

## NEUROSURGERY IN EGYPT: PAST, PRESENT, AND FUTURE—FROM PYRAMIDS TO RADIOSURGERY

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THE CONTEMPORARY DEVELOPMENT of neurosurgery in Egypt is described, with reference to the ancient past and recent American and European influences. This article traces the steps taken by several leading Egyptian pioneers. Egypt, one of the key countries in the Middle East, has led the development of the specialty in the region and has maintained close ties with the international body of neurological surgeons and surgical societies.

**KEY WORDS:** Egypt, History, Neurosurgical development, Papyrus papers

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**E**gypt has left its mark on the early development of surgery in general and neurosurgery in particular. The ancient Egyptians believed that in the afterlife the soul would return to the human body to take its place in the eternal Kingdom of Amon Ra. This belief led to the advancement of embalming techniques and the preservation of the human body. Preservation of the face was quite important, and the technique of removing the brain through the nostril led to the early development of the transsphenoidal technique (Fig. 1). Evidence of trepanation and the recognition of cross-cerebral control of the limbs are demonstrated in the Smith papyrus. It is possible that similar developments in human history might have occurred elsewhere.

The aim of this article is not only to search for the roots of neurosurgery in Egypt but also to highlight the present and future status of neurosurgery. The ancient Egyptians left much documentation regarding their knowledge and treatment of the brain, the spinal cord, and central nervous system diseases (Fig. 2). In modern times, neurosurgery did not develop as a subspecialty until the late 1950s. Within a few years, however, development was so rapid that the field reached international standards. The advancement of military neurosurgery contributed to the development of neurosurgical services for the military as well as for civilians. In the modern era of neurosurgery, it is worthwhile tracing our developmental roots in documenting the history of neurosurgery in Egypt.

### THE PAST—ANCIENT ROOTS

The rise of medicine in Egypt can be noted as early as the First Dynasty. Athotis, the second

king of the First Dynasty, wrote one of the earliest works, *Practical Medicine and Anatomic Book* (4). The Edwin Smith papyrus, dating from the 17th century BC, was discovered in 1862 and is attributed to Imhotop. The papyrus, dealing with cranial wounds and fractures, is the world's oldest known surgical treatise. It provided a description of the brain and noted correlations between cerebral lesions and loss of movement. A case of hemiplegia caused by a compound comminuted cranial fracture was documented. Particular attention was paid to cranial base fractures associated with bleeding from the nose and ears. It was noted that fractures of the cervical spine were associated with limb paralysis, neck rigidity, and conjugate eye deviation. The treatment for hemiplegia was applied to one-half of the belly and not to all of the paralyzed side (6). In the Ebers papyrus, 12 prescriptions for the treatment of headaches and migraines were presented. Migraine was called "half of the head" and was considered to be a special entity, thus requiring special treatment (5). Rogers presented two cases of intracranial meningiomas found in ancient Egyptian skulls (9).

In the process of mummification, the brain was drawn from the nostril by using the same approach that is now used for transsphenoidal removal of pituitary adenomas (4). The doctors in ancient Egypt, who specialized in different forms of treatment, were famous throughout the ancient world. They were taken from the ranks of the clergy and were required to be of good reputation. Evidence of specialized treatment of head injuries (Fig. 3), as well as evidence of amputation of limbs (Fig. 4), has been found.

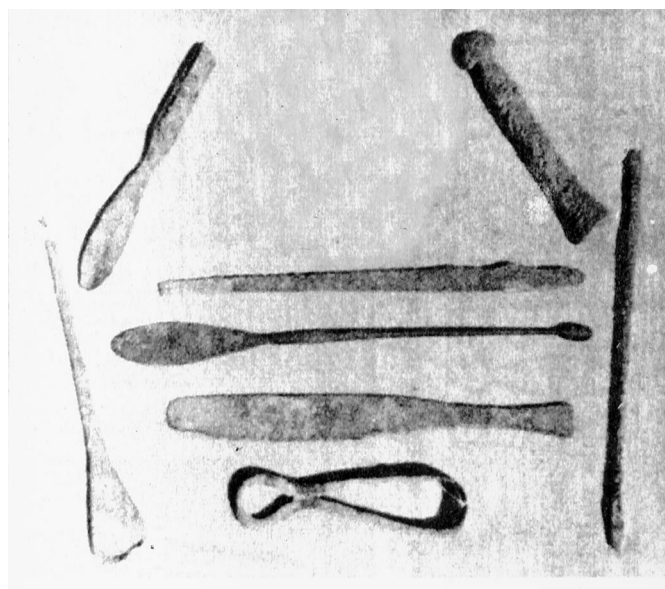


FIGURE 1. Some ancient Egyptian surgical tools.

