii, asked me in February 1998 to give him more details on the status of neurosurgery in Africa, and therefore what African neurosurgeons expected from the WFNS, I thought that the first mission of the group was to deepen the survey on the status of neurosurgery in the continent, and to push them to express their points of view on the type of help they expected from the WFNS. From that point, I started sending letters to the members of the group so they attended the following meeting in Dakar, and also insisting that a representative be sent from the Department of Mental Health in the WHO.

On the occasion of the PAANS Congress in Dakar, May 25-28, 1998, we held a meeting of the WHO African Subcommittee members on the evening of May 25, 1998. The meeting was attended by: A. El Khamlichi, Committee Chairman (Morocco), K. Kalangu, Secretary (Zimbabwe), A. Adeloye (Nigeria), M.T. Couto (Mozambique), A. El-Hakim (Egypt), R. Ruberti (Kenya), M. Gueye (Senegal), A. Olumide (Nigeria), S. Nadvi (South Africa), V. Bazeze (Ivory Coast), J. Brotchi, Vice-President of the WHO Working group in neurosurgery. Two representatives from the WHO attended the meeting: Dr. Prilipko, and Dr. C.L. Bolis. Discussions went on in an enthusiastic and positive atmosphere. All members were happy to see the WFNS officers interested in Africa, and all committed themselves to send me the form within a month, with the information pertaining to the status of neurosurgery in their respective areas and countries. The results of the second survey would be mentioned in a written report to be presented to the WFNS Administrative Council members during the yearly meeting in Geneva, on February 20th, 1999.

Subsequently, three months after the meeting in Dakar, all group members had got in touch with the neurosurgeons in their area, so they could send the forms pertaining to their respective countries. Among the key information in this second survey:

1- African neurosurgeons confirmed the alarming fact: the number of neurosurgeons was very limited with 17 countries having one or two neurosurgeons per country, and 12 countries without. As for Sub-Saharan countries, the ratio was one neurosurgeon to 8 million inhabitants (table 2);

Table 2: Number and distribution of neurosurgeons in Africa (1998)

	Population (in millions)	Neurosurgeons	Ratio (adjusted)
Africa	**800**	**565**	**1 : 1 066 666**
South Africa	**45**	**86**	**1 : 405 405**
North Africa	**140**	**400**	**1 : 254 545**
Sub-Saharan Africa	**615**	**79**	**1 : 8 107 847**
World	**5.479**	**23.940**	**1 : 230 000**
WHO recommended ratio			**1 : 100 000**
	77% of African population had 1 neurosurgeon for 8 million inhabitants		

2- Regarding training, most African countries voiced their need for basic training in neurosurgery for young neurosurgeons;

3- Regarding biomedical equipment, among the 51 African countries, only 5 had an MRI machine at that time (1998), 18 countries did not have a CT Scan, 13 had only one, and 13 others had more than 2 CT Scans. All African neurosurgeons expressed the need for shunts to be used in cases of hydrocephalus, and for surgical sets of instruments;

4- As for the pathologies treated at that time by African neurosurgeons, head and spine trauma had the highest rates of cases treated in 36 countries out of the overall 44 countries who had answered the survey. Central Nervous system infections were

the second group of pathologies to be treated in 30 countries out of 44. Hydrocephalus and nervous system malformations came in third place, and tumors in fourth, and vascular pathologies in fifth position.

All these information were presented to the members of the WFNS Administrative Council on February 20th, 1999. The request made by African neurosurgeons was clear: to be supported by the WFNS for the purchase of basic equipment, and to have access to basic training in neurosurgery. Regarding the first issue, the WFNS President, Dr. M. Samii, was already able to secure equipment, as he had already got in touch with two German companies, Aesculap, to manufacture basic instrument sets for craniotomy and laminectomy (figure 8) at a reduced price (3.000 USD for both boxes), and Carl Zeiss to provide an operating microscope (10.000 USD).

Figure 8: WFNS Foundation set of instruments for craniotomy and laminectomy given by the WFNS Foundation

Dr. M. Samii committed himself to make African neurosurgeons benefit from the equipment, within the conditions set by the WFNS, as soon as the equipment would be available. Regarding the support to training, the Administrative Council members committed themselves to encourage the organization of training courses in Africa, but also to think of a project that would help set up regional training centers to train African neurosurgeons in Africa. The training in regional centers was an aim for African neurosurgeons. It had many advantages: to avoid brain drain (the young who had been trained in Europe or North America rarely went back to their home countries). A second advantage would be to train young neurosurgeons in an environment that would be very similar to their home countries. A third advantage would be the low cost of the training compared to a training in Europe or North America.

The relationships between Africa and the WFNS evolved in an astounding way, following the positive circumstances mentioned above, but mainly due to the methodical promotion and dispatch of information towards African neurosurgeons and the WFNS officers. We will further see that beginning 2000, the WFNS would take historical decisions towards developing neurosurgery in Africa.

Of course, these changes would be in favor of the second bid for Marrakesh.

2.4- Success of the second bid for Marrakesh

The 12th World Congress of Neurosurgery was scheduled in 2001 in Sydney. The bid for Marrakesh had to be renewed for the 13th World Congress, scheduled in 2005. This second bid had to be prepared in better conditions than the first we have already dealt with.

In Morocco, both the Moroccan Society of Neurosurgery and the staff of the organizing agency *L'Événementiel* had gained experience following the failure in Berlin. They would both work hand in hand to make the bid a success, and would work on the basis of the same assets already developed during the first bid, but putting them forward through more professional and structured arguments.

The Moroccan authorities supported the bid by sending eight letters to the WFNS Secretary. Those letters were written by the Advisor to His Majesty the King of Morocco, the ministers of Health, of Higher Education, of Foreign Affairs, the Wali of the City of Marrakesh, the Secretary of the Academy of the Kingdom of Morocco, the President

of the Moroccan Society of Medical Sciences, and by the President of the National Council of the Medical Board. The results of the survey conducted on the status of neurosurgery in Africa backed up the arguments towards the moral and ethical duties of the WFNS to hold a world congress in Africa. The facilities offered by the city of Marrakesh were put in details through pictures and videos, in order to make the city more attractive in the eyes of delegates and future participants.

The WFNS officers saw that the time was appropriate for submitting the bid for Marrakesh. All WFNS AC members had listened to the presentation, and had received a copy of the report on the neurosurgery status in Africa. The WFNS President who had been elected in 1997 (Dr. Samii) had fixed the aim of supporting the development of neurosurgery in developing countries. When WFNS officers discussed backstage about the following world congress, we often heard them say, "It's time for Africa".

On the other hand, at the African level, the legitimate ambitions of some African colleagues would take up the lead following the first bid for Marrakesh. Indeed, the bid for Marrakesh in Berlin, even though it failed, beside the conviction of some WFNS officers that a world congress had to be held in Africa, pushed other countries to submit their bids: Cairo (Egypt) and Durban (South Africa). Even though I contacted the presidents of both societies in these countries to remind them of the letters from the PAANS and the PANS (Pan Arab Neurosurgical Society) supporting the bid for Marrakesh, both bids were maintained. This situation would not let Marrakesh be the one and only African bid. Beside this, the vote of the WFNS EC members may engender a tie; which may be in favor of bids from outside Africa, like Hong Kong, China, and Istanbul, Turkey. However, the submission of two additional African bids beside Marrakesh, would help African neurosurgeons overcome the situation and put pressure on the WFNS.

We prepared the brochure of the bid for Marrakesh while taking into consideration the abovementioned aspects, and highlighting the maximum number of assets offered by the city of Marrakesh. A copy of the brochure was sent along with the official application letter for the bid signed by the President of the Moroccan Society of Neurosurgery on July 22nd 1998, to the WFNS Secretary at that time, Dr. M. Choux. Once the application for the bid was recorded and accepted, a copy of the brochure with an information letter were sent

in October-November 1998 to all WFNS officers and the delegates of member societies, asking them to consider the bid for Marrakesh and to vote for it.

The presentation of the bid was scheduled during the WFNS EC meeting to be held during the Interim meeting in Lahore, November 7-12, 1999. Three months before the meeting, we had already booked a booth on the exhibition area of the congress to promote the bid for Marrakesh. Several members of the Moroccan Society of Neurosurgery and myself had already paid our registration fees for the congress, and booked our rooms at the hotel. Unfortunately, for political unrest in Pakistan two months before the congress, the Interim meeting was canceled and postponed to April 9, 2000, to be held during the Annual AANS Congress in San Francisco (American Association of Neurological Surgeons).

The promotion for the World Congress in Marrakesh was made easier following the first bid, as much as the bid itself. The promotion went on according to the usual plan: international congresses attended by members of the Moroccan Society of Neurosurgery so they dispatched the maximum number of brochures, then invite the WFNS officers and presidents of WFNS member societies to visit Marrakesh. Most of these emissaries who have visited this city were convinced of its assets. They consequently expressed their wish to see the WFNS choose Marrakesh to organize the first world congress in Africa. As a result, members of the Moroccan Society of Neurosurgery attended 21 international congresses organized in various countries, between 1998 and 1999.

When the Annual AANS Congress in San Francisco grew near, the bid for Marrakesh was made ready for presentation to the members of the WFNS Executive Committee, on April 9, 2000. Four other cities were submitting their bid: Cairo (Egypt); Durban (South Africa); Hong Kong (China); and Istanbul (Turkey). The presentations took place according to alphabetical order, and I had the privilege to present Marrakesh last. At the second round, Marrakesh had won the majority of votes, and was therefore voted as the venue of the 13th World Congress of Neurosurgery. A sense of euphoria and a feeling of relief followed the results, for Moroccan and African neurosurgeons, but also for a high number of delegates and WFNS officers, all satisfied to see an African city chosen to hold a world congress of neurosurgery.

2.5- Preparation and promotion of the 13th World Congress of Neurosurgery

Preparation and promotion would extend over five years, beginning April 9, 2000, when Marrakesh was chosen by the WFNS Executive Committee members in San Francisco, to June 19-24, 2005, when the congress would take place. These five years would witness intensive communication and promotion of Moroccan and African neurosurgery. Several factors were in favor of the promotion and made it easier: the historical opportunity of holding the first world neurosurgery congress in Africa; the commitment of Moroccan and African neurosurgeons, all being enthusiastic and proud of inviting colleagues from around the world to come to Africa; the availability of pertinent information on the status of neurosurgery in Africa, drawn from the results of the surveys conducted between 1996 and 1998, mentioned above. All this aroused curiosity among neurosurgeons worldwide, and pushed them to know more about neurosurgery in Africa, and the ability of Africans to organize a world congress of neurosurgery.

However, before beginning the promotion for the congress, we had to set up the organizing teams. This is why the Moroccan Society of Neurosurgery set up the organizing committee since their return from San Francisco. The Organizing Committee was made up of nine members: Drs. A. El Ouarzazi (Honorary President), A. El Khamlichi (President), M. El Azouzi (Vice-President), A. El Ouahabi (Secretary), Y. Bouzoubaa (Treasurer), A. El Azhari (Chairman of the Scientific Committee), N. El Abbadi (Assistant Secretary), A. Aghzadi (Assistant Treasurer), M. Achouri (Assistant to the Chairman of the Scientific Committee).

Other members of the Organizing Committee, whose names do not appear on the documents of the Congress, have worked in the shades and played a key role in the organization process of the congress. These are my two daughters Leila and Zeineb, who worked with Mr. Khalid Zerqali, and the three of them constituted the Organizing Committee Secretariat. The three of them master the English language. Leila would coordinate with the organization agencies, Zeineb would be responsible for setting up the scientific program under the supervision of its Chairman. All members of this committee have worked seriously, with a spirit of selflessness, and respect of each other, to make the congress a successful event. I hereby wish to express to them my recognition and deepest thanks.

The agency *l'Evénementiel* dealt with the logistics related to the promotion and organization of the congress, while the welcome of participants, room booking and the social program were assigned to a second agency, Objectif Maroc.

In order to give the congress a special prominence that would join the magnificence of the "One thousand and one nights" of Marrakesh, the Organizing Committee members thought of bringing a certain touch and feeling. The first step we thought of was to place the congress under the High Patronage of His Majesty Mohammed VI, King of Morocco. A written note was sent to the Director of the Royal Protocol. We received a positive answer two weeks later. The Royal Patronage has upgraded the level of the congress, honored the participants, but has also granted the organizers the mobilization and support from the authorities in Marrakesh. The second step was to bring the event in the historical context of the WFNS, by celebrating the 50 years of the WFNS, set up in Brussels on September 4th, 1955.

The third step is showed through the motto of the congress, "Bridging the gap in neurosurgery in Marrakesh, crossroads of the World cultures". The topic was to convey a strong message to the WFNS: the congress in Marrakesh should be an opportunity to initiate a momentum towards increasing the development of neurosurgery in Africa, and bring it close to neurosurgery in developed countries. This congress will be an occasion to sign a cooperation agreement between the WFNS and Mohammed V University of Rabat, supervising training in the first regional center for training young African neurosurgeons, which started in Rabat in 2002. Details about this center are presented in this book, as well as the activity summary of 16 years of its activity.

Through these three original steps, the Congress in Marrakesh was aimed at becoming part of history as a crucial step to push the WFNS officers to grant their support to the development of neurosurgery in Africa. This Congress also was aimed at being an important step in arousing the awareness of African neurosurgeons with regards to the fact that the lateness of neurosurgery in the continent is not an unavoidable law of nature, and that their role is crucial in developing it as a specialty.

The design of the preliminary program stated the goals of the Organizing Committee members, and became a communication medium for the promotion of the congress. The preliminary program became, therefore, the first step in preparing the event. It contained the main information pertaining to the congress (scientific preliminary program, registration, accommodation, exhibition area), but also a description of the events scheduled for the social program and of the magic city of Marrakesh. The preliminary program had been printed, uploaded to the website of the congress, and distributed to the delegates and WFNS officers eighteen months before the date of the congress.

The US Dollar witnessed an unprecedented devaluation in comparison to the local currency (Moroccan Dirham - MAD), by June 2004, while speakers began to confirm their presentations, participants to register, and exhibitors to book their booths in the exhibition area. Since the preparation of the bid for Marrakesh in 1998-2001 until the preliminary program was set up in 2003-2004, one US Dollar equated 10.5 to 11.5 Moroccan Dirhams. The preliminary budget of the congress had been mentioned in US Dollars. The amounts for registration, accommodation and exhibition booths were mentioned in comparison to local currency. However, by the end of 2004 until June 2005 when the congress was held, the value of the US Dollar fluctuated between 7.5 to 8.5 Dirhams, witnessing an average fall of 27.2%. In other words, the income of the congress (mentioned in US Dollars), would fall of approximately one third, whereas the expenditures in Moroccan Dirhams remained the same, which was a real issue.

Therefore, we found ourselves in a dead end situation that extended over a few months. On the one hand, we could not increase the amount of registration fees 6 months before the congress. On the other hand, we did not want to reduce the number of the various activities mentioned in the social program. We then had recourse to the Moroccan authorities for sponsoring some events in the social program of the congress, namely the opening ceremony and the gala dinner. The latter allowed us to balance the congress budget, meet expenditures, and honor the promise we gave the WFNS officers for the transfer of the amount mentioned in the brochure.

At the end of January 2005, which was the deadline for abstract submission (5 months before the congress), the last step of preparations had started, with the finalization of the congress program. The main contents of the program were made up of the scientific program. The program was full of events, mentioning an exceptionally high number of participants (the content of the program is detailed later).

Both the logistical aspect and the scientific program were the main elements of the congress to be defined and secured in the best possible way to meet the goals of the congress. These technical aspects had to be solved by the organizing agencies, but also depended on the staff of the Congress Palace and the authorities of Marrakesh. Therefore, meetings were held on a regular basis, for the last six months prior to the congress that would gather up all the staff and representatives of agencies, in order to set up the details of the congress organization.

2.6- The 13th World Congress of Neurosurgery in Marrakesh

The 13th World Congress of Neurosurgery was held in the Congress Palace in Marrakesh, from June 19 to 24, 2005. Many advantages made this congress different from the others: It was organized under the High Patronage of His Majesty Mohammed VI, King of Morocco. It was the first WFNS congress to be held in Africa. Moreover, the year 2005 coincided with the fiftieth anniversary of the WFNS. The theme that was chosen for the congress was very particular: "Bridging the gap in neurosurgery in Marrakesh, crossroads of the World cultures". It had several meanings: the geographical location of Morocco as a bridge between Europe and Africa, East and West, the richness in culture and the open spirit of its population. It also aimed at attracting the attention of the WFNS officers to the status of neurosurgery in Africa, and arousing their awareness so they support training projects for Africa.

The congress was a great success. A high number of participants took part in the event, with an overall number of 2,859, 11.23% among them from Africa (table 3).

Table 3: Number of attendees in the 13th World Congress in Marrakesh, by categories and by continents

	Participants		Residents		Guests		Invited participants		Exhibitors		Total	
	Nb	**%**	**Nb**	**%**	**Nb**	**%**	**Nb**	**%**	**Nb**	**%**	**Nb**	**%**
Africa	155	9.58	47	19.60	43	8.32	25	38.46	51	12.35	321	11.23
North America	157	9.68	20	8.55	66	12.53	14	21.54	47	11.50	304	10.63
South America	101	6.21	14	5.65	44	8.35	5	7.69	9	2.30	173	6.05
Asia	449	27.70	61	25.60	116	22.03	11	16.92	43	10.51	680	23.78
Europe	738	45.53	95	39.60	255	48.52	9	13.85	259	63.34	1356	47.43
Australia	21	1.30	2	1.00	1	0.25	1	1.54	0	0.00	25	0.87
Total	**1621**	**100**	**239**	**100**	**525**	**100**	**65**	**100**	**409**	**100**	**2859**	**100%**

For the first time in history, a significant number of African neurosurgeons attended a world congress of neurosurgery. Virtually, one neurosurgeon out of ten, and one resident out of five, attended the congress was African.

As in any WFNS world congress, two types of activities were held : the congress scientific and social programs, and working meetings of the various WFNS committees.

2.6.1- Scientific and social programs

The opening ceremony of the congress

The congress began with the opening ceremony on June 19, 2005, between 18:30 and 20:00. The ceremony was hosted by Leila and Zeineb El Khamlichi, who went onstage to welcome the participants and expose the program of the ceremony. They later took turns in exposing the various parts of the program. The ceremony began when the Advisor to the King Mohammed VI, late A. Meziane Belfkih, read a welcome message from His Majesty to the participants. Then, came onstage, alternately, the President of the Congress, Dr. A. El Khamlichi, the President of the WFNS, Dr. E. Laws, the President of the Moroccan Society of Neurosurgery, Dr. A. El Kamar, and the Chairman of the Scientific Program, Dr. A. El Azhari, to welcome the participants.

Photo 4 : Late Mr. Abdelaziz Meziane Belefkih Advisor to the King, reading the royal welcome message

Photo 5 : Dr. Abdeslam El Khamlichi Congress President, making his opening speech of the Congress

Photo 6 : Dr. E. Laws WFNS President, making his opening speech of the Congress

Photo 7 : Dr. Abdessamad El Azhari Chairman of the Scientific Program Committee making his opening speech of the Congress

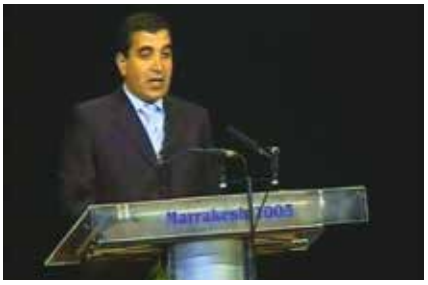

Photo 8 : Dr. Abdennebi El Kamar President of the Moroccan Society of Neurosurgery, making his opening speech of the Congress

These welcome speeches were interspersed by folkloric groups playing music and performing dances from various areas of Morocco. At each artistic presentation, movies were played on giant screens that helped locate the area on a map of Morocco, with its social, economic and cultural assets.

Later, the traditional ceremony of medals and prize awards took place. Dr. M. Samii, Past President of the WFNS and Chairman of the Medal of Honor Committee presented the four winners of the WFNS Medal of Honor: Doctors J. Haftek (Poland), J.A. Jane (USA), L.F. Levy (Zimbabwe), and G.M. Teasdale (United Kingdom)

Photo 9 : Dr. J. Haftek (Poland) receiving the WFNS Medal of Honor

Photo 10 : Dr. J.A. Jane (USA) receiving the WFNS Medal of Honor

Photo 11 : Dr. L.F. Levy (Zimbabwe) receiving the WFNS Medal of Honor

Photo 12 : Dr. G.M. Teasdale (UK) receiving the WFNS Medal of Honor

Photo 13 : Dr. N. Hashimoto (Japan) receiving the W.B. Scoville Prize

The biography of each winner was read before awarding him the medal. Following this, Dr. E. Laws, WFNS President, introduced the winner of the W.B. Scoville award, Dr. N. Hashimoto (Japan). Dr. R. Fahlbusch, Chairman of the Young Neurosurgeons Award

Committee, introduced the five winners, Doctors M. Jamous, S. Surash, F. Lefranc, D.C. Adamson, and W. Stummer.

Two other events were celebrated during this opening ceremony. The first was the signature of the cooperation agreement between Mohammed V University in Rabat, and the WFNS, pertaining to the "WFNS Rabat Reference Center for training African neurosurgeons".

Photo 14 : Dr. A. El Khamlichi, Director of the Department of Neurosurgery at Mohammed V University, and Dr. N. Hajjaj, Dean of the Medical School at Mohammed V University signing the Cooperation Agreement

Photo 15 : Dr. E. Laws, WFNS President and Dr. M. Samii, WFNS Foundation President, signing the Cooperation Agreement

The center was set up in 2002. It was the first African regional center accredited by the WFNS to grant young African physicians a complete basic training in neurosurgery. In order to make the project sustainable and institutional, it had to be put in the frame of an agreement committing both institutions (WFNS and Mohammed V University of Rabat), with the aim of granting young African neurosurgeons a high-level training.

The second event was the last to take place during the opening ceremony. It was the celebration of the 50th anniversary of the creation of the WFNS (1955-2005). The event was immortalized by a stamp, issued on this occasion by *Barid Al Maghrib* (The Moroccan Post Office). The stamp includes the logo of the WFNS, the logo of the congress,

a head and brain, and the name "*Royaume du Maroc*" (Kingdom of Morocco). The stamp was enlarged and projected on part of a giant screen. The other part of the screen showed pictures of the various presidents of the WFNS and presidents of congresses held by the WFNS between 1955 and 2005.

Since the release of the very first stamp, two centuries ago, this small thumbnail stuck on an envelope, representing public figures, pieces of art or monuments, has become, over time, a testimony to great events that made history in a country, a region or in the world. Releasing this stamp, in the effigy of the WFNS for its 50th anniversary and during its first world congress in Africa represented a new historical step in the relations between the WFNS and African neurosurgery.

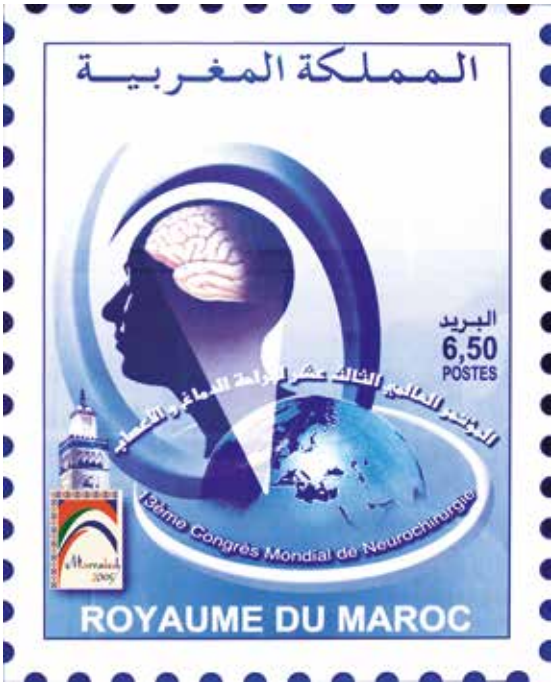

Photo 16: Special stamp issued on the occasion of the Marrakesh World Congress to celebrate the WFNS 50th Anniversary

At the end of the opening ceremony, all participants were invited to attend a welcome reception.

The scientific program

The scientific program took place over five days, from Monday, June 20th to Friday, June 24th. It included 2.398 scientific presentations, with 1.354 oral presentations and 1.044 posters. Oral presentations were distributed over 263 sessions. Each session was dedicated to a topic, which enabled participants to examine each neurosurgical pathology under its clinical, technical and research aspects. The distribution of sessions was made as follows:

Every day, from Monday till Friday, twenty breakfast and morning seminars were scheduled, each lasting one hour and thirty minutes. During each session, three lecturers who are experts in the session topic, gave lectures followed by exhaustive discussions dealing with the practical aspects of the topic. Morning seminars were free, which allowed young participants from developing countries to attend. For five days, these morning sessions were followed by "main topic sessions". There were ten of these scheduled every day, with five lecturers directing the session and the topic. These sessions were dedicated to an upgrade of the session topic, based on personal experience of the lecturer and recently published literature. At the end of the main topic sessions, a plenary session was scheduled, with two renowned lecturers chosen several months before, would deeply review a general topic. The topic chosen can relate to neurosurgery, neurosciences, or to another medical or non-medical subject. Afternoons were dedicated to oral presentations, with twenty sessions per day, and also to video sessions and symposia. As for posters, taking into consideration their high number (1,044), they were divided into two parts. The first half was exposed and visited on Monday and Tuesday, and the second half on Wednesday and Thursday.

Scientific sessions were separated by coffee breaks, one in the morning, a second one in the afternoon. Each coffee break lasted forty-five minutes, allowing participants to visit the exhibition area where one hundred and thirty medical companies had their booths.

The social program

The local Organizing Committee, in collaboration with the agencies and authorities of the city of Marrakesh, insisted on setting up a social program that would allow lecturers and their accompanying persons to discover the ancestral traditions of Morocco and the

magic of the city of Marrakesh. No world congress of neurosurgery had ever witnessed such a high number of events mentioned in the social program. Every day, during the six days of the congress, the participants were invited to discover one of the charming and exotic aspects of Marrakesh.

- On **Sunday, June 19th,** all participants were invited, following the Opening Ceremony, to the Welcome Reception offered by the authorities of the city of Marrakesh, and organized in open air at the Gardens El Harthi, downtown Marrakesh. Buffets with varied contents were exposed, representing dishes from various areas of the Kingdom of Morocco, to allow guests to taste the Moroccan cuisine.
- On **Monday, June 20th,** the President Dinner was offered at Stylia Restaurant, one of the best renowned restaurants in Marrakesh, known for its traditional Moroccan cuisine. More than 400 participants were invited to the dinner. Among them, were the WFNS officers, the presidents of WFNS member societies, and the delegates. The evening went on in a totally Moroccan atmosphere, exhaling through the architecture, the design of the restaurant, the music played by a female orchestra, oriental dancers, and local dishes.

Photo 17 : Dr. A. El Khamlichi, President of the Congress, with his wife welcoming guests at the President Dinner.

- On **Tuesday, June 21st,** two events took place. In the afternoon, from 04:00 to 05:00 pm, the 80th birthday of Dr. M.G. Yasargil was celebrated in the gardens of the Kempinski Hotel (Headquarter Hotel). The ceremony had been organized by Dr. O. Al-Mefty, with more than 500 neurosurgeons among friends, pupils and admirers of the icon of modern neurosurgery, Dr. M.G. Yasargil. All came to express their recognition to him, and wish him a long-lasting life.

Photo 18: Dr. M.G. Yasargil blowing out the candles on his 80th birthday cake at the ceremony organized to honor him, on June 21st, 2005, at the occasion of the 13th World Congress of Neurosurgery

In the evening, the Marrakesh Andalusian Music Orchestra, made up of 60 musicians, gave a music concert, interrupted from time to time by songs, in the great theater at the Congress Palace. The price for entrance was US$60, and the income from the musical evening was dedicated to the WFNS Foundation.

Photo 19: The Marrakesh Orchestra of Andalusian Music during the Musical Evening on June 21st, 2005, at the Congress Palace

- On **Wednesday, June 22nd**, all participants were invited to the Moroccan Evening that took place at "*Chez Ali*". It is an open air mythical space, whose architecture and scenery may remind the audience of Ali Baba's house. All tourists are bound to visit the place. Every evening, two to three thousand tourists gather up in the place for a dinner show, under big traditional tents, with artistic activities including folk songs and folk dances interrupted by intermissions with fantasia (fantasia is a Moroccan traditional horse sport that varies from tribe to tribe, when horses run and riders shoot their guns in the air while chanting, and women ululate), and traditional dances. On the evening of June 22, the space was booked for 2,764 Congress guests who have really discovered the cultural and ancestral traditions of the Kingdom of Morocco. The evening was closed after fireworks were set off and a spectacle was given, with words written in fire wishing a warm welcome to the guests and a happy anniversary to the WFNS (photos 20, 21, 22).

Photo 20: Some spectacles during the evening Chez Ali
A look inside a caidal tent: at the right, traditional tea being prepared.
In the middle, a folk troupe. On the left, the guests
(participants in the congress)

Photo 21: Horse fantasia

Photo 22: Fireworks marking the end of the dinner, with fire letters reading: "Welcome to the 13th World Congress of Neurological Surgery"

- On **Thursday, June 23rd**, the Gala Dinner was offered to honor 623 guests. It was an exceptional Gala Dinner from all points of view. It was offered by His Majesty the King of Morocco to honor the participants in the congress. The Organizing Committee members kept the amount of the dinner registration at 100 USD, to partly counterbalance the losses secondary to the decrease in the value of the US Dollar. The dinner took place at the Menara Gardens, made

up of an extended olive plantation surrounding a big pool whose building dates back to the 12th century (Almohad Dynasty). The dinner was chaired by his Royal Highness Prince Moulay Rachid (the King's brother). At the same table, were sitting the Minister of Health, the Congress President, the WFNS President, the WFNS Secretary, and other guests.

Photo 23: His Royal Highness, Prince Moulay Rachid, at the Gala Dinner. On his right, the Minister of Health and WFNS President Dr. E. Laws; on his left, Congress president Dr. A. El Khamlichi and WFNS Secretary Dr. J-G. Martín-Rodríguez

Photo 24: His Royal Highness, Prince Moulay Rachid, receiving a souvenir of the Congress, handed by the Congress President Dr. A. El Khamlichi and WFNS President Dr. E. Laws

Photo 25 : Dr. E. Laws, WFNS President, receiving a souvenir of the Congress

Photo 26 : Dr. J.G. Martín-Rodríguez, WFNS Secretary, receiving a souvenir of the Congress

During this Gala dinner, the Congress and the WFNS Presidents gave speeches, and thanked His Majesty the King of Morocco for the dinner He offered to the participants. After the speeches, they offered Prince Moulay Rachid a silver tray as a souvenir, where the logos of

the Congress and the WFNS had been carved. Two other souvenirs were handed over to the WFNS President and the WFNS Secretary by the Congress President, in order to thank them on behalf of the Organizing Committee members. Then, all the WFNS Administrative Council members and the Organizing Committee members received certificates of merit from the Congress and the WFNS presidents in acknowledgement of their work in the WFNS and the Congress.

After the dinner, a big cake to commemorate the anniversary of the WFNS, was presented (photo 27). The cake was made up of 50 pieces put on columns symbolizing the 50 years of the WFNS. The cake was cut by the Congress and the WFNS presidents, and handed over to the guests as part of the dessert. Later, the outgoing president of the WFNS, Dr. E. Laws, handed over the President's medal to the President Elect, Dr. J. Brotchi. After the dinner, the guests watched a sounds-and-light show that took place around the Menara Pool. The show was presented in two parts: The first recalled the story of the Menara Gardens, and the second part recalled that of the WFNS, therefore closing the commemoration of its fiftieth anniversary.

Photo 27: Dr. E. Laws (on the right) & Dr. A El Khamlichi standing in front of the WFNS 50th Anniversary cake

- On **Friday, June 24th**, the Closing Ceremony took place and marked the end of the Congress. The ceremony began with a short speech given by the Congress President, Dr. A. El Khamlichi, who thanked His Majesty King Mohammed VI for His High Patronage to the Congress and for offering the gala dinner. He also thanked the participants, the WFNS officers, the Organizing Committee members, the agencies, and the authorities of the city of Marrakesh for their participation in making the congress a success. Doctors E. Laws and J. Brotchi, respectively Past President and WFNS President, also gave short speeches to thank the same. After this, an artistic show was carried out by folk troupes and acrobats, while the logo of the congress and the stamp were projected; the stamp was a reminder of the 50th anniversary of the WFNS. The ceremony ended up after souvenirs were distributed to the WFNS Administrative Council members, to the members of the Congress Organizing Committee, and to the representatives of agencies who have taken part in organizing the event. All these were thanked for their efforts and the huge work they have carried out to make the congress a success.

At the end of the ceremony, the torch was passed over to Boston, the city of the following congress, when Dr. A. El Khamlichi handed over the Congress President Medal to Dr. R. Heros, president of the following congress.

Photo 28: Dr. R. Heros, President of the next World Congress (Boston 2009), receiving the chain from the Marrakesh Congress President, Dr. A. El Khamlichi

2.6.2- Working meetings of WFNS committees

On June 18th, a day before the congress began, meetings of the various scientific committees of the WFNS were held. During the congress, from June 19 to 24, three meetings of the WFNS Executive Committee took place (June 19, 09:30-17:30; June 21, 14:00-17:00; June 23, 08:30-14:00), two meetings of the Administrative Council members, and one of the Audit and Finance Committee.

Among the decisions and resolutions taken by the Executive Committee, we should remember the nomination of Dr. R. Patterson to the position of WFNS Parliamentarian, and the approval of the minutes of the EC meeting in Lisbon, as well as other amendments to the bylaws of the Federation. Two newly-created societies were admitted as members of the WFNS: the Asian Conference of Neurological Surgeons (ACNS), and the World Association of Lebanese Neurosurgeons (WALN). The vote for the bid of the 2007 Interim meeting had to choose between three candidate cities: Nagoya, Japan; Rome, Italy; and Beijing, China. Nagoya was finally chosen to host the WFNS Interim meeting in 2007. The meeting was scheduled to be organized by the Asian Australasian Society of Neurological Surgeons (AASNS), and presided by Dr. T. Kanno.

The Federation Historian, Dr. H. August van Alphen, presented the book he had just finished on the history of the WFNS, 1955-2005. He handed over a copy of the book to the WFNS President, and announced that he had 2.000 CD ROMs to be dispatched to the participants of the Congress in Marrakesh, and 500 additional CDs to be handed over to the delegates and officers of the Federation. The Treasurer of the Federation suggested that the membership fees of WFNS member societies be increased from 6 to 8 USD/member neurosurgeon. The suggestion was approved.

In his report, the Congress President, Dr. A. El Khamlichi, wished a warm welcome to the delegates and participants, and presented the program of the congress, as well as the last updates to the congress budget. He especially underlined that the fall of the exchange rate of the US Dollar compared to the Moroccan Dirham lied behind a decrease of an approximate 30% in the income of the congress. However, he reassured the participants regarding the efforts that were carried out by the Moroccan authorities in sponsoring some events in the social

program, in order to reduce the expenses. Dr. El Khamlichi has also outlined in his presentation the reasons lying behind the waiting time that some delegates experienced in front of the registration desk of the congress. This depended on the high number of registered participants on site (less than 50% of participants registered before the congress). It also depended on the limited number of registration desks. Dr. El Khamlichi also regretted to see the long line of delegates who had to wait before registration, and apologized to the participants on behalf of the Organizing Committee members.

C- List of WFNS Honorary Presidents and officers elected in Marrakesh

- **Honorary Presidents:** Dr. Fernando Rueda-Franco, Mexico; Dr. Iftikhar Ali Raja, Pakistan; Dr. J.G. Martin-Rodriguez, Spain; Dr. M. Choux, France; Dr. R. Ruberti, Kenya; Dr. S. Kobayashi, Japan.
- **Members** of the **Administrative Council**, 2005-2009: **President:** Dr. J. Brotchi; **Past President:** Dr. E. Laws; **First Vice-President:** Late K. Al-Moutaery; **Secretary:** Dr. R.G. Perrin; **Assistant Secretary:** Dr. H. Azevedo-Filho; **Treasurer:** Dr. N. Hashimoto; **Assistant Treasurer:** Dr. M. A. Arraez; **President of the XIVth Congress:** Dr. R. Heros.
- **Second Vice-Presidents:** Dr. Alexander V. Ciurea (at large); Dr. Wai S. Poon (at large); Late Dr. A. Bricolo (EANS); Late Dr. J.C. Peters (PAANS); Dr. T. Kanno (AASNS); Dr. C. M. Loftus (AANS); Dr. Leo F.S. Ditzel (FLANC), Historian: Dr. A. Basso.

Conclusions: Strong points of the 13th World Congress of Neurosurgery in Marrakesh

- The Royal honor that surrounded the Congress. This honor showed through the Royal Patronage, the welcome message of His Majesty King Mohammed VI, and the presence of His Royal Highness Prince Moulay Rachid who presided over the Gala Dinner offered by His Majesty in the participants' honor.
- A broad participation, never reached in previous WFNS congresses. This was made possible thanks to the promotional efforts developed before the Congress, and also to the conveniences offered to the young neurosurgeons, and to the ever-attractive side

of the city of Marrakesh. Among the participants, an exceptionally high number of young neurosurgeons from developing countries, especially from Africa, attended the congress (19.6%).

- A high-quality scientific program, with more than 2,398 scientific presentations spread over 263 sessions during five days.
- A social program aimed at unveiling the charming city of Marrakesh to the participants, as well as the ancestral culture and traditions of Morocco.
- The events celebrated on the occasion of the Congress: the 50th Anniversary of the WFNS, and the signature of the cooperation agreement between Mohammed V University of Rabat and the WFNS. This agreement sets up a reference center for the training of African neurosurgeons that implemented the first WFNS project aimed at developing neurosurgery in Africa.
- A financial balance met thanks to the sponsorship of part of the social program by Moroccan authorities, which enabled the organizers to overcome the deficit subsequent to the depreciation of the US Dollar, and to honor their commitments through transferring the amount agreed on to the bank account of the WFNS in Geneva. This amount was the basis of the commitment of the Organizing Committee on the brochure of the bid.
- Two Africans among the pioneer neurosurgeons were honored during the congress, namely: Dr. L. Levy, from Harare, Zimbabwe who was awarded the WFNS Medal of Honor, and Dr. R. Ruberti, from Nairobi, Kenya, who was elected WFNS Honorary President.
- The congress has been a real eye-opener at the individual and collective levels for African neurosurgeons. They understood, following the congress, that the lateness witnessed by neurosurgery in Africa is not an unavoidable law of nature, and that its development depends on their commitment to encourage the training of young neurosurgeons. They also understood that, in order to make their voices heard in the international neurosurgical community, they have to be united within a continental neurosurgical organization.

