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Ernst von Bergmann and the First Neurotraumatology Book

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ABSTRACT

We aimed to introduce Ernst von Bergman, who contributed greatly to the establishment of modern neurosurgery and introduced antisepsis practices to routine use in surgery, and his important work, which is the first book on neurotrauma.

The world's first book dedicated to neurotrauma, Lehre von Kopfverletzungen, written in 1880, is examined and presented together with the author's academic career.

Bergmann was the first surgeon to use surgical instrument sterilization and played a pioneering role in the establishment of the antiseptic method. In addition to his valuable studies and important results on intracranial pressure changes in head trauma, the innovations and principles he brought to wound care are very important.

Surgical sterilization, head trauma and the resulting increase in intracranial pressure, and his standardization of wound care make Ernst von Bergmann an important figure in the establishment of modern neurosurgery. Bergmann is the author of the first book on neurotrauma, which places him in a distinguished place in the history of neurosurgery.

KEYWORDS: Ernst von Bergmann, History of Neurosurgery, Neurotrauma, Incraised intracranial pressure

INTRODUCTION

Ernst von Bergmann (1836-1907) served as a professor of surgery in Würzburg and Berlin (Figure 1), and he also held roles as a military surgeon and neurosurgeon. His service practiced as a medical officer included participation in the Austro-Prussian war (1866), Franco-Prussian war (1870-1871) and Russo-Turkish war (1877-1878), through which he gained extensive experience of neurotrauma in the battlefield. He is known as a pioneer of aseptic surgery, introduced heat sterilization of surgical instruments and aseptic dressing. Most importantly, he was one of the founders of some neurosurgical applications, and author of the first neuro-traumatology book and one of the first neurosurgery books. The aim of this study is to review his medical life, and his contributions to neurosurgery.

LIFE and EDUCATION

Ernst Gustav Benjamin von Bergmann was born on 16 December 1836 in Riga, Livonia Governorate (now Latvia) within the borders of the Russian Empire. He received his doctorate from the University of Dorpat now known as University of Tartu (Estonia) at the age of 24 between 1854 and 1860. While working in Dorpat, he visited Albrecht Werner's clinic in Königsberg and made observations on hygiene measures that were very advanced for their time. In addition, he visited the clinic of Franz Schuh in Vienna, who performed the first pericardial puncture and used ether anesthesia. It is known that he also visited the clinics of Virchow and Langenbeck as an observer. He followed the work of Weber and Billroth and conducted research on human infections. He gained surgical experience to participate voluntarily in the army in the Austro-Prussian War in 1866 (4).

He started his assistantship at the surgery clinic of Prof. Georg von Adelmann and Prof. Georg von Oettingen. He completed his surgical training in 1864 at the age of 28. He published 3 important papers in 1868. In between 1870 and 71, he volunteered once again for the Franco-Prussian war.

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Figure 1: Portrait of Ernst von Bergmann, circa 1890.

He was the director in Lazarett Seilerbahn and carried out an outstanding job there. In 1871 he was appointed professor in Dorpat and worked there for 7 years. The Russo-Turkish War (1877-78) was the last war he participated in. He introduced new antiseptic wound treatment methods and immobilization of the extremities before searching for bullets, saving many lives and preventing amputations (14).

In 1878 he was accepted as a professor in Würzburg and after working for 4 years he was appointed to succeed Prof. Bernhard von Langenbeck in Berlin in 1888. His Clinic in Ziegelstresse Berlin was one of the best at his time. He used sublimate for disinfection. He published this work in 1880, which made him known as one of the most successful pioneers of the antisepsis concept (15). One of her assistants in Berlin was Curt Theodor Schimmelbusch (16 November 1860 – 2 August 1895), who invented the mechanical method of sterilizing surgical instruments and designed the Schimmelbusch -mask, which ensures the safety of the patient while she is under anesthesia (8). His other important pupil was Friedrich Gustav von Bramann (25 September 1854 – 21 April 1913).

Ernst von Bergmann was one of the most important surgeons of his time. In addition to his contributions to antiseptics and wound management, he was one of the pioneers in German surgery and neurosurgery. His clinic in Berlin was one of the best in the world and accepted patients from all over the world (12). He conducted research on the relationship between brain injury and intracranial pressure (ICP). In 1880, he wrote "Lehre von Kopfverletzungen", the first neurotraumatology book in history (11). In addition, in 1889, he wrote a second neurosurgery book, "Chirurgische Behandlung von Hirnkrankheiten" (10).