The first medical book that was written by specialists and covered different fields was known as the *Holy Book of Ember*. It included information on basic medical sciences and arts. The book was the official guide for the treatment of patients. If the attending physician followed the guidelines presented in the *Holy Book*, then he was protected from claims of malpractice, regardless of the results of treatment. Failure to adhere to the guidelines led to public execution if the result of treatment was not favorable.

Operations and trephinations were performed with local anesthesia, which was prepared from ground marble mixed with vinegar. The success of these procedures is evidenced by the discovery of healed wounds in skulls unearthed from tombs dating back 6000 years. In the tomb of Bany Hassan, there are paintings that depict a surgeon performing cranial surgery with the patient seated. There is also documented

	dnnt	skull
	mm	brain
	ct	limb
	ts	vertebra

FIGURE 2. Hieroglyphic words.



FIGURE 3. Neurosurgical operation depicted in a drawing from an old Egyptian temple (1500 BC).



FIGURE 4. Amputation of an upper limb depicted in a drawing from a wall of an ancient temple.

evidence that King Aminophis Ikhnaton IV was hydrocephalic and wore a helmet to disguise his malady.

### MODERN BEGINNINGS

The modern history of neurosurgery in Egypt owes much to its early pioneers; the most prominent were Dr. Ahmed Abu Zikry, Dr. Osman Sorour, Dr. Samuel Boctor, Major Dr. Ezzat Tewfik, Dr. Ibrahim Hegazy, and Dr. Ahmed El Banhawey. They played pivotal roles in the foundation of the modern neurosurgical service in Egypt. Having graduated from King Fouad University (now Cairo University) and finding no training facilities in Egypt, they traveled to the United States and Europe to attain proficiency in their chosen field. At that time, neurosurgery was not considered a promising career course, but they nevertheless chose to pursue it.

The first neurosurgical practice in Egypt was begun by Dr. Ahmed Abu Zikry (1), a general surgeon who studied neuro-

surgery at the Mayo Clinic for 2 months and the Lahey Clinic for 1 month in 1949. He then worked in the department of general surgery of Cairo University, under the chairmanship of Prof. Ibrahim Fahmy El Miniawy, and cooperated with Profs. Barrada and Guinena, who were the founders of the department of neurology of Cairo University. Dr. Abu Zikry performed several neurosurgical procedures, such as thoracolumbar sympathectomy, meningioma excision, and laminectomy to treat lumbar disc prolapse. He had a successful career in general surgery; therefore, he chose to continue as a general surgeon and encouraged his resident, Dr. Osman Sorour, to specialize in neurosurgery.

Dr. Sorour received his master of surgery degree in general surgery from Fouad University and joined the general surgical staff of the medical faculty. He was assisted by Dr. Ismail Shafie (neurology house officer) in thoracic surgical wards with 25 beds each for male and female patients. After separation of the service, Dr. Shafie became the first neurosurgical registrar, proceeding to eventually become chairman of the department in 1987.

Dr. Samuel Boctor treated patients in general surgical beds, assisted by Dr. Abdel Hamid El Shawarby (surgical resident), who later became a leader in psychosurgery. In 1956, Dr. Boctor established a neurosurgical department (the first in Egypt), with Dr. Gamal Azab as his registrar. This free service served the northern region of Egypt, with a population of more than 8 million Egyptians and a steady stream of Libyan patients from the eastern border.

Major Dr. Ezzat Tewfik joined the medical corps as a first lieutenant general surgeon, obtained his F.R.C.S. degree in the United Kingdom, and began neurosurgical training in the United Kingdom and Karolinska, Sweden, under the leadership of Dr. Herbert Olivecrona. After returning to Egypt, Major Tewfik practiced in the general surgical ward of the Kobba Military Hospital, mainly treating head injuries and performing a few spinal and brain operations.

Dr. Ibrahim Hegazy worked for the Ministry of Public Health after obtaining his F.R.C.S. degree in the United Kingdom. Dr. Hegazy joined the Ibrahim Pasha University (now Ain Shams University) and was assisted by Dr. Ahmed El Banhaway (M.S.).

