

NEUROSURGICAL CONTRIBUTIONS OF SAMUEL D. GROSS

DOPRINOSI NEUROKIRURGIJI
SAMUELA D. GROSSA

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SUMMARY

One of the most famous American Surgeons of the early 1800s was Samuel David Gross (1805-1884). His mastery of surgery was immortalized in Thomas Eakins' 1875 painting of Gross titled The Gross Clinic. Gross was a prolific surgeon and one of his textbooks, a System of Surgery, went through 6 editions. Not known to many is the fact that this book also covered neurosurgical diseases and techniques. Gross was a skilled surgeon and able writer. His textbooks on surgery were well received in his day. Moreover, he should be considered an early pioneer of neurosurgery as his System of Surgery is filled with neurosurgical diagnoses and neurosurgical techniques.

Key words: History of medicine; 19th century; anatomy; surgery; neurosurgery; United States

INTRODUCTION

Samuel David Gross, known as the greatest American surgeon of his time, was born on July 8, 1805 in the town of Easton, Pennsylvania. By the age of five years old, Gross knew he wanted to pursue a career in medicine. Gross, who grew up in a German-speaking household, learned to speak

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English at the age of 12. By age 17, he had attempted three medical apprenticeships, but his education proved substandard to others in the field. He then returned to school by attending the Wilkes-Barre Academy in Pennsylvania, later completing his education at the Academy in Lawrenceville, New Jersey. Two years later, Gross returned to his previous apprenticeship under the direction of Dr. Joseph K. Swift where he studied medicine, French, and assisted in surgical procedures for one year. Swift, an alumnus of the University of Pennsylvania urged Gross to receive further instruction from his alma mater. However, in 1826, Gross decided to pursue further training from Jefferson Medical College in Philadelphia founded just two years earlier. After graduating in 1828 in a class of just 27 students, Gross stayed in Philadelphia to begin his medical practice. Later that year, he married Louisa Weissell, a twenty-year-old widow with whom he later had six children, and they soon moved back to his hometown of Easton. Aside from practicing medicine, he spent countless hours studying animal and human dissections in a small laboratory that he built in the back of his house. In his spare time, he translated French and German medical literature into English, which included significant works such as *Elements of Operative Surgery* (1829) by Alphonse Tavernier, the first surgical text published in the United States. It was this experience that led Gross to begin producing his own body of medical literature when he published his first work *Treatise on the Anatomy, Physiology, and Diseases and Injuries of Bones and Joints* in 1830.

By the age of 28, he set out to pursue his latest goal of teaching anatomy and contacted his former professor at Jefferson Medical College, John Eberle. Eberle, then a professor at the Medical College of Ohio, gave Gross a position of Demonstrator of Anatomy in Cincinnati; however, Gross was required to lecture in an empty attic space. According to Gross, these lectures on visceral and surgical anatomy were the most successful courses he ever taught. Shortly thereafter, in 1835, he took a position at the Cincinnati Medical College as Professor of Pathological Anatomy. In 1839, he published his first comprehensive anatomy text *Elements of Pathological Anatomy*, which earned him worldwide recognition. Shortly thereafter, the Cincinnati Medical School closed and Gross accepted a position at the Louisville Medical Institute where he served as Chair of Surgery from 1840-1856. Aside from a one year move to New York, he resided in Louisville for sixteen years, teaching and seeing patients in his private practice. Gross helped earn the Louisville Medical Institute the highest distinction and national fame.

In 1856, Gross with his wife and children, moved back to Philadelphia where he accepted a position as the Chair of Surgery at his alma mater, Jefferson Medical College. During this time, he became one of the most well-known members of various medical organizations and served as the twentieth president of the American Medical Association in 1867. He also served as lead publisher for the *Transactions of the American Medical Association*, the predecessor to the *Journal of the American Medical Association*. Additionally, he was a founding member and first president of the American Surgical Association and the Philadelphia Pathological Association. In 1859, Gross published one of his best known works, *A System of Surgery: Pathological, Diagnostic, Therapeutic, and Operative* with over 2,300 pages in volume I. Six editions were published through 1882. During the Civil War, he served as surgical consultant for the US Surgeon General and authored a textbook on military medicine entitled *A Manual of Military Surgery* in 1861.



Figure 1: Thomas Eakins. The Gross Clinic, 1875, oil on canvas. Jefferson Medical College, Thomas Jefferson University, Philadelphia.