Bergmann died in Wiesbaden on 25 March 1907 at the age of 70, due to pencreas necrosis and peritonitis, even though he diagnosed himself as colon carcinoma 5 years before (3).

CONTRIBUTIONS

Bergmann's most important contribution to medicine and surgery was his ability to sterilize surgical instruments, thereby significantly reducing the rate of surgical infection. Bergmann's other notable contribution to infection reduction was his introduction of steam-sterilized surgical dressings and his demonstration that they were superior to chemical sterilization in dealing with infection. Bergmann was one of the first users and advocates of the knee-length white coat in medicine. As a military medic on the battlefield, he took a special interest in gunshot wounds, with an increased interest in cranial injuries (9).

As a general surgeon, he played a leading role in surgeries for hydrocele and esophageal diverticulum and contributed to appendectomy (7).

Bergmann left behind many medical works. The most important of these is "Die Lehre von den Kopfverletzungen" (The theory of head injuries), which deals with head trauma, published in 1880. His other important book in terms of brain surgery is "Die Chirurgische Behandlung der Hirnkrankheiten" (The surgical treatment of brain diseases), published in 1888. He also published a journal with his two colleagues called "Zeitschrift für ärztliche Fortbildung" (Journal for continuing medical education), which was about medical education, in 1904.

LEHRE VON KOPFVERLETZUNGEN

Lehre von Kopfverletzungen, was first published in 1880 (Figure 2). This book was a special part of Deutsche Chirurgie issued by Prof. Dr. Billroth and Prof. Dr. Luecke.

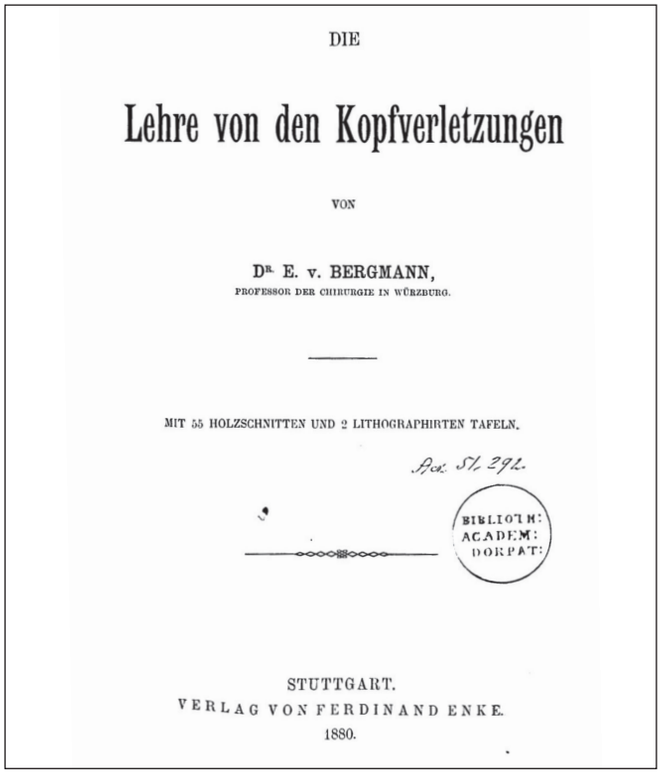
Lehre von den Kopfverletzungen consists of 560 pages. The book mainly contains 2 parts, and 6 sections. The part one contains 2 sections and 21 chapters. Part 2 contains 4 sections and 20 chapters (Table I). There are 2 lithographed plates and 55 illustrations (33 figures in part I, and 22 figures in part 2) demonstrating the fracture types, brain injury types, and ICP (Intracranial pressure) images.

All illustrations in this book are hand drawings and he explains the injury mechanism of that patient (Figure 3).

Part 1 is on bony and soft tissue injuries of head. It is divided into three sections and 21 chapters. Section 1 is on the intrauterin head injuries and birth injuries. Section 2 is on soft tissue injuries of the head, and section 3 is on skull injuries.