Dr. El Banhaway graduated from Cairo University in 1952. After working as a registrar in general surgery, he joined the anatomy department. In addition to his master of surgery degree, he obtained a diploma in neurology and psychiatry. He underwent neurosurgical training in Germany and Oxford, England. In 1964, he assumed the chairmanship of the military neurosurgical department, after Major Ezzat Tewfik was involved in a disabling automobile accident. Dr. El Banhaway was the first Egyptian to document a case of spinal cord bilharzioma. He later became assistant professor at Ain Shams University. In the 1970s, he was appointed dean of the medical school and deputy chairman of the university, before his premature death.

These early pioneers struggled to establish neurosurgical departments, because neurosurgery was a division of the de-

partment of general surgery at that time. Furthermore, the general population was mistrustful of new specialties.

## MILITARY NEUROSURGERY

In the middle 1950s, Major Dr. Ezzat Tewfik was uniquely placed to engineer the founding of the military neurosurgical service. His international connections allowed him to establish a neurosurgical department with high standards in the Air Forces Hospital in 1960. After his retirement from the Karolinska Institute in 1961, Prof. Olivecrona traveled to Egypt, with a staff of neurologists, neuroanesthetists, neurophysiologists, neuroradiologists, and nurses, to set up training programs for the Egyptian military. These programs heralded a new era in neurosurgical technology in Egypt, allowing Egyptian doctors to meet European standards. Major Dr. Rushdy Diwan, who had been trained by Dr. Hjelm Quist, practiced modern neuroanesthesia, and intensive care units were introduced. Captain Dr. Fouad El Nadi, who had been trained by Dr. Sjogren, practiced the techniques of percutaneous carotid and vertebral artery angiography, air encephalography, air myelography, and functional stereotactic surgery. Dr. Kamal Kamel was trained in neuropathology by Prof. Zulch. He became the dean and later the rector of Mansoura University. Drs. El Shawarby, Azab, and Salama of the university hospitals and Drs. Abdel Rahim Galal, Sayed El Kashashy, and Mokhtar El Mahdy from the medical corps joined the institutions for various periods.

During this period, Dr. Sayed El Gindi studied for the F.R.C.S. degree in the United Kingdom and continued his training at Brook Hospital (London, England), the Radcliffe Infirmary (Oxford, England) (under Dr. J. Pennybaker), and Oldchurch Hospital (Essex, England) (under Dr. J. Andrew). After his return to Egypt in 1967, Dr. El Gindi worked in the department of neurosurgery of the new Maadi Military Hospital. At that time, a system of collaboration between the universities and the military department was developed. Young residents recruited for military service were attached to the Maadi Military Hospital for a period of 1 year, to continue their training. In addition to working in the military service, Dr. El Gindi was appointed a visiting professor at Mansoura University, to establish the department of neurosurgery. In 1968, he became the chairman of the department of neurosurgery of the Maadi Military Hospital.

In 1959, the Middle East Neurosurgical Society was founded. Dr. Sorour was one of the founding members and was the president for 2 consecutive years. Egyptian doctors joined this society as individuals. It was not until 1967 that the Egyptian Society of Neurological Surgeons was founded, during a meeting at the Maadi Military Hospital. Prof. Boctor was appointed president, Dr. Sorour secretary, and Dr. El Gindi treasurer (*Fig. 5*). They were joined by 7 qualified neurosurgeons and 30 doctors in training. The number of neurosurgeons in the society is now more than 200. The Egyptian Society of Neurological Surgeons joined the World Federation of Neurosurgical Societies in 1969, with Drs. Boctor and So-



**FIGURE 5.** Memorial picture of the first board of the Egyptian Society of Neurological Surgeons, 1967. From the left are Drs. S. El Gindi, S. Boc-tor, and O. Sorour.

rouer as delegates. Initially, the main focus of the society was to publish articles in the *Journal of the Egyptian Medical Association*; this was before the creation of the *Journal of the Egyptian Society of Neurological Surgeons*. The society also held annual meetings and organized training courses.

Egyptian neurosurgeons had the opportunity to gain wide experience in treating war injuries. The vast majority of experience in this field was achieved in the treatment of casualties of the 1973 war. Teams of neurosurgeons from military hospitals and university clinics, together with doctors of allied specialties, actively shared in treating these war casualties.

