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PIONEERS IN NEUROLOGY

Giovanni Battista Morgagni (1682–1771)

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Abstract Giovanni Battista Morgagni (1682–1771) is considered the father of neuropathology and one of the most important innovators in the history of medicine. In his "opus magnum" *De sedibus et causis morborum per anatomen indagatis* (The Seats and causes of diseases investigated by anatomy), he established pathological anatomy as a science by correlating clinical histories with autopsy findings.

Giovanni Battista Morgagni was born on 25 February 1682, at Forli, a town near Bologna. He was a clever student and interested in poetry, philosophy, archaeology, history, and medicine in his childhood. His curiosity came out while finding archaeological artifacts at Ravenna and Forli. After finishing secondary school at Forli, he began to learn medicine and philosophy at Bologna at the age of 16. He finished his doctorate in 1701 and began to work at three different hospitals to improve his anatomical and clinical knowledge. His mentor, Antonio Maria Valsalva (1666–1723), with whom he worked for 6 years, made him study anatomy and pathology; meanwhile, his book, *Adversaria anatomica,* was published [1].

After Valsalva left the city of Bologna in 1707, Morgagni worked there for a while and then went back to Forli to begin medical practice. He married Paola Verazeri, a daughter of a noble family. He had 12 daughters and 3 sons. One of his sons became a priest and eight of his daughters became nuns. In 1711, he was invited to Padua as a professor in the second chair of theoretical medicine. He became a professor of anatomy after 4 years and took his place as chair of the anatomy department. He became a successor of Vesalius, Colombo, Fabricius, and Fallopio. Morgagni was a popular teacher; many students, not only from Italy but also from other countries throughout Europe, came to listen to his lessons [1–3] (Fig. 1).

He published the second volume of *Adversaria anatomica* in 1717 and the third in 1719. These books are the work of an intellectual and scientific academician. He did not publish any further books between 1719 and 1761 [4].

He published his opus magnum, *De sedibus et causis morborum per anatomen indagatis* (The seats and causes of disease investigated by anatomy), in 1761 when he was 79 years old. This monumental work consisted of five volumes: the first volume contained diseases of the head, the second volume thoracic diseases, the third abdominal diseases, the fourth covered the nature of disease and problems that may require surgery; the fifth volume is lost. The definitions of mitral stenosis, angina pectoris, endocarditis, cirrhosis, and congenital icterus were first made in this book. He presented 17 cancer cases and dissected cadavers with neurological diseases.

The first volume, 14 chapters concerning diseases of the head, is probably the first textbook of neuropathology. The first chapter contains knowledge about headache and chapters 2–6 are about apoplexy. It is within these chapters that paresis was first proven, pathologically, to result from damage to the contralateral side of the brain. Morgagni inferred that intracerebral hemorrhage might cause contralateral hemiplegia and the patient might benefit from trepanation. He noticed that subarachnoid hemorrhages

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Fig. 1 Giovanni Battista Morgagni

were commonly seen amongst young people and were often fatal. He was the first investigator to show the relation between aneurysms and hemorrhage and he was also the first to describe cerebral air embolism. One of the two cases was a 30-year-old Ethiopian trumpeter who lived in Venice. The man was blowing his trumpet for the entertainment of his friends at breakfast when he gradually fell backwards and died. Morgagni found that the anterior cerebral arteries, some branches of the middle cerebral arteries, and the basilar artery were filled with air instead of blood [5, 6].

Other chapters contain information and case presentations about epilepsy, delirium, hydrocephalus, ophthalmology, cerebral aneurysms, brain tumours, head trauma, meningitis, and ear diseases. Morgagni was the first person to describe how infection of the inner ear might cause intracranial suppuration and the first to describe cerebral gumma. He saw the connection between lung tuberculosis and meningitis and reported that head trauma might cause meningitis; he stated that meningitis might originate from the sinuses and noticed the swelling of the dura in a patient with fever and headache who had syphilis [5]. He reported that lesions at the optic chiasm caused scotoma in both eyes and stated that dilation of the pituitary gland might cause hydrocephalus. One of the main pathologic results that he realized was that brain tumours might cause blindness because of the pressure on the optic nerve [4, 5]. Morgagni was interested in head trauma, which has captured the attention of physicians ever since Hippocrates, and published several head trauma cases in the first volume of his book. He reported that superficial temporal artery rupture caused by head trauma might cause epidural hematoma, and showed via autopsy that trauma to the occipital area might be fatal because of the damage of the bulbus [5].

De sedibus was printed seven times and translated into three other languages. The importance of this book, which contains 1325 pages and 700 autopsies, is that the comparison of premortem symptoms with postmortem findings, the clinic-pathological relationship amongst diseases, was first described there. Saul Jarcho has pointed out: "In this heroic book Morgagni assembled in a systematic and coherent manner massive quantities of carefully evaluated evidence which provided the first satisfactory rational and extensive determination of the anatomical location of disease" [7].

Hippocrates' humoral pathology theory ended with this book. According to humoral pathology, diseases occurred because of imbalances between blood, phlegm, yellow bile, and black bile. Morgagni showed that diseases are caused by pathological processes in many cases. As Rudolph Virchow (1821–1902), the founder of cellular pathology, said, "Old dogmatic understanding is ended with Morgagni and a new modern medicine has begun". His book was a touchstone for the neurological sciences; the prevalence of brain dissections for determining neurological diseases increased [8, 9].

Morgagni was reliable, not jealous, gentle, admirable amongst students and colleagues, and was a man of independent thought with a strong personality. He was very religious. He had given lessons for decades at Padua and educated many physicians from all over Europe. He died on 5 December 1771, when he was aged 89, and was buried at Saint Maxim Church in Padua [10].

Compliance with ethical standards

Conflicts of interest None of the authors has a conflict of interest with the submission.

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