In chapters 8-21, the author classified skull fractures as impression fractures, split fractures, depression fractures, isolated fractures, and diastasis of sutures, He reviewed trans-

port, care, antisepsis and surgical treatment of fractures. He focused on skull base and craniovertebral junction fractures in separated chapters and discussed indications of trepanation in skull fractures. In chapter 15 the author explains trepanation techniques after skull fractures.


DIE

Lehre von den Kopfverletzungen

VON

Dr. E. v. BERGMANN,
PROFESSOR DER CHIRURGIE IN WÜRZBURG.

MIT 55 HOLZSCHNITTEN UND 2 LITHOGRAPHIRTEN TAFELN.

Acc. St. 292.

BIBLIOTH: ACADEM: DORPAT:

STUTTGART.
VERLAG VON FERDINAND ENKE.
1880.

Figure 2: Title page of "Die Lehre von den Kopfverletzungen". Verlag von Ferdinand Enke, Stuttgart, 1880.

Part 2 is on brain injuries and consists of 4 sections and 20 chapters. In the first section of part 2, the author gives sufficient information about anatomy, role of cerebrospinal fluid

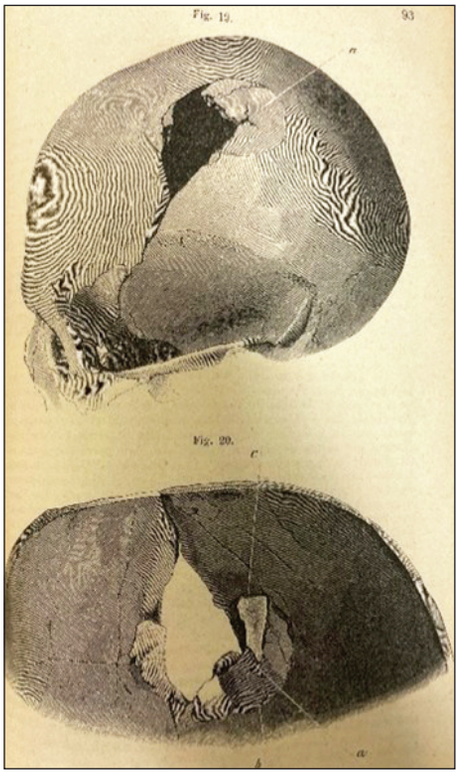


Figure 3: This drawing was made to show a gunshot wound in Karlsruhe, causing brain injury and arterial bleeding due to middle meningeal artery laceration from page 93 of the book, figure 19.

Table I: Summary of Contents of Each Part, Section and Chapter of the Lehre von den Kopfverletzungen

Part I	
Section 1 Chapter 1-2	Cranial injuries before or suring birth
Section 2 Chapters 3-7: covering scalp	Scalp injury of soft tissues
Section 2 Chapter 8-21	Cranial bone fracture
Part II	
Section 1 Chapter 1-5	Etiology, diagnosis and teratment of cerebral injuries. Classifications of cerebral injuries
Section 2 Chapter 6-8	Intracranial fossae and nerve injuries
Section 3 Chapter 9-18	Cerebral contusion, foreign body, postraumatic epilepsy, bainstem injuries, traumatic diabetes, teratment of fresh brain injury, tarumatic brain abscess, cerebral herniation, tarumatic psychose
Section 4 Chapter 19-20	Surgical teratment, indications, trepanation technique

(CSF), capacity of skull volume and its relationship with brain tissue, blood and CSF. Chapter 1-5 contains general aspects of cerebral injuries, their etiology, diagnosis and treatment, including the role of operative craniectomy and trepanation in neural injuries. The author classified cerebral injuries as commotio cerebri and compressio cerebri. Chapter 6-8 contains epidural and subdural hematomas, traumatic pachymeningitis, intrameningeal bleeding, injuries of cranial nerves, dural sinuses, and intracranial arteries, as well as arteriovenous fistulas (AVFs).

Chapter 9-18 contains cerebral contusion, foreign body, posttraumatic epilepsy, brainstem injuries, traumatic diabetes, traumatic brain abscesses, cerebral herniation, and traumatic psychoses (Figure 4). Chapter 19-20 contains surgical treatment, indications, and technique of trepanation in neural injuries.

WOUND MANAGEMENT

He was a strong advocate of antisepsis in surgical practice, and particularly in craniocerebral injuries. For the management of cranial wounds, other than bandage, he advised cold/ice application. There were various types of cold bandages. Ernst von Bergmann used the one that was invented by Goldschmidt, which was a compression bandage to reduce ICP that could be connected to a water pipe system to cool the head (Figure 5).