### THE PRESENT

Until 1960, there were only four neurosurgical departments and seven neurosurgeons; there are now more than 20 departments and more than 200 neurosurgeons. Three-quarters of these are in Cairo and Alexandria, with the others being distributed between Upper and Lower Egypt (Fig. 6 and Table 1). There are two gamma knife treatment centers. One is a private center directed by Prof. Ossama El Ghanam, and the other is the Nasser Institute (Ministry of Health). Two additional centers are under construction, one at the Maadi Military Hospital and the other at Menofia University Hospital. There are other centers for radiosurgery using linear accelerators, including two public centers at Cairo University and the Maadi Military Hospital, a private center at Mansoura University, and a center under construction at El Salam Hospital (Ministry of Health) in Cairo. To be eligible to practice neurosurgery in Egypt, candidates must be qualified with a M.D. or F.R.C.S. degree, American Board certification, or a degree from a recognized center, which must be deemed equivalent to the M.D. degree by a special committee.

Modern centers for stereotactic treatment of parkinsonism and functional neurosurgery (Drs. El Samra and El Gindi), as



**FIGURE 6.** Map showing neurosurgery centers in Egypt.

Area	No. of centers	No. of neurosurgeons
Cairo	9	125
Alexandria	2	25
Al-Mansūrah	2	6
Az-Zaqāzīq	2	5
Banhā	1	2
Sawhāj	1	2
Asyūt	1	4
Suez Canal	1	2
Al-Minyā	1	2
Tanta	1	2

well as endoscopic surgery (Drs. A. Zohdi and I. Ibrahim), have been developed. These centers are expanding in several locations and have been established in Cairo, Ain Shams, and Mansoura Universities. Centers for cranial base surgery, pediatric neurosurgery, and neurotrauma treatment are available throughout Egypt. Computed tomographic and magnetic resonance imaging scanners are also available throughout the country (Table 2).

**TABLE 2. Numbers of computed tomographic and magnetic resonance imaging scanners in Egypt in 2001<sup>a</sup>**

Area	No. of scanners	
	CT	MRI
Cairo	45	15
Alexandria	16	5
Lower Egypt	31	11
Upper Egypt	13	1

<sup>a</sup> CT, computed tomographic; MRI, magnetic resonance imaging.

The operating theaters are equipped with the most advanced modern technology, including operating microscopes and microsurgical instruments. Lasers, ultrasonic aspirators, stereotactic frames, electric or air drills, and neuroendoscopes can be found in most departments. Neurointensive care units have been established in some centers, but general intensive care units are shared in locations where a neurointensive care unit is not available.

### EDUCATION AND TRAINING

Becoming a neurosurgeon in Egypt is a long, arduous process. Undergraduate students participate in lectures, clinical rounds, and oral and written examinations, as well as spending several months in the departments of general surgery and general medicine. Moreover, students must attend outpatient clinics and emergency cases. After students obtain their undergraduate degrees, neurosurgical training continues for an additional 6 to 8 years. During this period, the master of general surgery and doctor of neurosurgery (M.D.) degrees must be obtained. At the end of the training, a thesis must be prepared and defended. Finally, the M.D. examination is taken. The candidate is then appointed as a lecturer. After lecturing for 5 years and submitting a series of articles, the candidate may apply for the post of assistant professor. To become a professor, a doctor must spend an additional 5 years lecturing and publishing more academic articles.

### THE HEALTH CARE SYSTEM IN EGYPT

The current health care system in Egypt includes five main divisions, as follows. 1) The government provides free treatment, administered through the 13 university teaching hospitals and the Ministry of Health and Population. 2) Military hospitals are restricted to military personnel and their dependents, as well as paying civilians. 3) The National Health Service serves the public free of charge, through an expanding system of National Health Service hospitals. 4) Privately owned clinics and hospitals provide paid services. 5) Special

interest group hospitals are restricted to professional members of trade unions (Table 3).

The predominant pathological conditions encountered by Egyptian neurosurgeons today are head injuries, lumbar disc problems, and infantile hydrocephalus. Other neurosurgical conditions are the same as in western countries, except for small numbers of aneurysms and arteriovenous malformations.