Chapter 3

THE WFNS RABAT TRAINING CENTER (WFNS-RTC) FOR AFRICAN NEUROSURGEONS: ITS RESULTS AND INFLUENCE ON THE DEVELOPMENT OF AFRICAN NEUROSURGERY

3.1- Setup of the WFNS-RTC

We have seen that the promotion of the bid for Marrakesh to hold the first world congress of neurosurgery in Africa took several years (1993-2000), as it was submitted twice (in Berlin, 1995 and in San Francisco, 2000). This long time span for promotion contributed to spreading more information regarding the status of neurosurgery in Africa. Two surveys were conducted that unveiled, for the first time, the historical lateness of African neurosurgery, before the members of the WFNS Executive Committee chose Marrakesh. When these events were taking place in Africa, Dr. M. Samii, WFNS President at that time, was getting ready to focus on neurosurgery in developing countries: setup of the WFNS Foundation in 1997, and agreement with the companies Aesculap and Zeiss so they respectively manufactured instrument sets for craniotomy and laminectomy, and operating microscope, at reduced prices. This equipment can be purchased through the WFNS Foundation, only by neurosurgeons practicing in low-income countries.

The report sent to the WFNS in 1999 on the status of neurosurgery in Africa pointed out that all African neurosurgeons agreed to request the help of the WFNS in providing basic training in neurosurgery to young Africans doctors. The advantages of training young African physicians in their country or area, namely in Africa, were also mentioned in detail in the same report, which emphasized the idea of the project of the WFNS Administrative Council to set up a regional training center in Africa for young African neurosurgeons. Since neurosurgery in Morocco held such an advantageous position, it was

chosen by the WFNS as a site for the first Regional Reference Center for training African neurosurgeons.

In February 2001, during the WFNS Administrative Council meeting in Geneva, the Department of Neurosurgery at Mohammed V University was accredited by the WFNS to train African neurosurgeon. The name of the center was "WFNS-Rabat Training Center for young African neurosurgeons", WFNS-RTC (WFNS Rabat Training Center).

After being back to Rabat, I informed my colleagues of the good news, first in the Department of Neurosurgery I chaired, then those at the Training and Research Unit in Neurosurgery and the Moroccan Society of Neurosurgery. Later, I presented the project to the authorities at the University Hospital Center and the University of Rabat. Everybody was happy and proud as the project was welcomed and was seen as an opportunity that enabled Marrakesh to be chosen, a year before, as a site for the first world congress in Africa.

The mission of training young African neurosurgeons was the result of an effort sustained for many years towards setting up the bases for the development of Moroccan neurosurgery, for Marrakesh to win the bid to host the world congress, and to raise awareness among WFNS officers, and to commit themselves to set up a realistic training program for young African neurosurgeons.

This program required three conditions to reach success and sustainability:

- The unconditional support of the authorities, of the University Hospital Center and other ministries (National Education, Health, Foreign Affairs, Home Office, ….) to manage the logistics surrounding the arrival of these young doctors, help them through the enrollment process, when their files reach the embassies of their respective countries in Rabat, during the training program, and in addressing their needs during their stay ;
- The upgrade of neurosurgery at the University Hospital Center of Rabat, to enable these young neurosurgeons to benefit from training with international standards. The Hôpital des Spécialités, we have already mentioned, had enabled neurosurgery and other disciplines of clinical neurosciences to advance (neurology,

neuroradiology, neuroanesthesia, neuropathology and others), and was certainly an appropriate environment to welcome the WFNS program. Yet, the hospital has been open to the public in 1983, and therefore had served patients for 20 years, which allowed to have sufficient numbers of doctors and nurses; but, the available equipment, which has never been renewed since then, became obsolete. Furthermore, training in neurosurgery requires practical learning (at the operating room, in imaging, at the laboratory) which, in its turn, requires expensive equipment. Without this equipment, the learning process of the trainees would remain below the required standards ;

- Give the project a sustainable dimension through a cooperation agreement between Mohammed V University in Rabat and the WFNS. In the agreement, both institutions should abide by the provisions of the center's management, and the environment where young African neurosurgeons are trained. This commitment of both institutions would make the trainees' admission criteria in the department of neurosurgery more flexible, and would enable them to obtain a variety of scholarships. This is a vital element to most trainees, who often come from low-income families and countries.

After thinking about the conditions required to ensure the success of the project, it became clear to me that, given the social and political environment in Morocco, the commitment of the department of neurosurgery and of my neurosurgeon colleagues were not sufficient to provide the three basic conditions mentioned above. I understood that the project had to be sponsored by a State Authority in the country. While I was building my plans to obtain this commitment from the State for the project, I shared my concerns with Dr. J-G. Martin-Rodriguez, an important WFNS member, who was very much in favor of the project. He, then, informed me that the WFNS are also concerned about the conditions where the training would take place, and that a sponsorship from Moroccan authorities of the project, would be very much appreciated. Understanding the importance of hierarchy in Morocco, and the respect placed on the Royal Directives, we both agreed to ask for an Audience from His Majesty Mohammed VI, the young and dynamic king who just succeeded His father, Late Hassan II. The idea was to submit to His Majesty both projects: the

WFNS-RTC project and the project for the upgrade of Moroccan neurosurgery. On May 5th, 2001, we were hosted by His Majesty King Mohammed VI at the Royal Palace in Agadir.

Photo 29: Royal Audience held by His Majesty King Mohammed VI to the WFNS Secretary Dr. J.G. Martín-Rodríguez and Dr. Abdeslam El Khamlichi May 5th, 2001, Royal Palace in Agadir, Morocco.

The outcome of the Audience was very positive. His Majesty was delighted to see that the Kingdom of Morocco had been chosen to welcome the WFNS-RTC among all African countries, and also to host the first World Congress of Neurosurgery in Marrakesh, in 2005. As a result, His Majesty reassured the WFNS of the commitment of the Kingdom of Morocco to provide all the conditions towards the success of the project. His Majesty put me in charge of building the National Center for Rehabilitation and Neurosciences (NCRNS), in collaboration with the Ministry of Health, to enable the technological upgrade of Moroccan neurosurgery, in order to provide young African neurosurgeons with training according to international standards.

3.1.1- The project of setting up a center for neurosciences

This project, which obtained the Royal Consent, was an encouragement to Hassan II Foundation to keep up its support to the Hôpital des Spécialités in acquiring new technologies. Indeed, Hassan II Foundation has already experienced this following the first donation of equipment donated by the Kingdom of Saudi Arabia in 1993, and was hosted at Hôpital des Spécialités. It was separated into two parts: (i) the equipment for the neurosurgery operating room, (cost 600.000 USD) which were included and listed as part of the hospital's equipment. Most of the cutting-edge equipment, which had to be maintained and serviced by the hospital, began to deteriorate once the warranty expired. This was due to the lack of maintenance contracts which had not been included in the hospital budget; (ii) The magnetic resonance imaging machine (cost 3 million USD) that had been set up separately within the confines of the hospital and was being managed according to a private non-profit mode by Hassan II Foundation, in partnership with the hospital. Thanks to this management mode, this machine keeps working perfectly, providing its maintenance, covering its capital cost allowance and its permanent upgrade.

Therefore, it became clear to me that the contribution of Hassan II Foundation to the hospital could not have a sustainable impact unless it is installed in a separate building within the confines of the hospital, with the devices being managed by Hassan II Foundation according to a private non-profit mode, following the example of the MRI device. Thus, occurred to me the building of a center dedicated to neurosciences. This Center would gather up all the technological devices required for an upgrade of neurosurgery and related disciplines such as neuroradiology, neurophysiology and neuropathology.

The combination of circumstances mentioned transformed the project from a dream to reality.

One week after the Royal Audience, I began preparing the project of the NCRNS, with the collaboration of an architect and a firm of engineering consultants. As the project had to be funded by Hassan II Foundation, it had to be submitted for examination to its Steering Committee. The members of the Steering Committee agreed on these main following aspects:

- Building up the center within the confines of Hôpital des Spécialités, so it could be included in the University Hospital Center (UHC). I must say that in the beginning, some members of the committee wanted the center to be built outside the hospital so it could be independent, and would therefore not be bound by the hospital administrative constraints. Personally, I could not imagine the project being built outside the hospital and the UHC. This was because Hassan II Foundation had been set up twelve years before (1989), and its main mission was to support patients and teacher-doctors inside the hospital by providing them with new technologies that the hospital budget could not purchase, and also by financially supporting research and continuing training (at that time, the UHC did not have a budget for this activity). The goal was to improve a public institution that congregated all the fields of clinical neurosciences, instead of creating competition through a private neuroscience institution. In other words, the mission of the foundation was and remains to improve the quality of healthcare, and to support the competence of medical research professors to enable them to emerge at the national, regional and international levels ;

- To accept the principle of funding the "National Center for Rehabilitation and Neurosciences" (NCR-NS) by our foundation through bank loans and leasing of equipment purchase, in case the amounts of donations and grants are not sufficient;
- To set up an agreement between the Foundation, the Ministry of Health, and the UHC of Rabat for the management of the Center by Hassan II Foundation according to a private non-profit model, with an engagement to provide free healthcare to a quotas of low-income patients.

After the members of Hassan II Foundation Steering Committee had defined these bases, we began preparing the engineering plan for the NCR-NS that we submitted to the Ministry of Health.

The ceremony for laying the foundational stone of the Center took place on July 12th, 2001. It was presided over by His Royal Highness Prince Moulay Rachid (photo 30). The Prime Minister at the time, Mr. A. El Youssoufi, the Minister of Health at the time, Late Thami El Khayari, and representatives of the WFNS, Doctors G. Martin-Rodriguez, M. Samii, and A. Basso, attended the ceremony. The Ministry of Health

gave the Center the name of The "National Center of rehabilitation and Neurosciences"(NCRNS), which was financed by Hassan II Foundation for the Prevention and Cure of Nervous System Diseases. A decision was made that it would be managed by the Foundation according to a private non-profit mode, based on an agreement signed in 2003 by the Foundation, the UHC and the Ministry of Health.

Photo 30: His Royal Highness Prince Moulay Rachid launches the building of the National Center for Rehabilitation and Neurosciences Rabat, July, 12th, 2001

Basic cutting-edge equipment for practicing neurosurgery were to be provided in this center : advanced imaging techniques, operating microscopes, ultrasonic aspirator, neuronavigation device, immunohistochemistry techniques and tumor markers at the neuropathology laboratory, video-EEG unit, endoscopy unit, …. The purchase of the last Gamma Knife PerfeXion Radiosurgery equipment was also planned. The Center was built within the confines of Hôpital des Spécialités, and hence, was a fundamental complement to the Department of Neurosurgery at Mohammed V University of Rabat.

Once the upgrade of Moroccan neurosurgery had begun in the field of biomedical equipment when the construction of the NCRNS started, I was informed through a letter from the WFNS dated January 28th, 2002 that the WFNS-RTC had been set up. Here is the full content of the letter written by Dr. J-G. Martin Rodriguez.

Madrid, January 28th, 2002

Prof. A. El Khamlichi
President, XIIIth World Congress of Neurosurgery, WFNS
Chairman, Hopital des Specialites, ONO
CHU Ibn Sina, Rabat, BP 6444 Rabat-Instituts
Rabat, Morocco

Dear Prof. A. El Khamlichi,

I have the pleasure to inform you that the WFNS has retained Morocco as a place for the training of Young African Neurosurgeons. As you know, the WFNS has recently created the Foundation for the Training of Young Neurosurgeons from Developing Countries. The Board of Trustees met last January 12th, 2002 in Geneva, and decided to grant the first scholarship to your institution and under your direction.

May I present my congratulations for this decision that honours your country from the WFNS and the WHO Working Group on Neurosurgery. It represents an international acknowledgement to the scientific level of Moroccan Neurosurgery, and to your efforts to make this project a success.

With no doubts, the Royal Decision of His Majesty King Mohammed VI to support the project of the National Center for Rehabilitation and Neurosciences was a fundamental issue on the election of the Moroccan University at Rabat for the Training of Young Neurosurgeons. Moreover, the conversation we had with His Royal Highness Prince Moulay Rachid and with Prime Minister Mr. Youssfi at the time of the Ceremony for the Placement of the First Stone of the Center, last July 12th, 2001, reassured us that the Center will be realized on the anticipated deadline and that its up-to-date medical technology will keep the standard of Moroccan Neurosurgery to International level.

I am very pleased to see that your personal status with World Neurosurgery has achieved this Honour for your country in addition to the honour of hosting the World Congress of Neurosurgery in Marrakesh in 2005, on behalf of the World Federation of Neurosurgical Societies.

Once again, may I congratulate you on the above achievements and wish a high success for both projects.

Yours sincerely.

J.G. Martin-Rodriguez
Secretary, WFNS

The construction was completed and equipment purchased by the end of 2006, and the Center provided open access to patients, students, and young doctors under training. Ever since, it has brought an exceptional contribution to the development of neurosurgery and neurosciences in Morocco. It has significantly improved the training level of young neurosurgeons, both Moroccans and Africans.

3.1.2- The launch of the second project: WFNS-RTC

Launching the WFNS-RTC depended on the availability of scholarships at the WFNS Foundation, which had been set up four years prior. During the WFNS Administrative Council meeting, which was held on the occasion of the 12th World Congress of Neurosurgery in Sydney (September 2001), I raised the issue of the delay behind the start of the WFNS-RTC, which had been accredited almost a year before. Furthermore, I mentioned that young African doctors were waiting to be granted a scholarship by the WFNS Foundation, so they could begin training in Rabat. During the discussion, it became apparent that the WFNS Foundation did not yet have funds for scholarships.

After I returned from Sydney, I sent an email on October 30th, 2001 to Dr. M. Samii, at that time, Past President of the WFNS and President of the WFNS Foundation, with copies to Doctors E. Laws and J-G. Martin-Rodriguez, respectively newly-elected President and Secretary of the WFNS. In that email, I explained the crucial importance of the two projects that had been agreed on by the WFNS, to support the development of neurosurgery in developing countries. Said projects involved providing sets of instruments and a microscope at affordable prices, and the accreditation of the Department of Neurosurgery at Mohammed V University in Rabat as a Reference Center for Training African Neurosurgeons. Taking into consideration the WFNS Foundation financial constraints at that time, I suggested the amount of 3,600 USD a year to begin with, as a scholarship to African trainees who would train in Rabat. I committed to finding, if possible, further support by providing housing and opportunities to participate in scientific meetings. In the mail, I insisted on adding the item on the agenda for the following WFNS Foundation meeting, which was scheduled in January 2002 in Geneva. I had to know how many

scholarships and when they would be made available by the WFNS Foundation, in order to begin the selection process of applicants for the training.

Actually, during the meeting of the WFNS Foundation members in Geneva on January 12th, 2002, the issue of the long wait of young African trainees was raised. Six applicants had already sent their files. My plea faced once more the lack of funds in the treasury of the WFNS Foundation. At that moment, two generous colleagues made a historical move towards supporting African neurosurgeons, which the WFNS shall never forget. Both Doctors J-G. Martin-Rodriguez and M. Samii took the floor to announce : "I donate ten thousand US Dollars to the WFNS Foundation". After the participants warmly applauded the two colleagues who had just proven their dedication to African neurosurgery, a suggestion was made that the WFNS donate the equivalent amount (20 000 USD) to the Foundation.

At that point, the WFNS Foundation had 40 000 USD in its treasury, and the WFNS President at the time, Dr. E. Laws, suggested to grant the first scholarship to the Center in Rabat beginning March 2002. The first African resident, Dr. Didier Mudjir Balanda (Democratic Republic of Congo), was about to come to Rabat, to begin his training at the Department of Neurosurgery at Hôpital des Spécialités in Rabat on March 1st, 2002.

3.2- Operation and development of the WFNS-RTC

During the year 2002, a second African resident joined the WFNS-RTC, Dr. Nasiru Ismail, from Nigeria. We were able to sponsor his scholarship by Philips Medical System, the company that managed the imaging devices available at Hôpital des Spécialités. Disseminating information regarding the setup of the first WFNS-RTC instigated an increased number of applications. Applications came from young African neurosurgeons, but also from applicants from Asia and the Middle East. Taking into consideration the limited number of available scholarships for the seats in the three units at the Department of Neurosurgery in Mohammed V University in Rabat, we had to set up a system for the selection of applicants, to make their chances equal in their access to training at the WFNS-RTC.

3.2.1- Selection system

The selection system had to take into consideration two sets of criteria: (i) those required by the WFNS for scholarship provision, and (ii) those required by the professors at the University of Rabat. The application process required some of the following:

- A curriculum of medical studies, a resume and recommendation letters confirming that the applicant has the skills that enable him/her to begin and succeed his/her career in neurosurgery;
- A written commitment from the applicant to go back to her/his home country once the training in Rabat is finished;
- The applicant should come from a country where the number of neurosurgeons is very limited (1 neurosurgeon/1 million inhabitants or more);
- The applicants who do not have a scholarship should prove they have the financial means that enable them to support themselves while living in Rabat;
- The file for the enrollment of applicants at the University of Rabat should go through a specific process: Embassy of the applicant's country in Rabat, the Moroccan Agency for International Cooperation, the University of Rabat, the Medical School, than, the Department of Neurosurgery;
- The applicant should commit herself/himself to sit for the same annual examinations as her/his Moroccan colleagues. The University accepts only one year to be repeated during the five years of training, for both Moroccan and African residents.

All these criteria have been mentioned in a document, with other more general criteria (degree in medicine, registration in the country's medical board as a doctor of medicine), and are sent to applicants who wish to join the WFNS-RTC. The applicants should first send their file directly to the WFNS-RTC where the selection is carried out by a commission made up of the chairmen of departments of neurosurgery who are responsible of the training. Once the file of the applicant has been accepted, she/he is informed through an acceptance certificate she/he would send along with her/his file through the embassy of her/his country in Rabat, and through the Ministry of Foreign Affairs for enrollment at the University. Once the applicant's enrollment at the University is valid, she/he then starts the training in a department of neurosurgery.

3.2.2- Training program and examinations

Training in neurosurgery was set up at the University Hospital Center (UHC) of Rabat in 1968, when the first interns in neurosurgery began training at the UHC. For twenty years, the specialization training lasted four years, and the young neurosurgeons were issued a qualification certificate in neurosurgery when they completed their training. Since the 1990s, a reform of all medical specialties resulted in setting up the residency system, especially the residency in neurosurgery extending over a period of five years, with a theoretical and practical training program, and specific examination modes. After five years of training, once all the steps of training are approved and after the resident passes the final specialization examination, she/he obtains a specialization diploma in neurosurgery.

The young African doctors who have been coming to Rabat since 2002 were included in the National Residency Program of Neurosurgery, similarly to their Moroccan colleagues (figure 9 and photo 31).

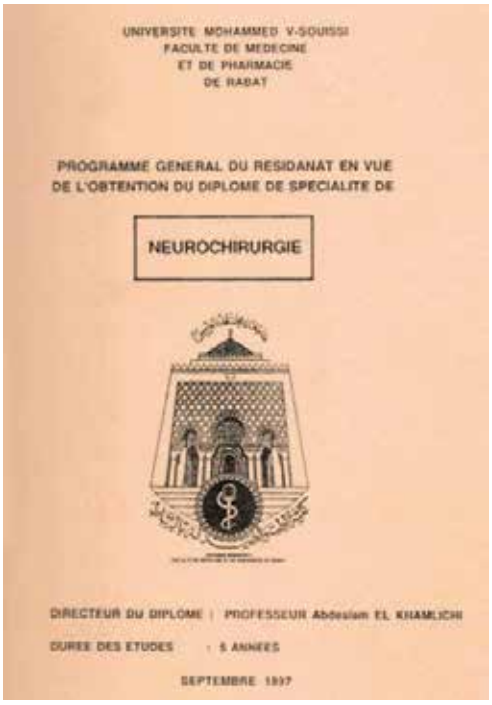

Figure 9: Residency Program of Neurosurgery, which was published by the Faculty of Medicine and Pharmacy of Rabat in 1997. It has been updated regularly since then.

Photo 31: Participation of African residents to a training class in neurosurgery at the Faculty of Medicine and Pharmacy of Rabat.

This program includes two parts: the theoretical and the practical parts, presented in appendix 1.

In order to test his/her knowledge and to do the necessary follow-up, the University requires that a "trainee booklet" be regularly updated by the trainee himself along with his/her mentor (one of the Professors in the department he has been appointed at). All activities conducted by the trainee must be recorded in the booklet, particularly activities related to surgery and participation in the department scientific meetings (seminars and publications). At the end of each semester, a commission made of department professors grades the trainee's internship and evaluates the booklet entries. This evaluation takes into consideration not only activities in the booklet but also assiduity, interaction with patients and colleagues, as well as interpersonal and professional qualities.

Internship grades are then sent to the University (Faculty of Medecine and Pharmacy). Trainees who pass ten internships of six months each, obtain clearance to take the Final Residency Exam. The Faculty of Medicine organizes this exam, in collaboration with a five-professor jury, which is designated by the Dean of the Faculty. This exam consists

of four parts: (i) a test on titles and scientific works, aimed at evaluating the trainee's scientific activity (seminars, congresses and publications) ; (ii) two written exams, one in fundamental neurosciences and one on neurosurgical pathology; (iii) a practical test on two clinical cases: an emergency one and neurosurgical pathology one; (iv) a surgery demonstration to evaluate the trainee's level of neurosurgical practice in the operating room. Trainees who pass all these examinations obtain the diploma of neurosurgery specialty. They receive a Specialty Diploma in Neurosurgery from the Faculty of Medicine. Trainees who do not pass are given the opportunity to take one extra year of training, at the end of which, they must retake the final exam in order to obtain a diploma. If the trainee fails a second time, he/she must leave the specialty program and can practice as a generalist doctor. This is the rule for all trainees at Mohammed V University in Rabat, regardless of specialties.

3.2.3- Cooperation agreement between the WFNS and Mohammed V University of Rabat

The first African trainees who arrived to Rabat were enrolled in the training program on the same basis of equality as their Moroccan counterparts (same rights and same obligations during their training). During the first three years of training (2002-2005), it was necessary to address administrative processes involving their enrollment and to find solutions as to their stay in the country and housing.

In order to ensure the durability of this project, we had to institutionalize it through a cooperation agreement between the WFNS and Mohammed V University in Rabat. With the approval of both WFNS and the University, we prepared this agreement, which intended to facilitate the selection, the training as well as administrative and logistical formalities of the young African doctors' stay in Morocco. Some of the agreement terms were as follows:

- The Department of neurosurgery at Mohammed V University was accredited by WFNS and its Foundation as a Reference Center for the purpose of training African neurosurgeons;
- WFNS, through its Foundation, commits, within the limits of the financial resources available, to grant scholarships to African trainees at the WFNS-RTC;

- Mohammed V University commits to organizing selection tests, in English if necessary, for trainees coming from English speaking African countries, and assist them, based on availability, to find housing at the university accommodations;
- Mohammed V University commits to training African trainees in the same conditions as Moroccan counterparts;
- Both institutions commit, within the limits of their means, to organize periodic workshops and seminars for African neurosurgeons.

This agreement was signed in Marrakesh on June 19th 2005, during the opening ceremony of the 13th World Congress of Neurosurgery. It was initialed by Drs. E. Laws, President of the WFNS, M. Samii, Founding President of the WFNS Foundation, N. Hajjaj, Dean of the Faculty of Medicine and Pharmacy in Rabat and A. El Khamlichi, Director of the WFNS-RTC (photos 14, 15, chapter 2).

The signing of this agreement facilitated the implementation of the WFNS-RTC project. Therefore, this agreement has:

- Transformed this project from an oral and physical agreement between two people (WFNS officials and the President of the 13th World Congress of Neurosurgery) to an institutional agreement (WFNS and Mohammed V University). This will allow WFNS-RTC to benefit from an unlimited duration as long as these two institutions accept and implement the agreement clauses ;
- Guaranteed a complete integration of young African trainees in the national neurosurgery training program, on the same basis as their Moroccan colleagues;
- Regulated and facilitated candidates' selection and enrollment at the University. In addition to the candidates' selection based their academic achievements, (adopted approach in the first years), the agreement has added another possibility for admitting African candidates to the specialty, by allowing them to take the Residency Exam. This exam is compulsory for young Moroccan trainees who want to undergo the specialty training. African candidates, who choose this way of selection and succeed the exam, have two

additional advantages: (i) a monthly stipend, paid by the hospital where internships are done, and (ii) a specialty diploma at the end of the training, instead of a certification of specialty.

- Facilitated the granting of scholarships and securing diversified financing sources to cover these scholarships. As a result, at the beginning, the number of candidates admitted to the WFNS-RTC was limited to three (number of scholarships granted by the WFNS Foundation). After signing the agreement in 2005, some candidates preferred the examination-based selection method that allows them to obtain a financial indemnity from the hospital. Others, obtain scholarships from universities and institutions from their country of origin, some will rely on their own financial means. The signing of the agreement provided a substantial advantage and explains, to a large extent, the great number of trainees that enroll and graduate from the WFNS-RTC.

3.2.4- Financing African neurosurgeons training at the WFNS-RTC

Funding is an important part of any efficient training system. It operates at two levels: first to put in place the required resources (human & logistics) to provide this training, and also to provide financial aid to candidates, in order to allow them to live decently and focus on their training.

The Moroccan authorities shoulder the first part, which accounts for 90% of the total expenses accrued. African doctors benefit from free enrollment at the university, which allows them to complete internships at the hospital. The only cost they may need to bear is that of a medical insurance, which often does not exceed 1.800 MAD (less than 200 USD) per annum.

At the beginning (2002-2010), only three departments of neurosurgery at Mohammed V University were able to host African trainees enrolled at the WFNS-RTC. Since 2011, three other universities (Hassan II University in Casablanca, Cadi Ayyad University in Marrakesh and Sidi Mohammed Ben Abdellah University in Fez), agreed, through their departments of neurosurgery, to become part of this training project. The increase in the number of departments of neurosurgery participating in the training of African neurosurgeons has spurred

a growth in the number of available spots available to candidates. Thanks to the commitment of all these departments, it became possible, to accept, starting from 2014, candidates of the WFNS second training program, in favor of Africa, «Africa 100» that has been launched and sponsored by Dr. Madjid Samii.

We have seen, at the beginning of this chapter, that Moroccan authorities, with the support of Hassan II Foundation for the Prevention and Cure of Nervous System Diseases, created a national center for neurosciences that is equipped with modern technologies, not available in other university hospitals in Morocco. This initiative was undertaken in order to upgrade Moroccan neurosurgery and allow young African doctors to train at international standards. One can easily imagine the efforts that were made by the Kingdom of Morocco, which provided the necessary human resources, as well as technical equipment to all relevant structures (four universities, nine departments of neurosurgery and a center for neurosciences), in order to guarantee adequate training, in the cutting-edge discipline that is neurosurgery, which is highly lacking in most of Africa.

In addition to the funding aspect of the training, several Moroccan institutions have began, starting from 2005, to take part in the second aspect. As a result, the University Hospital Center (Rabat) grants a monthly pay to African trainees who succeed the residency examination, which is administered by the hospital where the trainees complete their five-year internships. Also, the Moroccan Agency for International Cooperation, which manages university enrollment of candidates, has also accepted to make scholarships available to some of them. Hassan II Foundation for the Prevention and Cure of Nervous System Diseases plays a key role in the continuous training and in initiating young African medical doctors to research by providing support in two main areas : (i) covering the expenses of these African doctors associated with participating in scientific meetings and congresses, and (ii) organizing, in Rabat, seminars and workshops that are moderated by international experts, on a regular basis.

Hassan II Foundation is also involved in the management of scholarships for beneficiaries from WFNS Foundation, or within the framework of the Program «Africa 100», sponsored by Dr. Samii. WFNS Foundation and Dr. Samii, have transferred the annual

amount dedicated to scholarships at the beginning of January every year. Hassan II Foundation receives the funds and then delivers the scholarships to the young African doctors. Every year, Hassan II Foundation's accounting department releases a detailed annual report on all the scholarships that were granted. This report is also sent to WFNS Foundation headquarters' in Geneva, in December of each year.

The increase in the hosting capacity that started in 2010 has allowed us to accept scholarships' candidates from other universities or other African national or regional institutions. The arrival of these African scholarship holders from their home countries has allowed the WFNS-RTC to become a reference training center in neurosurgery that attracts young African doctors willing to take the training offered, but also to raise awareness on the importance of neurosurgery for African countries and universities. This has also contributed to shedding the light on the quality of the training provided by the WFNS-RTC.

3.2.5- Arrangements for these young African neurosurgeons to go back to their country after training at the WFNS-RTC

One of the reasons for the creation of the WFNS-RTC was to reduce brain drain, since the majority of young neurosurgeons who studied in Europe or North America reportedly chose not to go back to their country of origin after completing their training. This is why, as seen earlier, one of the conditions of eligibility to the WFNS-RTC is the submission of a written affidavit by the candidate stating they commit to going back to their country, once their training is over.

In order to facilitate the return of these young doctors to their countries of origin, it was necessary to provide them with a complete and graduation training program. We have already seen that graduates from WFNS-RTC (Moroccan or African), for those who pass the final exam at the end of the training, obtain a degree from the University and a diploma in neurosurgery. In addition, African graduates are granted a specialty certificate from WFNS. With these two diplomas, it becomes easier for a young African neurosurgeon to obtain equivalency, allowing him/her to integrate the health system (public or private) in his/her country of origin. Some end up working in both sectors, given the existing shortage of neurosurgeons in some countries.

However, an issue of great importance that young neurosurgeons face upon their return to their home country, is that of access to adequate equipment in order to practice. As seen earlier, the majority of these young trainees come from countries with few neurosurgeons (less than one neurosurgeon for ten million inhabitants). Very few among them end up joining an established team within an existing structure. Therefore, most of them find themselves in a situation where they have no choice but to try to convince their colleagues in surgery, their supervisors, as well as ministerial authorities to acquire basic necessary equipment in order to start a unit and, thus, be able to practice neurosurgery. Depending on the country, these procedures can take a while. This depends, in part, on the doctor's personality, the level of the authorities' awareness for neurosurgery-based needs, as well as the economic situation in a given the country.

While awaiting the response of the authorities regarding the purchase of required equipment, we try to support and help some of these young neurosurgeons, to get sets of instruments (reserved for neurosurgeons from developing countries) at reduced prices through the WFNS.

Donation of these instruments allows the young neurosurgeon to begin performing surgeries and save patients' lives, especially those admitted to emergency. This helps and comforts patients' families, raises medical staff awareness and allows hospital authorities to better grasp the role of neurosurgery in the health system and in the development of a given country.

This is why we have always defended among the WFNS and its Foundation the necessity to meet requests regarding equipment from young neurosurgeons who were trained at the WFNS-RTC and returned to their home country.

However, we firmly believe that we should not link the lack of equipment to the training of neurosurgeons in a given country. Once they have trained, graduated and gone back to their countries, they always manage to obtain the required equipment for them, as long as they are dedicated to the job and to the patients. We will see later, that the follow-up that we regularly conduct indicates that, almost all young neurosurgeons trained at the WFNS-RTC, manage to join

hospitals and universities in their homelands, within two to three years from their return date. The follow-up has also revealed that they manage to obtain the equipment required to perform surgeries on patients.

3.3- Sixteen-year activity report of the WFNS-RTC (2002-2018)

In this sixteen-year activity report, we will include information on the number of trained African neurosurgeons, the ongoing training that is provided to all of them during this period, information relevant to the realities faced by these newly trained neurosurgeons upon their return to their countries of origin as well as the role played by the WFNS-RTC in the development and the promotion of neurosurgery in different African countries.

3.3.1- Basic training report (5 years)

During these sixteen years, 61 young African doctors have enrolled at the WFNS-RTC: 54 to complete the 5-year training and 7 enrolled for a limited complementary training (6 months to 3 years) due to the fact that they were already enrolled in a training program in their home countries. Only one resident did not complete the training due to disciplinary reasons. This person was expelled from the program, while in the fourth year of training, based on a decision made by the disciplinary board of the University Hospital Center. A certificate attesting that the person completed a 3-year internship was provided. As a result, this person left to continue the training in a different country.

Out of the 60 remaining trainees, 30 have already finished the training and obtained a diploma of specialty in medicine (figure 10,a) following the passing of the final exam. A second diploma has been handed to them by WFNS (figure 10,b). Table 4 shows a list of these young neurosurgeons with relevant information including name, country of origin, ratio of neurosurgeons, training start and end dates as well as name of the institutions that awarded scholarships.

Royaume du Maroc
Ministère de l'Enseignement Supérieur
Et de la Recherche Scientifique
Université Mohammed V - Souissi
Faculté de Médecine et de Pharmacie de Rabat

المملكة المغربية
وزارة التعليم العالي و البحث العلمي
جامعة محمد الخامس السويسي - الرباط
كلية الطب و الصيدلة
الرباط

N° 01/ 2007

رقم: 01/ 2007

دبلـوم التخصص في الطب

DIPLOME DE SPECIALITE MEDICALE

Vu le procès -verbal de l'examen Final du jury siégeant à la Faculté de Médecine et de Pharmacie de Rabat

le 28-29 Mai 2007

Le Doyen de la Faculté de Médecine et de Pharmacie de Rabat atteste

que : MUDJIR BALANDA DIDIER

Né (e) le 26 FEVRIER 1968 A KINSHASA / R.D. CONGO

A obtenu le Diplôme de Spécialité Médicale le 29 Mai 2007

Spécialité : NEUROCHIRURGIE

بتاريخ : 28- 29 مـــاي 2007

تشهد عميدة كلية الطب و الصيدلة بالرباط

أن: مـــودجيـــر بـــلانـــدا ديـــديي

المزداد(ة) بتاريخ 26 فبراير 1968 بكينشاسا جمهورية كونغو الديمقراطية

قد أحرز(ت) على دبلوم التخصص في الطب في : 29 مـــاي 2007

التخصص : جـــراحـــة الأعصاب

Rabat le 27 Septembre 2007 الرباط في

Le Doyen de la Faculté de Médecine et de Pharmacie de Rabat
عميدة كلية الطب و الصيدلة

Signature de l'impétrant
توقيع المرشح

Le Président de l'Université Mohammed V - Souissi
رئيس جامعة محمد الخامس - السويسي

Fig 10a: Diploma of Specialty in neurosurgery of the Faculty of Medicine and Pharmacy of Rabat

WORLD FEDERATION OF NEUROSURGICAL SOCIETIES FOUNDATION

Board of Trustees

In authority of the WFNS Foundation

of the

WORLD FEDERATION
OF
NEUROSURGICAL SOCIETIES

and upon recommendation of the WFNS Rabat Reference Center,
of
Mohammed V University Souissi of Rabat

This document confers that from
March 1st, 2002 to April 28th, 2007

Didier Mudjir Balanda, MD

Successfully completed a 5 years training as a Resident in Neurosurgery
under the supervision of Abdeslam El Khamlichi, MD

Date: April 28, 2007

Fig 10b: Certificate Specialty issued by the WFNS

Photo 32: Late Dr. Didier Mudjir Balanda, First WFNS-RTC trainee in Rabat, receiving his diploma from Prof. A El Khamlichi, June 2007

Currently, there are 30 other young neurosurgeons who are still under training, distributed throughout nine neurosurgery departments in four different universities: Rabat, Casablanca, Fez and Marrakesh. Table 5 displays a list of these trainees with the same details as in table 4.

Analyzing tables 4 and 5 shows that young African neurosurgeons are selected and trained according to the criteria and conditions required by the WFNS. They come from 18 African countries: Benin, Burkina Faso, Cameroon, Congo Brazzaville, Ivory Coast, Gabon, Guinea Conakry, Malawi, Mali, Mauritania, Niger, Nigeria, Uganda, Democratic Republic of Congo, Rwanda, Tanzania, Chad and Togo. These are all countries where the number of neurosurgeons is very limited: one neurosurgeon for one to ten million inhabitants.

