ANCIENT SURGICAL PRACTICES: FROM TREPANATION TO MODERN TECHNIQUES.

Autors: Xasanov Azizbek Murodovich 2-grade student of Samarkand State Medical University faculty of treatment.

Mirzayev Bekjon Sharobiddinovich- 2-grade student of Samarkand State Medical University faculty of treatment.

Baxriddinova Gulnora Isomiddinovna- 2-grade student of Samarkand State Medical University faculty of treatment.

Scientific supervisor:Abulkosimova Dildora Asrorovna-assistant of the Department of Humanities, Samarkand State Medical University.

Abstract: Surgery is a field that has been constantly evolving throughout human history, and by studying ancient practices, one can gain a deeper understanding of the origins of current protocols and new technologies. Steps such as trepanation, antiseptics, anesthesia, and robotics have directly affected the quality of medical practice - therefore, the topic is of scientific and practical importance.

Keywords: Trepanation, ancient surgical procedures, skull piercing, neurosurgery, intracranial pressure reduction, cranial operations.

Research goals and objectives: Systematic analysis of the history of surgical practices from ancient times to modern techniques. Study of the history and archaeological evidence of trepanation. Analysis of the impact of discoveries in anatomy, anesthesia and antiseptics on surgery. Show the development of surgical technologies of the 20th–21st centuries - microsurgery, laparoscopy, robotic surgery.

Research materials and methods: The research methodology is based on historical-documentary and comparative analysis methods. Sources: archaeological reports, ancient medical texts (Hippocrates, Avicenna, Al-Zahrawi), historical monographs, clinical reviews and modern scientific articles. The research used a qualitative analysis and case-study approach.

Research results: Trepanation: Archaeological findings indicate that trepanation was widespread throughout human history and that in some cases, bone regeneration was observed in patients — this practice was sometimes used for therapeutic, sometimes for ritual purposes. Ancient societies used trepanation for the following purposes:

Exorcism of evil spirits (religious-mystical reasons)

People believed that spirits resided in the head. Severe headaches, seizures (epilepsy), and mental illnesses were “treated” in this way.

Treatment of head injuries-

To remove blood clots (hematomas) after a blow to the head during wars.

To reduce intracranial pressure-

To reduce pressure in cases of severe swelling or bleeding.

Why is it done now?

To remove brain tumors.

To stop bleeding.

To reduce intracranial pressure.

To restore spinal cord-brain function.

To create a route for drugs or electrodes.

Anatomy and the Renaissance: Vesalius and others put anatomy on a scientific basis and improved surgical techniques. 19th-century revolutions: The advent of anesthesia (ether, chloroform) and antiseptics (Semmelweis, Lister) significantly increased the safety of surgery. 20th-century advances: The development of antibiotics, microscopic methods, intensive care, and anesthesiology improved surgical outcomes. Minimally invasive and robotic technologies: Laparoscopy, endoscopy, and robotic surgery reduced patient trauma, accelerated recovery, and allowed for high-precision operations. Modern techniques:

Microsurgery. Neuronavigation.

Endoscopic craniotomy. Laser cutting. Minimally invasive approaches.

In the study of neurosurgery, historical and comparative methods were applied. Archaeological findings, ancient medical manuscripts, and classical surgical treatises describing cranial interventions were analyzed. Particular attention was paid to prehistoric trepanation practices, medieval surgical writings, and Renaissance anatomical studies. The evolution of neurosurgery was traced through major technological milestones, including the introduction of anesthesia, antiseptic principles, and microsurgical techniques. This methodological approach allowed an assessment of neurosurgery as a discipline that evolved from empirical cranial interventions into a modern specialized surgical field.

To examine the historical development of intracranial pressure reduction, descriptive and historical-analytical methods were used. Data were collected from archaeological skull specimens, early medical texts, and historical clinical observations related to head trauma and cranial decompression. The analysis focused on the transformation of trepanation from ritualistic practice to a therapeutic method aimed at relieving brain compression. Additionally, the study reviewed the emergence of physiological concepts of intracranial pressure and the development of surgical and conservative methods used for its reduction.

The methodology for studying cranial operations was based on a retrospective analysis of historical surgical sources and material evidence. Ancient, medieval, and early modern texts describing skull-opening procedures were examined alongside osteological findings demonstrating surgical intervention and postoperative survival. Comparative analysis was employed to evaluate changes in surgical techniques, instruments, and indications for cranial operations over time. This approach enabled a systematic assessment of the progression from early trepanation to modern craniotomy and decompressive cranial procedures.

Conclusion: The evolution of surgical practices depends on three main factors: the development of knowledge of anatomy and physiology, the fight against infections (antiseptics/antibiotics) and technological inventions (anesthesia, diagnostics, microinstruments, robotics). It is clear that in the future, artificial intelligence, bioprinting and individualized therapies will further improve surgical practice.

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