INTRACRANIAL PRESSURE AND INTRACRANIAL HYPERTENSION

Special emphasis is given to posttraumatic raised ICP and possible mechanisms of intracranial hypertension (ICH) in this book. In the book, three different hypotheses are put forward to explain the development mechanism of posttraumatic ICH. He attributed posttraumatic ICH to bleeding from brain vessels, impression fractures or foreign bodies, and infections. He also mentioned that the first two of those reasons are directly due to trauma, but infections are chronic complications of trauma. He measured ICP with a manometer and examined the circumstances resulting intracranial hypertension (Figure 6).

He stated that intracranial lesions increase the ICP and, as a result, decrease cerebral circulation. Reaction of cardiovascular system to raised ICP in patients and in experiments with dogs were well examined and shown in the book.

He recommended non-operative techniques such as venous drainage, cooling, other than surgical methods for treatment of intracranial hypertension.

DISCUSSION

Long-lasting, painless surgery without or with less risk of infection started in the 19th century. In 1846, ether anesthesia and in 1847 chloroform anesthesia were introduced and allowed for long lasting surgeries. Joseph Lister, British surgeon, defined principles of antisepsis, which reduced the risk of infection-related morbidity and mortality (6). Thus, reducing infection deaths drew attention to these new methods. During

Figure 4: Drawing of a Russion soldier with brain prolaps after a shotwound at the head on 18.07.1877. He saw this patient during his treatment by Dr. Kusmin in Sistowa at 50.th Feldnazareth, from page 533, figure 55.

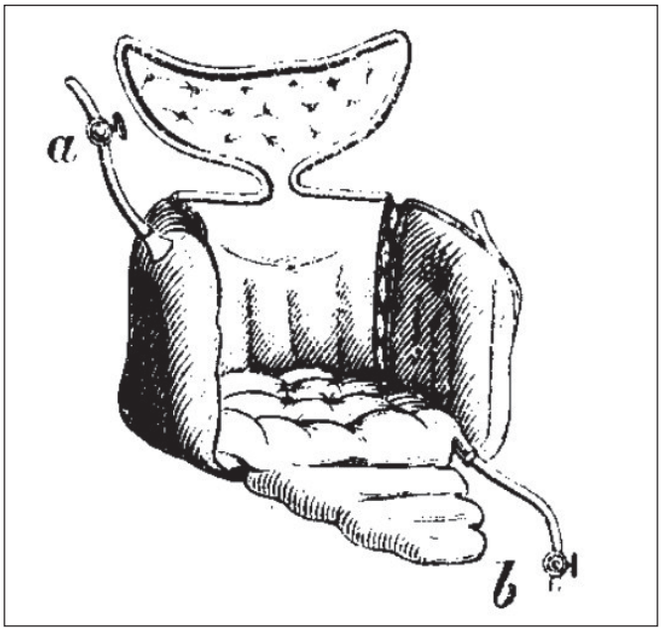


Figure 5: Water pipe system to cool the head in craniocerebral injuries. The letter a shows the pipe connected to the water pipe, and b is the drainage pipe of water, from page 53, figure 10.

Figure 6: Manometer diagram showing raised ICP after compression of neck, from page 324, figure 45.

his professional work, Bergmann understood the importance of antisepsis, visited the clinics of prominent surgeons in this field, developed what he learned and put it into practice. He also passed on his knowledge to future generations by writing down the principles he developed. It is very significant that he gave the principles of antisepsis and wound care in a work in which he wrote about trauma diseases that are most susceptible to infection. His work is the first neurosurgery book written solely about head traumas. Furthermore, Bergmann not only applied antisepsis, but he also introduced steam (heat) sterilization of surgical instruments and dressings in 1886. Surgical instrument sterilization, which is a common and essential practice today, was met with skepticism in Bergmann's time and received numerous objections from his colleagues.