Table 4: Neurosurgeons trained at the WFNS-RTC (March 2002-July 2018)

Country of origin	Doctor's name	Training period and duration	Origin of scholarship
Democratic Republic of Congo	Late Dr. Didier Mudjir Balanda	2002 - 2007 5 years	WFNS Foundation
	Dr. Jeff Ntalaja Mukengeshay	2009 - 2014 5 years	Moroccan Agency for International Cooperation
	Dr. Trésor Ngamasata Tanzey	2012 - 2017 5 years	No scholarship
Nigeria	Dr. Nasiru Jinjiri Ismail	2002 - 2004 3 years	Philips Medical Systems Morocco
	Dr. Abdullahi Onimisi Jimoh	April 2005 - September 2005 6 months	His university
	Dr. Ismail Hassan	2008 - 2009 1 year	His university
	Dr. Usman Babagana	2013 - 2014 1 year	His university
	Dr. Eghosa Morgan	2014 - 2015 1 year	His university
Mali	Dr. Youssouf Sogoba	2004 - 2009 5 years	WFNS Foundation
	Dr. Oumar Coulibaly	2006 - 2011 5 years	Belgium cooperation
	Dr. Mamadou Bata Dianka	2010 - 2015 5 years	No scholarship
Benin	Dr. Jean-Marie Kouassi Kisito Quenum	2005 - 2010 5 years	WFNS Foundation
	Dr. Ahokpossi Alidegnon Semevo	2010 - 2016 5 years	Belgium Cooperation
	Dr. Nabil Moussé Adio	2012 - 2017 5 years	University Hospital Center of Rabat, Morocco

Country of origin	Doctor's name	Training period and duration	Origin of scholarship
Niger	Dr. Ali Lasseini	2009 - 2011 2 years	His university of origin
	Doctor Habibou Mahamane Laminou	2009 - 2014 5 years	Ministry of health of Niger
Uganda	Doctor Justin Onen	2008 - 2013 5 years	WFNS Foundation + his hospital of origin
Congo Brazzaville	Dr. Hugues Brieux Ekouele Mbaki	2008 - 2013 5 years	His university of origin
	Dr. Sinclair Brice Kinata-Bambino	2009 - 2014 5 years	Society of Neurosurgery of the French Language
Togo	Dr. Achille Komlan Agbeko Doleagbenou	2009 - 2014 5 years	WFNS Foundation + his hospital of origin
	Dr. Egu Komi	2011 - 2016 5 years	WFNS Foundation
	Dr. Kodjo Mensah Hobli Ahanogbe	2011 - 2016 5 years	No scholarship
Guinea Conakry	Dr. Seylan Diawara	2007 - 2014 5 years	WFNS Foundation + her university
	Dr. Ibrahima Berete	2010 - 2015 5 years	None
	Dr. Aboubacar Camara M'mah	2012 - 2017 5 years	No scholarship
Tanzania	Dr. Laurence Lemery Mchome	2013 - 2015 2 years	His university of origin
Burkina Faso	Dr. Ibrahim Dao	2009 - 2014 5 years	Ministry of Defense of Burkina Faso
Rwanda	Dr. Claire Karekezi	2011 - 2016 5 years	Ministry of Health of Rwanda
Cameroon	Dr. Ben Ousmanou Djoubairou	2012 - 2017 5 years	Ministry of Defense of Cameroon
Mauritania	Dr. Mohamed Bouya Soueilem	2012 - 2017 5 years	Ministry of Defense of Mauritania

Table 5: African trainees currently in the WFNS Rabat Reference Center (December 2018)

Country	Name of the trainee	Origin of Scholarship	Training Starting Date	Expected duration of training	Year of training
Mali	Dr. Sylla Kandjoura	No scholarchip	May 29th, 2013	5 years	5th year
	Dr. Mamadou Diallo		February 21st, 2014	5 years	5th year
	Dr. Fah Bouaré		March 21st, 2016	5 years	3rd year
	Dr. Moussa Denou	WFNS Foundation since Sept. 9th, 2016	Sept. 9th, 2016	5 years	3rd year
Democratic Republic of Congo	Dr. Jean-Claude Bukasa Binene	Africa 100	October 7th, 2013	5 years	5th year
	Dr. Guelord Metre Mpambia	No scholarchip	July 20th, 2015	5 years	4th year
	Dr. Arsène Ntini Lebi		March 27th, 2017	5 years	2nd year
	Dr. Simon Kutoloka Mabiza		June 13th, 2017	5 years	2nd year
	Dr. José Dimbi Makoso		July 16th, 2018	5 years	1st year
Guinea Conakry	Dr. Mohamed Cherif	Africa 100	December 24th, 2013	5 years	5th year
	Dr. Kaba Djene Ibrahima		January 23rd, 2014	5 years	5th year
Cameroon	Dr. Mfouapon Ewane Hervé Blaise		March 10th, 2014	5 years	5th year
Mauritania	Dr. Taleb El Wavi Seyedna Ali	No scholarchip	May 12th, 2014	5 years	5th year

Country	Name of the trainee	Origin of Scholarship	Training Starting Date	Expected duration of training	Year of training
Malawi	Dr. Geoffrey Ndekha	Africa 100	June 9th, 2014	5 years	5th year
	Dr. Davis Mpando		December 22nd, 2014	5 years	5th year
Togo	Dr. Felix Kossi Kouma Segbedji	No scholarchip	February 10th, 2015	5 years	4th year
	Dr. Alena Ameyo Nubukpo-Gumenu		March 27th, 2015	5 years	4th year
Ivory Coast	Dr. Franck Kouakou Loukou	Ministry of Defense of Ivory Coast	May 18th, 2015	5 years	4th year
	Dr. Patrice Koffi Niamien		Feb. 22nd, 2016	5 years	3rd year
Niger	Dr. Hassane Ali Amadou	Africa 100	May 20th, 2015	5 years	4th year
	Dr. Ismael Mahazou Abdou	No scholarchip	April 13th, 2017	5 years	2nd year
Benin	Dr. Fortuné Gbetoho Gankpe	Africa 100	May 25th, 2015	5 years	4th year
	Dr. Armel Junior Tokpo	No scholarchip	Feb. 12th, 2016	5 years	3rd year
	Dr. Albéric Fabrice Sewa Bocco		March 16th, 2016	5 years	3rd year
	Dr. Nouroudine Adeniran Bankole	WFNS Foundation since Feb. 28th, 2017	Feb. 28th, 2017	5 years	2nd year

Country	Name of the trainee	Origin of Scholarship	Training Starting Date	Expected duration of training	Year of training
Chad	Dr. Olivier Ouambi Li-iyane	WFNS Foundation since July 24th, 2015	July 24th, 2015	5 years	4th year
Burkina Faso	Dr. Christine Milena Sayore	WFNS Foundation since Feb. 15th, 2016	Feb. 15th, 2016	5 years	3rd year
Gabon	Dr. Fernand Imoumby	Ministry of Defense of Gabon	Feb. 23rd, 2016	5 years	3rd year
Congo Brazzaville	Dr. Gédéon Colin Thouassa	No scholarchip	June 20th, 2016	5 years	3rd year
Nigeria	Dr. David John Tagurum		Nov. 19th, 2018	18 months	1st year

3.3.2- Future prospects of WFNS-RTC graduates upon return to country of origin

We have seen earlier that before being accepted at the WFNS-RTC, all these young doctors must submit an affidavit stating they commit to going back to their country of origin once their training is over. They are also required to fill in a form, upon their arrival, providing information regarding country population, number of neurosurgeons in the country and rate of neurosurgeons per capita. Throughout their training, they are regularly reminded that this experience was possible thanks to the support of the international neurosurgical community, which in turn expects them to be of service to their countries and contribute to the development of neurosurgery. During their training, the trainees learn about, alongside their professors, recent progress and strides that Moroccan neurosurgery has made, as well as the paths taken by those who have pioneered the field of the specialty.

Most of these young doctors return to their country with grand ambitions and a strong desire to lay the groundwork for the development of neurosurgery. In order to keep them motivated and

reduce potential discouragement that could arise due to professional constraints, we strive to maintain regular contact with them, upon their return. Keeping in touch is achieved through two means: first through email exchanges and second, and more importantly, as we will see later, through seminars and workshops that are regularly organized by WFNS-RTC (yearly or once every two years), which they are invited to attend.

In order to keep up-to-date records on their professional activities, a survey was conducted in 2016 to gather information on the progress of former trainees, two to three years after their return to their countries of origin. A questionnaire was sent to them to fill and return. Information requested includes place of practice, available equipment, patient data, and existing neurosurgery projects in their countries.

In 2016, out of 16 returning neurosurgeons who had been back for longer than three years, 15 responded to the questionnaire. Tables 6 and 7 summarize their answers. Table 6 shows that most of these neurosurgeons work at public hospitals (12 out of 13), and one works both in the public and private sectors. Some of them (6 out of 13) passed the exam to get position at the university as assistant professor in neurosurgery and start their hospital-university career. This will allow young doctors to congregate and maintain their interest in neurosurgery. In addition, we have learnt that the majority of these doctors (9 out of 13) end up work in teams, half of which (6 out of 9) are championing a local neurosurgery training programs. All of these young doctors have been performing between 100 to 300 surgeries per year.

In terms of equipment available to neurosurgeons, table 7 shows that they all have sets of instruments for craniotomy and laminectomy, bipolar coagulation, operating microscope, CT scan, MRI and even digital angiography for some of them. These exhibits show that, overall, all these young neurosurgeons are well incorporated into the national health system in their country and all are able to acquire the required basic equipment that allows them to operate on patients. They also successfully promote and lobby for neurosurgery in their countries and by doing so, manage to convince local authorities to launch a local training program.

Thus, thanks to these young neurosurgeons' work and achievements upon their return, we better understand the pivotal role that WFNS-RTC plays in the development and promotion of neurosurgery in Africa. We can see, as well, that the key to developing neurosurgery in a country is to train young doctors. This training must be complete and a diploma needs to be awarded at the end of it. This helps to set the stones to allow well trained neurosurgeons to play a pioneering role in the sustainable and solid development of neurosurgery.

There is nothing more harmful for neurosurgery in a country without neurosurgeons than to send poorly-trained neurosurgeons to it. This could lead to a poor performance, coupled with a potentially high and unacceptable morbidity and mortality rates, which could then result in giving a negative image on the usefulness of this specialty to patients and to the country, overall. Furthermore, if the poorly-trained neurosurgeon succeeds in getting a job at a local university, which is often the case because of the existing shortage of neurosurgeons, he/she can become too comfortable in a leadership position or as a university professor without honoring the fulfillment of his/true mission. There are some examples in several African countries, where these "pioneers of convenience" have gone on for 15 or 20 years, without training a single neurosurgeon or exploring the possibility of setting up a neurosurgery unit in these countries. As a result, neurosurgery doesn't develop much.

This is the reason we have always believed that it is much better, for a country without neurosurgeons, to wait for a couple of years, in order to have a well trained doctor, than to quickly recruit a poorly trained one. Also, some colleagues from developed countries still accept to train young African doctors in neurosurgery for short periods of time (2 to 3 years), who then get sent to their home countries, "to be able to do few emergency procedures", notwithstanding the risks associated with performing surgeries without being fully equipped to do so.

Besides a comprehensive training, the WFNS-RTC offers these African young neurosurgeons an ideal environment to prepare their return, and an initiation on how to further develop neurosurgery in their home countries. During their training, they are exposed to pathologies experienced by patients who go to see doctors when the illness has

Tab 6: Activities of neurosurgeons trained at the WFNS-RTC, upon their return to their home countries (13 answers)

Name	Number of years since their return	Public or private hospital	Job at the university	Job in the hospital	Number of operated patients	Work within a team or on his own	Training program	Number of trainees
DR. ISMAIL JINJIRI NASIRU	12	PUBLIC	YES	YES	3.000	TEAM	YES	3
DR. YOUSSOUF SOGOBA	7	PUBLIC	YES	YES	2.180	TEAM	NO	4
DR. ABDULLAHI ONIMISI JIMOH	11	PUBLIC	YES	YES	>3500	TEAM	YES	7
DR. KISITO QUENUM	6	Pub & private			417	On his own	NO	0
DR. ISMAIL HASSAN	7	PUBLIC	YES	YES	960	On his own	YES	1
DR. ALI LASSEINI	5	PUBLIC	YES	YES	300	TEAM	YES	2
DR. OUMAR COULIBALY	5	PUBLIC		OUI	700	TEAM	NO	4
DR. HUGUES BRIEUX EKOUELE MBAKI	3	PUBLIC	YES	YES	150	TEAM	NO	0
DR. ACHILLE KOMLAN	2	PUBLIC		YES	260	TEAM	NO	0
DR. JUSTIN ONEN	3	Pub & private		YES	999	On his own	NO	0
DR. JEFF NTALAJA	2	PUBLIC		YES	401	TEAM	NO	
DR. SEYLAN DIAWARA	2	PUBLIC		YES	4	TEAM	YES	14
DR. IBRAHIM DAO	2	MILITARY		YES	97		YES	7
TOTAL			***6***	***11***	***11.968***			***45***

Table 7: Equipment available to WFNS-RTC trained upon their return to their home countries (15 answers)

NAME	Set of laminectomy	Set of craniotomy	BIPOLAR	MICROSCOPE	CT	MRI	Dig ANGIO	ENDOSCOPE
DR. ISMAIL JINJIRI NASIRU	YES	YES	YES	YES	YES	YES	NO	YES
DR. YOUSSOUF SOGOBA	YES	YES	YES	YES	YES	YES	NO	NO
DR. ABDULLAHI ONIMISI JIMOH	NO	YES	YES	YES	YES	YES	NO	NO
DR. KISITO QUENUM	YES	YES	YES	YES	YES	NO	NO	NO
DR. ISMAIL HASSAN	NO	YES	YES	YES	YES	YES	YES	NO
DR. ALI LASSEINI	YES	YES	YES	YES	YES	YES	NO	YES
DR. OUMAR COULIBALY	YES	YES	YES	YES	YES	NO	NO	YES
DR. HUGUES BRIEUX EKOUELE MBAKI	YES	YES	YES	YES	YES	YES	NO	NO
DR. ACHILLE KOMLAN	NO	YES	YES	YES	YES	YES	NO	NO
DR. JUSTIN ONEN	YES	YES	YES	YES	YES	NO	NO	YES
DR. JEFF NTALAJA	YES	YES	YES	YES	YES	YES	YES	
DR. SEYLAN DIAWARA	YES	YES	YES	NO	YES	YES	NO	
DR. IBRAHIM DAO	YES	YES	YES	YES	YES	YES	NO	
DR. SINCLAIR BRICE KINATA	YES	YES	YES	YES	YES	YES	YES	
DR. LAURENCE LEMERY MCHOME	YES	YES	YES	YES	YES	YES	YES	
TOTAL	***7***	***10***	***15***	***14***	***15***	***12***	***4***	***4***

advanced. They do overnight shifts, often in departments encumbered by tens of patients who come for the first time long after they have been sick, sometimes years after. Sometimes, they deal with the same issues as their Moroccan colleagues, such as the absence of medical equipment, imaging machines breaking down, overloaded operating rooms, etc. During their internships in hospitals, most of them are placed in relatively new departments. Indeed, with the exception of two departments in Rabat and Casablanca, which have existed for longer than fifty years, most other neurosurgery university departments have been around for less than twenty. African trainees who work there often quickly understand the different steps of the development of Moroccan neurosurgery, as well as the required conditions to create a department of neurosurgery, with necessary equipment and a training program.

3.3.3- Continuing Medical Education

In the cooperation agreement mentioned above, signed in 2005 between the WFNS and Mohammed V University of Rabat, it is stipulated that both institutions will work together to ensure the provision of Continuing Medical Education in the form of seminars, workshops and symposiums, organized on a regular basis, as part of the WFNS-RTC. We have just seen the summary of the training delivered over the course of 5 years to young African doctors who desire to specialize in neurosurgery. The ongoing training that WFNS-RTC has committed to, through Mohammed V University and the WFNS, is geared towards both young African trainees and senior African neurosurgeons who are regularly invited.

We have already seen that the basic training was entirely financed by Moroccan public institutions (University and University Hospital Center), in the sense that these trainees enroll in the training program without having to pay tuition fees, similarly to their Moroccan colleagues. In terms of the ongoing training, it is a little different : neurosurgery departments, similarly to other university hospital departments, do not have a dedicated budget for ongoing training. The only support these departments get at times, although scare, comes from pharmaceutical laboratories and companies that manufacture medical equipment. Yet, setting up a training program in Africa often requires a bigger financial investment than in Europe, because African participants cannot afford, or are not accustomed to pay registration

fees. In fact, the majority of them will take part in a given training only if their travel expenses are fully covered. In addition to this, many European and North American colleagues, expect their expenses to be fully covered when they get invited to speak in Africa. Fortunately, WFNS asks from the members of its Education Committee to accept a maximum number of invitations to these activities, and to shoulder relevant travel expenses. As a result, we have had to constantly look for sources of funding in order to be able to set up an alluring training program for African neurosurgeons, organized by the WFNS-RTC, in collaboration with Mohammed V University.

This is where Hassan II Foundation for the Prevention and Cure of Nervous System Diseases has been a pillar of support. In the second chapter, we have seen that supporting the ongoing training was one of the three objectives which motivated the creation of this Foundation in 1989. We have also summarized the ongoing training program that this Foundation has sponsored during the first decade of its creation (1989-2000). Therefore, the Foundation will continue to be the main financial support to this ongoing training program set up by the WFNS-RTC, in collaboration with Mohammed V University in Rabat.

The report of activities of the ongoing training program between 2002 and 2018, can be summarized as follows:

Seminars and workshops: these are scientific meetings**,** which generally last from one or two days and are facilitated by foreign experts (1 to 3). The objective of these meetings is to allow Moroccan and African neurosurgeons to become familiar with diagnostic or treatment techniques (surgical, especially) that are not common in Morocco, and for which African patients have to go abroad for treatment. These short meetings are not new for the WFNS-RTC. They were part of the upgrade program of the Moroccan neurosurgery: a program I have worked on since I was appointed as Professor - Head of the Department of Neurosurgery in 1983. In order to introduce an exploratory technique or a neurosurgical technique, which was not practiced in Morocco at the time, my team and I were adopting the following approach. It involved inviting an international expert to chair a seminar in the department on a particular specific subject. This was an opportunity to become personally acquainted with, and for said expert to see the eagerness of Moroccan young neurosurgeons in terms of acquiring knowledge but also in terms of expanding the

scope of neurosurgery in the country. During these seminars, often one or two patients would be selected for surgery or exploration in the presence of expert, in local conditions. After that, either myself, or one of my associates would go to visit this expert, for a period of two weeks, in order to watch him/her practice this same technique within the confines of his/her department. After that, if necessary, other exchanges or visits, or even a second seminar, could be scheduled, six months or a year after the first one. This second seminar or workshop's objective is to assess the level technique mastery. Thanks to this international collaboration, we were able to introduce, very early on (1983-1990), the main sub-specialties in neurosurgery such as vascular surgery, pediatric surgery, skull base surgery, stereotaxy and pain-related surgery.

Since the 1990s, and thanks to the financial support of Hassan II Foundation, this program continues to develop in order to facilitate further development of neurosurgery, both on the technical and technological levels.

After the accreditation of the Department of neurosurgery of Mohammed V University by the WFNS in 2002, this ongoing training program, which was institutionalized through the cooperation agreement signed between the WFNS and Mohammed V University in 2005, will continue to further develop to meet the needs of Moroccan and African neurosurgeons. Since 2002, an average of two to three seminars and/or workshops are organized on a yearly basis by the WFNS-RTC.

As shown in table 8, these seminars were practice-driven in order to allow young African neurosurgeons to learn as much as possible. This program usually consists of three parts: conference-discussions, practical demonstrations and presentation of clinical cases, in addition to occasional bedside patient visits within the department. The practical demonstrations were not limited to neurosurgical operations in the operating room but involved also the practice of imagery techniques or exploratory techniques in laboratory (neurophysiology, neuropathology, neurochemistry, etc.).

The objective here is to take advantage of these seminars to link neurosurgery to other related multidisciplinary specialties: neuroradiology, neuroanesthesiology, neuropathology and neurophysiology.

In short, these practical seminars have allowed to expand technical and technological aspects of neurosurgery at the WFNS-RTC, but also to develop relationships with leading experts in the field, which has played an important role in allowing Moroccan and African neurosurgeons to master technical practices and build international careers.

Photo 33: Visit of Prof. M.G. Yasargil (Little Rock, USA)
Rabat, September 12-17, 2003

Photo 34: Visit of Prof. T. Kawase (Tokyo, Japan)
Rabat, May 3-4, 2007

Photo 35: Visit of Prof. P. Rabischong (Montpellier, France)
Rabat, February 15th, 2008

Photo 36: Symposium on epilepsy, with the team from
Hôpital Sainte-Anne (Paris, France)
Rabat, March 10-14, 2008

Photo 37: Master Class on Seizure Semiology, EEG and Epilepsy Surgery with Prof. Sarat P. Chandra and Prof. M. Tripathi (New Delhi)
Rabat, March 26-30, 2018

TABLE 8: Seminars and workshops organized at the WFNS-RTC (2003-2018)

Dates and duration	Topic of seminar or workshop	Foreign expert(s) invited	Objectives (techniques to be introduced)	Program
September 4, 2003	Surgery of cerebral aneurysms	Prof. S. Kobayashi Matsumoto, Japan	Microsurgery of anterior circulation aneurysms	- Lectures - Clinical case presentation
September 12-17, 2003	Vascular microsurgery: beginning, evolution, and current status	Prof. M.G. Yasargil, Little Rock, USA	- Evolution of microsurgery - How microsurgery has changed the practice of surgery	- Lectures - Clinical case presentation - Visit of patients with the residents
September 18-19, 2003	Skull base surgery	Prof. G. Mohr McGill University, Montreal, Canada	Surgery of the cerebellopontine angle and the sellar region	- Lectures - Clinical case presentation
December 16-17, 2003	Surgery of aneurysms and arteriovenous malformations (AVMs)	Prof. H. Sano Fujita Health University, Japan	Aneurysm and complex AVMs surgery	- Lectures - Clinical case presentation - Surgery - Visit of patients with the residents
February 20-24, 2006	Temporal epilepsy surgery	Prof. F.X. Roux, Dr. B. Turak, Dr. E. Landré Hopital Sainte-Anne, Paris, France	- Preoperative assessment - Criteria for the selection of patients to be operated - Surgical technique	- Lectures - Clinical case presentation - Surgery
April 6-8, 2006	Cerebral cavernomas	Prof. J.P. Houteville Caën, France	- Natural evolution of cavernomas - Family cases	- Lectures - Clinical case presentation
May 4, 2007	Skull base surgery	Prof. T. Kawase Tokyo, Japan	Surgical approach of tumors of the petrous apex	- Lectures - Clinical case presentation

Dates and duration	Topic of seminar or workshop	Foreign expert(s) invited	Objectives (techniques to be introduced)	Program
March 10-12, 2008	Temporal epilepsy surgery	Prof. F.X. Roux, Pr. B. Devaux, Dr. B. Turak, Dr. S. Rodrigo, and Dr. P. Vorlet Hopital Sainte-Anne, Paris, France	- Selection of surgical cases - Surgical techniques	- Lectures - Clinical case presentation - Surgery - Practicing Functional MRI
July 16-17, 2008	Gamma Knife Radiosurgery	Prof. J. Regis Hopital La Timone, Marseille, France	- Organizing a radiosurgery unit - Patients' selection - Target pathologies in radiosurgery	- Lectures - Gamma Knife radiosurgical treatment of patients at the Radiosurgery Unit of the NCRNS
April 6-10, 2009	Interventional radiology	Prof. F. Ricolfi UHC of Dijon, France	- Endovascular treatment of aneurysms and dural fistulas – Vertebroplasty and kyphoplasty	- Lectures - Clinical case presentation - Treatment of patients at the Interventional Radiology Unit of the NCRNS
April 17-20, 2009	Spine surgery and medico-legal issues	Prof. J. Brunon UHC of Saint-Etienne, France	- Complications of disc prostheses - Indemnification of medico-legal accidents	- Lectures - Clinical case presentation - Visit of patients with the residents
June 22-25, 2009	Epilepsy surgery	Prof. B. Devaux, Dr. B. Turak, Dr. E. Landré, Hopital Sainte-Anne, Paris, France	- Innovative techniques in epilepsy surgery - Selection of complex cases for surgery	- Lectures - Clinical case presentation - Surgery
October 12-14, 2009	Interventional radiology	Prof. F. Ricolfi UHC of Dijon, France	- Endovascular treatment of aneurysms and dural fistulas – Vertebroplasty and kyphoplasty	- Lectures - Clinical case presentation - Treatment of patients at the Interventional Radiology Unit of the NCRNS

Dates and duration	Topic of seminar or workshop	Foreign expert(s) invited	Objectives (techniques to be introduced)	Program
October 12-15, 2009	Functional neurosurgery and radiosurgery	Prof. S. Blond UHC of Lille, France	Radiosurgery in functional neurosurgery	- Lectures - Patients' treatment
March 12-13, 2010	Treatment of Parkinson's disease through deep brain stimulation	Prof. Jean Regis and Dr. Tatiana Witjas Marseille, France	Selection of patients, electrode implantation technique and patients' followup	- Lectures - Patients' treatment
October 30, 2010	Temporal epilepsy surgery : Seminar for technique assessment and expertise	Team of the Department of Neurosurgery at Hopital Sainte-Anne (Prof. F.X. Roux), Paris, France	Evaluation of patients operated since 2005 (special indications. Thoughts about extratemporal epilepsy surgery)	- Lectures - Surgery - Clinical case presentation
May 24-25, 2011	Treatment of Parkinson's disease through deep brain stimulation	Prof. A. Benazzouz Bordeaux, France	Electrode implantation technique for a patient	- Lectures - Evaluation of patients already treated - Patient's treatment
September 23, 2011	Treatment of spasticity	Prof. M. Vloebergh, Nottingham, UK	Implantation of programmable pumps for the treatment of spasticity	- Lectures - Clinical case presentation
November 15, 2011: 1 day	Treatment of dystonia through deep brain stimulation	Prof. P. Mertens Lyon, France	Implantation of electrodes for deep brain stimulation for a patient with dystonia	- Lectures - Clinical case presentation - Surgery
May 6, 2012	Drug-resistant epilepsy of the frontal lobe	Prof. P. Chauvel Marseille, France	Preoperative evaluation of drug-resistant epilepsy of the frontal lobe	- Lectures - Clinical case presentation

Dates and duration	Topic of seminar or workshop	Foreign expert(s) invited	Objectives (techniques to be introduced)	Program
May 28, 2013	Surgery of spine kyphoscoliosis	Dr. D. Refai Atlanta, USA	Surgical techniques applied to kyphoscoliosis	- Lecture
April 23, 2014	Skull base surgery	Dr. A. Basso Buenos Aires, Argentina	- Meningioma surgery - Visit of the WFNS-RTC	- Lectures - Clinical case presentation - Presentation of the WFNS-RTC
September 3-7, 2015	Pediatric neurosurgery	Prof. F. Boop Memphis, USA	- Pediatric surgery	- Lectures - Clinical case presentation
October 30, 2015	Neurophysiology	Prof. J.-P. Changeux Paris, France	- Neural functions	- Lectures
October 22-28, 2016	Extratemporal epilepsy surgery	Prof. S. Chandra New Delhi, India	Introducing hemispherotomy	- Lectures -Surgery - Clinical case presentation
February 10, 2017	Posterior fossa meningiomas	Prof. Francesco Tomasello Messine, Italy	Meningioma surgery	- Lecture
March 26-30, 2018	Master Class on Seizure Semiology, EEG and Epilepsy Surgery	Professor Sarat P Chandra (Dept. of Neurosurgery, All India Institute of Medical Sciences, New Delhi) and Professor Manjari Tripathi (Dept. of Neurology, All India Institute of Medical Sciences, New Delhi)	Surgery of extra-temporal lobe Epilepsy: - Patients selection -Techniques: Functional Hemispheroctomy and caltosotomy	- Surgery - Workshops and clinical case presentation - Lectures - Case discussion
June 12-13, 2018: 2 days	Seminar on physical therapy and golf	Alvaro Zerolo Vega de Seoane Madrid, Spain	- Spine movements and Golf practice	- Lectures

Courses organized by the WFNS-RTC

This aspect of continuing education, taken up by the WFNS-RTC, is dedicated to African neurosurgeons on training process, and those practicing in African countries. These courses have three objectives: (i) to broaden the ongoing training to include senior African neurosurgeons, (ii) to allow former trainees to return to Rabat and check on the progress they have made in their home countries, and encourage them to remain motivated, (iii) to allow WFNS to be in the loop in terms of African neurosurgery and to be regularly informed on the evolution and the results of the WFNS-RTC, as the first WFNS accredited regional center dedicated to the training of neurosurgeons in Africa.

To achieve these goals, we made sure to invite WFNS and its Foundation's officials as speakers, to each one of the courses. Also, in order to encourage neurosurgeons from Sub-Saharan Africa to attend, we invited some of them to come in a speaker capacity. Additionally, we covered registration fees and travel expenses, based on determined quota of young neurosurgeons per participating country. As part of the seminar's scientific program, half to a full day was dedicated to cover the topic of African neurosurgery. This allowed WFNS-RTC graduates, who returned to their countries, to present their work and activities at their respective hospitals.

All these courses were organized by the WFNS-RTC in collaboration with Mohammed V University in Rabat and the Moroccan Society of Neurosurgery. As seen earlier, the financial support is provided mainly by Hassan II Foundation in partnership with other national and international institutions (national: Moroccan Agency for International Cooperation, international: IBRO), and certain pharmaceutical/ medical equipment companies, for certain seminars. The financial aspect has always been a major constraint in organizing these courses. This is due to the absence of systematic institutional support coupled with the high costs associated with organizing these courses (USD 80.000 to 100.000 USD per course).

Since the accreditation of the WFNS-RTC (2002) to date (2018), a total of ten courses have been organized. Table 9 shows the details of these courses, including date, duration, subjects, number of participants, as well as side events. Furthermore, during these courses, meetings were held in the presence of WFNS and WFNS-RTC officials and some African neurosurgeons, in order to assess the course content, the program and discuss the future of African neurosurgery.

Each course was an opportunity to bring together, not only African neurosurgeons and WFNS officials and its Foundation, but also senior leading Professors, and in doing so facilitate knowledge and experience exchange and help African neurosurgeons come out of isolation and encourage to keep striving for the development of neurosurgery in their countries.

Some of these courses were an opportunity to create partnerships with national and international institutions that can contribute to the WFNS-RTC initiative. Hence, during the 4th course, a cooperation agreement was signed between Hassan II Foundation and St-Michael Hospital in Toronto (Canada), allowing WFNS-RTC trained African neurosurgeons to benefit from internships (6 months to 2 years) at St-Michael Hospital in Toronto.

I would like to express my deep thanks to Dr. R. Perrin, neurosurgeon at St-Michael Hospital in Toronto, and former Secretary of the WFNS who facilitated this exchange program with the support of benefactor Mr. A. Labatt, a Canadian donor who has supported the program and who provided African trainees with scholarships during their stay in Toronto.

Table 9 : Courses & workshops organized by wfns-rtc (2007-2018)

Dates, Duration, Venue	Topics	Participants	Observations
First WFNS-RTC-Mohammed V University Course Dates : March 8-11, 2007 Venue: Hilton Hotel & Medical School in Rabat	Workshops: - Neuro-endoscopy - Posterior spinal instrumentation Clinical course: - Spinal and cranial dysraphysms - Cerebellar and fourth ventricle tumors - Intracranial meningiomas - Cerebral aneurysms of anterior circulation	- 14 international lecturers - 47 participants in the workshops - 83 participants in the course, with 39 from Sub-Saharan countries	- Certificate of merit from Mohammed V University to Professors M. Samii (Hanover, Germany), and J.G. Martin-Rodriguez (Madrid, Spain)
Second WFNS-RTC-Mohammed V University Course Dates : June 12-15, 2008 Venue : Hilton Hotel, Rabat & Medical School of Rabat	- Workshop and hands-on skull base surgery - Clinical course : abnormalities in the CNS, pituitary surgery, spinal tuberculosis, CNS infections, spinal trauma, radiosurgery, controversies in neurosurgery, neurosurgery in developing countries, cerebrovascular malformations	- 24 lecturers - 72 participants	- Visit of the Gamma Knife PerfeXion Unit at the National Center for Rehabilitation and Neurosciences in Rabat, first unit to be set up in Africa at that time

Dates, Duration, Venue	Topics	Participants	Observations
Third WFNS-RTC-Mohammed V University Course Dates : March 26-28, 2010 Venue : Medical School of Rabat & Golden Tulip Farah Hotel	Workshops: - 3rd ventriculostomy - Management of intraventricular tumors Clinical course: Head and spinal injury, management of cerebrovascular malformations (microsurgery/ endovascular), functional neurosurgery and radiosurgery, CNS infections, neuroendoscopy, skull base surgery	- 22 lecturers - 71 participants, with 42 from Sub-Saharan countries	
Fourth WFNS-RTC-Mohammed V University Course Dates : March 25-27, 2011 Venue : Conference Center of Mohammed VI Foundation for Education works promotion	Workshop: - Hands-on suturing techniques Clinical course: Subarachnoid hemorrhage, brainstem tumors, sellar and parasellar tumors, meningiomas	- 19 international lecturers - 124 participants from various African countries	During the opening ceremony, a co-operation agreement was signed between the WFNS-RTC and the University of Toronto, aiming at granting scholarships to the trainees who finish their training at the WFNS-RTC for a training in Toronto.
Fifth WFNS-RTC-Mohammed V University Course Dates : November 8-11, 2012 Venue : National Center for Rehabilitation and Neurosciences & Tour Hassan Hotel Palace in Rabat.	Workshop: - Deep brain stimulation Clinical course: radiosurgery, brainstem tumors, cerebrovascular malformations, low-grade gliomas, head and spine trauma, CNS malformations Special session: African neurosurgery in transition	- 30 international lecturers - 172 participants from various African countries	- Celebration of the 10th Anniversary of the WFNS-RTC - A certificate of merit was handed over to the WFNS-RTC Director by the WFNS Foundation President, and a souvenir was given by the WFNS President - Testimonials of the WFNS Officers

Dates, Duration, Venue	Topics	Participants	Observations
Sixth WFNS-RTC-Mohammed V University Course Dates : March 27-30, 2014 Venue : Amphitrite Hotel Palace & National Center for Rehabilitation and Neurosciences, Rabat	- Cerebrovascular malformations - Pediatric neurosurgery - Functional neurosurgery and radiosurgery - Head and spinal trauma - Central nervous system malformations - Skull base tumors - Evolution of neurosurgical practice in Africa - How I do it (in the context of Sub-Saharan countries)	- 29 international lecturers - 79 participants from various African countries	The course was dedicated to the retirement of Prof. A. El Khamlichi, with a special ceremony to honor him, and a musical show given on the occasion by students from the Medical School of Rabat
Seventh WFNS-RTC-Mohammed V University Course Dates : May 9-21, 2016: WFNS-RTC Course IBRO-UMV Advanced School in Neurosciences Venue : Medical School of Rabat, and National Center for Rehabilitation and Neurosciences, Rabat	Basal ganglia	- 23 lecturers - 47 participants	- First instance of a course bringing together basic neurosciences and clinical neurosciences, including neurosurgery - Course sponsored by the IBRO (International Brain Research Organization)

Dates, Duration, Venue	Topics	Participants	Observations
Eighth WFNS-RTC-Mohammed V University Course Date: June 29, 2018: WFNS-RTC Course IBRO-UMV Advanced School in Neurosciences Venue: National Center for Rehabilitation and Neurosciences in Rabat	Basal ganglia	20 lecturers 27 participants	Course gathering cinical and fundamental neuroscientistes Course sponsored by IBRO
Ninth WFNS-RTC-Mohammed V University Course Dates : October 14-16, 2018 Venue : NCRNS, Rabat	- Functional neurosurgery; - Radiosurgery; - Vascular neurosurgery; - Tumors; - Spine; - Endoscopy; - Education in Neurosurgery	- 19 national and international lecturers - 35 participants	Creation of WFNS-RTC Alumni
Tenth WFNS-RTC-WFNS Venue:**Marrakesh Atlas Medina Hotel garden** **Oct. 17, 2018**	Education committee course -Tumors Pediatric NS **- Functional NS**	14 lecturers 85 participants	Meeting of the African trainees in the WFNS-RTC with Pr Servadei, WFNS president

Photo 38: Participants group photo, 3rd WFNS-RTC-M5U Course, Golden Tulip Farah Hotel, Rabat, March 26-28, 2010

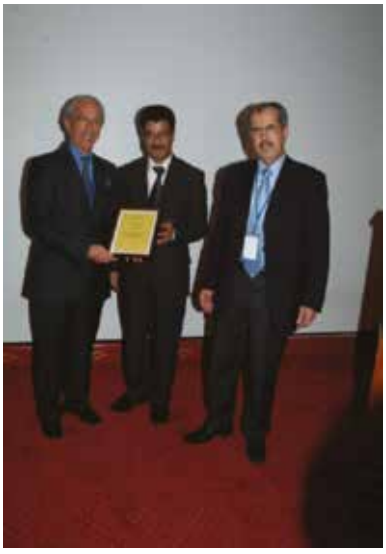

Photo 39: On the left, Professor Madjid Samii Receiving a Certificate of Merit from the President of Mohammed V University of Rabat - First WFNS-RTC - M5U Course – Hilton Hotel, Rabat, March 8-11, 2007

Photo 40: Family picture after a dinner organized at Professor El Khamlichi's home, 3rd WFNS-RTC-M5U Course - Rabat, March, 26-28, 2010

Photo 41: Speakers & participants of the 4th course WFNS-RTC-M5U Convention Center, Mohammed VI Foundation for the Promotion of Social Works in Education, Rabat, March, 25-27, 2011

Photo 42: Group of African speakers, invited to the 4th WFNS-RTC-M5U Course
Convention Center, Mohammed VI Foundation for the Promotion of Social Works in Education

Photo 43: Signature of the Cooperation Agreement between Hassan II Foundation for the Prevention and Cure of Nervous System Diseases and Saint-Michael Hospital (Toronto, Canada), Rabat, March 5th, 2011
From left to right : Mr. A. Labatt, Dr. A. El Khamlichi, Dr. R. Perrin

Photo 44: Speakers & participants in the 5th WFNS-RTC-M5U Course while visiting the National Center for Rehabilitation and Neurosciences – Rabat, November 8-11, 2012

Photo 45 (a,b,c,d): Celebrating the 10th Anniversary of the WFNS-RTC During the 5th WFNS-RTC-M5U Course
Tower Hassan Palace Hotel, Rabat, November 8-11th, 2012
(a) from left to the right : P. Black (President of the WFNS), A. Basso (WFNS Honorary President), M. Samii (Honorary President of the WFNS, A. El Khamlichi (Director of the Course), participating in cutting the

anniversary cakes

(b) Continuation of picture (a)

(c) Dr. A. El Khamlichi, receiving a souvenir from WFNS on the occasion of the 10thanniversary of the WFNS-RTC

(d) Dr. A. El Khamlichi, receiving a Certificate of Merit of the WFNS on the occasion of the 10th anniversary of the WFNS-RTC

Photo 46: Speakers and participants in the 6th WFNS-RTC-M5U course Amphitrite Palace Hotel, Rabat, March, 27-30, 2014

Photo 47: Group photo of the participants in the 9th WFNS-RTC-M5U course, NCR-NS, Rabat, October 14-16, 2018

3.4- Success of the WFNS-RTC as an example of North-South and South-South cooperation in the field of medical training

3.4.1- The main reasons lying behind the success of the WFNS-RTC

The main reasons can be summarized as follows:

- The unconditional commitment of Moroccan neurosurgeons and authorities, as well as the support of several national and international institutions : As stated before, the WFNS-RTC obtained the full support from Moroccan authorities, up to the highest level, the Royal support, from the very start.