In 1875, Gross was re-elected president of the AMA. It was during this same year that artist Thomas Eakins painted a famous representation of Gross in *The Gross Clinic*. This painting, originally known as *The Portrait of Professor Gross* (Fig. 1), depicts Gross performing an operation on a young patient to remove a tumor of the thigh while explaining proper surgical techniques to an audience of students at Jefferson Medical College. This piece is regarded as one of the finest works of art of its time and can be found in either the Philadelphia Museum of Art or the Pennsylvania Academy of the Fine Arts, which share ownership of this masterpiece. Gross was unanimously elected president of the International Medical Congress in 1876. He served as the Chair of Surgery at Jefferson Medical College until 1882 and retained the title of Emeritus Professor of Surgery until he died of congestive heart failure on May 6, 1884 at the age of 78. In 1887, the *Autobiography of Samuel D. Gross, M.D., with Sketches of his Contemporaries* was published posthumously. In 1897, a bronze statue sculpted by Alexander Calder was dedicated by

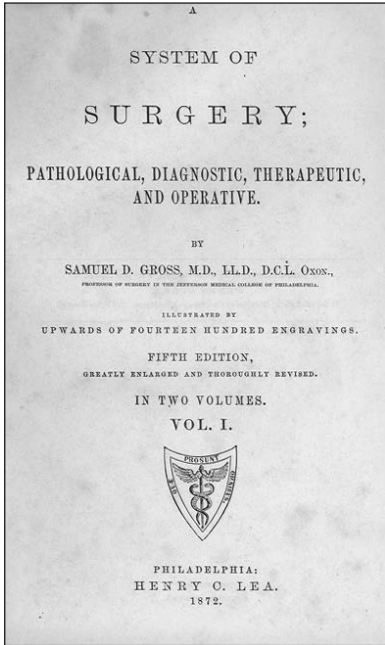


Figure 2: Title page of System of Surgery by Samuel D. Gross

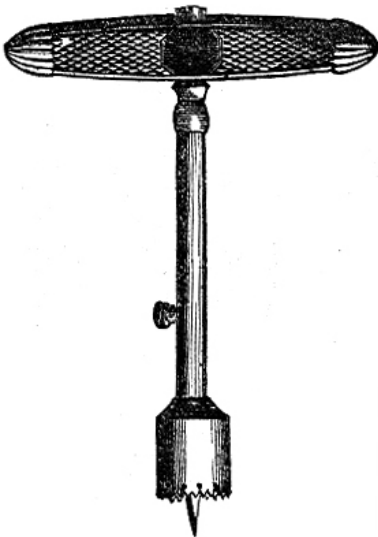


Figure 3: Drawing of a craniotome as illustrated in System of Surgery

President William McKinley in the National Mall of the U.S. Capitol. In 1970, it was relocated to Thomas Jefferson University in Philadelphia. A portrait of Gross also hangs in the Fred Rankin Amphitheater in Louisville, Kentucky.

SURGICAL BACKGROUND

Samuel D. Gross made several novel advancements in the field of surgery. Interestingly, Gross never thought he would become a surgeon as the sight of blood was “disagreeable” to him. In his autobiography, Gross states he suffered a near syncopal event while assisting in his first bloodletting. However, Gross states he was later unaffected by the appearance of blood while performing major operations, but he still cringed at the sight of blood when serving as an onlooker. He was the first to describe lithotomies to remove a calculus from the bladder and was renowned for his urological expertise. He also studied gunshot wounds, amputations, and was among the first to advise the use of artificial limbs and plaster paris in treating fractures. Gross was said to “cure the blind” after performing cataract surgery and performed innovative operative techniques such as clamping the subclavian artery for an axillary aneurysm. He advocated using an increased dose of morphine for anesthesia, which appalling at the time, later became widely accepted. He was also a pioneer of his time in developing modern

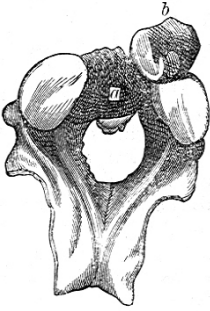


Figure 4: Fracture of the odontoid process as illustrated in System of Surgery



Figure 5: Aneurysm of the external carotid artery in a patient from System of Surgery

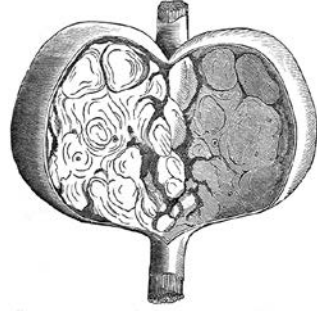


Figure 6: Excised nerve tumor from System of Surgery

medical equipment. Such devices included the tourniquet, an apparatus to transfuse blood, and an instrument to extract foreign objects from the ear or nose. He also originated the idea of calling for expert medical witnesses in medical-legal lawsuits.

