

The Pioneering Contribution of Italian Surgeons to Skull Base Surgery

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INTRODUCTION

Although the origin of neurosurgery as a modern, successful, and separate branch of surgery could be dated back to the end of the 19th century, surgery began in the prehistoric era and evolved throughout the years, being influenced by the sociocultural environment where it was practiced. The most important development of surgery occurred in Europe, and particularly in Italy, where the environment was unique.

In the Middle Age, the first medical school in Western Europe was the Italian Schola Medica Salernitana, in Salerno. It represented for many years the most important source of medical and surgical instruction all over the Europe, merging classical Greek, Arabic, and Jewish medical practices. It reached its highest point in the period between the 10th and 13th centuries, being favored by Emperor Federico II, allowing Salerno to receive the title of Hippocratica Civitas in 1070 (8, 26). One of its most important graduates was the Italian Rogerius Salernitanus Frugardi (1140–1195), who, in 1180, published the *Practica Chirurgiae*. This book represents a milestone in the history of surgery. It is a clear, brief, and practical manual of

The origin of neurosurgery as a modern, successful, and separate branch of surgery could be dated back to the end of the 19th century. The most important development of surgery occurred in Europe, particularly in Italy, where there was a unique environment, allowing brilliant open-minded surgeons to perform, with success, neurosurgical operations. Neurosurgery began at the skull base. In everyday practice, we still pay tribute to early Italian neuroanatomists and pioneer neurosurgeons who represented a starting point in a new, obscure, and still challenging field of medicine and surgery during their times. In this paper, we report at a glance the contributions of Tito Vanzetti from Padua (1809–1888), for his operation on a destructive skull base cyst that had, indeed, an intracranial expansion; of Davide Giordano (1864–1954) from Venice, who described the first transnasal approach to the pituitary gland; and, most importantly, of Francesco Durante from Messina (1844–1934), who was the first surgeon in the history of neurosurgery to successfully remove a cranial base meningioma. They carried out the first detailed reported surgical excision of intracranial lesions at the skull base, diagnosed only through clinical signs; used many of the advances of the 19th century; and conceived and performed new operative strategies and approaches. Their operations were radical enough to allow the patient to survive the surgery and, in the case of Durante, for the first time, to obtain more than 12 years of good survival at a time when a tumor of this type would have been fatal.

surgery, based on anatomical studies, reporting different cases of traumatic or surgical laceration of the brain, and meticulously describing different surgical techniques, including cranial trephination (25, 28). Afterwards, the foundations of surgery, neurosurgery, and skull base surgery were set, thanks to the dedicated work of brilliant anatomists such as Guido da Vigevano (who, in 1345, published the book *Anathomia designata per figures* containing 24 plates, 6 of those being dedicated to the anatomy of the central nervous system and depicting the head, meninges, parts of the brain, and the spinal cord (9)), Giacomo Berengario da Carpi (1470–1530, who described the sphenoid sinuses, pineal gland, and auditory ossicles in human cadavers), the Flemish Andreas Vesalius (1514–1564, who in Padua reviewed the Galenic concepts on cranial nerves and described the homonymous foramen and vein in the middle cranial base in *De humani*

corporis fabrica), and Constantius Varolius (1543–1575, remembered for his work on cranial nerves, for an examination of the brain from its base upwards, in contrast with previous dissections that had been performed from the top downwards, and for the description of the pons Varolii and the *crura cerebri* (38)).

Multifaceted man of unique mind, Leonardo da Vinci (1452–1519), as well as in painting, sculpturing, and engineering, significantly advanced the knowledge in anatomy, meticulously illustrating, for the first time, the cranial nerves and the optic chiasm (27, 36). His work marked the beginning of a modern concept of anatomy, where specific diseases were related with definite anatomical structures and functions. Leonardo had the permission to dissect human bodies at the Hospital of Santa Maria Nuova in Florence and later at hospitals in Milan and Rome: for this, he became master of topographic anatomy and collaborated with Marcantonio della Torre,

from Padua, producing more than 200 drawings and notes focused on human anatomy that unfortunately were unpublished but preserved and exposed all over the world (6).

During the 17th and 18th centuries, because of a significant progress in anatomical knowledge, Italy went on in contributing to the development of surgery as a scientific discipline, and to the birth of neurosurgery and skull base surgery through the genius of several pioneers in Bologna, Padua, Milan, Venice, and Pisa. Andrea Vaccà Berlinghieri (1772–1826), founder of the School of Medicine in Pisa, in his masterbook of surgery *Trattato di Chirurgia Teorico Pratico di Andrea Vaccà Berlinghieri* described the removal of what he called a “sarcoma” of the dura mater. Evidently he intended an intracranial meningioma, and he was convinced that the best way to remove this tumor was to completely cut the lesion together with the dura from which it came, tying the surrounding meningeal vessels (25). Zanobi Pecchioli (1801–1866), surgeon in Siena, reported the removal of what he called a “fungus of the dura mater” and that presumably was a meningioma of the convexity (23).

