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HISTORICAL NOTES

SUCCESSFUL PIONEERS IN NEUROSURGERY OVER 130 YEARS SINCE THE FIRST LONG-TERM SURVIVAL OLFACTORY GROOVE MENINGIOMA ABLATION

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Surgical treatment for the intracranial tumors started to develop extremely late in the history of neurosurgery because of the inexistence of paraclinical investigations, the absence of general anesthesia with intubation, correct use of blood transfusion, asepsis and antisepsis rules, undeveloped surgical instruments, lack of antibiotics, hemostasis instruments and a standardized ablation technique.
The authors discuss in detail the olfactory groove meningioma (OGM) ablation case published by Francesco Durante in 1884, in Rome. The authors reveal the clinical and operatory aspects of the meningioma ablation procedure, in a 35 years old woman. The authors emphasize Durante`s impossibility of using many of the modern diagnosis and surgical techniques for the OGM ablation. It is impressing that F. Durante removed the tumor partially and assured a long survival time for the patient (at least 21 years). Surprisingly, the patient also recovers her smell, but only on the right side. From his published article we found that the tumor recurred 12 years later, in 1896 and was once more removed allowing the patient to live at least another 10 years.
In conclusion such pioneering activities in all the surgical specialties are truly impressing and represent the key elements in the future development of the modern neurosurgery.
Also, the authors present the major progress made in the field of olfactory groove meningioma – total removal without recurrence and with neurological restitution.

Keywords: Neurosurgery, Durante, Olfactory Groove Meningioma, Total Removal.

INTRODUCTION

Different attempts of neurosurgical treatment of the intracranial lesions existed even from the ancient times. The surgical approach of the intracranial tumors was struck multiple times by the difficulty of the opening of the skull and of the intracranial tumor lesion ablation. In this field exited a lot of attempts of tumor ablation, some were even successful.

An important issue with surgical intervention in the 19th century was the incapability of performing a safe and correct blood transfusion. This procedure was rarely being performed and not until 1901 when Karl Landsteiner (1868–1943) discovered the human blood groups and thus transforming the practice of blood transfusion from taboo to science[1]. For this life-saving discovery he was rewarded with a Nobel Prize in Physiology and Medicine in 1930.

Asepsis and antisepsis rules were just introduced in surgery. Sir Joseph Lister (1827–1912) promoted the idea of sterilizing the surgical instruments and cleaning the wounds with phenol[2,3]. Sir William Macewen (1848–1924), greatly influenced by the work of Lord Joseph Lister adopted the systematical use of scrubbing, sterilization of surgical tools and the use of surgical gowns. He is also renown in the literature for the first total removal of a cerebral abscess[4,5].

Neurosurgical pioneering existed in different countries, including Romania, but few produced real therapeutic results and good outcome. Thoma Ionescu (1860–1926) realized for the first time in the world a superior rachianesthesia[6]. George Assaky (1855–1899) introduces in 1886 a new nerve suture procedure[4].

At the end of the XIXth century there was an effervescence in all the surgical fields regarding the approach and technique required to remove tumors. We mention some of the important pioneers: T. Ionescu (1860–1926), W. Keen (1837–1932), T. Kocher (1841–1917), F. Krause (1857–1937), H. Cushing (1869–1939). William Richard Gowers (1845–1915) was the first to identify a removable medular tumor in 1888. It was then operated succesfully by his colleague Sir Victor Horsley (1857–1916)[4,7].

All these pioneers worked under tremendeous pressure, since they could not check the patient status in the ICU, could not correctly and safely compensate for the loss of blood, could not use hemostasis intraoperatory and also there were no antibiotics, and adjuvant anticonvulsant and antiedema medication. Also, the opening of the cranium represented a huge obstacle because it had to be as centered on the lesion as possible, but it also had to be wide enough in order to limit the effects of the cerebral edema.

Often, we find ourselves surprised by the impressing results of the neurosurgical pioneers such as F. Durante, which operated on an OGM, which is difficult operation even with the actual technique.

MATERIALS

Remarkably, Francesco Durante (1844–1934) (Figure 1) succeeds in 1884, in Rome, at the total ablation of an olfactory groove meningioma (OGM) of a 35 years old woman, with long-term survival. It is very impressive that the surgery succeeded, considering the fact that F. Durante did not use blood transfusion for the patient during or after the surgery, he did not have the necessary tools for hemostasis and used the hammer and the chisel for the skull opening[9,10].