In the beginning, the program started at the Neurosurgery Department at Hôpital des Spécialités in Rabat in 2002. Later, all other University Neurosurgery Departments in Morocco and the Moroccan Society of Neurosurgery joined the program to provide training to these young African neurosurgeons. The training was provided based on the same criteria required for young Moroccan neurosurgeons who are under training. This effort on the part of neurosurgeons also led to gaining support from universities, medical schools, university hospital centers and the Moroccan Agency for International Cooperation. All these

institutions contribute to help young African neurosurgeons, through medical school enrollment, providing accommodation, facilitating the training free of charge, and awarding a five-year scholarship for those who sit for the residency exam.

In addition to these national institutions, the support of international institutions must also be mentioned. Beside the support of the WFNS and its Foundation, there is the International Institute of Neuroscience chaired by Dr. M. Samii who sponsors the Africa 100 Program, which we will examine later in detail. There is also the support of St-Michael's Hospital in Toronto in Canada, where internships are open and scholarships are provided to neurosurgeons who finish their training at the WFNS-RTC. There is also the International Brain Research Organization that helps provide continuing medical education at the WFNS-RTC. Figure 11 depicts all the institutions supporting the WFNS-RTC in its training activity.

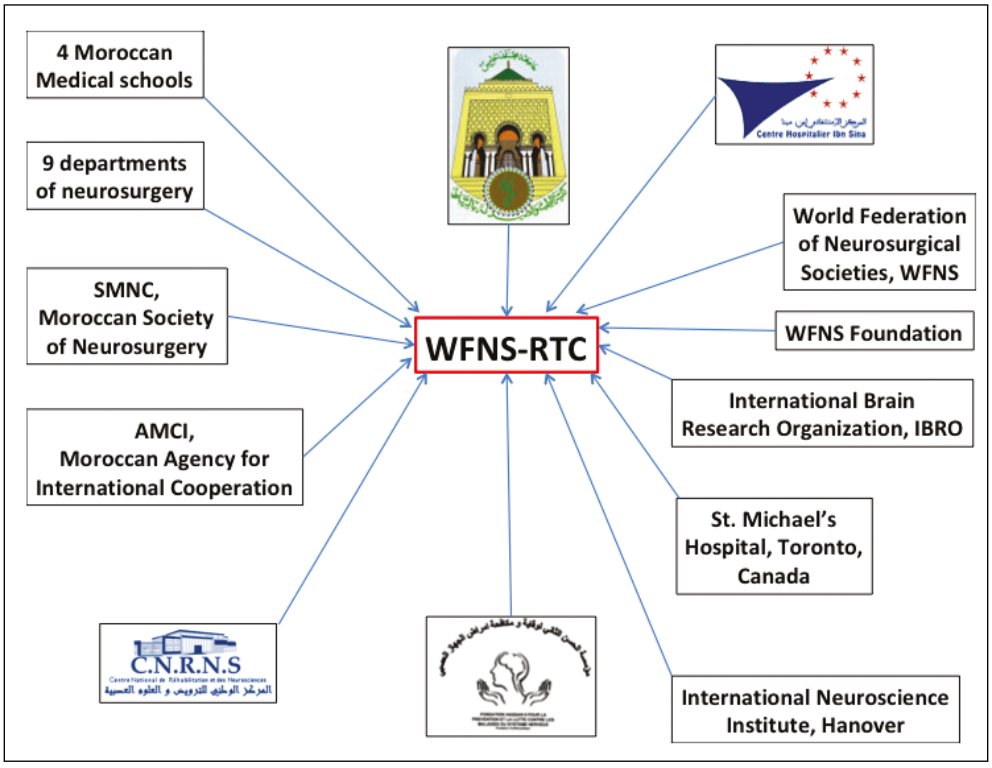

Figure 11: National and international institutions currently supporting the WFNS-RTC

- The full support of the WFNS: the WFNS has thoroughly studied the project before its inception. (i) A survey was conducted to obtain information regarding the status of neurosurgery in Sub-Saharan African countries, and to be sure that the training was the main request of African neurosurgeons, (ii) follow-up of the evolution of neurosurgery in Morocco through the promotion of the bid for Marrakesh to host the world congress of neurosurgery, (iii) set-up of the WFNS Foundation to bring in logistical support to the project (scholarships and low-price equipment, for neurosurgeons from developing countries).

Once the WFNS-RTC has been set up, the WFNS agreed on signing the agreement with Mohammed V University in Rabat, to allow institutionalization and sustainability. The agreement sets the criteria for the selection of applicants, resolve issues around their stay in Morocco while in training and puts together a program for the theoretical and practical training of neurosurgeons, with an in-depth examination of knowledge allowing for a specialization certificate upon success. All these points make WFNS-RTC a very attractive center for young African doctors searching for quality training in neurosurgery.

The WFNS ensures a follow-up on the WFNS-RTC activities since its beginning. A report, which includes all the details on these activities, is presented every year by the Director of the Center at the yearly meeting of the WFNS Foundation in Geneva in Switzerland. Officers of the WFNS often visit the Center when courses and/or seminars are being held at the WFNS-RTC. These visits by the WFNS executives allow them to assess the training program or even to participate in the training themselves. It allows them to show support and commitment to the teachers and trainees. They often take the opportunity to thank the representatives of Mohammed V University and the Moroccan authorities for their sustained efforts towards the development of the program.

To help the young WFNS-RTC trained neurosurgeons to become integrated once they return to their home countries, the WFNS agreed on providing them with instrument sets and other equipment available for purchase through the WFNS, at prices lower than the market average. Therefore, 241 instrument sets have been donated by the WFNS Foundation (up to December 2018), 125 (52%) among them have been donated to neurosurgeons from African countries (WFNS Central office, Geneva).

- The crucial role of Hassan II Foundation for the Prevention and Cure of Nervous System Diseases in the creation and management of the WFNS-RTC: as already mentioned at the beginning of this chapter, when discussing with the WFNS representatives, the option of choosing Rabat to set up the first regional center for training young African neurosurgeons, some concerns were raised by some colleagues at the WFNS. They questioned the technical and technological levels of Moroccan neurosurgery and it capability to provide African neurosurgeons with training in line with international standards. Consequently, we imagined the project of implementing the NCR-NS within the confines of Hôpital des Spécialités, at the UHC of Rabat. Through the Center, the Department of Neurosurgery at Mohammed V University in Rabat was equipped with state-of-the-art technologies that were not available elsewhere, which enabled it to be accredited by the WFNS as WFNS-RTC. Hassan II Foundation for the Prevention and Cure of Nervous System Diseases funded the NCR-NS, as already mentioned.

Beside this upgrade of Moroccan neurosurgery, Hassan II Foundation has brought a financial support to the WFNS-RTC through managing scholarships to African trainees, and through its support to the continuing education program which is delivered through courses, seminars and workshops, as previously mentioned.

These are the three forms of support that the WFNS-RTC has benefited from which have contributed to making a successful case of North-South and South-South cooperation.

3.4.2- The WFNS-RTC as seen by the WFNS officers and the neurosurgeons that were trained

As we have just seen, one of the reasons behind the success of the WFNS-RTC lies in the sustainable support provided by the WFNS officers and its Foundation. Their attendance of the courses held in Rabat has always been an opportunity for us to present the activity report of the center, but also constituted an opportunity for them to exchange with the trainees, and to hear first hand experiences of returning.

This regular follow-up by WFNS officers allows them to continuously assess the WFNS-RTC activity, and the evolution of its impact on the development of African neurosurgery.

In order for readers to have a glimpse on the WFNS officers' opinion on the activity of the center and its results, they are invited read the testimonies/statements below, on the occasion of the 10th Anniversary of the WFNS-RTC that was celebrated during the 5th WFNS-RTC Course (Rabat, November 8-11, 2012).

Dr. P. Black (Boston, USA, WFNS President at that time) wrote:

… For ten years, the WFNS Rabat Reference Center for Neurosurgeons has educated deserving and dedicated neurosurgical trainees for Africa. Under the capable direction of Prof. Abdeslam El Khamlichi, it has become a model for what the WFNS wishes to accomplish in parts of the world presently underserved by neurosurgery. Its high standards, devoted teachers, and bright and enthusiastic trainees have created a remarkable community that is changing the face of African neuroscience.

The Rabat unit remains a beacon of light for African neurosurgery and a model for all continents presently lacking adequate neurosurgical training centers. We are all proud to join in its tenth anniversary celebration.

Dr. Y.K. Tu (Taipei, Taiwan, WFNS President Elect at that time) wrote:

… An old Chinese proverb says that "It takes a decade to grow trees into a forest and a century to be able to cultivate elite scholars". Because the continuous efforts that Professor El Khamlichi and his colleagues have made to further the education of young neurosurgeons in Africa in the past decade, the seeds of neurosurgery have spread to many lands in Africa. I firmly believe that we do not have to take a century to see the glorious results of their efforts.

Dr. M. Samii (Hanover, Germany, WFNS Honorary President and WFNS Ambassador for Africa), said in his speech:

"The WFNS Rabat Reference Center was the beginning for the take-off of Africa in neurosurgery.[…]

Therefore, my dear Abdeslam, what you have done for Africa is unique and remains unique in history, and I hope, as you mentioned, that all my friends and colleagues from Algiers, from Sudan, from Egypt, and many other countries, that they follow this project, create such centers, that we can start with Africa 100 as soon as possible. Thank you very much. My congratulations for 10 years education here, and for the 5th year annual meeting for the education of those people who have already done neurosurgery, but every year, they come here to be educated furthermore for a better quality of neurosurgery in Africa".

Dr. A. Basso (Buenos Aires, Argentina, WFNS Honorary President and WFNS Foundation President at that time) said in his speech:

… "In the beginning, the Reference Center in Rabat was a dream. Step by step, it became a fantastic example of what should be done to develop such a program.[…]

The Reference Center in Rabat is an example of what should be done. This is the superstar in the WFNS educational program".

Dr. E. R. Laws (Boston, USA, WFNS Honorary President) wrote:

…." When the World Federation of Neurosurgical Societies became fully aware of the situation of neurosurgery in the continent of Africa, it immediately became apparent that Africa was a top priority with regard to the development of neurosurgical centers staffed by well trained indigenous neurosurgical staff, with modern neurosurgical instruments and equipment. With the assistance of the WFNS Foundation, originated under the leadership of Prof. Madjid Samii, and the Training Center in Rabat originated by Prof. El Khamlichi, these initiatives which once were only a dream, have been realized. As a result, each year, hundreds of thousands, and sometimes millions of people in Africa have access to and the benefit of first rate neurosurgical care".

Dr. H. Azevedo-Filho (Recife, Brazil, WFNS Secretary at that time) wrote:

… "The founding of a training center for African young doctors willing to become neurosurgeons and by consequence wishing to help their own countries in Africa represents one of the most important steps in the WFNS history and reflects a life-long commitment of Professor El Khamlichi to his people, his country and to Africa. […]

Of course, for his dream to become reality he had the full support of all WFNS Presidents, starting with Professor Madjid Samii, and at home the support of His Majesty, the King of Morocco, the Moroccan Society of Neurosurgery and of his University".

Further to the testimonials of WFNS executives, we will later look at the opinions of young African neurosurgeons who have been trained at the WFNS-RTC. Some of them kindly shared their testimonials upon their return to their home countries, which we have compiled into a single section at the end of this book (appendix 2).

3.4.3- The "Africa 100" program and setup of other regional training centers

The success of the WFNS-RTC through the five year basic training program, coupled with the exchange of experiences through continuing education meetings has sparked, in African neurosurgeons, the desire to further focus on the development and advancement of neurosurgery in their respective countries. In addition, these neurosurgeons have come to realize that there is an existing need to form a continental body to represent them and allows that their voices to be heard at the international level, especially in the WFNS. This unification of African neurosurgeons into a consolidated association has been a common wish. It remained a dream for more than ten years, and could not become a reality. Actually, since the Pan African Association of Neurological Sciences (PAANS) was set up in 1972, it represented African neurosurgeons at the WFNS. Despite having a dedicated section for neurosurgeons at the PAANS, said neurosurgeons would only rarely attend PAANS congresses, all the while their numbers continued to increase significantly across African countries. Towards the year 2000, during the 15th PAANS Congress (Cairo, 2002), neurosurgeons clearly expressed their desire to separate from the PAANS in order to form their own continental association that would represent them at the

WFNS level. Their desire was further expressed during the 13th World Congress of Neurosurgery in Marrakesh, in 2005. Two attempts were made to create Associations of Neurosurgery representing the African continent: the African Neurosurgeons Association (ANSA) in 2007 and the African Federation of Neurological Surgeons (AFNS) in 2009. These associations were presented to the WFNS, and were accepted, not as continental organization but only as regional ones.

So, for virtually over ten years, the representation of African neurosurgeons at the WFNS was more of a fiction than reality, and the succeeding presidents of the WFNS viewed it in rather a negative light (African neurosurgeons are not able to gather up into a single body), but did not try to lend a helping hand, nonetheless. Between 2011 and 2012, Dr. P. Black, WFNS President at that time, decided to engage mediation on the part of the WFNS to try and bring African neurosurgeons to an agreement. He chose Dr. M. Samii as a mediator, and nominates him "WFNS Ambassador for Africa".

Less than a year after his nomination as WFNS Ambassador for Africa, and after traveling to Africa to meet and consult with African neurosurgery leaders, the continental African organization of neurosurgeons was created under the name Continental Association of African Neurosurgical Societies (CAANS), suggested by Dr. M. Samii.

Photo 48: Meeting of Dr. M. Samii, WFNS Ambassador for Africa, with the representatives of the ANSA, AFNS, and PAANS to prepare for the creation of the CAANS, in Nairobi, on January 28th, 2012

Dr. M. Samii's project-driven nature and being a man of action, he did not limit himself to the scope of his diplomatic mission in Africa. He decided to set up a project to strengthen the training of young African neurosurgeons. He called this project "Africa 100". Through the project, he committed to managing the full basic training of one hundred young African doctors in neurosurgery, by providing them with scholarships and by enrolling them in training departments in Africa or elsewhere.

The launch of this ambitious project that began in January 2014, with six trainees enrolling at the WFNS-RTC, all of whom were sponsored by Dr M. Samii. The issue of setting up similar regional training centers in Africa, for Africa 100 applicants, was then raised. Thereby, three centers have been established (one in Dakar (Senegal), one in Algiers another one in Nairobi (Kenya)), a fourth one is underway in Egypt. In the span of four years (2014-2018), 15 trainees have enrolled in the "Africa 100" program, all of whom are currently under training. Eight among them have enrolled at the WFNS-RTC in Rabat. They too have been sponsored by Dr M. Samii. We will later examine how two newly established centers in Algiers and Nairobi are managed, through two articles that were written by the coordinators of these centers.

3.4.4- Impact of the WFNS-RTC on the evolution of African neurosurgery

We have just seen how the WFNS-RTC has been providing three training-related missions since it was set up in 2002. The first one is a basic five-year training in neurosurgery that leads to the issuance of a certificate to the young African neurosurgeons, with a regular increase over the years. A Continuing Medical Education Program is also provided at the Center to African neurosurgeons who have completed their training, and visit Rabat to attend courses, workshops and seminars organized jointly by the WFNS-RTC and Mohammed V University in Rabat, on a regular basis. During the basic training, and through different components (teamwork at the Medical School, emergency calls, discussion at the patients' bed, etc.), young African neurosurgeons became acquainted with local working conditions and understand patients' mind-set. In addition, they learn from their senior Moroccan colleagues how to deal with complex

situations with limited means. All of this takes place in an environment that shares similarities with the environment in which they will work upon their return to their native countries. Those who attend events geared towards continuing medical education, benefit from technical, teaching and organization-related expertise, delivered by field experts, on how to set up neurosurgery departments and training programs, as they interact with different neurosurgery lecturers and experts who are invited to give presentations. In other words, through these two training missions, the WFNS-RTC offers a third type of training: providing young African neurosurgeons with the means to face the reality of difficult working conditions and a strategy to discuss and convince (setting up and launching a department of neurosurgery, importance of neurosurgery in the healthcare system) healthcare system decision makers in their home countries.

This third type of training is as important as basic practical training and continuing medical education, in order to enable young neurosurgeons to play their role of pioneers who have been prepared to a career in their home countries, and attract young doctors into neurosurgery. The results of the survey on the activity of these young neurosurgeons since their return, which we have already mentioned, confirm the need for and efficiency of this third type of training.

Consequently, thanks to some enthusiasm, the momentum created by the first world congress of neurosurgery in Africa held in Marrakesh in 2005, WFNS-RTC's spirit of solidarity, and the encouragement and support shown by the WFNS and other international institutions, African neurosurgeons have stepped out of the shade. They have understood the need and the urgency to develop neurosurgery in Africa: a goal that can only be achieved through a commitment to train young neurosurgeons in their respective countries.

In order to bring together the results reached through this ambition on the part of African neurosurgeons and show the scope of its impact, we conducted in 2016 a survey on the status of African neurosurgery, similar to the survey conducted in 1997-98. The results of both surveys have shown positive results (table 10):

Tables 10 (a): Evolution of African neurosurgery
Results of the survey conducted in 1998

	Population (in millions)	Neurosurgeons	Ratio (adjusted)
Africa	800	565	1/1 066 666
South Africa	45	86	1/ 405 405
North Africa	140	400	1/ 380 658
Sub-Saharan Africa	615	79	1/ 7 784 810
World	5.479	23.940	1/ 230.000
WHO recommended ratio			**1/100.000**

Tables 10 (b): Evolution of African neurosurgery
Results of the survey conducted in 2016

	Population (in millions)	Neurosurgeons	Ratio (adjusted)
Africa	1.120 (+75)	1.727	1/ 654 000 (1/691000)
South Africa	55	171	1/ 420 000
North Africa	181	1.187	1/ 131 000
Sub-Saharan Africa	884	369	1/ 2 395 663
WHO recommended ratio			**1/100 000**

- Regarding the evolution of the number of neurosurgeons in Africa, table 10 shows that the overall number has increased from 565 in 1998 (for a population of 800 million inhabitants) to 1.727 in 2016 (for a population of 1 billion 120 million inhabitants). The number of neurosurgeons has, therefore, increased three times over 18 years. The ratio has decreased from 1 neurosurgeon to 1.066.666 inhabitants to 1 neurosurgeon to 654.000 inhabitants. The increase in the number of neurosurgeons in Sub-Saharan Africa is higher than in the remaining parts of the continent. The overall number of neurosurgeons in this area has increased from 79 in 1998 to 369 in 2016, which means the number has increased four and a half fold. The ratio in Sub-Saharan African was 1 neurosurgeon to

7 million inhabitants in 1998. In 2016, it reached 1 neurosurgeon to 2 million inhabitants. Of course, the ratio in 2016 remains weak, and the number of neurosurgeons in Sub-Saharan Africa is still alarmingly low given the existing high need for neurosurgeons. The progress that has been made this far is outstanding and very much promising nonetheless.

- In terms of the number of African countries involved in the national neurosurgery-training program, there were five countries in 1998. In 2016, the number reached 21, offering one or several training departments per country. Sixteen of these countries are in Sub-Saharan Africa. The number of trainees in these 16 countries is 285, which is a very promising number, and can be compared to the overall positive evolution of the ratio and number of neurosurgeons in Africa.
- With regards to organizational bodies, we have seen that Africa already has a continental association (CAANS) that represents the continent at the WFNS, with three congresses held in Algiers (May 9-12, 2014), Cape Town (July 26-29, 2016), and Abuja, Nigeria (July 24-27, 2018). In 1998, there were 5 national associations, and one regional association of neurosurgery. In 2016, there are 24 associations, namely:
- **One continental association**, the CAANS ;
- **Three regional associations :** the AFNS, the ANSA and the Maghrebian Federation of Neurosurgical Societies ;
- **Seventeen national associations** representing the following countries : the Algerian Society of Neurosurgery, the Burkinabese Society of Neurosurgery, the Cameroonian Society of Neurosurgery, the Egyptian Society of Neurological Surgeons, the Society of Ethiopian Neurological Surgery Professionals, the Ghana Academy of Neurosurgeons, the Neurological Society of Kenya, the Libyan Association of Psychiatry Neurology & Neurosurgery, the Moroccan Society of Neurosurgery, the Mauritanian Association of Neurological Sciences, the Nigerian Academy of Neurological Surgeons, the Congolese Association of Neurosurgeons (DRC), the Association of Neurosurgery of Rwanda, the Society of Neurosurgeons of South Africa, the Sudanese Association of Neurosurgeons, the Tunisian Society of Neurosurgery, the Society of Neurosurgery of Zimbabwe

- **Three affiliate associations :**Neurosurgical Society of East and Central Africa, the Malagasy Society of Neurological Surgery and the Nigerian Society of Neurological Sciences.
- Regarding the pathologies managed by African neurosurgeons, there were five main clusters in 1998 (considered as priorities): skull and brain trauma, nervous system infections, hydrocephalus and nervous system malformations, tumors and vascular diseases. Vascular diseases were the least encountered. Moreover, during the last three decades of the 20th century, when aneurysms were treated mostly with microneurosurgery in Europe, African neurosurgeons expressed, during the scientific meetings they attended between 1970 and 1990, that cerebral aneurysms were rare, even non-existent in Africa (20,31,32,33). This belief, which is incorrect, remained constant in the minds of African neurosurgeons and neurologists over the last fifty years of the 20th century. Between 1982-1984, following a research paper based on autopsy series, we proved that empirical belief was wrong, and that cerebral aneurysms had the same frequency in Moroccan patients and elsewhere, in the autopsy series examined (22,23,24,25). Following these autopsy data that were later confirmed by a clinical series (26), aneurysms were discovered in Africa gradually, as the number of neurosurgeons increased, and the tools to diagnose subarachnoid hemorrhage secondary to aneurysm evolved (especially the CT scan and angiography). In 2016, during the second CAANS Congress in Cape Town (July 26-29, 2016), three series of patients who underwent surgery to treat aneurysms in three Sub-Saharan countries (Mali, Nigeria, Senegal) were presented, which shows the great progress witnessed in the evolution of African patient management over the last sixteen years, along with the increase in the number of neurosurgeons.

This is the practical overview of the WFNS-RTC and its positive impact on the evolution of African neurosurgery and the management of patients in Africa. This chapter recalls the historical circumstances that worked together towards setting up the WFNS-RTC by the WFNS, and the unconditional support of the institutions related to the hospital and the university, and the Moroccan authorities to enable it to operate and shine. The signing of the cooperation agreement by

representatives of both the WFNS and Mohammed V University of Rabat has made the project sustainable, and has permitted optimal conditions to ensure a comfortable stay of young African doctors, and meet the requirements for their training.

The results gathered from WFNS-RTC trained neurosurgeons activity follow-up, after returning to their home countries, through surveys, and through the scientific meetings that are held at the WFNS-RTC in Rabat, show that regional training centers represent the best adopted system. The system should be supported and reinforced in order to encourage the development of neurosurgery in Africa, where the death toll related to skull, brain, and spine trauma is far above that HIV and malaria combined.

The impact that WFNS-RTC has had on the evolution of African neurosurgery has led to recognition by several international institutions, such as the WFNS (in 2012 and 2013), the International Neurobionic Foundation (Hanover, Germany, 2014), the Maghrebian Federation of Neurosurgical Societies (2010), and the French-Speaking Society of Neurosurgery (Paris, France, 2016).

Chapter 4

CHOOSING AN EFFICIENT TRAINING SYSTEM TO SET UP A NEUROSURGICAL DEVELOPMENT STRATEGY IN SUB-SAHARAN AFRICA BY 2030

As previously mentioned in chapter 1, the main reason behind the delay of neurosurgery in Sub-Saharan Africa, was the lack of an appropriate training system, attractive to young doctors keen to specialize in neurosurgery. We have explained the causes underlying the absence of such a system during the colonial period and after the independence of Sub-Saharan African countries, whereas North African countries and South Africa succeeded in partially overcoming these difficulties and in setting up a national training system at an early stage. This situation resulted in disparity in the regional development of African neurosurgery during the second half of the 20th century.

Nowadays, after African neurosurgery has taken off and beside the increasing awareness of African neurosurgeons and health decision makers in different African countries, two important issues have to be clarified in order to secure a sustainable development of neurosurgery in these countries. First, it is time for all Sub-Saharan African countries to recognize neurosurgery as a specialty in the healthcare system; second, it is a requirement to set up an efficient training program that enables to educate competent neurosurgeons in sufficient numbers for the country. We know that in advanced countries, these two factors represent the starting point to any development program of neurosurgery, in developed countries, where neurosurgery has been practiced for decades.

4.1- Introduction of neurosurgery as a specialty in the healthcare system of African countries

During the colonial period and earlier after independence, some pioneers of African neurosurgery have shown some reluctance to set up neurosurgical departments or units. They would rather keep practicing neurosurgical procedures in general surgery departments,

for many years. They put forward the following arguments: (i) the lack of technological devices to take care of patients' diagnosis and treatment (according to them, neurosurgery depends on technology); (ii) the country has to face the public health priority diseases; (iii) there should be a high number of general surgeons before introducing more advanced surgical specialties of (34).

These same arguments are still used by some "expert" colleagues who consider it would be a mistake to train neurosurgeons without having prepared his/her working conditions in his/her country. Such a mindset has a detrimental impact on African neurosurgery development. As a matter of fact, we have seen in chapter 3, through the example of young African neurosurgeons trained at the WFNS-RTC, that as soon as these young trainees are back home, they manage to set up the optimal conditions that enable them to practice neurosurgery.

We have already mentioned in chapters 1 and 3 that in Africa and other developing countries, these arguments cannot be taken into consideration, because when neurosurgery is not separated from other specialties in a healthcare system, a training program for specialization cannot be set up, and therefore, there is a lack of neurosurgeons, and from there the specialization field cannot be developed.

We have also examined, through the experience acquired by young neurosurgeons trained at the WFNS-RTC once they return back home, that they can easily :

(i) demonstrate, through the emergency procedures they carry out, the important role of neurosurgery in the treatment of priority diseases in their respective countries, (ii) gradually purchase the equipment required, and (iii) attract young doctors into training in their specialty, with the aim of setting up a training program, which represents the backbone for the development of neurosurgery in the country.

Therefore, it is crucial that young African neurosurgeons understand without a doubt that the first step towards the development of neurosurgery in their countries, should begin with the training of young people. As soon as the first two or three neurosurgeons have been trained, it becomes a priority to recognize neurosurgery as a specialty, and requires a dedicated service or department. A group of neurosurgeons in the same department would enable them to develop

their activity in balance with the diagnosis and treatment requirements of nervous system diseases and to share their knowledge to take care of patients. Hence, neurosurgery would, gradually, come out of the shade, be recognized as a useful specialty that requires equipment and a training program. Step by step, this development of neurosurgery would benefit the population all over the country.

4.2- Choosing an efficient training system

We have seen that after having witnessed a historical lateness, neurosurgery in Africa has began developing only by the end of the 20th century and the beginning of the 21st. Hence, in less than two decades, the number of neurosurgeons in Sub-Saharan Africa increased by virtually five times (79 in 1998, 369 in 2016). The ratio improved in the same way: 1 neurosurgeon for 7 to 8 million inhabitants in 1998 to 1 neurosurgeon to 2-3 million inhabitants in 2016. The progress has been the result of an unconditional support to training of young African neurosurgeons on the part of international institutions, WFNS being the first. For Sub-Saharan countries to reach a ratio close to the one in developed countries, an efficient training system should be adopted, which should meet their social and economic conditions and would also meet their requirements as neurosurgeons. Therefore, we have to carry out an analysis of the training systems currently followed in Africa, in order to define the one that answers these aims the best, so it is adopted, and so international institutions are encouraged into supporting it.

What are the training systems currently available for young African doctors who wish to specialize in neurosurgery?

4.2.1- System supporting training outside the country

This is the oldest system, which was adopted to train a very limited number of African doctors during colonization, and which mainly developed in most African countries after reaching independence. These countries required specialized medical executives, and therefore sent young native doctors to Europe or North America. These doctors were granted scholarships for a full training in neurosurgery, and had to join their home countries where they could practice neurosurgery and develop it as a specialty.

Although this system provided some African countries with pioneer neurosurgeons, it proved to be highly inefficient in training high numbers of neurosurgeons. Quite the contrary, this system encouraged even more the brain drain by indirectly supporting their stay in the countries where they trained. Most African countries that adopted this training system and that still keep it as the one and only training system, currently witness an alarming lack in neurosurgeons.

4.2.2- Local or national training system

In the first chapter, we also examine that the discrepancy witnessed in the development of neurosurgery between North Africa and South Africa on the one hand, and Sub-Saharan countries on the other, has been the result of a local training system adopted in the two first areas, while Sub-Saharan countries kept training neurosurgeons outside the country, far after reaching independence. As opposed to the last training system, the local or national training system is a way to fight the brain drain by training young doctors in the environment of their country, which prepares them to stay home once they finish training. Beside this main advantage, local training has other advantages: it is less costly, and therefore allows to train higher number of neurosurgeons. Consequently, the number of neurosurgeons in the country increases more rapidly. Over the long term, this can allow neurosurgeons to put the pressure on healthcare providers in the country so they plan to set up departments of neurosurgery as the number of trained neurosurgeons increases.

Hence, neurosurgery can be included in the national healthcare system, which grants it a sustainable development according to the social and economic evolution in the country and the progress of its healthcare system. Moreover, local training urges clinical research on the most frequent diseases, which enables neurosurgeons to include their specialty in healthcare issues and would make it easier to include it as a priority specialty in medical schools.

4.2.3- WFNS accredited regional training system

We have seen that training at the WFNS-RTC has the same advantages as national training centers. Consequently, all young neurosurgeons

who trained at the WFNS-RTC went back home once they finished training. They have all begun to serve in public hospitals and to work in the universities in their home countries. They have also been able to purchase basic equipment that are required to treat patients, and could train teams of young neurosurgeons in order to set up national training programs.

Therefore, regional training centers are similar to national training centers, and therefore to the local training system.

4.2.4- Other training systems

Beside these three main training systems – national, regional and outside the country, there remain in Africa, training systems that are off the beaten track. Among them, there are two main ones that should be mentioned:

- **Multinational regional training system,** meaning several countries share the same course and the same regional qualification certificate. This multinational regional system is organized by surgery departments in the countries located in the area, with laws applied to all surgical specialties, among them neurosurgery. Hence, young doctors attend a shared course of general surgery for two years to achieve competence in general surgery. Subsequently, neurosurgeons attend a five-year course in the neurosurgery departments in the area, to achieve qualification in neurosurgery.

This type of training is adopted in two extended areas that gather up almost all Sub-Saharan countries. This training is organized by the College of Surgeons of East, Central and South Africa (COSECSA) in the Eastern area of Sub-Saharan Africa, and by the West African College of Surgeons (WACS) in the Western area.

Although these colleges were set up very early (respectively in 1950 and 1960), their training programs in neurosurgery have contributed very little to developing the specialty in both regions, and the number of neurosurgeons trained through the system remains very limited.

- **"Hybrid" training system:** it is a training system that was first set up by foreign teachers in an African country (foreign teachers, meaning Europeans and/or Americans). It aims at training young Africans in neurosurgery in their home countries by foreign teachers, at least in the beginning. In fact, it is a European or an American training system with its teachers, and part of the equipment used there, which has been set up in a neurosurgery department in an African country, after having adjusted the premises and upgraded the equipment. In that department, patients are admitted so they undergo surgery carried out by these foreign neurosurgeons, in collaboration with local neurosurgeons. Also, young African doctors would be registered and would be trained by these same foreign neurosurgeons.

The teams of foreign teachers relay each other after a period of time, with stay periods extending from few months to few years, with the aim of providing training to African neurosurgeons in a given country and treatment to patients, while allowing local neurosurgeons time to gradually take the lead.

Among these "hybrid" systems, two instances need to be mentioned, namely:

- The **Norwegian-Ethiopian training program in neurosurgery**: it was set up in Addis Ababa in 2006 by the University of Bergen and the University Hospital of Haukeland, in collaboration with the Norwegian Peace Corps (main sponsor), and the University of Addis Ababa with its university hospitals. In a recently published article (35), M.L. Johansen, the originator of the project, explains the steps behind the setup, the cost, and the results. The project began with an exchange of visits, with missions carried out by Norwegian expert neurosurgeons to Addis Ababa, and training periods for neurosurgeons and general surgeons from Ethiopia in Bergen, in order to show them how a department of neurosurgery is organized and how it operates in a developed country. This first period extended over four years (2002-2006). In 2006, a cooperation agreement was signed between Ethiopian and Norwegian institutions. Between 2006 and 2011, training was mainly provided by teachers from different foreign countries relaying each other for missions extending over three months or more. Some among them

even chose to stay for many years. Since 2011, the number of Ethiopian teachers participating in the training increased more and more.

The cost of the project was evaluated as follows:

- Exchange period between 2002 and 2009 : two million two hundred twenty thousand USD (2,220,000 USD) ;
- Between 2010 and 2015, a yearly average budget of three hundred seventy thousand USD (370,000 USD); ten percent of this budget was aimed at purchasing equipment.

This budget does not include the work carried out by volunteers or the salaries of foreign neurosurgeons who stayed in Addis Ababa for an extended period of time.

As for the results:

- Between 2006 and 2011, three general surgeons from Ethiopia have been trained in neurosurgery (duration of training: 3 years);
- Between 2010 and 2015, fifteen neurosurgeons finished their training (5-year training);
- By the end of 2016, Addis Ababa has five hospitals taking part in the training program in neurosurgery where thirty-five residents have enrolled (35,36).

- **The Uganda East African neurosurgery training program** (37,38): This program has been set up by an American university under the name of "Duke University East African Project". This project was launched in 2007, and had two aims: (i) to improve the practice of neurosurgery, and subsequently the treatment of patients, then (ii) to set up a training system. The project started with an equipment donation from Duke University to Mulago Hospital in Kampala, Uganda, to allow for an upgrade of its neurosurgery department, its operating room, the intensive care unit, and adjacent units. Beside this transfer of technology, Duke University organized one or two yearly missions of 23 to 55 healthcare professionals to Mulago Hospital in order to set up the technology, and to train the local staff, and also to carry out neurosurgery.

Since 2009, a training program in neurosurgery was set up at the Department of Neurosurgery at Mulago Hospital. The program was co-directed by two people, one from Uganda, and the second one from Duke University, with a program that combined the one taught at Duke University and the one adopted by COSECSA, mentioned before.

With regards to the funding of the project, only the cost of equipment donations is mentioned, and amounts to 11,035,000 USD (eleven million thirty five thousand USD). This amount is the equivalent of the value of equipment donations, whether the equipment is second-hand or new. The amount was transferred between 2007 and 2015 (37,38). The overall amount is certainly very high, if we add the travel expenses and stay of 23 to 55 people who travel once or twice a year from Duke University, North Carolina, USA to Kampala in Uganda.

As for the results, according to the promoters, the project has brought crucial changes to the practice of neurosurgery at Mulago Hospital (37,38, Website of Duke University). Hence, the number of surgeries has increased from 75 patients per year operated in 2007 to more than 500 since 2014. As for the number of neurosurgeons trained, two residents have begun training in 2009, and finished in 2014-2015. Two others enrolled in the program in 2012, and finished in 2017. A third group of two residents enrolled in 2016 will finish training in 2020. The aim is to increase the number of neurosurgeons in Uganda from six in 2007 to twenty-two by 2022, which will improve the initial ratio of one neurosurgeon to six million inhabitants to one neurosurgeon to 1.7 million inhabitants.

4.3- Which training system should be adopted in Africa?

African neurosurgery is currently at the take-off stage, which shows through a strong will from African neurosurgeons to push neurosurgery forward in their respective countries, and by supporting the training of young doctors. This strong will to attract young doctors towards specializing in neurosurgery, which is encouraged by the lack of neurosurgeons in the countries, explains the diversity of the training systems that have been set up in each area in Africa, mentioned before. All these training systems and the colleagues who have conducted

them, deserve acknowledgement, as we have already seen, they have enabled neurosurgery to leap forward during the last decades. However, if we want to reach a significant number of neurosurgeons in all the countries in the area, we should focus on increasing the current number of neurosurgeons by 2030.

Hence, we should examine among the training systems mentioned above, which ones can push forward African neurosurgery the most, and meet the needs of patients in neurosurgery over the continent in fifteen to twenty years.

Below is a comparison between the five training systems described before, mentioning the main advantages and disadvantages of each of them (table 11).

The table shows that the two first training systems, which are probably the oldest, namely the system that encourages training outside the country and the multinational regional training system, are the ones that meet the least the needs. The first one tends to be harmful to neurosurgery in Africa, as it promotes the brain drain. The second one is currently obsolete, as it has shown it has limits in training neurosurgeons and providing good quality training. The third training system that we have named a "hybrid" system, even though it is very useful in modernizing neurosurgery in a target country, it cannot be extended to a high number of African countries to make it a lever for training throughout the continent, because of its excessive cost.

Table 11 : Comparison between neurosurgery training systems currently in use in Africa

Training system	Advantages	Disadvantages
Training outside the country	Basically, good quality training in a modern environment	- Highly promotes the brain drain - Proves to be inefficient in increasing the number of neurosurgeons in the country - Costly
The multinational regional training system (COSECSA and WACS programs)	Attracts the attention of countries and medical staff in the area as to the importance of neurosurgery	- Limited efficiency
Local training with teachers from a foreign country (the hybrid training system)	- Upgrading and pushing forward the development of neurosurgery in the targeted country - Promoting exchange and opening to the practice of neurosurgery in a developed country	- High costs - Benefits to a very limited number of countries. Therefore, it has limited efficiency when considering the whole African continent
WFNS accredited regional training system	- Good quality training in an African environment - Training in neurosurgery and preparing the trainees to their return in their home countries - Less costly - Ideal for the countries where a national training system is not available	- Does not meet the needs of Sub-Saharan countries, as the number of scholarships provided is limited
Local or national training system	- Best way to increase the development of neurosurgery in the country - Encourages research on neurosurgical diseases treated locally - Pressure easier put on healthcare decision makers to adapt demand to supply	- Refresher training required in a foreign country, to encourage more interaction with the practice of neurosurgery in other countries

The two remaining training systems are those relating to local training: training in a national center, which is the ideal system adopted in all countries around the world: as soon as a minimal number of neurosurgeons has been reached in a university hospital, a national training program is set up, with a diploma issued at the end of the training for specialization in neurosurgery. We have insisted many times in this monograph on the advantages of this local or national training system.