Bergmann's other important contribution was in the field of military surgery. It is noteworthy that the organized military health service was started in the second half of the 18th century by Dominique Jean Larrey (1766-1842) and Pierre-François Percy (1757-1825) during the wars of Napoleon I (13). A school was opened in Algeria between 1840 and 1850, which served as a military health school for French surgeons. A similar one was used for the training of German surgeons during the Schleswig War (1848-1851) (5). Bergmann was also a pioneer in the application of antisepsis in German organized military health institutions. He stated that

'Like cholera, every gunshot wound becomes a source of poison for the organism that receives this wound. The body then becomes a workshop for this frightful poison or germ that is then able to spread itself throughout the entire organism' (2).

By the war of 1870, Bergmann was aware of the concept of cerebral localization and knew that brain lesions could cause contralateral symptoms (1). However, the mortality rate of his trepanations was around 75%, leading her to think that there might be some problems related to increased ICP. He demonstrated cardiovascular results of raised ICP in 1873, which was later defined as "Cushing's reflex" in 1901 by Harvey Cushing.

CONCLUSION

This study revealed that Ernst von Bergmann is one of the most important surgeons of the 19th century. His contributions are not limited to the establishment of antisepsis in surgery and wound management. He was also a pioneer in ICP concept in head traumas and organized military health services.

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Declarations

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AUTHORSHIP CONTRIBUTION

Study conception and design: UE, SN, EH
Data collection: SN, EH
Analysis and interpretation of results: UE, SN, EH
Draft manuscript preparation: UE, EH
Critical revision of the article: UE, SN, EH
All authors (EH, UE, SN) reviewed the results and approved the final version of the manuscript.

REFERENCES

1. Blair JSG: "Ernst Von Bergmann". J Royal Army Med Corps 152:108-119, 2006. https://doi.org/10.1136/jramc-152-02-09
2. Buchholtz A: Ernst von Bergmann: mit Bergmanns Kriegsbriefen von 1866, 1870/71 und 1877. Leipzig, Vogel, 1911.
3. Czymek R, Düsel W: On the centennial of Ernst von Bergmann's death. Der Chirurg; Zeitschrift für Alle Gebiete der Operativen Medizen 78:265-272, 2007. https://doi.org/10.1007/s00104-006-1299-8
4. Hanigan WC, Ragen W, Ludgera M: Neurological surgery in the nineteenth century: the principles and techniques of Ernst von Bergmann. Neurosurgery 30:750-757, 1992. https://doi.org/10.1227/00006123-199205000-00017
5. Legouest L: Traité de Chirurgie d'Armée. Paris, J.B. Baillière, 1872.
6. Lister J: Illustrations of the antiseptic system of treatment in surgery. Lancet 2:668-669, 1867. https://doi.org/10.1016/S0140-6736(02)58116-2
7. Luther B, Wirth I: The development of surgery by Ernst von Bergmann. Zentralblatt für Chirurgie 111:1389-1397, 1986.
8. Pawlow W: Die wissenschaftlichen Leistungen des Chirurgen Ernst von Bergmann (1836-1907) für die Entwicklung der Medizin im Spiegel seiner Korrespondez in den Jahren 1877 bis 1878. Beitr Orthop Traumatol 37:349-352, 1990
9. Salcman M: Ernst von Bergmann performs a brain operation - by Franz Skarbina. Neurosurgery 38:1254-1255, 1996. https://doi.org/10.1227/00006123-199606000-00046
10. Von Bergmann E: Die Chirurgische Behandlung von Hirnkrankheiten. Berlin, Hirschwald, 1889.
11. Von Bergmann E: Lehre von den Kopfverletzungen, Stuttgart, Verlag von Ferdinandenke, 1880
12. Von Bruns V: Die chirurgischen Krankheiten und Verletzungen des Gehirns und seiner Umhüllungen. German: Tübingen Laupp, 1854
13. Walusinski O: Neurology and Neurologists during the Franco-Prussian War (1870–1871). Front Neurol Neurosci 38:77-92, 2016. https://doi.org/10.1159/000442595
14. Zimmermann M: Life and work of the surgeon Ernst von Bergmann (1836–1907), long-term editor of the Zentralblatt für Chirurgie. Zentralblatt für Chirurgie 125:552-560, 2000
15. Zülch KJ: Ernst von Bergmann and the beginning of neurosurgery in Berlin. In: Wenker H, Klinger M, Brock M, Reute F (eds). Advances in Neurosurgery, Vol. 14. Berlin: Springer-Verlag Heidelberg, 1986:6-7. https://doi.org/10.1007/978-3-642-71108-4_2