### ACTIVITIES IN AFRICAN AND ARAB COUNTRIES

The following are Egyptian names linked to the foundation of the joint Neurological Science Societies in African and Arab countries. Dr. Sorour was the president of the Pan African Association of Neuroscience. Dr. El Gindi was the chairman of the neurosurgical section of the Pan Arab Society of Neurological Sciences (Fig. 7) and their representative in the European Association of Neurosurgical Societies (Fig. 8). Several Egyptian neurosurgeons have been instrumental in establishing neurosurgical departments in Arab countries (especially Saudi Arabia and Kuwait), such as Drs. Mahdi, A.W. Ibrahim, and A. Ammar.

### ACTIVITIES IN THE WORLD FEDERATION OF NEUROSURGICAL SOCIETIES

Egyptian neurosurgeons have participated in numerous international conferences (Fig. 9). In 1993, Dr. El Gindi was elected as the second vice president of the World Federation of Neurosurgical Societies; in 1997, he became an honorary president. Dr. El Banhaway was one of the founding members of the neurotrauma committee.

### TRAINING PROGRAMS

The Egyptian Society of Neurological Surgeons organizes a meeting every 3 months in one of the departments, at which clinical cases are presented (Fig. 10). A summer meeting is organized by Alexandria University and convened in Alexandria. Every March, the annual meeting is convened in Cairo, with international figures being invited to participate. International teaching courses are organized with the World Fed-

**TABLE 3. Numbers of neurosurgical beds in different Egyptian hospitals in 2001**

Service	No. of beds	No. of outpatients	No. of operations
Free beds (universities and Ministry of Health)	1336	242,530	23,133
National Health Service	146	52,000	3000
Private and special interest groups (e.g., military or police)	230		8100



**FIGURE 7.** Dr. S. El Gindi surrounded by African colleagues during the Pan African Neurosurgical Course, Zambia, 1974.



**FIGURE 8.** European-Pan Arab Neurosurgical Course, Cairo, March 1988.

eration of Neurosurgical Societies, European Association of Neurosurgical Societies (Fig. 11), and International Society of Pediatric Neurosurgery and are attended by African and Arab neurosurgeons.

### THE FUTURE OF NEUROSURGERY IN EGYPT

It is envisioned that the specialty of neurosurgery in Egypt will expand in the following three directions. 1) Neurosurgical departments will spread to cover all of Egypt. 2) Subspecialties will become common in every department. 3) The number of specialized trauma units will increase, with emphasis on placement near highways. This will be undertaken in conjunction with improvements in ambulance services and more strict control of road safety measures.



**FIGURE 9.** International Congress of Neurotraumatology, Cairo, 1978. From the left are Prof. A. Banhaway (chairman), Prof. Markiez, Prof. I. Badran (Egyptian Minister of Health), Prof. Y. Taher (Neurology), and Dr. S. El Gindi.



**FIGURE 10.** Recent meeting of the Egyptian Society for Neurological Surgeons, Mansoura University, November 1, 2001.

In addition, it is hoped that international collaboration with universities around the world can be achieved. There have also been efforts to instigate joint research projects between different departments, with the establishment of a National Registry Program for Neurological Diseases.

Egypt is now on the threshold of a new era in neurosurgery. This includes the use of minimally invasive techniques such as endovascular stenting and embolization of aneurysms and arteriovenous malformations, stereotactic brain biopsies, and treatment of abnormal movement disorders. Gamma knife surgery should be applicable to wider ranges of pathological conditions, even including malignant tumors (with modification of the biological behavior of malignant cells). Gene therapy and immunotherapy should provide approaches to many diseases that do not now respond to treatment. It is hoped



**FIGURE 11.** Memorial picture of some Egyptian and European neurosurgeons and their wives during the first European-Pan Arab Neurosurgical Course, Cairo, 1979. Sitting from left are as follows: first row, Profs. Pertuiset, El Shafei, and Pia; second row, Mrs. El Gindi, Mrs. El Banhawwy, Mrs. Sorour, Mrs. Pertuiset, and Mrs. Pia. Standing from left are Dr. Rifat, Dr. El Banhawwy, Dr. El Gindi, Dr. Emily, Mrs. Emily, Prof. Sorour, and Mrs. Rifat.

that, with further progress in the field of neurosurgery, more patients will benefit from safe affordable treatment.