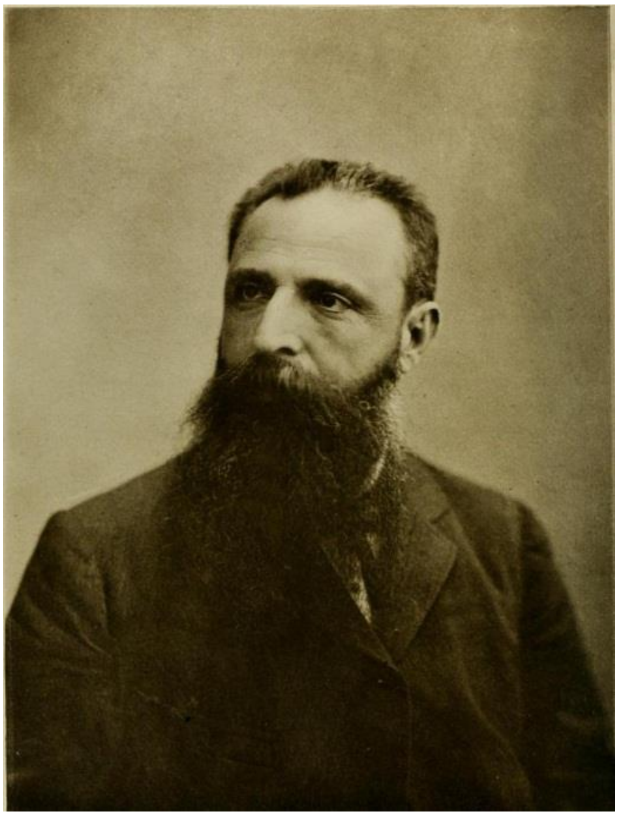

Figure 1. Francesco Durante (1944–1934).

The operation took place in the Clinical Surgery at the Royal University of Rome (now University “La Sapienza”) (Figure 2).

Figure 2. University “La Sapienza”, Rome – modern view.

In this time period the diagnosis was made entirely clinically. Durante diagnosed his patient based on the following symptoms: intracranial hypertension syndrome, headache, loss of memory, vomiting, a sensation of vacuity papilledema, bilateral anosmia, forte amblyopia, confusion, etc. The value of the neurological semiology in the diagnosis of an OGM was crucial[11].

Another impediment for Durante was the fact that he could not use X-rays for paraclinical examination, because those radiations were discovered 10 years later (Wilhelm Conrad Röntgen (1845–1923) discovered X-rays' medical use on December 22, 1895)[12].

The skull was opened with great difficulty, because F. Durante had to use the hammer and the chisel (Figure 3). Durante did an incision, which extended from the inner angle of the left orbit to nearly the hairline as far as the temporal region (this technique is outdated, by today's standards). The calvarian frontal opening was made with a hammer and chisel and had about 5 cm[2, 9,10].

Figure 3. Hammer and chisel used for surgery at the end of the 19th century.

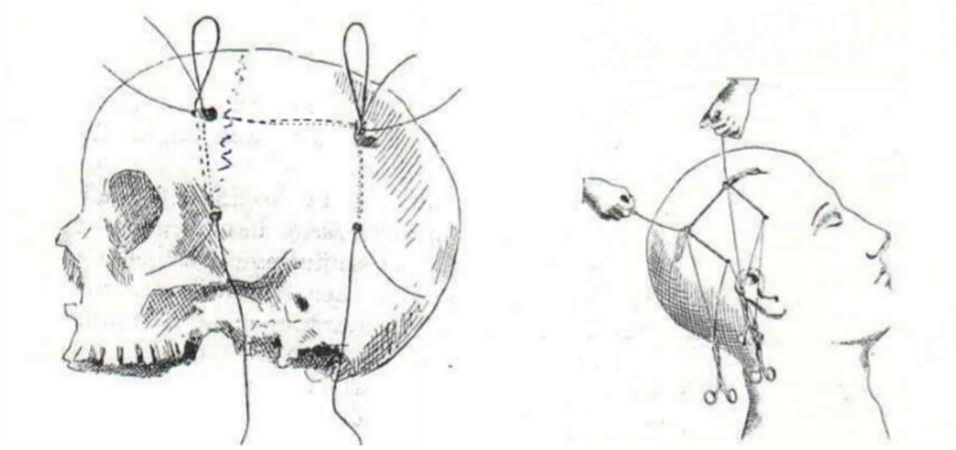

Figure 4. The use of the Gigli saw[8].

The Gigli saw (Figure 4), which simplified this process, was invented in 1898 by Leonardo Gigli (1863–1908)[13].

It is remarkable that his 35 years old patient with OGM survived the first intervention and after 11 years another one. She was still living at the time of her last contact with Durante, in 1905[14,15].

Admirably, F. Durante's article was published and is referred as classic in the approach of the meningioma type of intracranial lesions, especially this kind of tumor, found exactly in the anterior level of the cranium base.

F. Durante's pioneering in Rome was crucial, because he succeeded the tumor evacuation, homeostasis and most important long-term survival of the patient with good outcome and quality of life.

DISCUSSION

The ablation of an OGM represented neurosurgical pioneering. Soon after the publishing of his experience with this case, he became a world-renown personality. He participated in the birth of the “Policlinico Umberto I”, which was opened in 1903. He became friends with the King and many important Italian politicians and intellectuals. His political activity was very intense and focused on helping the poor and the disabled vetrans[11].

The case was published in the Rome Academy of Medicine`s Bulletin in 1884 and in The Lancet in 1887 and represent the first publishing of a successful experience with OGM[9,10].

The Olfactory Grove Meningioma was approached by all the renown surgeon of that time, each one making astonishing steps towards the definition of the neurosurgery as a stand-alone surgical specialty.

