



Meningioma: The Tumor That Taught Us Neurosurgery

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“In the practice of tolerance, one’s enemy is the best teacher.”

Dalai Lama

The journey to modern neurosurgery has never been easy, and a voyage through the history is always fascinating. The amalgamation of innovative ideas and clinical discoveries of our forefathers has effectively reproduced the modern day neurosurgery in its current state of art.¹ In the present day scenario it is easy to get overwhelmed with the amount of support and guidance that current technologies and advances have provided. The imaging and localization devices effectively provide us with the tiniest detail of the tumor and its relation to the surrounding structures in submillimeter accuracy. Now looking back, let us imagine a situation that many of us would consider hypothetical but which really existed only a few centuries ago. Now, for instance, imagine opening the head without bipolar cautery, forceps, or clips. Let us imagine asking a patient to have his head opened because he has some kind of vague headache. Or imagine operating on a patient with multiple

The history of neurosurgery is ever fascinating. The journey has been tedious; nevertheless, in the landscape of success and failures we have become more efficient and polished. Skills were learned, innovations were made, and in the process we evolved. The immense contribution of *meningioma* surgery in this maturation process is attested by history itself. Countless stories that testify the momentous role of meningioma in the process of evolution and reformation of neurosurgical techniques exist in the literature. With every step and every attempt at conquering this tumor, we reformed to be better surgeons, more skilled and more precise. In this paper we have walked down the lane of neurosurgery and paid a due tribute to this “necessary evil.”

cranial nerve palsies based on a bunch of head radiographs. But those great and brave souls believed that they could do it. They were troubled, devastated, and tired but never lost hope. They developed new instruments, methods, and approaches, and they ultimately succeeded. In this process, a great history was created.

It would not be overemphasizing to quote the elegant statement by MacCarty²: “If we were to designate an intracranial neoplasm that has had the most effect on the development of neurologic surgery, very likely the intracranial meningioma would be prominently considered.” This novel tumor has witnessed the tiring and arduous efforts of our ancestors. Surgeons have tried and conquered to remove this tumor, and in this process they mastered the core skills of neurosurgery that helped them to excel in the entire field (Table 1). This interesting tumor has attracted the attention of many experts in the fields of surgery, anatomy, and pathology for centuries because of its striking appearance and capability to attain an enormous size.³ Its characteristic tendency to produce hyperostosis has made its presence obvious in skulls that can be traced back to prehistoric times (Figure 1A and B).^{4,5} X-ray and computed tomogram studies of these excavated skulls has evidenced its existence as far back as about 3400 BC.^{6,7} Countless stories exist in the literature that would testify the momentous role of meningioma in the

process of evolution and reformation of neurosurgical techniques. In this paper we have tried to reminisce about the memoir of neurosurgery and paid a due tribute to this “necessary evil.”

CHRONICLE OF MENINGIOMA

The earliest descriptions of meningiomas were limited to autopsy findings. The earliest literature reference goes to Felix Plater,⁸ an eminent professor at the University of Basel in Switzerland. In 1664, Plater described the autopsy findings of one of his patients who had multiple behavioral problems and ultimately died after 6 months; “... a remarkable round fleshy tumor, like an acorn. It was hard and full of holes and was as large as a medium-sized apple. It was covered with its own membrane and was entwined with veins. However, it was free of all connections with the matter of the brain, so much so that when it was removed by hand, it left behind a remarkable cavity.”⁹ More than a century later, Jean Cruveilhier, a French professor of anatomy and pathology, well known for his contribution in multiple sclerosis, presented his autopsy finding on a patient with cerebellopontine angle meningioma associated with hearing loss.¹⁰ Surprised by the location, its relation to the cranial nerves, and the extent of damage of this large tumor, he felt the efforts toward surgical removal of