## REFERENCES

1. Abou Zikry AS, Guindi A, Hashem M: Pilonidal sinus and cyst: Report of 22 cases. *J Egypt Med Assoc* 37:696-705, 1954.
2. Breasted JH: *The Edwin Smith Surgical Papyrus*. Chicago, The University of Chicago, 1930, pp 201-216; 323-339.
3. Broun G: Feature profile of a neurosurgery. *Egypt Med Mag* 3:16-22, 2000.
4. Ebeid NI: *Egyptian Medicine in the Days of the Pharos*. General Egyptian Book Organization, pp 135-179.
5. Ghalioungui P: *The Ebers Papyrus*. Cairo, Cairo Academy of Scientific Research and Technology, 1987, pp 85-86.
6. Ghalioungui P: *The Ebers Papyrus*. Cairo, Cairo Academy of Scientific Research and Technology, 1987, p 192.
7. Guirot J: *Medicine and Mummification in Pharaonic Era*, Zekri A (trans). El Saada Publishers, 1926.
8. Hussien MK: An Ancient Egyptian treatise on traumatology: 2800 BC. *J Bone Joint Surg Br* 31B:309-312, 1949.
9. Rogers L: Meningiomas in Pharos people: Hyperostosis in ancient Egyptian skulls. *Br J Surg* 36:423-426, 1949.
10. White MJE: *Ancient Egypt: Its Culture and History*. New York, Dover Publication Inc., 1952, pp 105-106.

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## COMMENTS

**E**l Gindi, the senior living doyen of modern neurosurgery in Egypt, presents a fascinating perspective on the matriculation of a body of professionals into an effective clinical and

academic society of neurosurgeons serving the most populous country in Africa and the Middle East. Egypt has always been a large and influential country and has always played a critical role in the birth and future crossroads of civilizations. El Gindi touches on the ancient roots of medicine in Egypt, but sadly too briefly. He then skips all the way to the modern era, denying the reader any glimpse of the evolution of medical knowledge in relation to neurology and surgery during the Hellenic, Roman, Arabian, Turkish, Napoleonic, and British eras. The famous library of Alexandria was an important reservoir that preserved and transmitted ancient articles that later influenced prominent Greek and eventually Islamic physicians and surgeons. In addition, libraries at the famous Al-Azhar University preserved many important articles, some of which remain untranslated and uncataloged in the West, with fascinating glimpses at the evolution of knowledge, including concepts about neurological diseases and injuries.

El Gindi succeeds beautifully in framing the era just preceding his own entry onto the neurosurgical scene and the 2 subsequent decades. He seems to know every personality, and he articulates clearly their unique roles. This era was a time of professional and intellectual renaissance in Egypt after independence and the revolution that brought Nasser and the young, fiery, and intellectual Free Officers to power. It was also a period that exacted a heavy postcolonial toll, however, and increasingly segregated Egypt as a developing country and added a heavy burden of poverty in an exploding population with limited resources. It was a period of government-mandated programs, which succeeded beautifully in establishing a cadre of influential neurosurgeons in the institutions most relevant to the government, notably the military. It was there that El Gindi and his fellow pioneers benefited from structure, direction, planning, and resources, and their influence soon spread to the sprawling university system, albeit under rigid government control.

El Gindi paints a nostalgic picture of that era, including the coalescence of professional societies, training programs, certification requirements, and the quest for technical evolution. It was a time when respected pioneers in dark suits and with graying hair commanded the fearful respect of a much larger emerging core of younger neurosurgeons. These early leaders guarded with jealousy the highest standards of rigor and excellence in every facet of professional neurosurgical education and practice. They were demanding taskmasters and tough educators. The progress of Egyptian neurosurgery from the 1950s to the 1980s is most beautifully commemorated in this thoughtful and insightful article. El Gindi seems less in touch with more recent developments in Egyptian neurosurgery, its unique challenges, and also its splendid successes. His tables and charts clearly articulate the persistent maldistribution of neurosurgeons in this vast country. These charts do not convey another facet of maldistribution, which exists within the large metropolises of Cairo and Alexandria. There, increasing overpopulation and poverty are challenging the meager and inadequate resources of the public health care system. Modern hospitals are emerging within the private

sector, but they afford limited and privileged access to a very small fraction of the population. In those private hospitals, complex neurosurgical operations are performed in great volume in a clean environment with good results. These private neurosurgical practices attract the best talent and the most gifted professors during most of their working hours. True academic work is performed in the large public university hospitals, mostly by junior trainees without laboratory or research resources and with little mentoring.