It is important to know that today OGM represent 10–12% of the meningioma cases world-wide[16].

The current approach strategy consists of many tumor ablation procedures: bilateral subfrontal approach, unilateral subfrontal approach, pterional approach, fronto-orbital approach, endoscopic transethmoidal approach, embolization of the meningioma, followed by microsurgical approach and total ablation[16,17].

Each one of these approaches have recommendations depending on: tumor size, patient’s age, associated pathology, tumor vascularization, the inclusion or compression of different vascular formations (the anterior or neural cerebral artery), the optic nerve or the olfactory nerve, finally the relationship of the tumor with neural and vascular structure[16,17].

Now, these kind of tumors are being diagnosed using the entire neurosurgical arsenal: skull base X-ray (to visualize the air sinuses), CT3D evaluation, simle and native MRI, angio-MRI, DSA, Diffusion Tensor Imaging (DTI).

This hard steps, made at the end of the 19th and the beginning of the 20th century led, step by step, to the development of the current management of the tumors situated at the skull base, in particular the management of the OGMs (Figure 6).

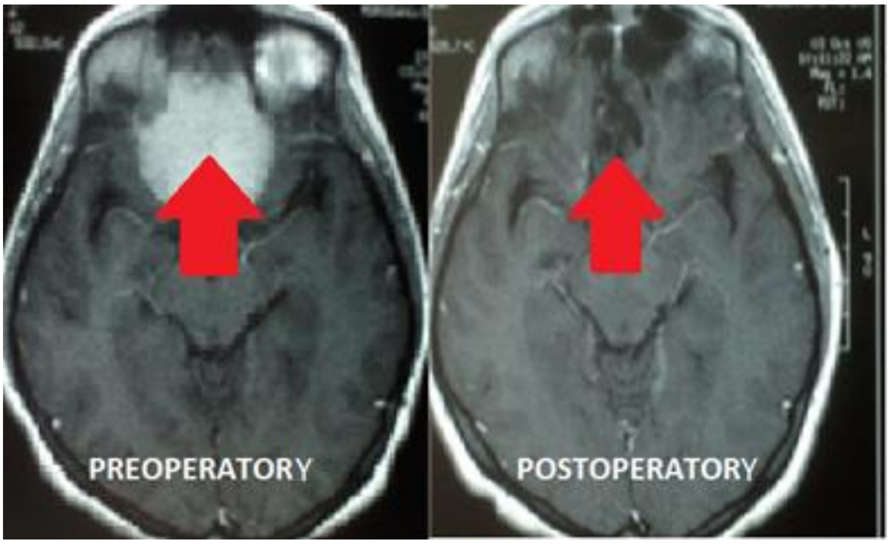

Figure 5. Horizontal section, MRI. Personal case Prof. A.V. Ciurea, total resection of an OGM.

Like any other skull base tumor, the OGM relationship with the adjacent vascular and neural structures is extremely important and it must be well known by the neurosurgical staff, because an intraoperatory lesion is very likely to be permanent (ex: the lesion of the optic nerve or one of the anterior cerebral arteries).

Once the operating microscope was introduced there was clear jump forward. Surgeons started to perform more intracranial tumor ablations and the number of cases in which they succeeded a complete removal started getting higher (even 100%). This technique, along the use of CUSA (Cavitron Ultrasonic Surgery Aspirator) and neuronavigation decreased the mortality and complication rate while increasing the patient's quality of life[7,8].

It is necessary to mention some of the modern neurosurgical masters in intracranial meningioma: Yasargil[19], Pamir and colab.[20], Romani & Hernesniemi[21], DeMonte, McDermott and Al-Mefty[22]. In our days the strategy consists in the total ablation of the tumor with a good outcome and quality of life and minimum stress on the cranial nerves, even with the possibility of maintaining the partial or total function of the 1st nerve[7,16].

CONCLUSIONS

These historical facts represent only a small step, but a truly important one in the treatment of the intracranial lesions, especially meningiomas, which have an extremely bad prognosis due to their benignity.

The ablation of an intracranial tumor was extremely difficult at the end of the 19th century, because of the high intra and postoperatory mortality rate. Any successfully operated neurosurgical case represented a pioneering act. It is even more impressive when a case survives for more than 10 years after a 2nd operation, due to recurrence of the tumor. After this case, F. Durante became famous and neurosurgery started to be recognized world-wide as a stand-alone surgical specialty.

Because of the progress made in the OGM neurosurgery, this giant invalidating tumor with multiple neurological deficiencies such as bilateral frontal lobe compression (memory and equilibrium impairment, bradypsychia), visual and olfactory deficiencies can be efficiently treated even with the possibility of "restitution ad integrum"[18].

ABBREVIATIONS

OGM – Olfactory Groove Meningioma

CT3D – Computed Tomography with 3d Reconstruction

MRI – Magnetic Resonance Imaging

angioMRI – Angiography using Magnetic Resonance Imaging

DSA – Digital Substraction Angiography

DTI – Diffusor Tensor Imaging

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