The second remaining system which has as many advantages as the local or national training system, is the system for training in WFNS accredited regional training centers. We have already examined the activity report of the first of these centers, the WFNS-RTC which, in sixteen years, has trained a significant number of neurosurgeons. It has provided continuing medical education to African neurosurgeons through yearly courses and workshops. It has also granted the trained neurosurgeons a smooth return to their home countries. Another advantage of training at the WFNS-RTC is its openness to all African countries. The young neurosurgeons who have trained in the center had come from 18 Sub-Saharan African countries.

4.4- Suggesting a strategy to the development of neurosurgery in Sub-Saharan Africa by 2030

Why should 2030 be the deadline?

Three years ago, the WHO attracted the world's attention to the high number of deaths in developing countries, because of a severe lack of surgery, especially emergency surgery: 1/3 of the world population receive only 3.5% of surgical treatment, and 18.6 million patients die each year because of a lack in emergency surgical treatment, which is far above the number of deaths caused by HIV, tuberculosis, and malaria together (39,40,41). During the General Assembly of the WHO in 2015, Resolution 68/15 was adopted, where it recommends member countries to set up a strategy for 2030. This strategy should lead to an appropriate medical coverage of the need for emergency surgery for the population. However, neurosurgical procedures are those that lack most because of a severe lack in neurosurgeons. As a consequence of this call, the neurosurgical community became aware all over the world, which led to the publication, during the same year, of a document called Global neurosurgery consensus document, which was

endorsed by the WFNS and continental federations of neurosurgical societies, including CAANS, in 2016. Among the recommendations mentioned in the document, two should be mentioned, namely (i) increase the number of neurosurgeons trained (Sub-Saharan Africa is the area witnessing a severe lack of neurosurgeons throughout the world), and (ii) high-income countries should help this development of neurosurgery throughout the world.

In Sub-Saharan Africa, this strategy should be based on increasing the number of neurosurgeons trained through national programs and WFNS regional programs. These are the two training systems that both African neurosurgeons and international institutions, mainly the WFNS should support, to bring concrete help to the countries in Sub-Saharan Africa, to help them out of this severe lack in neurosurgeons. Neurosurgeon teachers and the WFNS should work together through these two training systems to set up a medium-term strategy (2018-2030) to reach a satisfactory ratio of neurosurgeons that might secure an appropriate treatment to patients in need for neurosurgery in Sub-Saharan Africa.

Regarding these national training programs, there is a national training program in 21 countries, according to the survey we conducted in 2016. Among these 21 countries, there are 16 Sub-Saharan countries: Angola, Burkina Faso, Cameroon, Ethiopia, Ghana, the Ivory Coast, Kenya, Madagascar, Mauritania, Mozambique, Rwanda, Senegal, Sudan, Tanzania, Uganda, Zimbabwe). Among these Sub-Saharan countries, only Nigeria had several training centers, an overall 7 (see Dr. Ismail Nasiru's article in the appendices).

If we encourage training program coordinators in all the centers in Sub-Saharan Africa (an overall 21), we may predict that by 2030 the number of neurosurgeons will have trained in these centers, knowing that currently, each of these centers enrolls an average of two new residents per year.

There are currently four WFNS accredited regional training centers (Rabat, Alger, Nairobi and Dakar). The current number of African residents under training in these centers is below their training capacity. Several applicants who wish to come to Rabat, for example, remain on the waiting list because of a lack in the number of scholarships to help

them cover their expenses during their stay. Other countries can be included in this regional training system. If two new residents enroll every year in every regional center, we can also evaluate the number of neurosurgeons trained in these centers by 2030.

In order to have an estimation of the number of neurosurgeons to be trained by 2030, we should go back to the evolution of neurosurgery in Sub-Saharan Africa between 1998 and 2016 (chapter 3). If we summarize this evolution (table 12), we will note that the number of neurosurgeons in Sub-Saharan Africa has increased from 79 in 1998 to 369 in 2016; in other words, the number increased by 4.6. During the same period of time, the population in Sub-Saharan Africa increased by 1.4 (615 million inhabitants to 884 millions). The ratio of neurosurgeons to population has evolved from 1:8 million inhabitants to 1:2.5 millions. If we keep the same progression pace, by 2030 we will have reached 1,697 neurosurgeons and 1,237 million inhabitants. The ratio of neurosurgeons will evolve from 1:2.4 millions to 1:700,000 inhabitants.

In order to reach a satisfactory level of development in neurosurgery in the area, the ratio should be improved to reach one neurosurgeon to less than 500,000 inhabitants. In order to achieve this, the training pace should be increased to enable for an increase of the current number of neurosurgeons (369) not by 4.6 but by at least 7. This will allow the number of neurosurgeons to become 2,583 in Sub-Saharan Africa by 2030, with a ratio of 1:480,000 inhabitants.

Table 12 : Evolution of neurosurgery in Sub-Saharan Africa by 2030

Year	Number of neurosurgeons	Population	Ratio
2000	79	615 M	1 : 8 M
2017	369 = 79 x 4.6	884 M	1 : 2.4 M
2030	1 697 = 369 x 4.6	1,237	1 : 700,000
2030 (Strategy)	2 583 = 369 x 7	1,237 M	1 : 480,000

We think that we will be able to reach this objective by 2030, through the commitment of the instructors at the training departments mentioned above, when they enroll all young applicants who are eligible to training in neurosurgery, and through the scholarships made available through the support of international institutions under the auspices of the WFNS.

As for the WFNS-RTC, we will be able to double the number of neurosurgeons trained during the last 15 years at the center, to reach 118 trainees (61 x 2 = 122) by 2030, through the commitment of the instructors at the training departments, when they enroll all young applicants who are eligible to training in neurosurgery, if the scholarships are made available.

Of course, the setup and implementation of such strategy require the participation of African neurosurgeons and the coordinators of all training centers. This will also require strong support from the WFNS Foundation and other institutions so they provide a sufficient number of scholarships to meet the needs of young African doctors who wish to specialize in neurosurgery, and who meet the criteria for the selection of applicants.

Through this 2030 strategy, African neurosurgery will have evolved through three stages:

- **An information and awareness stage (1993-2005)** through the results collected during the first survey on the status of neurosurgery in Africa, and also through the enthusiasm brought about by the promotion and organization of the first world congress of neurosurgery organized in Africa (Marrakesh, 2005);
- **A take-off stage (2002-2016)** through the initiatives of the WFNS, especially the one relating to setting up the WFNS-RTC and Africa 100 and also through the commitment of African neurosurgeons;
- **An evolution stage (2018-2030)** to enable neurosurgery to reach a respectable level through the **"2030 strategy for African Neurosurgery"**.

We wish to find a substantial support from international institutions through the WFNS, and through African colleagues to commit into this strategy.

CONCLUSION

I would like to conclude this monograph with three photographs :

- **Photo 49,** which represents the WFNS-RTC Graduates, who have already finished their training, and are back home, and who came to Rabat to attend the 9th WFNS-RTC-M5U (Mohammed V University) Course (October 14-16, 2018). They held a meeting and decided to create «**WFNS-RTC Alumni**». I had the great pleasure to meet with them on the last day of the course, and had a very exciting discussion during two hours on their future commitment in the development of African neurosurgery, through the strategy developed in the fourth chapter of this book. At the end of this meeting, we took the following picture.
- **Photo 50,** which represents the same group, with the President of the WFNS, Dr. F. Servadei, some members of the WFNS Education Committee, and some Professors of the WFNS-RTC and other African colleagues. This photo was taken after a meeting held with the President of the WFNS, the WFNS-RTC Alumni as well as WFNS-RTC Professors, on the occasion of the 10th WFNS-RTC-M5U Course held in Marrakesh on October 17, 2018. During the meeting, all acknowledged the remarkable results of the collaboration between the WFNS and Africa, and all promised to double efforts to continue to develop neurosurgery in Africa.
- **Photo 51,** representing the neurosurgery department chairpersons who take part in the training process at the WFNS-RTC, whose model collaboration and maintained efforts have helped achieve the results mentioned in this monograph.

Photo 49 : Group photo of the WFNS-RTC Alumni with Dr. A. El Khamlichi, holding a souvenir given him by the Alumni (map of Africa)
Rabat, CNR-NS, Oct. 16, 2018

Photo 50 : Group photo with WFNS President, WFNS-RTC professors and trainees 10th WFNS-RTC-M5U Course, Marrakesh, Atlas Medina Hotel garden, Oct. 17, 2018

Photo 51 : Head of Departments taking part in the WFNS-RTC, from left to right: Drs. Abdelhakim Lakhdar, Mohamed Faiz Chaoui, Abdessamad El Ouahabi, Abdeslam El Khamlichi, Abdessamad El Azhari, Najia Abbadi, Said Ait Benali, Rachid El Maaqili, Brahim El Mostarchid

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SUMMARY

Neurosurgery has witnessed a remarkable evolution in Africa over the last three decades. This book is a testimony to the events which contributed to the emergence of African neurosurgery.

The book begins with an outline of the peculiar historical context of the African continent, considered as the cradle of humankind, which contributed to the ancient history of medicine and neurosurgery, but would sink into a deep slumber for the following millennium, and would wake up entirely colonized at the beginning of the 20th century.

The colonization of Africa took place alongside a large European medical diaspora, among whom were a few neurosurgeons who introduced modern neurosurgery in Africa. African countries remained aside from knowledge and technology for centuries. Their population was young with an illiteracy rate of more than 90%. So, soon after African countries gained their independence, they had to face huge social and economic challenges, along with a disastrous healthcare situation. This is one of the main reasons lying behind the historical lateness of African neurosurgery, despite the efforts carried out by the pioneers. In Sub-Saharan African countries, the situation worsened. In those countries, a system was adopted that allowed neurosurgeons to be trained outside their respective countries. This system proved to be ineffective in increasing the number of neurosurgeons in the area. Therefore, African neurosurgeons would not be able to participate in the WFNS activities until the beginning of the 21st century, as their number was limited, and they would not gather up in an active continental association.

Towards the end of the 20th century, three main events would push African neurosurgery out of the shade. In 1993, the Moroccan Society of Neurosurgery decided to submit the bid for Marrakesh to welcome the first world congress of neurosurgery in Africa, as it was pushed

forward by the outstanding evolution of neurosurgery in the country between 1970 and 1990, but also by its relationships at the regional, continental and international levels, and by the support it received from a neurosurgery-dedicated charitable foundation. Although the bid had been prepared carefully, it would fail (Berlin, 1995). This failure would initiate a second favorable event, namely the first survey on the status of African neurosurgery (1996-98), which would announce an alarming situation: approximately 80% of the African population had one neurosurgeon to 8-10 million inhabitants. These results, after having been presented at the international level and mentioned in a report to the WFNS, would be in favor of the success of the second bid for Marrakesh (San Francisco, 2000), and also initiate a third event in favor of African neurosurgery: setup of the first regional center for training African neurosurgeons by the WFNS, the WFNS-RTC (March 2002).

The organization of the first congress of neurosurgery in Africa in the magical city of Marrakesh (June 19-24, 2005) has benefited from exceptional assets: the High Patronage of His Majesty the King, celebration of the 50th anniversary of the WFNS, and the theme of the congress that allows for a deeper commitment of both the WFNS and African neurosurgeons: "Bridging the gap in neurosurgery in Marrakesh, Crossroads of the World's cultures". Therefore, the congress would leave unforgettable memories in the minds of participants. It would also arouse an individual and collective awareness of African neurosurgeons who realized, following the congress, that the lateness of neurosurgery in Africa is not inevitable, and that neurosurgery can only be developed if young neurosurgeons are trained. They also realized that they should be united into a continental neurosurgical organization if they want to be heard at the international level. Consequently, the congress in Marrakesh has played a major role in raising the awareness of the WFNS officers as to their duty in supporting the development of African neurosurgery.

The WFNS-RTC has benefited from unconditional support from the WFNS, as well as Moroccan authorities and neurosurgeons. The activity of the WFNS-RTC has been made durable and has been supervised through a co-operation agreement signed in 2005 by the WFNS and M5U, on the occasion of the 13th World Congress of Neurosurgery in Marrakesh. The co-operation agreement especially

mentions the applicants' selection process, the training program, and the examination method. The report on the WFNS-RTC, after 16 years (2002-2018), mentions remarkable results: 61 young doctors from 18 Sub-Saharan African countries enrolled in the center for basic training in neurosurgery (5 years). After their examination results have been accepted, these young neurosurgeons are issued a specialization certificate in neurosurgery from M5U, and a 5-year training certificate in neurosurgery from the WFNS. Since the WFNS-RTC started, it has provided a continuing training program to African neurosurgeons, as seminars and workshops (2 to 3 per year), and yearly courses (WFNS-RTC-M5U Course for African neurosurgeons). These CME courses are the ideal opportunity for all African neurosurgeons to perfect their knowledge, and to strengthen their relationship with the WFNS, and to also see the on-field activity carried out at the WFNS-RTC and the results it has achieved through the presentations made by young neurosurgeons trained at the center, who are already gone back to their respective countries.

In addition to basic training, the WFNS-RTC also provides young African neurosurgeons an ideal environment close to the one in their respective countries, and to introduce them to take the tasks of neurosurgery in their countries. A survey conducted in 2016 among those who have returned to their home countries for more than three years after their training, has shown that all of them are working in public hospitals, or even hold a position at the university, and have started to attract young doctors to neurosurgery, to set up a national training program. Encouraged by these results, the WFNS launched another training program for Africa named «Africa 100», entirely sponsored and coordinated by Dr. M. Samii. In order to provide sufficient training positions for the applicants, the WFNS decided to accredit other regional training centers.

To put into perspective the impact of Marrakesh World Congress and the WFNS-RTC on the evolution of African neurosurgery, we conducted in 2016 a survey similar to the ones performed in 1996-98. The results have shown a spectacular progress: over fifteen years, the number of neurosurgeons in Sub-Saharan Africa, increased by five times. The ratio went from 1 neurosurgeon to 10 million to 1 neurosurgeon to 2.5 million inhabitants. The number of African countries with a national training program evolved from five in 1998,

to twenty in 2016. Among these countries, fifteen are located in Sub-Saharan Africa. As to the organization, we currently have in Africa one continental society (CAANS), three regional societies, and seventeen national societies of neurosurgery, whereas in 1998, there were only five national societies. Because of this impressive impact on the advance of African neurosurgery, the WFNS-RTC was delivered an award, and is supported by many international institutions as a model of North-South cooperation in training and education.

However, this evolution of African neurosurgery remains below the needs of African population. This is the reason why African neurosurgeons should go on with their mobilization towards training young neurosurgeons, and double their efforts to reach a respectable ratio of neurosurgeons by 2030. This 2030 strategy was recommended by the WHO, in its 68/15 resolution which was endorsed by the WFNS in 2016 (Global Neurosurgery Consensus Document). Through this document, the WHO and WFNS ask different countries worldwide to do their best to meet the needs of their populations in emergency surgery, including, of course, neurosurgery. To succeed in this strategy, African neurosurgeons and the WFNS, have to encourage and support the national and regional training centers, to increase to 20-30% their current training capacity. The target of this strategy is to increase the current number of neurosurgeons in Sub-Saharan Africa, by seven times by 2030, knowing this number has increased by 4.6 times over the last sixteen years.

Therefore, African neurosurgery will have evolved through three stages: (i) a stage of information and awareness (1993-2005) through the results of the first survey on the status of African neurosurgery and the enthusiasm aroused by the promotion and organization of the first world congress in Africa (Marrakesh, 2005); (ii) a take-off stage (2002-2017), thanks to the WFNS initiatives, especially the WFNS-RTC, and Africa 100; (iii) a stage of development (2018-2030) to achieve an acceptable level and meet the needs of African populations in relation to the 2030 strategy.

THE AUTHOR'S BIOGRAPHY

Professor Abdeslam El Khamlichi has dedicated all his career at the UHC of Rabat. His dedication to medical training, education and research have enabled him to receive several national and international awards, among which his nomination as WFNS Honorary President, Honorary President of the CAANS, and Resident Member of Hassan II Academy of Sciences and Technology.

After finishing his medical studies and specializing in neurosurgery at the UHC of Rabat, he carried out training for more than two years in Switzerland (Lausanne and Zurich), in France (Lyon and Paris), and in North America (Cleveland and New York). He was nominated Professor and Chairman of the Department of Neurosurgery in 1983. He proved all through his career that his passion for neurosurgery can only be equaled by his dedication to his country and his commitment to develop neurosurgery and neurosciences in the public sector.

He is an experienced man, with an ability to work for unlimited periods of time. He is also a visionary. He would find a solution to meet the lack of means at the hospital by setting up Hassan II Foundation for the Prevention and Cure of Nervous System Diseases in 1989. This Foundation would fully contribute in continuing education, research, and purchasing new technological devices. Through the evolution of techniques and technology, Professor El Khamlichi has introduced in the UHC of Rabat several exploration and healthcare techniques as vascular neurosurgery, skull base neurosurgery, functional neurosurgery, and stereotaxy. All these techniques are made available at the National Center for Rehabilitation and Neurosciences. This center is a model of a center providing healthcare, education and research on nervous system diseases at the national and African levels. Alongside

this evolution in healthcare quality, the center has enabled for the implementation of a national training program in neurosurgery, for the benefit of generations of interns and residents.

He has been invited by more than forty universities throughout the world as a "Visiting Professor" or as a lecturer in more than one-hundred and fifty international congresses. He is a member of several international societies (with the two main North American societies, and the Japan Neurosurgical Society). Professor El Khamlichi has become the symbol of North-South and South-South cooperation in the field of medical education. Indeed, after the upgrade of Moroccan neurosurgery, he focused his attention on developing neurosurgery in Africa. Therefore, he has been the pioneer of the first international Reference Center for Training African Neurosurgeons, the WFNS-RTC, which he has been managing since 2002, and which has helped train (and is still) tens of neurosurgeons from Sub-Saharan African countries. Since 2012, he has been coordinating a second training program, "Africa 100", also for the benefit of African neurosurgeons. In 2005, he has organized the World Congress of Neurosurgery in Marrakesh, which was the first congress of its kind to be held in Africa.

With this experience that has lasted for more than 40 years, backed up by a continuous commitment to the development of Moroccan and African neurosurgery, Professor El Khamlichi wishes to bring through this monograph a testimony as to the history of a model collaboration between African neurosurgeons and the WFNS. This collaboration has extended over more than twenty years, and has resulted in significantly developing Moroccan neurosurgery and in the emergence of African neurosurgery. He also wishes to pay tribute to the originators of these events who have led to this development, and also to those who have contributed with their support and participation.

APPENDIX 1

Neurosurgery Residency Program at the WFNS-RTC

Theoretical part

First year	
Core curriculum for residents in neurosurgery, neurology, and psychiatry:	
Neuroanatomy	The spinal cord; the brain stem and the cerebellum; the diencephalon; the pituitary gland; the telencephalon; the cortical functional areas; the brain vascularization; the motor pathways; the sensitive pathways; the optical pathways; the cochlear and vestibular pathways; the cranial nerves; the brachial plexus; the lumbosacral plexus
Neuro-radiology	Skull and spine X-rays; myelography ; CT scan; cerebral and spinal cord angiography; Magnetic resonance imaging (MRI); Radioisotope explorations and PET scan
Neurophysiology and neurobiology	Physiology of nerves and muscles; motor and sensory functions; physiology of pain; physiology of equilibration; neurophysiological explorations (EEG, EMG, and evoked potentials); cognitive functions; neurotransmitters and synapses; introduction to neuropharmacology; contribution of genetics in neurological diseases; neuroimmunology
Neurological pathology symptoms	Symptoms of motor, sensory and vegetative functions; amnesia- and dementia; peripheral nerves, root and truncular syndromes; polyradiculopathy symptoms; muscle and myasthenia syndromes; epilepsy; headache and craniofacial pain spinal cord compression symptoms; Intracranial hypertension; head and spine trauma; peripheral nerve trauma; stroke symptoms; cerebral vein thrombosis symptoms; behavioral and emotional disorders; delirium and hallucinations; psychiatric emergencies
Second year	
Neurotraumatology	Head injury; craniofacial trauma; skull base fractures; Post-traumatic intracranial hematoma; spinal and spinal cord trauma; peripheral nerve trauma

Infectious and parasitic diseases	Tuberculous and non-tuberculous spondylitis; Intracranialinfections (Abscess, empyema); meningitis and meningo-encephlitis; cranial vault infection; Brain and spinal hydatid cyst; CNS mycosis
Tumors	Anatomical and pathological classification of the CNS tumors; cranial vault tumors; orbital tumors; intracranial meningiomas (anterior skull base meningiomas, sphenoid wing meningiomas, parasagittal and convexity meningiomas, falco-sinusal meningiomas, posterior fossa meningiomas, and foramen magnum meningiomas); Cerebellum and 4th ventricle tumors (medulloblastoma, ependymoma, astrocytoma, hemangioblastoma); Gliomas of the brain hemispheres, and the basal ganglia; CNS lymphoma; Cerebral metastases; **Vertebral and medullary tumors:** spinal tumors; Intraspinal tumors (extramedullary tumors, intramedullary tumors); Peripheral nerve tumors
Degenerative pathologies and disc herniation	Lumbar disc herniations; Cervical myelopathy and cervical disc herniations; Dorsal disc herniations; Lumbar stenosis; Spondylolisthesis; Outlet syndrome
Malformations, CNS dysraphysm, CSF hydrodynamics disorders	hydrocephalus; Meningocele and myelomeningocele; Encephalocele; Dandy-Walker malformation; Craniocervical junction malformation; Syringomyelia; Craniosinostosis; Cysts of the endomeninx; Normal pressure hydrocephalus in adult patients; Benign intracranial hypertension; CSF hydrodynamics and intracranial pressure
Microsurgical anatomy and neurosurgical approaches	The lateral ventricles; The 3rd ventricle and the pineal region; The cerebellum and the 4th ventricle; The cerebellopontine angle; The sellar and parasellar region; The skull base; The spine, the spinal cord, the cauda equina

Third year	
Tumors	Pituitary and sellar region tumors (pituitary adenomas, craniopharyngiomas, Tuberculum and diaphragm sellae meningiomas); Cavernous sinus lesions; Lateral ventricle tumors; 3rd ventricle tumors; Pineal region tumors; Cerebellopontine angle tumors (cerebellar tumors, medulloblastoma, ependymoma, hemangioblastoma); Invading tumors of the skull base; Brainstem tumors
Vascular pathologies	Intracranial aneurysms (anterior circulation aneurysm, posterior circulation aneurysm, peripheral aneurysm); carotid-cavernous fistula; cerebral AVM; spinal cord AVM; spontaneous intracerebral hematomas; carotid artery and vertebral artery thrombosis
Neurosurgical treatment of pain	V, IX neuralgia, vascular facial pain; peripheral neuralgia; treatment of cancer pain
Neurosurgical treatment of epilepsy, Parkinson's disease and movement disorders	**Principles of non invasive neurosurgical techniques:** stereotaxy and neuroendoscopy, the use of laser in neurosurgery
General Principles of neuroanesthsiology and neurointensive care	Cerebral blood flow and metabolism; effects of anesthetic drugs on ICP, brain metabolism and CSF flow; brain protection; hydro electrolytic balance; vital functions control

The theoretical part is delivered on a weekly basis, through interactive teaching seminars. Each seminar takes places in a classroom with a teacher and all the trainees of different University Departments of neurosurgery. The topic is usually addressed partly by the teacher, and partly by the trainees, in an interactive way, almost during the entire duration of the seminar (4 hours).

Only some chapters from the program listed above are delivered in the form of seminars, but residents have to review all the chapters for the examination.

- Practical program

The teaching of the practical part of the program takes place in the hospital through a series of internships. During its training, the resident in neurosurgery at Mohammed V University of Rabat has to pass ten (10) internship semesters: 9 in departments of neurosurgery and one in neurology. During each one of these internships, the resident has to fulfill three activities: a clinical activity, which entails taking care of a certain number of patients, a surgical activity in the operating room, as well as an emergency activity. In each of these activities, one or several professors supervises the resident, under the charge of the Department Head. Furthermore, and in order to progressively learn different technical and surgical gestures, the resident must master different techniques, based on a detailed program that starts from the first internship until the final one (8^{th}). The program consists of the following:

First and second semesters
Practicing the lumbar puncture and ICP measuring; skin sutures; CSF drainage; positioning patient for surgical approaches; burr-hole and craniotomy for intracerebral hematomas;skull fracture treatment.

3^{rd} and 4^{th} semesters
Laminectomy; burr-hole and craniectomy; craniotomies for supratentorial approaches without opening the dura; VP shunts, brain abscess drainage

5^{th} and 6^{th} semesters
posterior fossa and CPA approaches; anterior skull base fracture with CSF fistula repare; Cranioplasty; spinal stabilization, intracerebral hematomas evacuation; laminectomy for lumbar canal stenosis and lumbar discectomy

7th and 8th semesters

Craniectomy for craniosinostosis; menongocèle repare; removal of supratentorial tumors: cervical spine stabilization intraspinal tumors; posterior fossa tumors; osteodural decompression for craniocervical malformation and or syringomyelia; TS approach until the dura.

During his/her last semester (9th), the resident should progressively be able to acquire his/her autonomy in order to practice basic surgeries on his/her own, with the help of a Professor from the department, and to be in charge of surgery in the emergency room.

APPENDIX 2

Articles written by African neurosurgeons trained at the WFNS-RTC

- Take-off of African Neurosurgery and the World Federation of Neurological Societies Rabat Training Center (WFNS-RTC), Claire Karekezi (Rwanda)
- Contribution of WFNS-RTC to the development of Neurosurgery in Sokoto Nigeria, a trainee report, Nasiru Jinjiri Ismail
- The growth of neurosurgery in Africa, with special emphasis to Uganda, Justin Onen
- Practicing Neurosurgery in Mali, Oumar Coulibaly
- Neurosurgery in Togo, Doleagbenou Agbéko Komlan
- Neurosurgery in Burkina Faso, Dao Ibrahim
- The practice and development of neurosurgery in the Democratic Republic of Congo, Jeff Ntalaja

Take-off of African Neurosurgery and the World Federation of Neurological Societies Rabat Training Center (WFNS-RTC)

Claire Karekezi, Rwanda
Department of Neurosurgery, Rwanda Military Hospital, Kigali, Rwanda

THE HISTORY OF THE WFNS-RTC

Before 1998, the situation of Neurosurgery in Africa was almost unknown. Dr. Abdeslam El Khamlichi who, at that time, was the Head of the Department of Neurosurgery at Hôpital des Spécialités of Rabat, Mohammed V University (M5U) and the Second Vice-President of World Federation of Neurological Societies (WFNS) representing Africa (1997-2001) felt that the WFNS should help in improving the development of Neurosurgery in Africa, especially in Sub-Saharan Africa (SSA). Before seeking for any help, a full report of the situation of Neurosurgery in Africa at that time was mandatory.

This report 1,2 referred to a severe limitation in the number of neurosurgeons, especially in Africa and the situation seemed catastrophic with SSA counting only for 81(16.2%) of all the 500 African neurosurgeons with a rate of approximately 1 neurosurgeon to 8 million inhabitants, North Africa (NA) counted itself for more than 345 (70.8%) of all African neurosurgeons, South Africa (SA) counting for 65 (13%). Following this obvious deficit, an idea of creating a center that could train other African Neurosurgeons rose; the WFNS Rabat Training center (RTC) was then established in 2002 after an agreement between the Mohammed V University (M5U), the Faculty of Medicine and Pharmacy of Rabat, the WFNS Foundation (3).

Over the last 16 years (March 2002 to December 2018) about 58 trainees from approximately 18 Sub-Saharan countries where the number of neurosurgeons has been less than 1Neurosurgeon for 3-10 Million inhabitants, joined the WFNS-RTC, these trainees were integrated in the National Residency Program in Neurosurgery at M5U. Unique learning opportunities were offered to the trainees who received similar training as their Moroccan colleagues (photo 1).

Morocco being a place between the developed world and the Low and middle income countries (LMICs), offered working conditions similar to those in most African countries with similar patient profile and a very similar hospital organization. Morocco had on the other hand developed its Neurosurgical service delivery over the last years with very well established neurosurgical departments in main cities; the WFNS-RTC following its accreditation by the WFNS, offered a clear standardized teaching curriculum in Neurosurgery; this made the center to be an excellent place to train for these Neurosurgeons.

The curriculum in Neurosurgery included rotations between the three departments of Neurosurgery in Mohammed V University of Rabat, including a rotation in neurology and one year of training abroad (France, Belgium, Canada, United States of America); exposure to multidisciplinary teams including Neurologists, Neuropathologists, Neuroradiologists, Neurooncologists and Radiation-Oncologists; participation and presentation into national and international conferences of research projects leading to publications was also mandatory (figure 1). The 5-year training led to a University Specialization Diploma in Neurosurgery (photo 2) after sitting for board exams and a WFNS Fellowship Certificate was delivered to each trainee (3).

Between 2010-2012, Professor Madjid Samii launched a second training program for Africa, under the name of "Africa 100". To meet the increasing number of African applicants who wish to train in neurosurgery at the WFNS-RTC, the Departments of Neurosurgery in the University Hospital Centers of Casablanca, Fez, and Marrakesh joined in the program of the WFNS-RTC.

Up to date, 30 finished their training, while 28 are still under training. We were able to trace 29 neurosurgeons who trained in this center and reviewed the current situation, their establishment back in their respective countries, their clinical and academic positions and different challenges they meet in providing neurosurgical care in such source limited countries

Current situation of the former trainees

This Center has up-to-date received more than 58 neurosurgical candidates, from approximately 18 sub Saharan African Countries:

Benin, Burkina Faso, Cameroon, Chad, Democratic Republic of Congo (DRC), Gabon, Guinea Conakry, Ivory Coast, Malawi, Mali, Mauritania, Niger, Nigeria, Republic of Congo, Rwanda, Tanzania, Togo and Uganda. Thirty Neurosurgeons completed their training; about 29 are already back and practicing in their respective countries (Table 1).

A. Some examples of former wfns-rtc trainees

Dr. Didier Mudjir Balanda (Democratic Republic Of Congo)

Late Dr. Mudjir Didier Balanda (2002-2007) was the first WFNS-RTC first trainee and the first to benefit from WFNS scholarship to train as a Neurosurgeon for 5 years. He returned home to DRC in 2007 and was able to establish a Neurosurgery Department at Ngaliema Clinic in Kinshasa, that time he became one of two only Neurosurgeons providing neurosurgical care in the whole DRC. Dr. Mudjir passed away on 27 September 2012.

Dr. Jeff Ntalaja became after Dr Mudjir, the second candidate from DRC to join the training. He, also after completion of his training (2009-2014), joined his local colleagues in DRC; together they were able to create the Congolese Neurosurgical Society (SCNC), which is currently registered as a member society of the Continental Association of African Neurological Societies (CAANS). They also created a regional Society together with colleagues from the Republic of Congo among them Dr. Hugues Ekouele Mbaki and Dr. Kinata Sinclair both WFNS-RTC Alumni.

Today the neurosurgical workforce in DRC is made up of 16 surgeons: of which 7 are locally based Neurosurgeons, 4 are Congolese Neurosurgeons based abroad and 5 are General Surgeons dedicated to neurosurgical practice. They were able to increase the number of Computed Tomography (CT) Scans to 13 in the country and acquired 3 Magnetic resonance Imaging (MRI) Scans. A first International Symposium of the SCNC was held in Kinshasa on the 5-7th November 2018, which gathered many regional Neurosurgeons. DRC is a big country with a population of 77.8 million people; the main challenge remains the unequal distribution of neurosurgeons in the whole country with a big number of the population still lacking access to Essential Neurosurgical care.

Dr. Nasiru Ismail (Nigeria)

Nigeria is part of the West African College of Surgeons (WACS), the training in surgery is usually 2-3 years of General Surgery followed by 2-3 years in a specific area like Neurosurgery. There have been 6 Nigerian trainees who have been admitted at the WFNS-RTC for their complementary training in Neurosurgery, after completing their basic background in General Surgery; they later once back home sat for the WACS exams to be recognized regionally. Following this example, Dr. Ismail Nasiru, became the second trainee to join the WFNS RTC after late Dr Mudjir. He returned to Sokoto, Nigeria, in 2005, after 3 years of complementary training in Rabat, has been able with the guidance of Doctor Bello Bala Shehu, a Senior Neurosurgeon trained in the United Kingdom (UK), to set up a department of Neurosurgery at Usmanu Danfodiyo University Teaching Hospital & Usmanu Danfodiyo University in Sokoto, North Nigeria. This department serves a region with more than 30 million inhabitants. Today, Dr. Nasiru is chief of the department, has associates and several residents. He and his team contributed up to date to the training of several Neurosurgeons in Nigeria. 3.

Dr. Youssouf Sogoba and Dr. Oumar Coulibaly (Mali)

The two finished their 5-year training in Rabat in 2009 and 2011 respectively, and returned to their country, as the two first Neurosurgeons in the country. Together with local Neurosurgeons, they have been able to set up a unique neurosurgical team in Gabriel Toure Hospital, in Bamako and received sets of basic neurosurgical instruments and a microscope from the WFNS Foundation3.4. Mali is a West African country with a population of 18 million and a big part is still lacking access to basic Neurosurgical Care.

Dr. Justin Onen (Uganda)

Dr. Onen after completing (2009-2014) his training in Rabat, went back to Uganda and now works as a pediatric Neurosurgeon at the CURE Children's Hospital of Uganda (CCHU) in Mbale, Eastern Uganda, this is a non profit organization hospital specialized in children's Neurosurgery especially the treatment of Hydrocephalus and Spine Bifida; the hospital is owned and operated by CURE International. The hospital is also a teaching center in pediatric neurosurgery for

Sub-Saharan Africa with its "CURE Hydrocephalus and Spina Bifida (CHSB) Fellowship Program" which attracts other surgeons from all over the world and where Dr. Onen serves as faculty. Dr. Onen has gained relevant experience in this care.5

Women In Neurosurgery (WIN)

The Center has been joined by 3 women so far among them: Dr. Seylan Diawara (Guinea Conakry) from 2007 to 2014 and Dr. Claire Karekezi (Rwanda) from 2011 to 2015 who are also back to their respective countries as First Female Neurosurgeons. Dr. Milena Christine (Burkina Faso) is under training since 2015, and currently doing a 1-year rotation in France.

B. Integration in the local public systems and different challenges

about 30 former trainees completed their training at the WFNS-RTC; we were able to document 29 who are back in their respective countries. Among these 29, about 23 (79.3%) were able to integrate the local public health systems and only 10 (34.5 %), have University positions where they contribute to neurosurgical education. The remaining 6 are: Late Dr. Mudjir Didier who passed away in 2012, Dr. Justin Onen who works with a non-profit private organization (CURE International) and 4 (13.8%) others are not yet integrated in local public health systems. (Table 1)

The main challenges common to all the former trainees have been being able to join local public hospitals, which did not have sufficient resources to accommodate Neurosurgical departments, with sometimes difficulties in convincing local Health Deciders and Governments in investing in this care. Neurosurgery has been so far regarded as a luxury care and many SSA countries up to date face catastrophic expenditure sending patients for surgery abroad instead of operating them locally (6). Unfortunately, this explains why some of the former trainees are still not yet hired in countries with severe deficits in neurosurgical Workforce. Fortunately, this situation is currently increasingly rare.

In order to improve neurosurgical care in any country, usually the whole Health System needs to follow to address different issues. These trainees have acquired needed surgical skills but the lack of prioritization of neurosurgical service delivery in many SSA countries,

can reduce the local impact of these trainees. The working conditions are still challenging with lack of most basic neurosurgical equipment and other supporting subspecialties to function (7,8); It remains very easy for instance to perform a burr-hole for a patient with a chronic subdural hematoma, needing urgent evacuation but this may be insufficient if there is no after care and/or Neuro-critical care support needed, it may also be easy to operate a superficial glial or metastatic tumor but this still insufficient if there is no Neuro-Oncology care to follow (including access to radiation and/or chemotherapy) this justifies the very common expenditure abroad in these countries.

The WFNS Foundation has also the will to help these young neurosurgeons establishing themselves back in their countries; providing basic neurosurgical instruments for both cranial and spine surgeries, sometimes a microscope but so far only 4 former trainees (DRC, Mali, Congo Brazzaville, Burkina Faso) benefited from these donations4. The other main challenge remains career progression for these former trainees; the issue being having lots patients for few Neurosurgeons making it difficult to find time for specific research projects related to Neuroscience or for doing short fellowships. Starting with clinical research should be encouraged, as there is an absolute need to fill in the huge gap in the documentation of different neurosurgical pathologies in SSA. Though sometime young trainees found it also hard integrating local neurosurgical teams basically due to different trainings, it is important to remember that working, as a team is the only best way to improve African Neurosurgery. The more senior neurosurgeons should be supportive and encouraging, also for young neurosurgeons starting their career: remaining humble, working on communication, starting slowly while improving gradually are the keys to success.

" Holding a stitch, holding a sucker has no language, understand the science, the science will elevate you" Dr. Justin Onen.

The WFNS-RTC alumni and future directions

In 2015, the Lancet Commission on Global Surgery highlighted that an estimated 5 billion people do not have adequate access to surgical and anesthesia care especially in LMICs, leading to significant social and economic impact in these countries and that an additional 143 million surgeries each year were needed to address this issue, allowing to save lives and prevent disabilities (6,7).

In many SSA countries, numbers show that the neurosurgical capacity deficit is even profound where the rate still approximately 1 neurosurgeon to 1-3 million inhabitants when the expected ratio by the World Health Organization (WHO) is at least 1:100.000. An estimated 5 million essential neurosurgical cases go untreated each year (8,9). Among these, emergent neurosurgical surgeries to address Traumatic Brain injuries (TBI) and Traumatic Spine Injuries (TSI). Over 23,000 more neurosurgeons are needed in these countries to address this issue, by 2030 (10,11); therefore developing Emergency Neurosurgery in SSA is a priority (8,11).