NEUROSURGICAL CONTRIBUTIONS

Specific neurosurgical contributions of Gross included his innovative technique to suture sectioned nerves together. He also published an early case report in the *American Journal of Medical Sciences* of a gunshot wound to the neck, which involved the spinal cord and subclavian artery. He reported this patient went on to suffer death “by convulsions.” He also references early operations to relieve neuralgia. He remarked that one the highest compliments he could ever receive came from one of his colleagues who acknowledge Gross’s teaching and literature saying he merely “simplified surgery.” His surgical text, *System of Surgery*, published in 1872, was filled with neurosurgical methods and cases (Fig. 2-6). Methods described in the book included using trepanation for opening the skull, removal of nerve tumors and surgical exposure of aneurysms. For example, he described ophthalmic artery aneurysms and that these can be due to trauma or can occur spontaneously. As a treatment of ophthalmic artery aneurysms, he recommended ligation of the common carotid artery (Fig. 7) as early in the disease as possible. Interestingly, he also made an early description of a carotid cavernous fistula or as he described it “aneurism by anastomosis.” The suggested treatment



Figure 7: Surgical exposure for ligation of the carotid artery from System of Surgery.

was injections with perchloride of iron or digital compression of the carotid artery. Gross also described “arterio-venous aneurism” of the extracranial part of the internal carotid artery with the internal jugular vein and that these were often due to injury from gun shot or knife. Although he found intracranial aneurysms to be of “little interest in a surgical point of view”, he described aneurysms of the basilar, middle cerebral, vertebral and internal carotid arteries. Symptoms from such vascular dilatations were mentioned and included: hemiplegia, deafness, vertigo, and headache. Although considered inoperable, he mentioned ligating the carotid artery in the neck as a treatment for such intracranial pathologies.

Gross described removal of an arterio-venous malformation of the “popliteal” nerve and a cystic tumor of the median nerve. For diseased nerves, he advocated three steps: 1. removal of the disease affecting the nerve with surgical dissection; 2. Excision of the affected part of the nerve; and 3. Amputation of the limb with this option used only when the disease was incurable e.g., tumor. For traumatic transection of peripheral nerves, he advocated suturing the cut ends in the hopes of restoring function.

Odontoid and other spine fractures were also discussed and treatment methods presented. Gross did not recommend decompression of fractures compressing the spinal cord (Fig. 8) and believed that the inflammation that followed such procedures often resulted in more injury to the patient. Therefore, bracing was the most common treatment for such injuries. However, for spinous process fractures, he advocated removal of shattered fragments.

Samuel Gross was a skilled surgeon and able writer. His textbooks on surgery were well received in his day. Moreover, he should be considered an early pioneer of neurosurgery as his *System of Surgery* is filled with neurosurgical diagnoses and neurosurgical techniques.



Figure 8: Fracture of the spine with posterior dislodgement and compression from *System of Surgery*.

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SAŽETAK

Samuel David Gross (1805.–1884.) bio je jedan od najpoznatijih američkih kirurga prvog dijela 19. stoljeća. Njegova kirurška vještina stekla je besmrtnost u Grossovoj slici Thomasa Eakinsa iz 1875. naslovljenoj Grossova klinika (The Gross Clinic). Gross je bio plodan kirurg i jedan je od njegovih udžbenika, Sustav kirurgije (System of Surgery), doživio 6 izdanja. Ono što je malo poznato jest činjenica da je ta knjiga također pokrila neurokirurške bolesti i tehnike. Gross je bio vješt kirurg i sposoban pisac. Njegovi udžbenici o kirurgiji bili su dobro primljeni u njegovo vrijeme. Štoviše, trebao bi se smatrati ranim pionirima neurokirurgije, budući da je njegov Sustav kirurgije ispunjen neurokirurškim dijagnozama i neurokirurškim tehnikama.

Ključne riječi: povijest medicine; 19. stoljeće; anatomija; kirurgija; neurokirurgija; Sjedinjene Američke Države