Yet, a bright light is emerging from this vast and difficult landscape, as has often happened in the great civilizations of the East throughout history. Private neurosurgical sources are planting local seeds of excellence and allowing the local investment of Egyptian resources in Egyptian health care. Once local standards are in place, they generate an inevitable push toward modernization in the rest of society. Hence, the new direction for high standards in Egyptian neurosurgery is no longer generated by central planning in the government, but rather through a pressure to achieve excellence generated within the private sector. Egyptian neurosurgeons have maintained strong links between education, training, and technical development with colleagues and friends in Europe and America. These links continue to be leveraged in the increasingly dynamic circles of professional Egyptian societies and academia.

In recent years, I have had the privilege of working with the Egyptian Ministry of Health and Population on models of Egyptian neurosurgical development. I also have had the wonderful opportunity to help train a number of young neurosurgeons who have now returned to become rising stars in Egyptian academic neurosurgical circles. I hence take great pride in El Gindi's exposition of the Egyptian neurosurgical renaissance, and I know that a new era in Egyptian neurosurgical development is forthcoming. El Gindi articulated some of its elements, but other writers have described more effectively the integration of private and academic careers, the restoration of true scientific literacy in relation to neurosurgery, and a culture of outcome monitoring and evidence-based practice. As it has been since the great age of the pyramids, Egypt remains a paradigm of the relevance of human ideas. The progress of Egyptian neurosurgery reflects the best that modern civilization has to offer and the most difficult challenges in achieving it.

**Issam A. Awad**  
*Denver, Colorado*

**I**t is always a pleasure to be reminded of past civilizations, ancient medicine, and the work of pioneers. It is also good to be reminded where the first neurosurgeons were trained and how difficult were the challenges that they faced. We also learn with great interest the rapid progress of neurosurgery in Egypt to the present high technological level, with eight centers now or soon able to perform radiosurgery (four with gamma knife and four with LINAC radiosurgical technology). At present, Egypt has more than 20 neurosurgical departments and more than 200 neurosurgeons. The operating theaters are equipped with the most sophisticated modern tools. Obviously, the practice of neurosurgery in modern Egypt is competitive with that in developed

countries. The evolution of neurosurgery in a big country such as Egypt and the modern challenges Egyptian neurosurgeons face, together with the historical data presented here, are subjects that everybody should know.

**Jacques Brotchi**  
*Brussels, Belgium*

**T**his article describes the spectacular evolution of Egyptian neurosurgery and adds to other previously published articles on the evolution of neurosurgery in other African countries. It illustrates the progress that this specialty is achieving on the African continent in spite of economic difficulties and the terrible lack of technology that African countries unfortunately need for the development of neurosurgery. Articles describing the history of neurosurgery are generally appreciated, especially when they relate to an ancient civilization such as Ancient Egypt. Egypt is the African country that has the largest number of neurosurgeons, and neurosurgery developed as a specialty earlier in that country than in the other African countries. For that reason, the pioneers of Egyptian neurosurgery have played an important role in the development and organization of Arab neurosurgery and in African neurosurgery generally.

The author mentions many names among the pioneers of the Egyptian neurosurgery, which prevents him from providing more details regarding the role of each one of them. In fact, he should have limited himself to two or three pioneers and elaborated on their first scientific works and the organizations that they led during their careers in Egyptian neurosurgery. A map of Egypt showing the distribution of the neurosurgical services and neurosurgeons in Egypt also would have added a great deal to the informative quality of this article.

**Abdeslam El Khamlichi**  
*Rabat, Morocco*

**T**he author presents an interesting overview of neurosurgical developments in Egypt, with reference to the early beginnings of medicine in that country with ancient roots beyond compare. El Gindi, who is himself an outstanding and internationally renowned neurosurgeon, guides the reader through Egypt's neurosurgical history, from the early papyrus and embalming techniques to the development of modern neurosurgery in Egypt. The founders of modern neurosurgery in Egypt and their struggles to set up independent departments to improve neurosurgical care are described in detail. The interested reader will learn from this description how the constant striving for education and training formed the basis of this pioneering work. Special respect is paid to Olivecrona for his contributions to the development of Egyptian neurosurgery. The significance of military hospitals and the description of the Egyptian health care system are of special interest for neurosurgeons throughout the world who must cope with similar structures.

**Wolf Lüdemann**  
**Madjid Samii**  
*Hannover, Germany*