Even though the WFNS-RTC showed good results over the last years, there is still a lot to be done. Today, it is the responsibility of the former trainees to become leaders in their respective countries, motivate and train young people, to be able to improve neurosurgical Care. If each of these Neurosurgeons contributes to increase 1-2 trainees per year to reach at least 1 neurosurgeon for less than 500 000 inhabitants per country by 2030, it would be a tremendous achievement.

The 9th WFNS-Rabat Training Center Course for African Neurosurgeons which took place in Rabat from the 14th to the 16th October 2018; course preceded by a Workshop on Research and Education in Neuroscience at the Hassan II Academy of Sciences and Technology on October 13th, 2018, became an excellent occasion for the WFNS-RTC former and current trainees to gather, share ideas and think about having a look at the future and ways of contributing in advancing Neurosurgery in their respective countries. Following this, an alumni association of the former WFNS-RTC trainees was created on October 16th, 2018. Dr. Kisito Quenum (Benin) designated as the President of the Alumni, Professor El Khamlichi as Honorary President and Dr. Claire Karekezi (Rwanda) as the secretary of the association (photo 3).

The WFNS-RTC alumni association could later help itself by finding support and funds from different sponsors, this can be for instance a good step in obtaining needed instruments, contribute to various projects like providing scholarships to young trainees going for short fellowship trainings, it will also be a good way of developing more specific research projects related to neuroscience, organize local and international courses and conferences.

"The future of African Neurosurgery is on its highway, the WFNS allowed the African Neurosurgery to take-off. The train is on its wheels and now we are seeing it taking the rails with its own support" Professor El Khamlichi told the former trainees

The WFNS has also accredited more centers (Algeria, Kenya, Senegal) and currently about 21 countries in SSA have at least a local program in Neurosurgery. The idea is to later have a WFNS-regional Alumni association bringing together all the African training centers, serving as a bridge with the WFNS community.

It is also important to work with local surgical teams, universities and regional surgical bodies and find a good way of maintaining Continuous Medical Education (CME) and career progression. A good example is the development of the CAANS, which is a good platform that allows an African-based education by Africans providing a forum for educational programs for Sub-Saharan Neurosurgeons[12]. This is also possible through other surgical bodies such as the West Africa College of Surgeons (WACS) and the College of Surgeons of East, Central and Southern Africa (COSECSA), emphasizing on having more candidates trained locally.

Conclusion

The WFNS-RTC has served as an important Masterpiece in giving the African Neurosurgery its own way to develop; it is absolutely an experience worth replication. Most Former trainees have today been able to establish themselves back in their respective countries, we are seeing them taking over and training more young neurosurgeons locally, this is a big achievement. There is still a lot to be done to be able to improve local conditions and achieve career progression of these Neurosurgeons. These young people need to be encouraged and supported by the whole Neurosurgical Community.

Acknowledgement

Great Thanks and Acknowledgement to all the former trainees who are doing amazing work in their respective countries despite lots of challenges. They are incredible pioneers of the African Neurosurgery.

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Table 1. Current Clinical and Academic positions of WFNS-RTC Former Trainees

N°	Coountry	Nomber/ Gender	Hired in Public Hospitals	University position	private/ Unhired
1	BENIN	3/M	2	1	1
2	BURKINA FASO	1/M	1	-	-
3	CAMEROUN	1/M	1	-	-
4	DRC*	3/M	2	-	1*
5	GUINEE CONAKRY	2/M,F	1	1	1
6	MALI	3/M	2	2	1
7	MAURITANIE	1/M	1	-	-
8	NIGER	1/M	1	-	-
9	NIGERIA	6/M	6	3	-
10	REPUBLIQUE DU CONGO	2/M	2	1	-
11	RWANDA	1/F	1	-	-
12	TANZANIE	1/M	1	-	-
13	TOGO	3/M	2	2	1
14	OUGANDA	1/M	-	-	1
Total		**29 (27M,2F)**	**23**	**10**	**6**

RDC*: Democratie Republice of Congo: 1* Late Dr. Didier Mudjir, M: Male, F: Female

Photo 1: WFNS-RTC Non-Moroccan and Moroccan trainees along with Professor Abdeslam El Khamlichi, Director of the Center and Professor Abdessamad El Ouahabi,Director of the Training program in Neurosurgery at Mohamed V University, Rabat

Photo 2: WFNS-RTC First trainee from Democratic Republic of Congo, Late Dr. Mudjir Didier Balanda receiving his Neurosurgery Diploma from Professor Abdeslam El Khamlichi

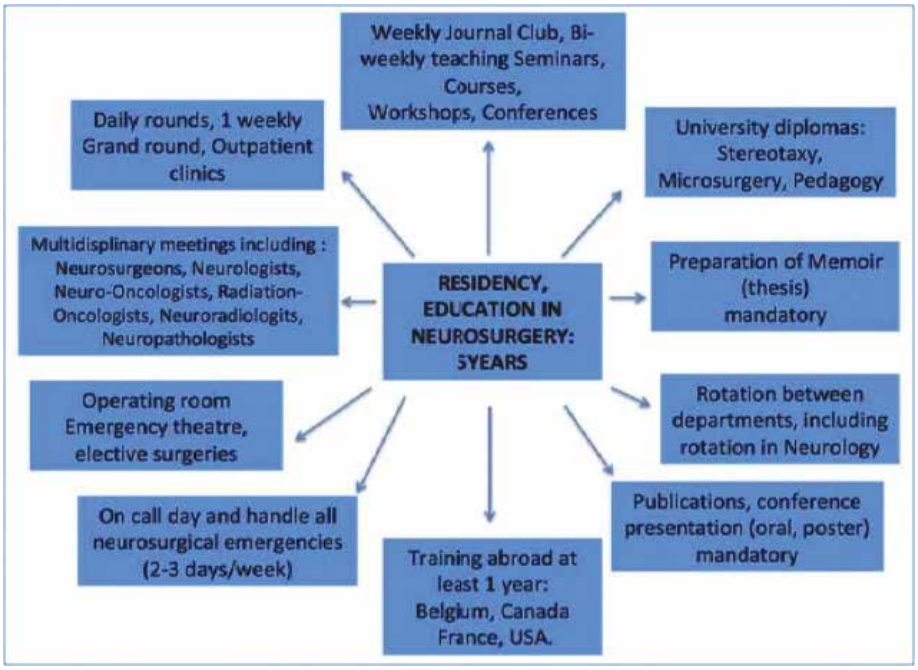

Figure 1 : Training Program In Neurosurgery at Mohamed V University of Rabat, WFNS Rabat Training Center.

Photo 3 : Former and Current WFNS-RTC Trainees with Professor Abdelslam ElKhamlichi during the 9th WFNS Course for African Neurosurgeons, October 2018, Rabat - Morocco.

Contribution of WFNS-RTC to the development of Neurosurgery in Sokoto Nigeria, a trainee report

Nasiru Jinjiri Ismail

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Introduction

The World Federation of Neurological Societies (WFNS) set up a foundation to train Young African Neurosurgeons with Rabat Morocco as the first Reference Center. This was aimed to address the gross inadequacy of Neurosurgeons especially in Sub Saharan Africa. I was opportune to be the second trainee in the program. Below is the short account of some the challenges and success during my training in Rabat and my experience coming back home in Sokoto Northern Nigeria to help established the first Regional Center for neurosurgery in Northern Nigeria, which as at the time of this writing has trained fourteen Neurosurgeons, all serving in Nigeria. This could serve as a lesson for future trainees and to show how a simple gesture of good will by WFNS could produce wonderful result.

Neurosurgery in Nigeria before my training in Rabat

There where seven neurosurgeons in Nigeria before the year 2000, six located in southern part of the country and only one in the North. There whereless than ten CT scan machine in the country and only one MRI machine in Abuja the Federal capital, serving a population of more than 150 million. There where two training centers then in Lagos and UCH Ibadan. Most of the neurosurgical cases where managed by the few neurosurgeons and the general surgeons. Many neurosurgical patients, that can afford, travel abroad for treatment.

I started my neurosurgery training in Ahmadu Bello University Teaching Hospital Zaria in 1997, under Prof B. B. Shehu who in September 2002, later sent me to Prof Abdeslam El Khamlichi in Hopital des Specialites Rabat Morocco (The WFNS Reference Center), to be the second young African Neurosurgery trainee under the WFNS Young African neurosurgery training program, the first trainee was

Dr Mudjir Didier Balanda from Congo of blessed memory who died suddenly few years after he completed his training and returned to his home country.

It's now fifteen years since WFNS Rabat Reference Center was set up to train young African residents in neurosurgery. Many Young African Neurosurgeons where trained in WFNS Rabat Reference center and are back to their countries to provide neurosurgical services. Majority where able to successfully began their practice but many faces challenges, ranging from lack of facilities, lack of team to work with and problem with obtaining local certificates in their home country to get license to practice neurosurgery. I was fortunate to come back home to meet my teacher Prof B. B. Shehu, who I was able to team up with to form the neurosurgery department and later have a center, the Regional center for Neurosurgery in Sokoto Nigeria.

There were a number of challenges in the delivering neurosurgical services in Nigeria in 2000.

1. Few neurosurgeons (7: 150 million population)
2. Only two training centers taking only 2 to 3 trainees at a time. There is a long waiting list for the new trainees.
3. Limited diagnostic facilities, such as CT scan machines and MRI
4. Lack of neurosurgical instruments such as neurosurgical microscope, and basic instruments sets
5. Lack of trained manpower such as perioperative nurses, anaesthetist and ICU nurses to form a good neurosurgical team
6. Poor socioeconomic situation of the country and lack of administrative support. The hospital administrators see neurosurgery as a highly capital intensive venture that can consume most of the hospital resources. This prevents allocation of funds and subsequent development of neurosurgery, not minding the suffering of neurosurgical patients and the huge resources spent by government and individuals in sending patients for neurosurgical treatment abroad.

It was a heart-breaking memory, knowing when children with hydrocephalus were either left to die or receive ventriculoperational

shunt with IV giving set tubing or feeding tube, due to lack of VP shunts. The many cases of brain tumors and chronic subdural hematomas that were managed in the medical wards for presumed stroke, the spinal and brain trauma cases also suffered immensely due to lack of adequate care.

We used to sit and discuss for a long time with my teacher, on how I could further my training. There were limited spaces in Lagos and Ibadan for residency training in Neurosurgery and study of Neurosurgery abroadis going to be long and highly competitive. Unknown to us, help is underway from unlikely sources. Professor BB Shehu discussed the situation of the neurosurgery in Nigeria especially the northern Nigeria with Prof. Abdeslam El Khamlichi during the PAANS meeting in Cairo in 2002, he offered to train me under the WFNS Young African Neurosurgery training program in Rabat.

Training in WFNS Rabat Reference

I commence my training in WFNS Rabat reference center September 2002 to September 2004. As a trainee in Rabat, I was aware of the challenges of neurosurgical services back home in Nigeria. I came ready not only to learn neurosurgery but also to learn the whole setup of neurosurgical care and neurosurgery team building.

There was an excellent structured neurosurgery-training program in Rabat. The program consist of ward round, out patient clinic, operation theater sessions, bed side teaching, seminars, journals club presentations, clinical research, inter departmental seminars, regional and national neurosurgery meetings and workshops. I participated in the whole program.

I was sponsored to attend a three weeks Neurosurgery course and training at International Neuroscience Institute (INI) Hanover Germany, where I train under Prof. MadjidSamii and his team. I was offered a six-month Gamma knife fellowship training in University of Virginia Charlottesville in USA.

I also learned a lot of perioperative neurosurgical nursing and neurosurgical anaesthesia, and to a large extent some of the administrative protocols for effective setup of neurosurgical center. This prepared me adequately to face the challenges back home.

Establishment of neurosurgery training in Sokoto

I came back home and completed my neurosurgery training in 2004 after passing the fellowship examination of The West African College of Surgeons and joined my teacher Prof. BB Shehu to set up the first neurosurgery-training center in Usmanu Danfodiyo University Teaching Hospital, Nigeria. The Regional center for neurosurgery Sokoto (RCNS) was later commissioned in 2007 and our center got the first WFNS basic set of neurosurgical instruments and the operating microscope.

Neurosurgery Training Program

Our neurosurgery training program is based on the curriculum of The West African College of Surgeons, in which the resident undergoes a compulsory 2 year General Surgery training program and after a successful completion of the program and passing the part I fellowship examination they proceed to a 4 year neurosurgery training. The training involves, case presentations in the clinics and wards, operation theater sessions, seminars, tutorials, journal club, morbidity mortality meetings, neuropathology and neuroradiology meetings, bed side teachings, grand rounds, update courses organizes by the West African Collages of Surgeons and also Nigerian National Postgraduate collage, clinical research and dissertation.The residents also participate in under graduate medical students teaching.

At the moment, the center has successfully trained fourteen neurosurgeons now working in various other centers within the country.

Strategies for Our Success

These are some of the strategies we adopted for our success

1. Upon my return, we trained a group of perioperative nurses basic handling of neurosurgical instruments, including how to make improvised cotton patties etc.
2. We ran a two-week intensive neurosurgery course for our nurses in the ward. We gave them series of lectures that covers basic neurosurgical cases, and care of neurosurgical patients, and some practical demonstration of some neurosurgical facilities.

3. We had series of clinical meetings and case discussions with anaesthetic team to discuss our patients before surgery and also occasionally during our seminars and morbidity and mortality meetings.
4. I was a visiting neurosurgeon to many other centers including National Hospital Abuja and Aminu Kano Teaching Hospital in Kano, and occasionally University of Maiduguri Teaching Hospital to offer neurosurgical services. In all these areas I actively organized training sessions for the perioperativeand ICU nurses and held clinical discussion with the anaesthetists.
5. We organizes one month peri operative nursing training for Nurses from Aminu Kano Teaching Hospital in Kano where two of our newly qualified neurosurgeons set up a new neurosurgery unit.
6. We had a good administrative support as my teacher Prof BB Shehu was appointed the Chief Medical Director of Usmanu Danfodiyo University Teaching Hospital Sokoto. The hospital provided twoapartments accommodation for the neurosurgery residents and other trainees coming from other centers for their neurosurgery postings.

These strategies help us build a sound and formidable neurosurgical team, which is essential for neurosurgery training. The hospital has a CT Scan machine and a 0.3Tesla MRI and a LINAC accelerator machine. Our residents continued to do their part training in Rabat reference center ranging from 6 months to 2 years, and later other centers in Brazil, University of Virginia USA and some centers in India assisted in giving our residents some additional training. South Africa has offered posting for our residents also.

Current status of Neurosurgery in Nigeria

Currently, there are (48) forty-eightindigenous neurosurgeons in Nigeria, eight of which came back from abroad to join the local neurosurgeons. Recently, two neurosurgeons, one Indian and the other Turkish came to Nigeria and set up private Neurosurgery practice making current total of 50 Neurosurgeons in Nigeria. 10 were senior neurosurgeons and the rest of the 40 were trained locally in Nigeria, of which 14 were trained from the Regional Center in Sokoto alone. And the remaining 26 were trained from the seven other localtraining

centers in Nigeria, six of whom had part of their training in Sokoto. This shows the impact of the WFNS Rabat Reference center, not only in Sokoto but also in Nigeria.

Formation of Nigerian Academy of Neurological Surgeons (NANS)

In 2007, during the Nigerian Society of Neurosciences (NSNS) meeting in Sokoto, which comprised both neurosurgeons and neurologists, the Nigerian Academy of Neurological Surgeons (NANS) was born due to increase in the number of neurosurgeons in the country. Now NANS is fully registered with WFNS and organize annual scientific meeting and workshops, including hands on cadaver courses.

Neurosurgeons trained from RCNS Sokoto

The 14 neurosurgeons trained in our center are now working in various centers within the country and are distributed as follows,

Two are in Aminu Kano Teaching Hospital, Kano, two in University of Maiduguri Teaching Hospital, two in University of Jos Teaching Hospital, one in Ahmadu Bello University Teaching Hospital, Zaria, one in Kaduna State University Teaching Hospital, two in National Hospital Abuja, one in ObafemiAwolowo University Teaching Hospital Ife, one in University of Abuja Gwagwalada, while two have been retained at the regional center in Sokoto.

Current number of Trainees

The number of trainees has remarkably increased from the year 2000 when the center in Lagos and Ibadan were having only 2 to 3 trainees at a time to currently an average of 4 to 8 trainees per training center. We have seven neurosurgery training canters in Nigeria. The projection in the next ten years, the training centers in the country are likely to graduate an additional fifty neurosurgeons.

With this present development, there has been a tremendous change and improvement in the neurosurgical practice. Our neurosurgery center has indirectly stimulated the birth of new neurosurgical centers and has encouraged the return of few neurosurgeons back to the country. Now in virtually most of the teaching hospitals with the exception of very few there is existence of neurosurgical services and general surgeons are hardly involved in care of neurosurgical patients.

Diagnostic facilities

The improvement in availability of diagnostic facilities such as CT Scan and MRI has allowed for the diagnosis of many neurosurgical diseases, including aneurysms and Arteriovenous malformations that were missed in the past. Cases like hydrocephalus and other CNS malformations have become routine procedures especially now with the supply of Chhabra Shunts from India.

Number of cases operated

We currently operate 600 to 800 cases per year in our center and smaller centers were able to treat an average of 200 to 300 cases per year. We have clipped two ACOM and one MCA aneurysms recently. Spine cases ranging from trauma, tumors and degenerative including spine fixations are now commonly practiced in our center. We have an operating microscope, C arm fluoroscopy, motorized craniotome, and basic set of neurosurgical instruments for craniotomy and spinal surgeries.

Suggestions on the way forward for WFNS Young African Neurosurgery Program

1. Need for establishment of a WFNS reference center in Sokoto (Nigeria) which has a link with WFNS Rabat reference center that can effectively give local neurosurgical training with posting in other centers abroad where required. This ensures the residents comes back to his country and serve and avoids difficulties of the regional fellowship exams certificate to practice Neurosurgery. In some African countries the trainees had difficulty with getting certificate to practice in their home country due to lack of local regional fellowship certificate.
2. Visit by senior eminent neurosurgeons to centers in Africa, to provide short term (3 to 4 days) neurosurgical training and also to meet with hospital administrators to facilitate the neurosurgical services. My visits to other centers in Nigeria help our trainees settle and establish new units of neurosurgery.
3. Continued support and supply of basic neurosurgical instruments, microscopes, and electro cautery equipments to new centers in Africa.

4. Inclusion of short term (one to three months) training for other members of the neurosurgical team like perioperative and ICU nurses and anaesthetists in a well established neurosurgical centers. This helps the new trainee form a good team to start neurosurgical practice.

Conclusion

The WFNS Rabat Reference canter has been instrumental to a rapid change in Neurosurgery in Sokoto and by extension Nigeria the most populous black nation on earth. It is never too late to change. Make a simple gift; you never know how many lives you can save, including yours! We are immensely grateful to the Team in WFNS Rabat reference center, the WFNS authorities, and all the centers in the world that provided help and training for our residents.

The growth of neurosurgery in Africa, with special emphasis to Uganda

Justin ONEN
MD, Cure Children Hospital, Mbale, Uganda

Neurosurgery is a speciality that stands aside from all the other medical specialities in that it is costly, time-consuming and entails a great deal of endurance. Neurosurgery has seen great strides in the world from inception by its founding father Dr Harvey Cushing about a century ago, thus marking the beginning of modern neurosurgery as evidenced by the notable advancements.

Neurosurgery in the sub Saharan Africa is a very challenging profession, given the rarity and dire need for neurosurgeons. It is either less known or simply underrepresented. In the health sectors of many of the sub-Saharan countries, neurosurgery is not given much attention thus, the onus is on the neurosurgeons to advocate for a fair share of attention regarding the budget. Thus, the implementers need to be more enlightened vis-à-vis the different neurosurgical pathologies and their true prevalence. The pathologies encountered in the rest of the world with better developed medical systems are also encountered in this sub-region, only that the numbers are overwhelming due to the extremely low numbers of neurosurgeons in attendance. These pathologies require more or less the same amount of sophistication regarding their treatment if good results are to be achieved. Neurosurgical centers are extremely sparsely distributed, resources very limited and yet the neurosurgical needs of the patients have to be met. It is against this background that a neurosurgeon in such a setting is required to be able to handle the myriad of cases that present before him/her, with a lot of innovation to achieve good results.

Status of neurosurgery in Sub-Saharan Africa

The population of Africa is estimated to be 1,200,000,000. With that of sub-Saharan Africa being 988,088,000. Mathematically speaking, sub-Saharan African population constitutes 82.3% of the total African population. Information is scanty or not consistent regarding the total

number of neurosurgeons in Africa, let alone those in the sub-Saharan part of the continent. However, considering extrapolation of statistics obtained from previous writers(Abdeslam El Khamlichi), only 14% of the Africa's neurosurgeons are found in Sub-Saharan Africa. These take care of 82.3% of Africa's population. Thus, there is dire need for neurosurgeons in this region. A lot of emphasis is being made in that regard by the collective efforts of the WFNS Rabat Reference center for the training of African neurosurgeons under Professor Abdeslam El Khamlichi of which I am a product and the COSECSA program as well as the University of Cape Town,to facilitate and train African neurosurgeons to offset the disparity.

The situation regarding neurosurgery in East Africa

East Africa has an estimated population of 165,753,561(one hundred and sixty five millions), from the countries that constitute the East African union (Uganda, Kenya, Tanzania, Rwanda, Burundi).

The total number of neurosurgeons in the East African union corresponding to the aforementioned population is 39, giving a ratio of 1:4,250,091.

The situation in Uganda

Uganda has a population of 40 million with 10 neurosurgeons. 2 in the Eastern region(Mbale), 06 in the capital city(Kampala), 2 in the South Western part of the country. This gives a ratio of neurosurgeon per population of 1:4000000

I am one of the 02 working in the Eastern part of the country, where we see 5000 patients each year with 1200 operations(see details below).

My personal experience involves personally operating on 999 patients from the point of my return from Rabat, Morocco in December 2013. (Data considered is between December 2013 and July 2016).

Results

The table below illustrates the breakdown of the myriad of cases thus worked on upon my return;

Procedure	Number of patients operated
ETV/CPC	292
ETV	76
Venticuloscopy	42
Ventriculoscopy/VPS	74
Endoscopic cyst fenestration	04
VPS placement	129
Encephalocele repair	13
Tumour resection	18
ETV/VPS placement	29
VPS revision	30
Ventricular irrigation	42
LTF	21
Dermoid cyst excision	11
MMC	121
Discectomy	03
Chronic subdural hematoma	12
Aqueductoplasty	07
Vps removal	23
Epidural hematoma	03
Subduroperitoneal shunt	04
Other procedures	45

Cure Childrens' Hospital of Uganda(CCHU) is widely known mainly for the state of the art endoscopic technique for treating hydrocephalus. Endoscopy alone constituted 545 of the patients thus operated by me during this period of time.

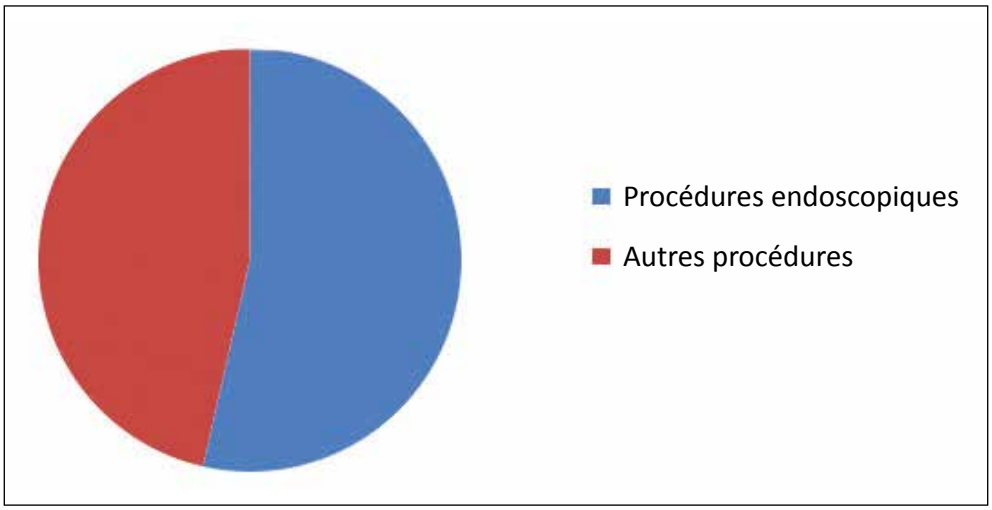

Table 2: The above table directly demonstrates the purpose for which the center wasopened; the most highlighted procedure being the endoscopic ones. ETV/CPC comprised 292 of the patients

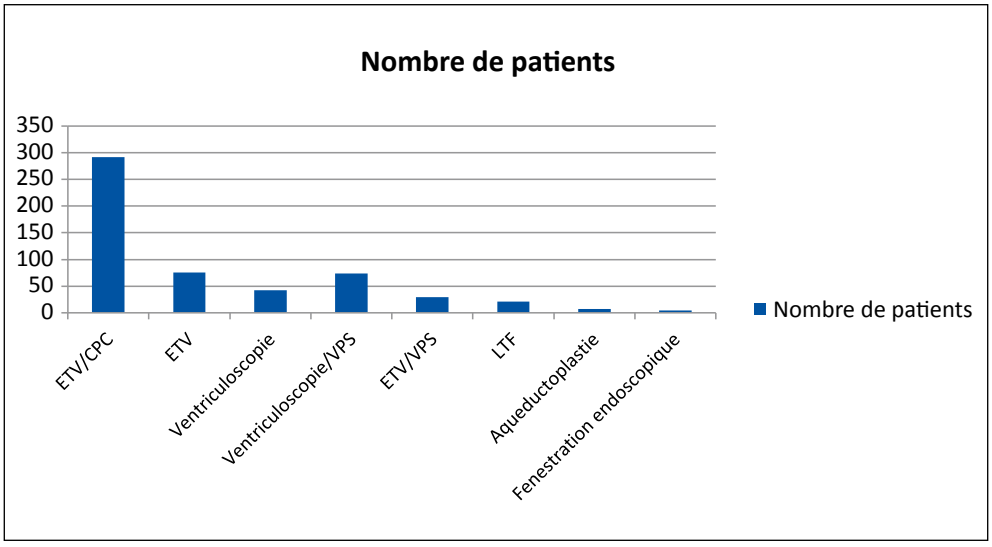

Table 3: The above graph is illustrative of the different cases managed endoscopically in our center, with ETV/CPC being the most dominant procedure

Training of residents/fellows :

We are also briskly involved in the training of international fellows and residents who come for placements. The fellows specifically come for neuroendoscopy fellowships, whereas the residents paediatric neurosurgery.

Conclusion

Neurosurgery in the Sub-Saharan African is still pretty much in its neonatal stages. The demand for neurosurgical care is extremely high yet resources are very limited. To ensure growth in capacity that requires both the human and material support; support from the local neurosurgical societies seconded by the international ones; including the WFNS, FIENS etc. must be achieved. Indeed a lot has already been done by the WFNS and FIENS to that end as evidenced by the WFNS initiative through the WFNS Rabat Reference Center For the Training of Young African Neurosurgeons. I am a Typical product of that effort and the preliminary results of my personal post-residence experience is highlighted herein to prove that the training in the reference centers is not merely basic but world class. This capacity building dream will surely be achieved with the continuation of the program. The above results are simply preliminary. A more diverse scope of patient data regarding the different neurosurgical pathologies will be provided in the next couple of years and beyond,of my practice after residency in Rabat.

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Practicing Neurosurgery in Mali

Oumar Coulibaly
Neurosurgeon, Mali Hospital, Bamako, Mali

My name is Doctor Oumar Coulibaly, neurosurgeon from Mali trained at WFNS Rabat Reference Center for training African neurosurgeons.

I first reached the center on February 20, 2006, and began training on March 20, 2006. During my training, I attended the courses and monthly seminars aimed at residents. I have trained at both Department of Neurosurgery at Ibn Sina Hospital and Hôpital des Spécialités, University Hospital Center of Rabat, for 5 years.

During the training, I was graded on a monthly basis on my operative activity, and my daily management of hospitalized patients and the patients admitted during my supervision.

All these activities were graded by all the teachers at the Research and Education Department of Neurosurgery at the end of each academic year.

My final exam for specialization in neurosurgery began around 08:30. I was alone that morning. Five eminent professors in neurosurgery were members of the jury that day. I was self-confident. However, the fear of failing at the examination, and the time I was allowed for each session, pushed me to concentrate on the examination until the end of the day. Around 17:30, after the results were announced, I became a neurosurgeon. Once I reached my apartment, I started thinking of tomorrow… Should I go back to my home country, or not?

Eventually, after spending a few months in Morocco, I took the decision to join my home country, in July 2012. At that given time, I became the second Malian neurosurgeon having trained at the WFNS Rabat Reference Center, and the 6th neurosurgeon joining his home country. Dr. Sogoba, had begun training in Rabat two years before me, and had finished in August 2009, and had gone back home in the same year.

Mali is a country located in Western Africa, with 16 million inhabitants and 1,241,000 square kilometres.

Before Malian neurosurgeons began training, neurosurgery was practiced by Cuban neurosurgeons, all residing in Bamako. However, when the first neurosurgeons began coming back home, things changed. Currently, we are 10 neurosurgeons dispatched over 4 hospitals. Four work at Hopital Gabriel Toure, 4 at Hôpital du Mali, 1 at Hôpital Mère-Enfant Le Luxembourg, and 1 at Mopti, outside Bamako.

Before trained neurosurgeons came back home, patients were treated in Maghrebian countries (Tunisia and Morocco), with huge amounts spent by Malian authorities. Only 10% of patients travelled towards Maghrebian countries. 15-20% were operated by Cuban neurosurgeons, and more than 50% died of their illnesses. This has currently changed, although there is still a lot to be done.

Once I returned home in July 2012, I really had to struggle. The Northern part of Mali witnessed inter-tribal violence. It was very hard for me, and I spent one year before being recruited by the Ministry of Health. Before being recruited, I worked as a volunteer with younger neurosurgeons. Some even struggled more than I did, and thought of leaving the country.

As for decision-makers, only 7 neurosurgeons of 10 among us have been recruited by the Ministry of Health. When young neurosurgeons have finished training, only two are recruited by the ministry, without taking into consideration the real needs for neurosurgeons in the country. Consequently, 5 Malian neurosurgeons hesitated into going back home after training. They decided to practice neurosurgery in Equatorial Guinea or in neighbouring countries. This brain drain is also witnessed in other fields of healthcare.

Normally, a neurosurgeon from Mali should not remain jobless. Departing from this, we have created a trade union of Malian neurosurgeons, Syndicat National des Médecins du Mali (SY.ME.MA). This trade union will examine with members of the government the way physicians are recruited, and their salaries. The issue we are confronted with is that salaries do not depend on the certificates and training carried out. This is the main reason why other Malians who have been recruited by their ministries have set up their own trade union.

A Malian neurosurgeon cannot survive with his salary from the Ministry. Even though we keep insisting for better working conditions so we can operate more patients, some decision-makers have dared ask us to work less, as we cannot save all our patients. I have also been told that I work too much. I know this is going to change, and we will keep the struggle until things change.

As from our side, we do not differ from each other, even though we have been trained in different countries. Our main aim is to let patients judge us positively. Some young colleagues have been discouraged when coming back home, as they were told not to stay in Mali, or to work somewhere else. But we keep struggling for the situation to evolve positively.

Every day, we see medical practice being tarnished, because some decision-makers do not want to see young physicians succeed.

The only positive evolution from our decision-makers is the general application of measures to allow for a wider coverage of medical expenses throughout the country.

Since my return home at the end of 2012, I have operated approximately 700 patients (in both public and private hospitals), and I have also attended national and international events.

I have personally been able to change the management of neurosurgical emergencies, because I have convinced my colleagues that saving lives is like running against time.

Currently, I can operate patients at 03:00 am. I work on call in a hospital as an intern and as a neurosurgeon, because calls are mostly carried out by an emergency-oriented general practitioner. I have left a message at the emergency, saying "You can phone me 24/24, I will answer you." Since 2014, I have been living 2 minutes walk from the hospital, so I can answer the calls and treat the patients on time. I have even demanded from the administrative staff that every time I request a CT scan urgently, that it be carried out in emergency, without financial constraints to families of patients.

I wish that all neurosurgeons in Mali work as a team, in order to better manage our patients.

In order to reach an optimal management, my colleagues and I have:

- set up a Malian Society of Neurosurgery;
- worked towards setting up specialization in neurosurgery (3 years in Mali, 2 in Rabat)
- supported that we have neurosurgeons in each area of Mali. The majority of neurosurgeons work in Bamako, with no other neurosurgeon in the remaining areas of the country. I hope politicians support my idea and send the next recruited neurosurgeons to the main areas of the country. I personally think that there should be neurosurgeons in every area of Mali, with equipment provided in the hospitals. Later, after setting up the society, we will organize national and international scientific meetings.

The training we have received at the WFNS Rabat Reference Center remains unrivaled, with positive effects.

I hereby wish to thank all WFNS officers for the training I have received, but also for the equipment we have been provided with at the end of the training. I urge the WFNS to keep making efforts towards training young African neurosurgeons, and to set up an office that would push some countries to take care of trained neurosurgeons who have decided to join their home countries.

Finally, I have to thank all our teachers who have trained us. I am proud of you, and of your heritage that we hand on to future generations.

Thank you again, Usted, for everything you have done, and thank you also for the young Dr. Denou who has told me he has reached Rabat to begin his training at the WFNS Rabat Reference Center.

Neurosurgery in Togo, Doleagbenou

Agbéko Komlan

After achieving my medical studies at Faculté Mixte de Médecine et de Pharmacie de Lomé (currently Faculté des Sciences de la Santé), thanks to the support of the Moroccan Agency for International Cooperation (AMCI), I was able to enroll for a basic training in neurosurgery at the Medical School of Rabat. The training took place at the WFNS Rabat Reference Center for training African neurosurgeons. It lasted 5 years. During that period, we have acquired the bases of neurosurgery and the management of neurosurgical pathologies.

After I finished my training, two additional Togolese doctors benefited from training through the AMCI: Dr. Komi Egu, who studied medicine in Morocco, and Dr. Hobli Ahanogbe.

Two other Togolese citizens are currently training at the WFNS Rabat Reference Center: Dr. Alena Ameyo Nubukpo-Gumenu, and Dr. Felix Kossi Kouma Segbedji.

1. Neurosurgery in Togo from 2008 to September 2016:

Togo is a country located in Western Africa, with a population of 7 million inhabitants. Neurosurgery is a specialty that was launched in the country in 2008.

When the specialty was first launched, there was only one neurosurgeon. Currently, there are six active neurosurgeons. However, this limited number remains low for an appropriate management of the high number of cases with neurosurgical diseases. This low number of neurosurgeons prevents the population in the country from benefiting from treatment, because all neurosurgeons work in the capital city Lomé. Five of the six neurosurgeons in the country work at the Sylvanus Olympio University Hospital Center. The sixth neurosurgeon works in the private.

Since the last examination for the admission of assistants into the two universities in Togo in December 2015, a department has been set up in Kara, the second most populated city, located in the North. Consequently, the current distribution of neurosurgeons in the country is as follows: 4 at the SOUHC, 1 at the UHC of Kara, and 1 in the private.

2. Neurosurgery in Togo since June 2014 : healthcare, changes, drugs, number of operated patients, training, decision makers, and future projects.

After I finished my training at the WFNS Rabat Reference Center and went back to Togo, I signed a contract with the Regional Hospital Center of Lome Commune, where I carry out most of my neurosurgical activity. I joined the surgery team at that center. At the center, we have 20 patient beds that I share with my 4 colleague surgeons: 3 visceral surgeons, and 1 traumatology surgeon.

With regards healthcare, we have adopted the same work pace as the one we had in our initial training center, namely at the WFNS Rabat Reference Center. Indeed, we had an operative activity at the emergency department, and patients for scheduled surgery. Patients themselves noticed the quick pace we adopt at the emergency department in the hospital, which added quality to neurosurgical healthcare in Togo. Consequently, as we began with ten patients examined at appointments during our first two months of activity, we have now reached an average of 85 patients examined per month.

The following table shows the number of patients operated between September 2014 and March 2016.

Table 1 : Distribution of operated patients according to pathology

	Number of patients
Chronic subdural hematoma	20
Extradural hematoma	15
Malformative hydrocephalus	15
Malformation of the occipital cervical junction	2
Convexity meningioma	15
Lumbar and cervical disc herniation	40
Spinal stenosis	100
Posterior cranial fossa tumors	8
Intracranial suppuration	10
Slow spinal cord compression	20
Spinal trauma	20
External ventricular drain	5
Intracerebral hemorrhage	6
Brain metastasis	1
TOTAL	**277**

Since November 2016, a neurosurgeon who had trained in Casablanca, Morocco, through the WFNS Rabat Reference Center training program, joined us. Our return to the country allowed us to improve the management of cases such as subarachnoid hemorrhage, or stroke. When insisting on the emergency of these cases, especially through etiology, or at least using the CT scan to show a subarachnoid hemorrhage, three patients were taken to a center with more equipment for a better management. These facts are in the process of changing the way other colleagues conceive of subarachnoid hemorrhage and strokes. More and more cases of ruptured aneurysms that engender subarachnoid hemorrhage, are therefore diagnosed. When the patients' condition allow for it, they are taken to centers with better equipment, for better management.

We keep on learning and training through the various courses, seminars and congresses held in various areas of the world. Besides, we try to keep in touch with our colleagues who have been trained before us, or during the same period, or after us, at the WFNS Rabat Reference Center.

Practicing neurosurgery in Togo is a difficult task. Both CT scans at the two University Hospital Centers are often down. Also, none of the UHC has an MRI device. Therefore, only one of the two departments in the capital city Lome is functional: that of Sylvanus Olympio UHC. Since the last admission examination was jointly held by the Ministries of Health and Public Service, the two neurosurgeons at the Regional Hospital Center of Lome Commune were appointed at the SO UHC. This enables for a new but unfair distribution of patients' access to neurosurgical healthcare. However, political decision makers seem not to have much concern about this situation. There is a lack of operating rooms at the UHC, for all specialists who come back to Lome after finishing their training, beside a severe lack in technical equipment.