The successful neurosurgery began at skull base. The first description of a removal of a brain tumor was performed by Sir William MacEwen from Glasgow, on July 27, 1879, in a 14-year-old girl who was affected by a bulge located on the upper and inner portion of the left orbit, and therefore at the skull base, and published in *The Lancet* in 1881 (31).

However, the birth of modern surgery and neurosurgery had to wait for the discoveries of anesthesia, antiseptics, multidisciplinary team, and localization (32), and, the 19th century witnessed the origins of systematic cranial operations as being imagined by brilliant and open-minded surgeons who challenged new practices, despite intense criticisms.

Among Italian pioneers of skull base surgery, the leading roles belong to Tito Vanzetti, Davide Giordano, and Francesco Durante.

TITO VANZETTI AND THE DESTRUCTIVE SKULL BASE CYST

Tito Vanzetti was born in Venice in 1809, where he started his medical studies,

receiving the degree of Medical Doctor in Padua in 1832. He attended the prestigious biennial master school at the University of Wien, accessible only by the best students of the Austro-Hungarian Empire. Then he returned to Padua, where he dedicated to surgery. He improved his surgical knowledge and skills, showing a growing interest for neurosurgery. The chairman at that time, Bartolomeo Signoroni, published a book on neurotraumatology titled *Sulle ferite di cervello con perdita di sostanza. Memoria patologico-chirurgica* in Milan, in 1828. In 1835, Vanzetti moved to Kharkov, Russia, now Ukraine, where he became the personal physician of the general Naryskin, one of the most influential Russian personalities of that period, and the Czar himself. In 1839, he was appointed professor of surgery and ophthalmology at the University of Kharkov. This was one of the most productive period for Vanzetti, and in 1844, in Paris, he published his book *Quelques observations pratiques recueillies à la Clinique Chirurgicale de l'Université Impériale de Karchoff (Russie)* (22) (Figure 1B). This treatise been reported different surgical cases and topics, and it also contained the description of one of the first attempts of skull base surgery. Vanzetti described the case of a man affected by a “large bone cyst on the right side of the head that had destroyed the base of the skull without affecting cerebral function.” The clinical diagnosis was simple because of the evident deformity of the patient’s head (Figure 1C). He operated the patients on November 26, 1841, with the conviction that the lesion was only a bone cyst, and that it had no intracranial extension. During the operation, Vanzetti had to change his surgical plan because of the evidence of a massive intracranial invasion, and tried to completely remove the lesion. The patient survived the operation, but he died on the 32nd postoperative day because of infection, despite Vanzetti’s efforts to save him. Postmortem examinations confirmed the wide intracranial extension of the tumor, with a large involvement of the skull base (25). He did not report the histology of the lesion, but Vanzetti’s operation can be certainly considered one of the first examples of a skull base approach for removing an intracranial tumor. After the Russian experience that gave him great honor and visibility, he was a visiting

professor in the most important European Universities (in Germany, France, and the United Kingdom), and in 1849 he returned to the University of Padua, where he was appointed professor of surgery (Figure 1A). Here, he continued his activity, and his reputation continued to increase and spread all over Europe. He was dean of the Padua Medical School from 1860 to 1866 and Magnifico Rettore of the University in 1866. Despite his leading role at the University of Padua, after the annexation of Veneto to Italy, he was fired together with other 16 faculty members for their sympathy toward the Austro-Hungarian Empire. He then moved to Palermo, where he was appointed professor of surgery, refusing the offer to migrate to Paris. In short time, he was recalled to Padua. After a brilliant career as surgeon and scientist that made him famous all over Europe, he died on January 6, 1888, at the age of 78, in Padua, the city that more than the others took advantage of his talent. He demonstrated his affection for the University of Padua with a donation of the fabulous figure of 100,000 lire, together with a most valuable scientific library to his alma mater (39).

He gave additional contribution to neurosurgery, describing and anticipating surgical strategies of intracranial aneurysms. Based on his previous experience with a successful treatment of popliteal artery aneurysms through digital compression, for some days, by the patient itself, in 1856, he cured a woman affected by postpartum ophthalmic artery aneurysm with self-compression of the ipsilateral carotid artery (40). He presented this case at the Scientific Meeting of Surgeons in Bonn (Germany) on September 23, 1857. And a second case was published in 1858 (41). In 1865, at a National Academy of Science meeting in Paris, on March 5, 1866, he received the Montyon Prize of 2500 French francs.

Like many other surgeons of the 18th and 19th centuries, he was known as a great general surgeon who was interested in whole surgery, “from the head to the feet.” His amazing and meticulous knowledge of gross and surgical anatomy, derived from the great anatomy tradition of Padua Medical School, allowed him to express his surgical skills in different fields, from surgery of the genitourinary tract to neurosurgery (3). Vanzetti is

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