Table 1. History of Meningioma Surgery

Surgeon	Year	Country	Contribution
Felix Plater	1536	Switzerland	First to describe meningioma
Antoine Louis	1730	France	First pictorial description of meningioma
Francois Quensay Kaufman-Heister Crellius	1743	France Germany	First attempted surgical treatment of meningioma
Andrea Vcca Berlinghieri	1813	Italy	First to associate meningioma with trauma
Zanobi Pecchioli	1835	Italy	Successful radical removal of intracranial meningioma
John Cleland	1864	United Kingdom	Association between meningioma and pacchionian granulations
Francesco Durante	1885	Italy	Successful meningioma surgery in which patient lived >20 years
Robert Fulton Weir	1887	United States	First attempted removal of meningioma in United States
William Keen	1887	United States	First successful meningioma surgery in United States in which patient lived >30 years
Milis and Pfahler	1902	Philadelphia	First radiologic description of meningioma
Harvey Cushing	1905	United States	Cushing's most famous meningioma surgery on General Leonard Wood
Harvey Cushing	1922	United States	Term <i>meningioma</i> was coined at the Cavendish Lecture

these tumors would be unavailing. His pathologic descriptions of the nervous system and his accompanying illustrations were unique in style and in color. They included many specimens of olfactory groove and cerebellopontine angle meningiomas. The notion persisted that, as stated by Rudolf Matas, “The head, chest and abdomen were still regarded as ‘sanctuaries’ not to be opened, unless by accident.”¹¹

RECALLING DOOMED VENTURES

Early attempts to remove brain tumors were audacious but futile. In 1743, French surgeon Quensay initially hinted at possible removal of brain tumors, mostly meningiomas.¹² In tumors causing considerable pain, he advised surgery and exploration of cerebral hemisphere to cut a portion of the tumor. He suggested, “... and if we should succeed in discovering its position, would it not be reasonable to extirpate the tumor, rather than leave the patient to perish miserably.”¹³ In the same year, Heister, a German surgeon, tried putting caustic lime on the tumor in a 34-year-old Prussian soldier (Figure 1C and D).³ However, the patient died due to infection. In 1774, Antonine Louis published his literature on diagnosis and surgery of intracranial meningiomas in “tumors

fongueuses de la dure-mere.”¹⁴ A year after, in 1775, Olaf Acrel, a Swedish surgeon described his experience in *Chirurgiska Handelser* as “cranii cerebrique fungus cancerous.”^{15,16} He had explored the meningioma on a 30-year-old patient by insertion of fingers, which resulted in massive bleeding, postoperative convulsion, and subsequent death.

BEACON OF LIGHT

The great surgeon Professor Zanobi Pecchioli, an Italian surgeon from Siena, performed the successful removal of a brain tumor in 1835, for the first time in the history.^{17,18} He operated on a 45-year-old farmer with a meningioma over the right sinciput. He prepared a triangular flap based on 3 trephinations to expose the tumor. This wide exposure of the dura by a large craniotomy beyond the margin of the tumor is the current practice for surface meningiomas. His description denotes the following: “... this vegetation lying on the dura mater for some distance and here he detached it with ease. At other points it adhered to the outer surface of the dura and here he excised the vegetation together with the outermost fibers of the dura. ... the vegetation was so tightly knit with the dura as to form a single body, which had to be removed, thus leaving 2 extensive areas of the underlying arachnoid exposed.”¹⁹ This

classic operative note highlights 1 important aspect of meningioma surgery “excision of the involved dura along with the tumor” to prevent recurrence of the tumor. As a testimonial to Pecchioli’s sincere efforts, the patient lived without recurrence for more than 30 months. Following this success story, in 1879, Sir William Macewen operated on a 14-year-old female with orbital and olfactory groove meningioma with satisfactory outcomes.²⁰ Francesco Durante, an Italian surgeon, deserves credit for the first successful removal of a skull base meningioma.²¹ He operated on an “apple-sized” olfactory groove meningioma in 1885. For the first time in history, he prepared an osteoplastic bone flap for the craniotomy. The patient required a second surgery for recurrence 11 years later. The outcome was superb, and the patient was noted to be doing well 20 years after the primary surgery. The first success in North American neurosurgery was effected by William W. Keen when he removed a meningioma in a 26-year-old carriage maker in 1887 (Figure 2).^{22,23} His merit of success comes from elaborate antiseptic measures. He considered removing the carpets from the operative room and even wiping down the walls and ceilings. This practice of antiseptics has subsequently been modified and improved to a greater extent in subsequent years, which allowed

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