- Our future projects:

  - Building up a real department of neurosurgery, with a dedicated operating room and the required equipment. This will never be done without support from political decision makers. We wish to do this also with support from various partners, including the WFNS;
  - Setting up the Togolese Society of Neurosurgery;

- Managing pathologies like pituitary adenomas;
- Organizing missions where our teachers from the WFNS Rabat Reference Center could bring their expertise (pituitary surgery, intracranial aneurysm surgery, …etc.)
- With an increasing number of neurosurgeons in Togo, we wish to set up a Specialty Diploma in Neurosurgery, as soon as we have two teachers from Rank A at the Medical School. Currently, two neurosurgeons are enrolled for the next Aggregation examination, and two others, including me, are Clinic Assistant Directors.

The WFNS Rabat Reference Center for training African neurosurgeons is an excellent training school for young Africans.

We also wish that the WFNS Rabat Reference Center holds meetings in the home countries of neurosurgeons who have trained there. This will bring a strong support to the development of neurosurgery in these countries.

Neurosurgery in Burkina Fasso

Dao Ibrahim

COURSE

I was born on October 5, 1980 in Bobo Dioulasso, Burkina Faso. I began studying medicine on September 15, 2000, at the Medical School of Rabat.

My love for neurosurgery was born and developed through the neuroanatomy courses of the first and second years of my medical studies. The brain and nervous system seemed to be both fascinating and fragile. Therefore, their management requires smoothness and know-how.

This willingness and desire grew stronger during my 4th year medical training in 2004 at the Neurosurgery Department at Hopital des Specialites, chaired by Professor El Khamlichi.

After I enrolled in the internship examination at Ibn Sina University Hospital Center in April 2007, I noticed that the management of patients with severe pathologies (brain trauma, multiple trauma, …etc.) at the emergency unit and later at the intensive care unit during my 2-year internship (2007-2009) that a neurosurgeon has a heavy work load and needs lots of energy to achieve his career as a specialist. Therefore, this love for neurosurgery developed into passion.

During my internship, all my doubts went away during the period I spent at Ibn Sina Neurosurgery Department chaired by Professor Bellakhdar (December 2008 to June 2009). I again operated cases including tumors, and vascular, pituitary, traumatic, spinal pathologies …etc.

Eventually, I began specializing in neurosurgery with enthusiasm, in July 2009 at Mohammed V Military Hospital in Rabat, at the department chaired by Professor Boucetta, in accordance with the training program of African neurosurgeons at the WFNS Rabat Reference Center, supervised by Professor El Khamlichi.

This 5-years training unfolded as follows:

2009-2010: 1st year of specialization in neurosurgery

- **Objectives :**
  Central nervous system
  Neuroanatomy
  Neurology-Neurophysiology
  Neuroradiology
  Neurotraumatology
  Infections

2010-2011: 2nd year of specialization in neurosurgery

- **Objectives :**
  Neuro-oncology
  Spinal degenerative diseases
  Anatomy and microsurgical techniques in neurosurgery

2011-2012: 3rd year of specialization in neurosurgery

- **Objectives :**
  Spinal trauma
  Central nervous system malformations

2012-2013: 4th year of specialization in neurosurgery

- **Objectives :**
  Central nervous system malformations
  Spinal degenerative diseases
  Epilepsy

2013-2014: 5th year of specialization in neurosurgery

- **Objectives :**
  Posterior fossa tumor and the cerebellopontine angle
  Sellar region tumors
  Neurovascular diseases
  3rd ventricle approach (V3)
  Brain stereotactic biopsy

Besides, I was selected for an internship in neurosurgery at the University Hospital Center of Angers (France) from November 2012 to November 2013. When I finished my training, a medical specialization training certificate in neurosurgery was given to me.

Moreover, I spent my vacations in my home country Burkina Faso, I trained at the Neurosurgery Department chaired by Professor Kabre, at the University Hospital Center Yalgado Ouedraogo, so I could get acquainted with the working conditions and the neurosurgical pathologies I would have to attend to once I would have gone back home.

I obtained my specialization diploma in neurosurgery from Rabat Medical School, in November 2014.

RETURN TO BURKINA FASO

When I finally went back to Burkina Faso, my home country, 2015, the neurosurgical team grew to 5 members over the country, all distributed over 3 university hospital centers, to serve a population of 17 million inhabitants.

As I was the first military neurosurgeon in the country, I was appointed Director of the Neurosurgery Clinic at the Medical Camp General Aboubacar Sangoule Lamizana. There, I faced a neurosurgical clinic where no equipment was available.

There, I began my main activity, namely neurosurgical examination (an average 100 patients per month), hospitalization, and preoperative tests of patients, along with the postoperative followup of patients I had operated in other hospitals.

Along with this activity, I was detached as a neurosurgeon at Yalgado Ouedraogo University Hospital Center, at the Department chaired by Professor Abel Kabre.

I have been practicing there within a team of 3 neurosurgeons from Burkina Faso, who are sometimes backed up by neurosurgeons from Cuba.

As a reminder, neurosurgery in Burkina Faso was born to Professor Kabre and under his impulsion. Before him, neurosurgical diseases

were managed by foreign neurosugeons from Russia, then from Algeria. It is beginning 2002 that the Neurosurgery Department was born as such in Burkina Faso. The first Neurosurgery Department was located at Yalgado Ouedraogo University Hospital Center in Ouagadougou, the capital city of the country.

In 2012 and 2013, 3 neurosurgeons from Burkina Faso who had finished their training abroad came back home, and brought the team to 4 members at the national level. This has enabled authorities to open two additional neurosurgical departments:

- one at Blaise Compaore University Hospital Center in Ouagadougou;
- and one at Souro Sanou University Hospital Center in Bobo Dioulasso, the second city in the country.

Also, the Burkina Faso Society of Neurosurgery was set up in 2012. A specialization training program in neurosurgery was set up in 2015.

My activity at the Neurosurgery Department of Yalgado Ouedraogo University Hospital Center may be summarized as follows: the management of emergency cases, scheduled surgery of neurosurgical and spinal cases, neurosurgical examinations, examination and postoperative followup of patients, weekly calls.

NEUROSURGICAL ACTIVITY REPORT – JUNE 2015 TO NOVEMBER 2015 (BURKINA FASO)

(PATIENTS OPERATED AT YALGADO OUEDRAOGO UHC, AND OTHER HOSPITALS)

		BRAIN = 58	TOTAL
1	Tumor (4)	Telovelar approach to the cerebral posterior fossa	1
2		Convexity brain tumors	3
3	Trauma (36)	Decompressive flap	4
4		Bone flap +/- craniectomy to evacuate intracranial hematoma (extradural or acute subdural hematoma)	11
5		Suboccipital approach of extradural hematoma of the posterior brain fossa	1
6		Suspicion of intracranial hematoma. Trephine exploration hole (before radiology imaging)	1
7		Osteomeningeal defect	3
8		Skull and brain injury	5
9		Chronic subdural hematoma : trephine hole for evacuation	8
10		Depressed fracture of the skull	3
11	Hydrocephalus (9)	Ventriculocisternostomy	4
12		Ventriculoperitoneal shunt - Congenital hydrocephalus	5
13	Malformative (1)	Anterior fontanel cyst	1
14	Infectious (5)	Cerebral abscess : trephine puncture	3
		Empyema (bone flap)	2
15	Pituitary (3)	Pituitary adenoma : transsphenoidal approach (Microscope + Endoscope)	3
		CERVICAL SPINE = 7	
16	Degenerative and traumatic(7)	Anterior approach of the cervical spine (Osteosynthesis)	5
17		Cervical laminectomy	2
		DORSAL AND LUMBAR SPINE = 29	
18	Degenerative (22)	Laminectomy +/- lumbar discectomy	13
19		Interlamellar approach	9
20	Traumatic (5)	Osteosynthesis of the lumbar spine Roy Camille	5
21	Infectious (2)	Infectious spine compression	2
		PERIPHERAL NERVES = 3	
22	Peripheral nerve (3)	Carpal tunnel syndrome	3

The practice and development of neurosurgery in the Democratic Republic of Congo

Jeff NTALAJA

Two years after I came back to my home country upon finishing my training at the WFNS Rabat Reference Center (Morocco)

Jeff Ntalja, Neurosurgeon, Secretary General of the Congolese Society of Neurosurgery

Coordinator of the National Hospital of Excellence (Kinshasa, July 2016)

The beginning

The practice of neurosurgery began in the Democratic Republic of Congo many years ago:

- in 1976, Professor Sakho was the first Congolese neurosurgeon;
- since 1986, Doctor Beltchika and his team have been practicing neurosurgery at the University Hospital Center of Kinshasa;
- after a few years spent at Clinique Ngaliema, Professor Kalala Okito currently resides at the University of Gant, Belgium. He often comes back to his home country to participate in the development of neurosurgery in the framework of the diaspora;
- Doctor Mudjir Balanda was the first fellow countryman to be trained at the WFNS Rabat Reference Center, and who came back to his homecountry, and who deceased at a young age after having practiced neurosurgery for a short period (1998-2012);
- as far as we are concerned, as soon as we came back home after a training at the WFNS Rabat Reference Center in December 2013, the development of neurosurgery in the country witnessed major advances, namely in improving patients' management and equipment purchase.

Work environment:

- The DR of Congo: a surface area of 2,345,409 km², 75,000,000 inhabitants, and only 4 neurosurgeons dispatched in two provinces out of 26.

- Our activity is focused in Kinshasa, the capital city of the country (12,000,000 inhabitants), and in the Southeastern part of the country called Katanga, the old mining district (496,877 km², 14,000,000 inhabitants);
- Before we came home, there was the following equipment in the DR of Congo:
  - 1 MRI device, 0.35 Tesla;
  - 4 CT scan devices;
  - 1 image intensifier.

- Neurotraumatology was the main neurosurgical activity;
- As soon as we came back to our home country, we have thought of improving the patients' management conditions, and of changing working conditions;

How?

- We have written an appeal to the political and administrative authorities for the purchase of tools in order to improve our working conditions and patients' management conditions;
- We contacted the neurosurgeons who were practicing outside the country, so they could help us improve our working conditions and the patients' management conditions, and also to purchase new technologies;

The result was as follows:

- The political and administrative authorities allowed us to purchase new equipment. By working conjointly with the neurosurgeons outside the country, we can count:
    - intensive care equipment;
    - new medical equipment.

As an example, in the DR of Congo, we have:

- 4 image intensifiers;
- several CT scan devices, with 3 including 64 slices;
- 5 MRI devices, with two 1.5 Tesla;
- 1 digital angiography device;
- 1 basic operating microscope;
- 2 Medtronic Quadrant systems;
- etc.

Thanks to this recently-acquired equipment, we have begun carrying out an appeal with the aim of advancing our specialty and start a new era of neurosurgery, with an important support from neurosurgeons outside the country.

The diaspora (neurosurgeons outside the country) is an important partner towards the development of neurosurgery in the DR of Congo, namely by strengthening competence and by sharing practical experience in neurosurgery.

This collaboration with the neurosurgeons from the diaspora allows for a transfer of skills that stands for a qualifying training over a long period:

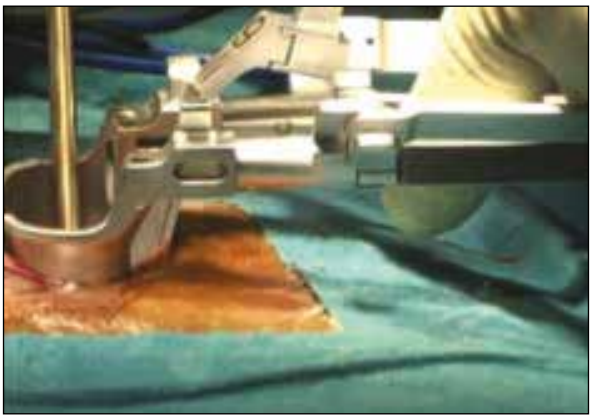
- With Professor Kalala from the University of Gand, we have begun the surgery of :
- anterior circulation aneurysms by clipping (8 cases operated to this date, with 2 deceased);
- spondylolisthesis with lumbar prosthesis, a routine to this date;
- skull base tumors, still in the beginning.

- With Doctor Orphee Makiese, neurosurgeon at Clinique Floreal in France, we have begun practicing lumbar minimally invasive surgery under local anesthesia (peridural), and a Medtronic retractor system.

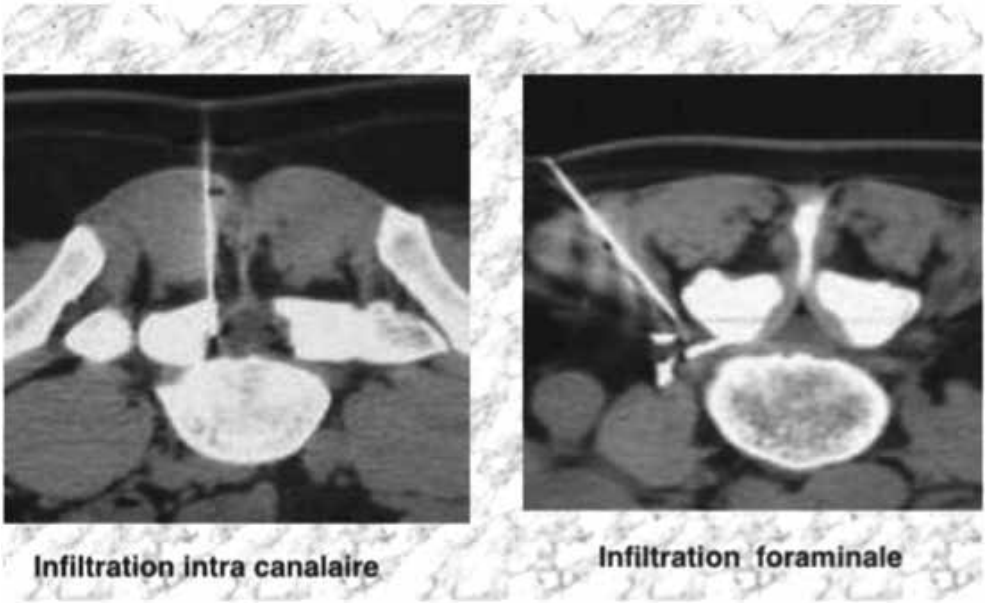
With no false modesty, in the DR of Congo, this is the first center to carry out this surgery under peridural anesthesia.

For almost four months now, we have successfully operated 68 cases of lumbar minimally invasive surgery under peridural anesthesia.

Currently, minimally invasive surgery is a routine surgery in our country.



- With Doctor Hugues Matondo, an interventional radiologist practicing in Belgium, we have carried out 306 cases of lumbar and cervical surgery under CT scan over 14 months.



To strengthen this collaboration between neurosurgeons from the country and those outside the country, we have thought of evolving together by setting up some milestones:

- setting up a scientific society, namely the Congolese Society of Neurosurgery, whose Secretary General has been myself since 2015.

- setting up an online information exchange platform with an information website and to the Congolese Society of Neurosurgery;
- last March, we set up a National Neurosurgery Excellency Pole whose coordination has been carried out by myself;
- The pole is a unit including neurosurgery specialists who practice neurosurgery with all its modes, ranging from minimally invasive surgery to the surgery of big size malformations, including tumors, traumatology and degenerative surgery.

It is a collaboration platform gathering up neurosurgeons (3 from outside the country), and specialists from other fields (anesthetists, radiologists, …etc.).

Surgery statistics

Before the National Neurosurgery Excellency Pole started, we have carried out between 2014 and 2015:

- 401 cases of surgery, with an average of 3 cases per week (see table below).

ORIGIN OF OPERATED AND EXAMINED PATIENTS BETWEEN 2014 AND 2015 (22 MONTHS)

Country of origin		Number of patients examined	Number of patients operated	% of patients operated
DR of Congo	*Provinces (DRC)*			
	Kinshasa	3071	303	75,50
	Ex-Kivu		12	3,00
	Ex-Katanga		58	14,50
	Eastern province		6	1,50
	2 Ex-Kasai		8	2,00
Angola			8	2,00
Congo Brazzaville			4	1,00
Gabon			2	0,50
Total			**401**	**100,00**

PATHOLOGIES ARE INCLUDED INTO 6 GROUPS

1	**Neurotrauma**	**:**	**136 (34%)**
2	Infections	:	26 (6%)
3	Tumors	:	36 (9%)
4	**Degenerative**	**:**	**142 (35%)**
5	Malformations	:	38 (9%)
6	Vascular	:	24 (6%)

Since our platform has been set up, we operate 10 to 12 cases per week at the National Neurosurgery Excellency Pole, with the aim of operating 600 cases per year.

Objective 2016-2017

- to purchase a new operating microscrope from Cavitron, and endoscopy equipment to carry out ventriculocisternostomy and pituitary surgery;
- to launch a Neurosurgery Excellency Pole at Lubumbashi, in August 2016 (Southeast of the country);
- to launch pituitary surgery by transsphenoidal approach and endoscopy (November 2016);
- to hold the first conference on neurosurgery in Kinshasa, with neurosurgeons from Brazzaville, Gabon, Togo, Benin, Mali and Morocco (October 2016).

Conclusion

Neurosurgery in the DR of Congo has witnessed development since our return, after purchasing basic equipment, and setting up the Congolese Society of Neurosurgery, but mainly after starting the National Neurosurgery Excellency Pole that makes of Neurosurgery an alternative way to develop medicine in our country.

APPENDIX 3

Articles written by Directors of other WFNS-Regional Training Centers

«AFRICA 100 PROJECT» in Algeria

Abderrahmane SIDI SAID *

Introduction

The progress and technological advances witnessed recently in neurosurgery have required significant financial, material and human resources, to grant patients safe and efficient treatment.

The scientific meetings held, beside our exchange, and the strengthening of our friendships with the WFNS through countries and continents, have all led us to learn of differences, and even a gap that separates us from one another in our activity.

Long-term, organizational lacks and limited human resources witnessed by our neurosurgeon colleagues practicing in low and average income countries engender a feeling of frustration in them and in their patients, this because basic neurosurgical practice has become gradually difficult, sometimes even impossible in many Sub-Saharan African countries.

The WFNS being a space for listening and reacting, it has the fundamental role of promoting the specialty around the world. In recent times, the WFNS has witnessed huge advances in training and both the logistic and material support, through its presence and the participation of its members. This has engendered interest and enthusiasm for neurosurgery among young physicians, namely in Africa where surgery is still considered to be a "luxury".

Evolution of neurosurgery in Algeria

After Algeria reached independence in 1962, the Central Library in Algiers was set fire to. The hospitals and the university were devastated after physicians and teachers left in great numbers.

A small group of neurosurgeons got together, and got organized to give their specialty a new start. Among the group, there were Algerians: Doctors Abada and Abdelmoumen. There were French

* Translated from the French.

citizens: Doctors De Rougement and Barge. There were Italians: Doctors Giovine and Galli. They would all be joined later by Doctors Bou Salah and Boutmene.

As there were no premises for the Neurosurgery Department, the Chairman of the Department of Orthopedics would lend a few beds for neurosurgical patients, and would lend the keys of the operating room at night, after the orthopedics sessions ended. Therefore, neurosurgery would then be practiced during the night, which would allow neurosurgeons to "taste the sunrise over the Bay of Algiers. This was their reward!", according to I. Galli. But their willingness, self-sacrifice, and determination of the pioneers of neurosurgery allow for their first victory, which was the first independent department of neurosurgery. As there were no equipment available, they had to be neurosurgeons, anesthesiology and reanimation specialists, masons, and painters. But eventually, neurosurgery was recognized as a specialty and independent surgical discipline. This was an important step!

Since 1964, the demand for neurosurgery increased. The authorities decided, under the pressure imposed by the pioneer neurosurgeons, to give them a second department for their practice, at Ali Ait Idir Hospital. The first CT scan was purchased in 1978, and the first MRI device in 1987. These were new steps in the management of neurosurgical cases.

In 1987, stereotactic surgeons took a momentum, at the same time as functional neurosurgeons. Adapted equipment, an operating microscope, an ultrasonic aspirator, an endoscope, and a neuronavigation device, are all currently available in Neurosurgery Departments, with more than 300 neurosurgeons countrywide and approximately 50 MRI devices, and more than 350 CT scans.

With regards postgraduate training in neurosurgery in Algeria: teaching the discipline was set up in 1974. In the 1970s and 1980s, in order to meet the increasing demand for neurosurgery in a vast country and scattered population, with a density of 17 inhabitants/square km, training in general surgery includes neurotraumatologywhich was taught by the pioneer neurosurgeons, beside training in neurosurgery. Consequently, after finishing his training in neurosurgery, a general surgeon was able to manage a patient with multiple trauma, namely a patient with multiple brain trauma, all over the country, as there were no neurosurgeons available.

Assessment and status of neurosurgery in Africa:

Even though the countries in Sub-Saharan Africa are diverse, they experience common challenges, namely to find a cure to the main health scourges like the rapid increase of population, and the control over infectious diseases, or again the high mortality rates of mothers and infants, and finally limited access to health care.

This engenders endemic poverty that prevent the countries in the continent to build up their human and economic resources. The world ratio of neurosurgeons to population is 1:230,000 inhabitants, while in Africa, it is of 1:1,352,000. Neurosurgery remains a specialty that has been put aside for a long time in the continent, so that some countries in Sub-Saharan Africa only have one to five neurosurgeons. To this situation, we should add long-term intrinsic failures (lack of instruments, bipolar, drill, microscope), and extrinsic ones (lack of medical imaging devices, lack of intensive care equipment, …etc.).

What can be done to help solve the situation?

Africa 100 training project: In order for Africans to help solve these issues, we consider it necessary to begin by setting up a dynamic and to invest in training human resources. To this end, the large-scale project for training 100 African neurosurgeons in Africa is in itself a milestone in international collaboration and in the commitment of neurosurgeons.

As WFNS Ambassador for Africa, Professor Madjid Samii announced the Africa 100 project in February 2012, during a meeting in Nairobi.

The aim is to train young African physicians in neurosurgery in Africa in their regional environment. The training would be a positive investment for Africa, and would be carried out in such a way as to avoid any loss or "brain drain".

An international committee "Africa 100" including 7 members was gathered up to examine the submitted applications and assess the admission criteria of applicants. The process included all African countries.

This call initiated by Professor M. Samii for setting up regional training centers in neurosurgery in Africa has obtained the support, help and

commitment from Algerian neurosurgeons, and later from healthcare and university authorities in Algeria.

Since 2013, African physicians began to enroll in the postgraduate training in neurosurgery at the University of Algiers.

With regards Algerian applicants, they can enroll in the postgraduate training after sitting for a national examination. Once the results have been issued, applicants can choose the hospital where they can begin, according to their results and ranking.

With regards African applicants, as they will be going back to their respective home countries after they have finished training, we have obtained that they enroll without a previous national residency examination, but we have also enabled them to be granted a scholarship that would help them solve administrative formalities related to their stay in Algeria, and cover their boarding expenses at the university campus.

However, even though the applications are accepted and sent to the international committee members for Africa 100, the submitted documents are examined in detail previously by a committee including Algerian experts who should issue equivalent diplomas, especially for the degree in medicine, in order for the enrollment to be carried out.

During the academic year 2013-2014, 4 applicants enrolled, coming from the Democratic Republic of Congo, Mozambique, Tanzania, and Niger.

An English-speaking applicant preferred to stop her studies in order to take French courses, and later resumed her training during the academic year 2014-2015. She is currently in 4th year, and is achieving good results during her training.

During the year 2016-2017, six applicants enrolled, coming from Guinea and Mauritania (the second applicant from Mauritania did not show up).

As for the current academic year, two applicants have begun their training at the University of Algiers (1 from Guinea and another one from Chad).

We have noticed that all applicants who are training in Algiers, feel happy and full of motivation, with a commitment and a never-ending willingness.

Their enthusiasm and calmness are not changed when confronted to the duration of the training (5 years) or the distance from their family members, as we have applicants who are married and who have children.

During their training and their hospital-related activities, African residents have the same rights and obligations as their Algerian colleagues.

Currently, 20 to 30 Algerian residents enroll every year throughout the country, for whom Algerian authorities have issued their acceptance for enrollment for the next academic year (2018-2019), and also 10 African physicians who have enrolled in the universities located in the eastern and western parts of the country, namely in the departments of neurosurgery in Tizi Ouzou, Annaba, Blida, Oran and Algiers.

In 2018, the Africa 100 committee accepted the applications of 31 students from the following countries: Somalia, Nigeria, Zimbabwe, Chad, Tanzania, Gambia, Swaziland, Niger, Mauritania, Zanzibar, Cameroon, Guinea Conakry, Benin, Malawi, and the Democratic Republic of Congo.

These applicants are under training in Morocco (Fez, Casablanca, Marrakesh), and in Algeria (Algiers).

Finally, it is worth noting that African physicians from Benin, Mauritania, and Mali are under training at the Department of Neurosurgery of the Military Hospital of Algiers, at the University of Algiers.

Conclusion

For more than 10 years, North Africa with more than 1400 neurosurgeons, has taken part in neurosurgery training of African physicians, namely from Sub-Saharan African countries. Thanks to the participation and contribution of the WFNS Foundation and its members, some positive results have been witnessed, but efforts still have to be made towards continuing training programs. This continuous support that

has lasted many years, will certainly have a positive impact of training and neurosurgical healthcare in Africa.

However, we still need the effective agreement, support and contribution from international organizations, especially the WHO, the African Union, and local healthcare authorities, namely regarding the development of infrastructures and neurosurgical equipment.

As representatives of the WFNS attended the 70th Assembly of the WHO in May 2017, their attendance as partners of this organization, can contribute in implementing the WHO Resolution number 68.15 pertaining to international cooperation and increasing emergency healthcare in African countries where brain trauma, central nervous system malformations, and hydrocephalus remain significant sources of mortality and morbidity, which are real public healthcare issues.

The WFNS Reference Training Center in East Africa

Mahmood QURESHI, MBChB, M.Med (Surgery), FCS-ECSA, FRCSEd (SN), Coordinator, C-CNS-ECSAR

The Neurosurgical Training program of the East, Central and Southern African region known as the **Consortium of Collaborative Neurosurgical Sites of Training of the East, Central and Southern African region (C-CNS-ECSAR)**, is the Second WFNS Reference Training Center in Africa. Commenced in 2006, it is an Anglophone training Site, following in the footsteps of the First Francophone Reference Training site in Rabat, Morocco. The C-CNS-ECSAR incorporates neurosurgical training at major hospitals in the East African region of Sub-Saharan Africa. The initiative, led by Dr Mahmood Qureshi, of Kenya, Prof Paul H Young of the Foundation for International Education in Neurosurgery (FIENS), and Dr Benjamin Warf who was working in Mbale, Uganda at the time, followed meetings with neurosurgical leadership from across the region, culminating in a Stakeholders meeting in Nairobi on 29th September 2004. This was followed by the development of neurosurgical training Curriculum, known as the Neurosurgical Training Program of the ECSA region (NSTP-ECSA) with input from various regional stakeholders. The hospitals accredited to train included the following:

- Kenyatta National Hospital, Aga Khan University Hospital in Kenya
- Mulago Medical Complex and CURE Childrens Hospital (Uganda)
- Black Lion Hospital and Myun Sung Mission Hospital (Ethiopia)
- MuhimbiliOrthopaedic and Neurosurgery Hospital (Tanzania).

The Centerswere selected on the basis that they had the capacity to provide varying levels of training, with none having the capacity to provide a full comprehensive training at the time. The aim of the Consortium was to consolidate the diverse capabilities of the various centers that would enable an internationally accredited standard of training. Trainees enrolled in the program, after initial 1 year training in their base center, are trained for a further 3 years in centers outside their base center to achieve comprehensive training. The centers to which the trainees currently go to include Aga Khan University Hospital- Nairobi, and the Kenyatta National Hospital in Kenya. The

training is carried out under the Coordination of Dr Mahmood Qureshi, supported by his neurosurgical colleagues based at the two hospitals. To enhance their experience, an external rotation is carried out at renowned centers abroad. Centers in Mumbai (under the supervision of Prof Basant Misra), in Izmir (Turkey, under Prof Mehmet Zileli), and in England (Bristol Royal Infirmary). Most recently, Prof Ling Feng has offered external rotation availability at the INI-China in Beijing. We hope to send our future residents for a period of 3-6 months to this unit as part of their External rotation.

The NSTP-ECSA curriculum was presented to the Council of the Regional College of Surgeons of East Central and Southern Africa, COSECSA, by Dr Mahmood Qureshi in May 2005. The College Council approved the Curriculum and the training sites in August 2005, and is now responsible for administration of the program as well as examinations uponcompletion of training. The graduates receive the Award of Fellow of the College of East Central and Southern Africa in Neurosurgery (FCS-ECSA, Neuro), at the College Graduation Ceremony.

The following residents have completed their training through the program,and are currently working as certified neurosurgeons, having been certified by their respective National Medical Practitioners Boards

- Dr John Boore (Kenya),
- Dr Peter Wanyoike (Kenya),
- Dr Peter GichuruMwangi (Kenya),
- Dr Benjamin Okanga (Kenya)
- Dr David Kitya(Uganda),
- Dr Alexander Muhindo (Uganda),
- Oscar Obige (Uganda),
- Blessing Taremwa (Uganda),
- Dr. AbenezarTirsit (Ethiopia)
- Dr. TsegazeabLaeke(Ethiopia)
- Dr. AzariusKassahun (Ethiopia)

A further six candidates are enrolled in the program. (2 Kenyans, 2 Tanzanians and 2 Ugandans).

The program, along with several others in Africa, were evaluated by Prof Peter Black, Past President of the WFNS, and report published in World Neurosurgery. The positive evaluation, ranking the program equivalent in standard to established programs and comparing favorably with other programs on the continent of Africa, has been an encouraging start to this young program The recognition of the C-CNS-ECSAR as a Reference site by the WFNS has been a boost for the East Central and Southern African Program.

Following the accreditation by the WFNS as A Reference Training Site in 2012, he WFNS Foundation hasapproved a stipend worth USD 5400/= per resident per annum for three residents in the program.

Additional Regional Sites have been accredited by COSECSA for neurosurgical training. Lusaka Teaching Hospital in Zambia, Mbarara University Teaching hospital in Uganda and King Feisal Hospital in Rwanda have been approvedfor COSECSA neurosurgical training.

It is gratifying that the regional program has, since its inception in 2006, produced 11 holders of a FCS-ECSA(Neuro). They are currently among the leadership of hospitals in the region, with others taking on responsibility of starting new neurosurgical units in Cities outside the capitals in their countries. This is line with the objective of the regional C-CNS-ECSAR of providing an opportunity for training to young African candidates, within Africa without the need to travel to centers in Europe or the West for their general neurosurgical training. This latter model of training in centers in Europe and the West has resulted in a large number being trained but who have not returned back home to impact their countries All these locally trained candidates will undoubtedly benefit from additional fellowship training at WFNS accredited post graduate centers for period of training in neurosurgical sub-specialties. We look forward to the support of WFNS post-graduate centers to further enhance the quality of the FCS-ECSA(Neuro) graduates in the coming years.

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بتضاعف 7 مرات، وهكذا تصبح نسبة جراحي الدماغ في إفريقيا جنوب ألصحراء مع الأخذ بعين الاعتبار زيادة ألسكان جراح واحد لكل 480 ألف نسمة سنة 2030، عوض جراح واحد لكل 2.5 مليون نسمة سنة 2016. وهذه النسبة (1/480 ألف نسمة) ستوفر للمنطقة إمكانية وأسس تطوير الجراحة العصبية بسرعة أكثر مما يجعلها تدرك نسبة جراح واحد لكل 100 ألف نسمة التي تعتمدها منظمة الصحة العالمية. وباعتماد هذه الإستراتيجية فإن جراحة الدماغ والأعصاب الإفريقية تكون قد تطورت على ثلاث مراحل:

- مرحلة اكتشاف نفسها والوعي بواقعها (ما بين 1993–2005)، وذلك بفضل الأبحاث الميدانية الأولى حول وضعية الجراحة العصبية الإفريقية وبفضل ما أحدثه مؤتمر مراكش من وعي وحماس متبادل بين الفدرالية العالمية للجراحة العصبية وجراحي الدماغ والأعصاب الأفارقة ؛

- مرحلة الإقلاع (2002–2018) بفضل مبادرات الفدرالية العالمية (وبالخصوص إنشاء المركز المرجعي بالرباط لتكوين جراحي الدماغ الأفارقة)، وتعبئة جراحي الدماغ والأعصاب الأفارقة.

- مرحلة التطور (2018–2030) لتصل إلى مستوى مشرف يلبي حاجيات المرضى الأفارقة. وذلك بفضل استراتيجية تطورها في أفق 2030.

ويأمل الكاتب أن يجد اقتراحه لهذه الإستراتيجية ما يكفي من الدعم لدى زملائه جراحي الدماغ والأعصاب الافارقة وكذا لدى المسؤلين على قطاع الصحة في بلدانهم، لتحقيق هذه الإستراتيجية التي ستُتمم فعليا بزوغ جراحة الدماغ والأعصاب الافريقية والتي ستحقق الحُلم الذي كان يُراود ألمؤلف وهو يجند نفسه لهذا المشروع ، ألا وهو توفير العلاج للمرضى الأفارقة المصابين بأمراض الجهاز العصبي.

الذي طرأ على عدد جراحي الدماغ والأعصاب في القارة، بدأت البحوث العلمية على هذه الأمراض كما تبين من برامج اللقاءات العلمية التي كانت تنظم في القارة ابتداء من سنة 2015.

واعتبارا لهذا التأثير الملحوظ الذي أحدثه المركز المرجعي بالرباط لتكوين جراحي الدماغ والأعصاب الأفارقة، فقد منح عدة مكافآت من مؤسسات دولية، باعتباره نموذجا للتعاون شمال-جنوب وجنوب-جنوب في ميدان التربية والتكوين.

في الباب الرابع والأخير، يقترح المؤلف برامج التكوين في جراحة الدماغ والأعصاب التي يراها ملائمة لإفريقيا مع استراتيجية تطوير هذه الجراحة في أفق 2030.

كمقدمة لهذا الباب، يرى المؤلف أنه قد حان الوقت لجل البلدان الإفريقية أن تهيئ الأرضية لإنشاء وتطوير جراحة الدماغ والأعصاب، وذلك بالبدء بخطوتين أساسيتين وهما الاعتراف بالجراحة العصبية كاختصاص مستقل عن الاختصاصات الطبية والجراحية الأخرى، وإنشاء النواة الأساسية لبرنامج تكوين وطني بمجرد توفر البلد على جراحين أو ثلاثة في هذا الاختصاص. فمن عوامل تأخر الجراحة العصبية في إفريقيا إبقاء هذا الإختصاص تابعا للجراحة العامة لمدة طويلة بدعوى عدم توفر التقنيات، والعدد الكافي لجراحي الدماغ والأعصاب لفصل هذا الاختصاص من الجراحة العامة، وبديهي أن غياب الجراحة العصبية أو غيرها كاختصاص مستقل يؤخر حتميا إنشاء برنامج وطني للتكوين في هذا الاختصاص، مما سبّب تخلفا تاريخيا، كما شهده العديد من البلدان الإفريقية. بعد هذا تطرق الكاتب إلى دراسة برامج التكوين في جراحة الدماغ والأعصاب المتواجدة حاليا في إفريقيا، والتي يمكن تصنيفها إلى أربعة برامج مختلفة: (1) التكوين خارج إفريقيا (في أوروبا أو أمريكا غالبا) الذي اعتمدته كثير من البلدان الإفريقية بعد استقلالها. وكما سبق ذكره في الباب الأول من الكتاب، فإن هذا النموذج من التكوين أدى إلى تشجيع هجرة الأدمغة أكثر من توفير جراحي الدماغ والأعصاب في أغلبية البلدان التي طبقته (2) التكوين المحلي داخل البلد من خلال برنامج تكوين وطني، وهو الذي اعتمدته بلدان شمال إفريقيا وجنوب إفريقيا منذ استقلالها، وهو النموذج الذي اعتمدته كل البلدان المتقدمة لتوفير العدد الكافي من جراحي الدماغ والأعصاب، ودمج الجراحة العصبية في المنظومة الصحية للبلد (3) التكوين في المراكز الإقليمية المرجعية المعتمدة من طرف الفدرالية العالمية للجراحة العصبية داخل إفريقيا، كما رأينا في المركز المرجعي بالرباط (4) بالإضافة إلى هذه النماذج الثلاثة، ما زالت في إفريقيا بعض نماذج التكوين، شيئا ما فريدة من نوعها، ذكر منها المؤلف نموذجين: التكوين الجهوي المشترك بين عدة بلدان تُديره هيئة الجراحة العامة، واحد في بلدان غرب إفريقيا، والثاني في بلدان شرق إفريقيا، والتكوين الذي يسميه الكاتب «نموذج التكوين الهجين» (Système de formation hybride)، الذي تقوم بتمويله وتأطيره مؤسسة أوروبية أو أمريكية، في بلد إفريقي، بمشاركة جراحي الدماغ والأعصاب في البلد الذي ينظم فيه. أعطى الكاتب مثالين لهذا النموذج، واحد في أديس أبابا، إثيوبيا، وآخر في كمبالا، أوغاندا. بعد هذا، حاول المؤلف مقارنة هذه النماذج معتمدا على نقط القوة ومواطن الضعف فيها، فخلص إلى القول أن نموذج التكوين خارج إفريقيا أو التكوين الجهوي، تحت إشراف هيأة الجراحة العامة هما الأقل فعالية ومساهمة في تطوير جراحة الدماغ الإفريقية، وقد أصبحا متجاوزين، وعلى جراحي الدماغ والأعصاب الأفارقة أن يستبدلوهما بنموذج التكوين الوطني بمجرد توفر البلد على جراحين أو ثلاثة، وقسم مستقل لجراحة الدماغ والأعصاب. أما التكوين المصطلح عليه ب «التكوين الهجين»، فنظرا لتكلفته الباهضة وتبعيته لبلد أجنبي، فلا يمكن توسيع دائرته والاعتماد عليه لتطوير الجراحة العصبية في إفريقيا.

ويختم الكاتب هذا الباب باقتراح استراتيجية للإسراع بتطوير جراحة الدماغ والأعصاب الإفريقية إلى أفق 2030، وذلك بتقديم نموذج لهذا التطور ما بين 2018-2030 مبنيا على التطور الفعلي الذي حصل ما بين 1998-2016، والذي عرضه الكاتب في الباب الثالث. ففي البلدان الإفريقية جنوب الصحراء التي تعرف أكبر خصاص في جراحي الدماغ والأعصاب، انتقل العدد فيها من 79 سنة 1998 إلى 369 سنة 2016، بمعنى أنه تضاعف 4.6 مرات. ونظرا لما رأيناه في الباب الثالث من تحسن في برامج التكوين في هذه البلدان سنة 2016، يمكن تقدير زيادة عدد جراحي الدماغ في هذه المنطقة من 369 سنة 2016 إلى 2783، أي

استغرقتها، والمواضيع العلمية التي تطرقت إليها، مع عدد المشاركين الأجانب والأفارقة، وكذا الملاحظات أو الأحداث الخاصة التي رافقتها مزينة بالصور التذكارية.

وبعد تقييم عمل المركز، يبرز الكاتب أسباب نجاح هذا المركز المرجعي والتي يلخصها في (1) الالتزام اللا مشروط لجراحي الدماغ والأعصاب والمسؤولين المغاربة والعديد من المؤسسات المغربية والأجنبية لإنجاح هذا المشروع (2) المساندة الكاملة للفدرالية العالمية للجراحة العصبية، ويستدل الكاتب على ذلك بما قاله أعضاء المكتب التنفيذي للفدرالية العالمية لجراحة الدماغ والأعصاب أثناء الاحتفال بالذكرى العاشرة لإنشاء المركز (3) الدور الفعال لمؤسسة الحسن الثاني لوقاية ومكافحة أمراض الجهاز العصبي التي وفرت الإمكانيات المادية لتحديث جراحة الدماغ المغربية مما مهد لإنشاء النواة الأولى لهذا المركز. وانطلاقا مما سبق، وبهدف الإسراع أكثر بوثيرة تنمية الجراحة العصبية في إفريقيا، وبمبادرة أيضا من الدكتور ماجد سامي، قررت الفدرالية العالمية سنة 2012 إطلاق برنامج تكوين ثاني خاص بإفريقيا سمي «إفريقيا 100» (Africa 100) يهدف تكوين مائة جراح دماغ إفريقي في أقصر مدة ممكنة، وفي سنة 2014، وصل ستة أطباء من المنخرطين في هذا البرنامج الجديد لبداية تكوينهم في المركز المرجعي بالرباط.

ويختم الكاتب الباب الثالث لكتابه بالحديث على مدى تأثير المركز المرجعي بالرباط لتكوين جراحي الدماغ الأفارقة على نمو وتطور جراحة الدماغ والأعصاب الإفريقية، مبينا أن هذا المركز يباشر، بالإضافة إلى التكوين الأساسي والتكوين المستمر، مهمة تكوين ثالثة ألا وهي تدريبهم على التكيف على العمل بإمكانيات تقنية محدودة وإقناعهم بأن الجدية والمثابرة وشغفهم بمهنتهم، هم أقوم المناقب التي ستساعدهم على النجاح في إرساء جراحة الدماغ والأعصاب في بلدانهم وتطويرها. هذا النوع الثالث من التكوين يعتبره الكاتب أساسيا لجراح الدماغ الإفريقي الشاب عند رجوعه إلى بلده اعتبارا للصعوبات التي ستواجهه، والتي دفعت بالعديد من زملائهم فيما قبل الذي تكونوا خارج إفريقيا، إلى الهجرة إلى البلدان التي تكونوا فيها. وبالإضافة إلى العمل المباشر للمركز الذي يتجلى في المهام الثلاث المذكورة، فقد كان له تأثير غير مباشر على جراحي الدماغ والأعصاب الأفارقة نتيجة تواصلهم المستمر مع بعضهم البعض ومع زملائهم من خارج إفريقيا خلال الندوات السنوية التي كان ينظمها المركز في الرباط أو خلال اللقاءات الأخرى التي نشطت عبر القارة منذ مؤتمر مراكش سنة 2005، كما ذكر سلفا. وللتعرف أكثر على مدى تأثير عمل المركز المرجعي بالرباط وما صاحبه من وعي جماعي لجراحي الدماغ والأعصاب الأفارقة، قام الكاتب بإجراء بحث ميداني آخر سنة 2016 حول وضعية جراحة الدماغ والأعصاب بإفريقيا، ومقارنته بنتائج البحث الذي أجراه سنتي 1996 و1998. تبين من مقارنة نتائج التحقيقين أن جراحة الدماغ والأعصاب الإفريقية خطت خطوات هائلة خلال عشرين سنة (1998–2016): تضاعف عدد جراحي الدماغ والأعصاب ثلاث مرات في القارة كلها من 565 سنة 1998 إلى 1727 جراح دماغ سنة 2016، مع نسبة واحد لكل أكثر من مليون نسمة سنة 1998، إلى واحد لكل 650 ألف نسمة سنة 2016. وفي إفريقيا جنوب الصحراء، تضاعف العدد خمس مرات تقريبا، من 79 سنة 1998 إلى 369 سنة 2016، بنسبة واحد لكل 8 ملايين نسمة سنة 1998 إلى واحد لكل مليونين و300 ألف نسمة عام 2016. بالنسبة للبلدان التي توجد فيها برامج وطنية للتكوين في جراحة الدماغ والأعصاب، انتقل عدد هذه البلدان من خمسة سنة 1998 إلى 21 سنة 2016، من بينها 16 بلدا في افريقيا جنوب الصحراء. بالنسبة للتنظيم، فلم تكن في افريقيا سنة 1998 إلا خمس دول لها جمعيات وطنية لجراحي الدماغ والأعصاب، وأصبحت تتوفر سنة 2016 على 20 جمعية وطنية، وثلاث جمعيات جهوية، وجمعية قارية تمثل مجموع القارة الافريقية. وكنتيجة حتمية لهذا التطور العددي والتنظيمي، تحسن مستوى علاج أمراض الجهاز العصبي بشكل ملحوظ لدى الساكنة الإفريقية، ويعطي الكاتب كمثال على ذلك مرض النزيف الدماغي نتيجة تشوه في شرايين الدماغ. فبينما كان يتطور علاج هذه التشوهات في أوروبا خلال النصف الثاني من القرن العشرين، كان يعتبر أطباء وجراح الدماغ الأفارقة الأوائل خلال نفس المدة، أن هذه التشوهات نادرة أو غير موجودة في إفريقيا والشرق الأوسط، وذلك بناء على معتقدات تقليدية لا علاقة لها بالمعطيات العلمية. وحتى بعد سنتي 1982–1984، عندما أثبت بحث علمي تشريحي في المغرب خطأ هذا المعتقد وأن شذوذ شرايين الدماغ موجودة في المغرب، وطبعا لا شك في إفريقيا وغيرها، فإن علاج هذه الشذوذ لم يبرز في أغلبية البلدان الإفريقية. إلا أنه مع التطور

العصبية» بمستشفى الإختصاصات بالمركز الاستشفائي الجامعي بالرباط، الذي وفّر ما يحتاج إليه تكوين الأطباء الأفارقة والمغاربة من تقنيات حديثة، وتنظيم للندوات الدراسية التي يتطلبها التكوين المستمر. بعد ذلك، هُيّئت اتفاقية التعاون بين الفدرالية وجامعة محمد الخامس بالرباط، وتم الإمضاء عليها خلال المؤتمر العالمي للجراحة العصبية بمراكش من طرف كل من المؤسستين، ومدير المركز المرجعي بالرباط. وهكذا، وصل أول طبيب إفريقي إلى الرباط من جمهورية الكونكو الديمقراطية، وبدأ تكوينه في فاتح مارس 2002، تلاه بعد ذلك أطباء آخرون من مختلف البلدان الإفريقية، يُقبَلون كلهم وفق شروط صارمة وضعتها الفدرالية العالمية وجامعة محمد الخامس، من أهمها انعدام أو قلة جراحي الدماغ في بلد المرشح (أقل من 1/مليون نسمة)، وحصوله على منحة أو دعم مالي، يمكنه من الإقامة أثناء دراسته. أما الدراسة فتستغرق خمس سنوات، وتخضع لنفس المعايير التي يخضع لها الأطباء المغاربة (نفس البرامج النظرية، نفس التداريب في المستشفى، نفس الامتحانات)، ويتخرجون بنفس شهادة الاختصاص. وبالإضافة إلى ذلك، يبين الكاتب كيف يُهيّئ الأطباء الأفارقة للاضطلاع بمهامهم المهنية عند الرجوع إلى بلدانهم، وذلك من خلال احتكاكهم بتجربة زملائهم في المستشفيات الجامعية المغربية.

بعد هذا، يتطرق الكاتب إلى أهم جانب في الباب الثالث ألا وهو تقييم هذا المركز المرجعي لتكوين الأطباء الأفارقة خلال ستة عشر عاما الاولى من عمله (2002–2018). أثناء هذه الفترة، سُجل في المركز واحد وستون جراحا، أتوا من ثمانية عشر بلدا إفريقيا جنوب الصحراء. ثلاثون منهم أنهوا تدريبهم ورجعوا إلى بلدانهم وبيدهم دبلوم جامعي يخولهم الاعتراف بهم ومزاولة عملهم كجراحي الدماغ والأعصاب في بلدهم. أما الباقون (واحد وثلاثون)، فما زالوا يتابعون تدريبهم في أقسام جراحة الدماغ والأعصاب الجامعية بالرباط، والدار البيضاء، وفاس، ومراكش؛ ذلك أنه بعد سنة 2010، امتد عمل المركز المرجعي بالرباط إلى كل المستشفيات الجامعية المغربية، ليتمكن من استقبال الأعداد المتزايدة من الأطباء الأفارقة. ويجد القارئ في الكتاب لائحة هؤلاء الأطباء جميعهم (61) بما في ذلك اسم الجراح وبلده والعدد الذي يتوفر عليه من جراحي الدماغ والأعصاب، مع تاريخ بداية ونهاية التدريب ، وكذا الجهة التي مولت منحته أو تكاليف إقامته أثناء التدريب. واقتناعا من الكاتب بأن أحسن دليل على جودة ونوعية التدريب الذي يتلقاه هؤلاء الجراحون في المركز المرجعي بالرباط ، هو عملهم الميداني عند الرجوع إلى بلدانهم، فقد قام سنة 2016 ببحث ميداني على شكل استمارة، طُلب ملؤها من كل الذين رجعوا إلى بلدانهم منذ ثلاث سنوات أو أكثر، فتبين من هذا البحث أن جميعهم يشتغل في المستشفيات العمومية حيث يجرون ما بين 50 إلى 200 عملية جراحية في السنة، بعضهم أُدمج مبكرا في كلية الطب كأستاذ مساعد (50%)، والآخرون ينتظرون المناصب المالية، ومنهم من بدأ نواة لبرنامج تكوين وطني في جراحة الدماغ والأعصاب. والشيء الذي يثلج الصدر أن كل هؤلاء الذين أنهوا تدريبهم ورجعوا منذ ثلاث سنوات أو أكثر، وُفِّرت لهم التجهيزات الأساسية للقيام بعملهم، بحيث أجابوا جميعهم أن لديهم الأدوات الجراحية وجهاز السكانير (CT Scan)، و80% لديهم جهاز الفحص بالرنين المغناطيسي (IRM). تكتسي مسألة توفير التجهيزات أهمية بالغة، إذ بينت التجربة أن الأولوية ليست تتجلى في توفير التجهيزات قدرما تكمُن في تكوين الإطار المؤهل الشغوف بمهنته وخدمة بلده.

بالإضافة إلى التكوين الأساسي في الاختصاص اضطلع المركز المرجعي بالرباط لتكوين جراحي الدماغ والأعصاب الأفارقة بالتكوين المستمر، وذلك بتنظيم ورشات تدريبية شهرية بمشاركة مشاهير جراحي الدماغ والأعصاب على الصعيد العالمي، مما مهد الطريق لإدخال التقنيات الجراحية الجديدة، أو تقنيات التشخيص أو العلاج بمجرد تطبيقها وبروز أهميتها واستفادة المرضى منها. كما أن المركز اعتاد أن ينظم كل سنة تقريبا منذ نشأته ندوة دولية تجمع جراحي الدماغ والأعصاب الأفارقة مع ثلة من الخبراء من الجراحين يُنتقون من مختلف بقاع العالم. تُنظم هذه الندوة دائما في الرباط، وبمشاركة الفدرالية العالمية لجراحة الدماغ والأعصاب، الشيء الذي يجعل منها مناسبة للتبادل العلمي، وفرصة لمسؤولي الفدرالية للاطلاع عن قرب على مسار وعمل المركز المرجعي بالرباط، وكذا فُسحة لجراحي الدماغ الأفارقة للانفتاح على زملائهم عبر العالم وكذا تجديد عزمهم على مواصلة تعبئتهم للنهوض بجراحة الدماغ والأعصاب الإفريقية. وقد أورد الكاتب لوحات تفصيلية عن كل هذه الورشات والندوات يبين فيها التاريخ والمدة التي

والأعصاب (1997). وفي نفس السنة، انُتخب كرئيس للفدرالية العالمية الدكتور ماجد سامي من ألمانيا الذي كان يعتبر أكبر المناصرين لفكرة النهوض بجراحة الدماغ والأعصاب الإفريقية. هذه الظروف ساعدت المؤلف على تهييئ تقرير مفصل حول وضعية جراحة الدماغ والأعصاب في إفريقيا، وتقديمه إلى المكتب التنفيذي للفدرالية العالمية (20 فبراير 1999)، مما نتج عنه لفت نظر الفدرالية إلى الوضعية، واتخاذ قرار مبدئي للبحث عن الطرق الملائمة للنهوض بجراحة الدماغ والأعصاب في إفريقيا. كما أن الظروف السالفة الذكر، كانت كذلك ملائمة لتهييئ ترشيح مدينة مراكش للمرة الثانية لاحتضان المؤتمر العالمي لجراحة الدماغ والأعصاب لسنة 2005، والذي كان سيتم التصويت عليه كما ذكرنا في سان فرانسيسكو. وقد تم التصويت على مراكش واختيارها من بين أربعة مدن أخرى مرشحة (إسطمبول بتركيا؛ هونكونغ بالصين؛ دوربن بجنوب إفريقيا والقاهرة بمصر) لاحتضان المؤتمر العالمي الثالث عشر لجراحة الدماغ والأعصاب سنة 2005، والذي سيكون أول مؤتمر من هذا النوع يعقد على القارة الإفريقية. وقد اعتُبر هذا الفوز أول مبادرة إيجابية من الفدرالية العالمية إلى جراحة الدماغ الإفريقية، تلتها مبادرتين اثنتين تارخيتين ما بين 2001–2005، وهما (1) الموافقة على إنشاء مركز بالرباط لتكوين جراحي الدماغ الأفارقة داخل القارة الإفريقية تفاديا لهجرة الأدمغة، وأحدث هذا المركز فعليا سنة 2002 تحت اسم «المركز المعتمد من طرف الفدرالية العالمية لجراحة الدماغ والأعصاب بالرباط لتكوين جراحي الدماغ والأعصاب الأفارقة. وستأتي نتائج عمل هذا المركز في الفصل الثالث من الكتاب. (2) موافقة الفدرالية على توفير بعض المنح للأطباء الأفارقة أثناء تكوينهم في الرباط، وكذا مساعدة بعضهم بالأدوات الجراحية الأساسية عند رجوعهم إلى بلدهم بعد إنهاء اختصاصهم بالرباط.

كل هذا خلق مناخا جديدا للعلاقة بين الفدرالية العالمية لجراحة الدماغ والأعصاب وبين الجراحة العصبية الإفريقية. هذه العلاقة التي ستُعزز أكثر أثناء انعقاد المؤتمر العالمي في مراكش (19–24 يونيو 2005). فقد عملت الجمعية المغربية لجراحة الدماغ والأعصاب على أن يتميز انعقاد هذا المؤتمر على من سبقوه بعدة أحداث: (1) تنظيمه تحت الرعاية السامية لجلالة الملك محمد السادس، ملك المغرب، وافتتاحه بكلمة سامية من جلالته يرحب من خلالها بالمشاركين، وإقامة مأدبة عشاء خاصة على شرفهم في نهاية المؤتمر (2) الاحتفال بالذكرى الخمسين لإنشاء الفدرالية العالمية لجمعيات جراحي الدماغ والأعصاب (1955–2005)؛ (3) اختيار شعار للمؤتمر ذي معنى عميق «تقليص الفوارق في الجراحة العصبية في مراكش، ملتقى حضارات العالم»؛ (4) إمضاء اتفاقية تعاون بين الفدرالية وجامعة محمد الخامس بالرباط تحدد أسس التكوين للأطباء الأفارقة بالمركز المرجعي الدولي بالرباط (5) العدد المرتفع من المشاركين يزيد على ثلاثة آلاف، يكون الأفارقة حوالي عشرين في المائة منهم (6) نوعية البرنامج العلمي للمؤتمر. وبهذه الامتيازات، تمكن مؤتمر مراكش من تسليط الأضواء على جراحة الدماغ والأعصاب الإفريقية، وفك العزلة على جراحي الدماغ الأفارقة الذين فهموا أن تأخر اختصاصهم في القارة الإفريقية ليس بقدر محتوم، وأنه يمكن تغييره بتجنيدهم فرديا وجماعيا. وسيبين الكاتب فيما بعد نتائج هذا الوعي الذي أحدثه مؤتمر مراكش، وما صاحبه من تحسن في العلاقات بين الفدرالية العالمية والجراحة العصبية الإفريقية.

خُصص الباب الثالث من الكتاب للمركز المرجعي بالرباط لتكوين جراحي الدماغ والأعصاب الأفارقة وانعكاسه على تطور جراحة الدماغ والأعصاب الإفريقية. كما ذُكر سلفا، تم إنشاء هذا المركز في فبراير 2001، وبمجرد مصادقة مكتب الفدرالية على إنشاء هذا المركز تحت مسؤولية الكاتب، بادر هذا الأخير لتهييئ الظروف الملائمة لإنجاحه والتي بلورها في ثلاث إنجازات (1) جعل هذا المركز يحظى بالدعم الكامل للجامعة والمستشفى الجامعي والإدارات الوصية، وذلك بوضعه تحت الرعاية الملكية لجلالة الملك محمد السادس (2) توفير الإمكانيات لتحديث جراحة الدماغ والأعصاب المغربية لتمكينها من القيام بمهمتها التكوينية على أحسن وجه (3) ضمان ديمومة المشروع بجعله مؤسساتي ، وذلك بالعمل على إمضاء اتفاقية تعاون بين الفدرالية العالمية للجراحة العصبية، وجامعة محمد الخامس بالرباط. يروي الكاتب بتفصيل كيف استطاع الوصول إلى ضمان هذه الإنجازات الثلاثة بفضل مساعدة الفدرالية العالمية التي أوفدت كاتبها العام لعرض المشروع على جلالة الملك محمد السادس (5 ماي 2001)، وموافقة مؤسسة الحسن الثاني لوقاية ومكافحة أمراض الجهاز العصبي على تمويل بناء وتجهيز «المركز الوطني للترويض والعلوم

قلة عدد الأطباء المبعوثين إلى الخارج قصد التكوين نتيجة قلة عدد المنح، بقاء العديد من هؤلاء للإقامة في البلدان التي كُوِّنوا فيها بعد تكيفهم مع مناخ العمل في البلد المضيف خلال خمس إلى سبع سنوات من المدة التي يقضونها في الإختصاص، وحتى الذين يرجعون إلى بلدهم في نهاية الإختصاص، فكثيرا ما يهاجرون من جديد تذمُّرا من انعدام الإمكانيات التقنية لممارسة اختصاصهم أو هربا من ضغط المناخ الإجتماعي والسياسي في مجتمعاتهم الإفريقية. وهذا ما يبين القلة المفزعة لعدد جراحي الدماغ والأعصاب في إفريقيا جنوب الصحراء، في نهاية القرن الماضي ، والذي لا يتجاوز جراح دماغ واحد لكل عشرة ملايين نسمة.

في الباب الثاني من الكتاب، يتطرق الكاتب إلى الدور الفعال الذي لعبه المؤتمر العالمي للجراحة العصبية بمراكش في تسليط الأضواء على جراحة الدماغ والأعصاب الإفريقية. يُطلعنا الكاتب في الجزء الأول من هذا الباب إلى الظروف التي دفعته سنة 1993 إلى ترشيح مدينة مراكش لاحتضان أول مؤتمر دولي للجراحة العصبية في إفريقيا، ذلك أن الفدرالية العالمية لجمعيات جراحي الدماغ والأعصاب، منذ نشأتها سنة 1955 إلى سنة 1993، عقدت 11 مؤتمرا عالميا (واحد كل أربع سنوات) استضافتها كل القارات، باستثناء إفريقيا. ويبين الكاتب بأن ترشيح مدينة مراكش كأول مدينة إفريقية لاحتضان مثل هذا المؤتمر في ذلك الحين، كان يبدو للكثير «خيالا» و«مُغريا» في نفس الوقت. لذا، أصّر الكاتب على بيان الأسباب التي جعلته يفكر في تنظيم هذا المؤتمر منذ بداية التسعينات، والتي تتجلى في (1) التطور الملحوظ لجراحة الدماغ والأعصاب بالمغرب ما بين 1970 و1990 (2) إنشاء الجمعية المغربية لجراحة الدماغ والأعصاب سنة 1984 وقبولها كعضو في الفدرالية العالمية لجراحة الدماغ والأعصاب سنتين بعد إنشائها (3) نمو مستمر للتبادل القاري والدولي لجراحة الدماغ والأعصاب المغربية مع تنظيم عدة مؤتمرات وندوات تكوينية (4) إنشاء مؤسسة الحسن الثاني لوقاية ومكافحة أمراض الجهاز العصبي سنة 1989 التي أتاحت تحديث جراحة الدماغ والأعصاب المغربية، وذلك بتوفير المساعدة المادية الضرورية لاقتناء التقنيات الحديثة، وتطوير التكوين المستمر (5) التجربة المشجعة التي عاشها الكاتب شخصيا على مستوى الفدرالية العالمية لجمعيات جراحي الدماغ والأعصاب كمندوب للجمعية المغربية لجراحة الدماغ والأعصاب منذ سنة 1987. إنطلاقا من هذه المعطيات، تقدمت الجمعية المغربية لجراحة الدماغ والأعصاب سنة 1993 بملف ترشيح رسمي يقترح مدينة مراكش لتنظيم المؤتمر العالمي سنة 2001. كان التصويت مقررا في 9 ماي 1995 بمدينة برلين بألمانيا، بحضور مندوبي الجمعيات الوطنية التي تُكون الفدرالية العالمية، وبالإضافة إلى مراكش، كانت هناك خمس مدن أخرى مرشحة: سيدني (أستراليا)، إسطنبول (تركيا)، القدس (إسرائيل)، وبوسطن وأورلاندو (الولايات المتحدة الأمريكية). ويبين الكاتب المجهودات التي رافقت تهييئ ملف ترشيح مراكش والترويج لها في عدة مؤتمرات دولية، إلا أنه لم يُكتب لها أن تنال موافقة أغلبية المندوبين أثناء التصويت في برلين، وفازت سيدني بمؤتمر 2001.

وهنا يقف الكاتب وقفة تأمل فريدة، يبين لنا من خلالها كيف استطاع تحويل عدم فوز مراكش في برلين، إلى تجديد التزامه بمواصلة العمل للنهوض بجراحة الدماغ والأعصاب الإفريقية. وهكذا، فقبل رجوعه من برلين، اتخذ قرارين: (1) تقديم ترشيح مراكش من جديد للمؤتمر العالمي المقرر سنة 2005 (2) العمل على الصعيد الإفريقي ومع الفدرالية العالمية لتهييئ مناخ نجاح ترشيح مراكش للمرة الثانية الذي سيصوت عليه سنة 2000 في مدينة سان فرانسيسكو الأمريكية. بعد ذلك مباشرة (ما بين 1996–1997)، قام بأول بحث ميداني حول وضعية جراحة الدماغ والأعصاب الإفريقية بمساعدة جراحي الدماغ والأعصاب القلائل المتواجدين في البلدان الإفريقية آنذاك. وبفضل هذه الدراسة، اكتشف العالم والأفارقة أنفسهم الوضعية المزرية التي توجد عليها جراحة الدماغ والأعصاب في إفريقيا في نهاية القرن العشرين: باستثناء بلدان شمال إفريقيا، وجنوب إفريقيا، نسبة جراحي الدماغ والأعصاب في باقي المناطق الإفريقية كانت 1|10 ملايين نسمة (المعدل الذي توصي به منظمة الصحة العالمية هو 1|100 ألف نسمة)، بمعنى أن جراحة الدماغ والأعصاب تكاد تكون منعدمة في غالب الدول الإفريقية. أثناء إجرائه لهذا البحث، شاءت الأقدار أن تُهيأ له الظروف الملائمة لجعله يتابع بشكل كامل التزامه بالعمل من أجل تطوير الجراحة العصبية في إفريقيا. وهكذا انتُخب رئيسا للجنة الفرعية لخبراء جراحة الدماغ والأعصاب لدى المنظمة العالمية للصحة، والخاصة بإفريقيا (1996)، وكذا كنائب ثاني لرئيس الفدرالية العالمية لجمعيات جراحة الدماغ

تدريبهم، تاركين بلدانهم الأصلية رغم افتقارها إليهم (معضلة هجرة الأدمغة). ويلح المؤلف على أن التكوين المحلي أو الوطني له شروط، وسيستوفيها القارئ من خلال قراءته لتفاصيل التكوين في المركز المرجعي الدولي بالرباط. وبما أن أحسن دليل على جودة أي تكوين هو النتيجة على أرض الواقع، لذا طلب من مجموعة من الجراحين الأفارقة الذين تكونوا في الرباط، والذين رجعوا إلى بلدانهم منذ أزيد من ثلاث سنوات أن يكتبوا مقالا يلخص ما عملوه بعد رجوعهم، وقد جمع المؤلف هذه المقالات ونشرها في آخر الكتاب كملحقة (Annexe). وختم المؤلف مقدمته بتقديم الشكر والامتنان إلى جلالة الملك محمد السادس على دعمه لهذا البرنامج، وتقديم الشكر كذلك إلى كل من ساهموا في فعاليته ونتائجه، خصوصا الزملاء الأساتذة في مختلف أقسام جراحة الدماغ والأعصاب بالجامعات المغربية.

خُصص الباب الأول من الكتاب لإعطاء نبذة تاريخية حول جراحة الدماغ والأعصاب الإفريقية، مع التذكير بالسياق التاريخي العام لإفريقيا. هذه القارة «مهد الإنسانية»، والتي كانت في تاريخها القديم وفي القرون الوسطى مهدا للعديد من الحضارات، تراجعت بعد القرن الثاني عشر الميلادي لتسقط في سُبات عميق، استغرق أزيد من ثمانية قرون، عزلها كليا عن الثورة العلمية والاقتصادية التي بدأ يعرفها العالم ابتداء من القرن الخامس عشر، ولم تستيقظ إلا في بداية القرن العشرين لتجد نفسها محتلة ومقسمة بين القوى العظمى الأوروبية. يتعرّض المؤلف بعد ذلك، إلى مساهمة إفريقيا في التاريخ القديم لجراحة الدماغ والأعصاب انطلاقا من تقنية امتصاص المخ من الأنف عند الفراعنة قبل دفنهم (لتتمكن روحهم من الصعود إلى السماء)، ومرورا بازدهار الطب الإسلامي في شمال إفريقيا، ووقوفا عند تقنية ثقب القُحف (Trépanation) التي يتقنها «المعالجون» (Guérisseurs) في العديد من القبائل الإفريقية. أما جراحة الدماغ والأعصاب العصرية، فقد دخلت إفريقيا مع وصول المحتلين الأوروبيين الذين سارعوا إلى إرساء القواعد الأولية للطب في إفريقيا والمصطلح عليه تاريخيا «بطب الإحتلال» (La médecine coloniale)، إذ كانوا في أمس الحاجة إلى الإسراع في تطوير النظم الصحية حفاظا على الجنود وموظفي الحماية من الأمراض المعدية والأوبئة التي كانت منتشرة آنذاك في إفريقيا. ومع دخول أطباء الحماية، وصل بعض جراحي الدماغ والأعصاب الذين كان لهم الفضل في إجراء أولى العمليات الجراحية في الدماغ في ذلك الوقت. وهنا، يشيد المؤلف بالدور الذي قام به هؤلاء الجراحون الأوروبيون الأوائل في إرساء قواعد جراحة المخ والأعصاب، في العديد من البلدان الإفريقية ابتداء من خمسينات القرن الماضي، كما يسرد تاريخ هذه البداية في الجهات الأربع لإفريقيا: الشمال، الجنوب، الشرق والغرب. ويتبين من هذه اللمحة التاريخية، أن جراحي الدماغ والأعصاب في عهد الحماية لم يعتنوا بالتكوين، إذ لم يكن أي بلد إفريقي يتوفر على جراح دماغ من مواطني البلد عند الاستقلال. وهذا الواقع ينطبق على ندرة الأطباء الأفارقة بصفة عامة في البلدان الإفريقية عند استقلالها، مع العلم أن العديد من كليات الطب أنشئت في إفريقيا من طرف الدول الأوروبية المستعمِرة، إلا أن ولوج هذه الكليات كان حِكرا على أبناء الجالية الأوروبية. والشيء الذي يؤسف له أن هذه الوَضعية التاريخية أثرت كثيرا على تَطور جراحة الدماغ والأعصاب في إفريقيا خلال النصف الثاني من القرن العشرين، رغم استقلال القارة بأسرها خلال هذه الفترة. وقد كان العامل الأساسي الذي أثر على هذا التطور هو الطريقة التي انتهجتها البلدان الإفريقية المستقلة في تكوين أبنائها في الإختصاصات الطبية بصفة عامة، وجراحة الدماغ والأعصاب بصفة خاصة. فرغم أن كل هذه البلدان أنشأت، مباشرة بعد استقلالها، كلية وطنية للطب، إلا أنها تصرفت مع التكوين في الجراحة العصبية بطريقة متباينة. فبلدان شمال إفريقيا وجنوب إفريقيا بادرت إلى تشجيع التكوين في الاختصاصات الطبية، ومنها الجراحة العصبية، منذ تخرج الأفواج الأولى من الأطباء من الكلية، ونظموا مباريات لآختيار الطلبة المتفوقين، وتوجيههم للاختصاص مع الاستعانة في البداية بالأساتذة الأجانب ليشرفوا على تكوينهم في المستشفيات الوطنية، وإنشاء النواة الأولى لبرنامج تكوين وطني بإمكانه تدريجيا توفير الأطر الوطنية الكافية في الإختصاصات الطبية بصفة عامة، ومن بينها جراحة الدماغ والأعصاب. أما أغلبية البلدان الإفريقية الأخرى، فقد نهجت نهجا آخر يعتمد على بعث بعض الأطباء المتخرجين من هذه الكليات الوطنية للتكوين في الجراحة العصبية في أوروبا أو أمريكا. وهذه الطريقة، التي اتُّبعت خلال نصف قرن تقريبا، أبانت قصورها على توفير العدد الكافي لحاجيات المواطنين من جراحي الدماغ والأعصاب، وذلك لعدة أسباب:

بزوغ جراحة الدماغ والأعصاب الإفريقية

المركز المرجعي الدولي بالرباط لتكوين جراحي الدماغ والأعصاب الأفارقة

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تاريخ الإصدار: يونيو 2019

تتصدر الكتاب مقدمات تمهيدية كتبها ثمانية أساتذة أجلاء في جراحة الدماغ والأعصاب من المغرب وإفريقيا وأوروبا وأمريكا الشمالية والجنوبية يعتبرون كلهم من الخبراء الدوليين في الميدان، كما أن أغلبهم سبق أن شغل منصب رئيس الفدرالية العالمية لجمعيات جراحي الدماغ والأعصاب (World Federation of Neurosurgical Societies, WFNS) أجمعت كلها على أن الكتاب يعتبر وثيقة تاريخية مميّزة حول تاريخ جراحة الدماغ والأعصاب بإفريقيا، وإسهاما قيّما فريدا من نوعه للمملكة المغربية في إبراز وتطور الجراحة العصبية بإفريقيا. تأتى ذلك بفضل ابتكار الكاتب لمبادرة فريدة من نوعها وهو إقناع الفدرالية العالمية (WFNS) بالتعاون معه في إنشاء مركز دولي مرجعي بالرباط لتكوين الأطباء الأفارقة في جراحة الدماغ والأعصاب وإمضاء اتفاقية تعاون في هذا المجال مع جامعة محمد الخامس بالرباط. كما أثنى هؤلاء الأساتذة جميعهم في هذه المقدمات على المجهودات الجبارة التي قام بها المغرب لتهييئ المناخ المناسب لنجاح هذا المركز المرجعي، وجعله يعطي النتائج الرائعة خلال الستة عشر سنة الأولى من عمله، والتي ارتأى المؤلف أن يخصص لها هذا الكتاب، آملا أن تكون مثلا يُحتذى في الميادين الأخرى. وقد أشاد هؤلاء الخبراء بجدية التكوين الذي يتلقاه الأطباء الأفارقة في هذا المركز سواء فيما يتعلق بالأساتذة المكوّنين أو التجهيزات أو البُنى التحتية. ومما أثار انتباههم في هذا الجانب، جدية الامتحانات. وأجمع هؤلاء الخبراء في نهاية مقدماتهم التمهيدية على تهنئة المؤلف على هذه التجربة الرائدة في ميدان التربية والتكوين في الجراحة العصبية، وعلى تهنئة المغرب على مبادرته الأخوية اتجاه البلدان الافريقية، وكذا تهنئة إفريقيا على ما أنجزته من تقدم في هذا الاختصاص الطبي، وما ستحرزه إن هي استمرت في نهج التخطيط الذي اقترحه المؤلف لأفق 2030، والذي يتماشى مع توصيات منظمة الصحة العالمية.

يتحدث لنا المؤلف في مقدمته ، عن العوامل والأحداث التي جعلته يلتزم بالعمل من أجل إبراز وتطوير الجراحة العصبية في إفريقيا، ويسجل من بينها أول بحث ميداني قام به حول وضعية الجراحة العصبية في إفريقيا بين سنتي 1996 و1998، وانتخاب مدينة مراكش في سان فرانسيسكو (سنة 2000) لاحتضان أول مؤتمر عالمي لجراحة الدماغ والأعصاب في إفريقيا. تلا هذين الحدثين حدث ثالث بلور هذا الالتزام، وهو إنشاء المركز الدولي في الرباط لتكوين جراحي الدماغ والأعصاب الأفارقة بتعاون مع الفدرالية العالمية لجمعيات جراحي الدماغ والأعصاب (WFNS)، هذا المركز الذي حظي بدعم من جلالة الملك محمد السادس، ملك المغرب، مما مهد له تعبئة جراحي الدماغ والأعصاب، والمراكز الإستشفائية الجامعية للنهوض به، الشيء الذي مكنه من تحقيق نتائج ملفتة للنظر خلال الست عشرة سنة الأولى من العمل (2002-2018)، والاستفادة من مساعدة العديد من المؤسسات الدولية كنموذج للتعاون شمال - جنوب وجنوب - جنوب في ميدان التربية والتكوين. بعد هذا، يتطرق المؤلف في مقدمته إلى الهدف من صياغة هذا الكتاب والذي يتجلى أولا، في اقتناعه بضرورة تدوين مرحلة من التعاون المثالي بين الفدرالية العالمية (WFNS) وجراحة الدماغ والأعصاب الإفريقية. هذه المرحلة التي عايشها المؤلف، وساهم فيها بحماس، وعاين تأثيرها على تطور جراحة الدماغ والأعصاب الإفريقية منذ ما يزيد على خمسة وعشرين سنة، ويَعتبر المؤلف هذا التدوين تكريما لمن أسسوا وساهموا في الأحداث السالفة الذكر، وعبرة للتأمل للأجيال الصاعدة. وثانيا، جعل هذا الكتاب بمثابة دعوة لتشجيع التكوين المحلي الوطني في جراحة الدماغ الأعصاب ، أي داخل مراكز للتكوين وطنية وجهوية داخل إفريقيا. ويبرر المؤلف نظريته هذه بكون التكوين في المراكز الوطنية هو السائد في البلدان المتقدمة، وبما عاشته الكثير من البلدان الإفريقية نفسها التي اكتفت بتدريب أطبائها في جراحة الدماغ خارج إفريقيا، في أوروبا أو أمريكا، مما دفع أغلبية هؤلاء إلى البقاء في بلدان

The very specific historical context of Africa explains the various healthcare issues this continent faces. These issues are closely related to the shortage in physicians, and more specifically in neurosurgeons, among other reasons. If modern neurosurgery has been introduced in Africa by European surgeons during the colonial period, the lack of a national training system in most African countries, after reaching independence, would lead, at the end of the 20th century (1998), to an average ratio of one neurosurgeon for 10 million inhabitants in Sub-Saharan countries. Yet, the recommended ratio by WHO is one neurosurgeon for 80 to 100.000 inhabitants. Following these alarming figures, three actions have been conducted for the last two decades, thanks to an exceptional collaboration between the WFNS, African neurosurgeons and Moroccan university hospital authorities. These actions have enabled neurosurgery to emerge in Africa, and allowed for the setup of a strategy towards developing African neurosurgery by 2030. The reader will find in this book the details of these actions, and a testimony as to the recent evolution of neurosurgery in Africa.

Professor Abdeslam El Khamlichi has dedicated his entire career to the University Hospital Center of Rabat, and trained generations of physicians and neurosurgeons. After an upgrade of Moroccan neurosurgery, the various responsibilities he fulfilled during his career led him to get involved in the development of African neurosurgery. Thanks to the support of the WFNS and Moroccan and African colleagues, he conducted three leading projects that allowed the emergence of African neurosurgery: (i) Organizing of the first world congress of neurosurgery in Africa, in Marrakesh-2005; (ii) Launching the first Regional Center for Training African Neurosurgeons (2002); (iii) Delivering an annual program of continuing medical education for African neurosurgeons.

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