History and Careers

Brief History of European Surgery: A Coloproctology Perspective

Breve História da Cirurgia Europeia: A Visão da Coloproctologia

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ABSTRACT

The field of colorectal surgery has evolved over the millennia, shaped by the continuous interplay of cultural values, anatomical discoveries, and technological advances. From the ancient Egyptian papyri that detailed anorectal conditions and therapeutic enemas to the empirical innovations of Greek and Roman physicians, the early approach to surgery was curious yet pragmatic. Although classical medicine introduced the principles of observation and rationality, surgical practice was still limited by pain and infection. Throughout history, anorectal disease has remained a concern, even during periods of stagnation such as the Middle Ages. While institutions in Europe declined, knowledge was preserved in monasteries and advanced in Islamic centers of learning. Figures such as Albucasis made significant contributions to surgical technique and instrumentation during this period. The Renaissance reignited anatomical study and repositioned surgery within academic medicine. Landmark contributions, such as those of Andreas Vesalius, challenged long-standing dogma and laid the foundations for modern approaches.

By the 19th century, the advent of anesthesia and antisepsis had transformed surgery into a more precise, planned and humane practice. Institutions such as St Mark's Hospital were established, procedures were systematized and surgical outcomes improved. The 20th and 21st centuries have witnessed a technological revolution. Innovations such as laparoscopic and robotic surgery, surgical staplers and artificial intelligence have broadened the scope of surgery. Today, coloproctology focuses not only on effective treatment but also on functional preservation, personalized care, and improving patients' quality of life. Colorectal surgery exemplifies how

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medicine evolves in response to knowledge, necessity and compassion, transforming ancient techniques into sophisticated, patient-centered interventions.

Keywords: Colorectal Surgery/surgery; History of Medicine

RESUMO

O campo da cirurgia colorretal evoluiu ao longo dos milénios, moldado pela interação contínua de valores culturais, descobertas anatómicas e avanços tecnológicos. Dos antigos papiros egípcios que detalhavam as condições anorretais e os enemas terapêuticos às inovações empíricas dos médicos gregos e romanos, a abordagem inicial à cirurgia era curiosa, porém pragmática. Embora a medicina clássica tenha introduzido os princípios da observação e da racionalidade, a prática cirúrgica ainda era limitada pela dor e pela infeção. Ao longo da história, a doença anorretal permaneceu uma preocupação, mesmo durante períodos de estagnação como a Idade Média. Enquanto as instituições na Europa declinavam, o conhecimento era preservado em mosteiros e avançado em centros islâmicos de ensino. Figuras como Albucasis fizeram contribuições significativas para a técnica e instrumentação cirúrgica durante esse período. O Renascimento reacendeu o estudo anatômico e reposicionou a cirurgia na medicina académica. Contribuições marcantes, como as de Andreas Vesalius, desafiaram dogmas de longa data e lançaram as bases para abordagens modernas.
No século XIX, o advento da anestesia e da antissepsia transformou a cirurgia em uma prática mais precisa, planejada e humana. Instituições como o Hospital St. Mark foram estabelecidas, procedimentos foram sistematizados e os resultados cirúrgicos melhoraram. Os séculos XX e XXI testemunharam uma revolução tecnológica. Inovações como a cirurgia laparoscópica e robótica, grampeadores cirúrgicos e inteligência artificial ampliaram o escopo da cirurgia. Hoje, a coloproctologia se concentra não apenas no tratamento eficaz, mas também na preservação funcional, no atendimento personalizado e na melhoria da qualidade de vida dos pacientes.
A cirurgia colorretal exemplifica como a medicina evolui em resposta ao conhecimento, à necessidade e à compaixão, transformando técnicas ancestrais em intervenções sofisticadas e centradas no paciente.

Palavras-chave: Cirurgia Colorretal/história; História da Medicina

INTRODUCTION

The practice of colorectal surgery dates back to antiquity, with early records describing anal procedures. Over the centuries, the field has evolved to encompass advanced laparoscopic and robotic techniques. The history of colorectal surgery reflects scientific progress as well as cultural, technological and epistemological changes that have shaped surgical practice. This article provides a brief historical overview of medicine from a coloproctological perspective, highlighting key milestones, technological advancements, and paradigm shifts in understanding and treating colorectal conditions.

ANCIENT EGYPT

Even before Hippocrates was recognized as the father of medicine, the ancient Egyptians practiced a highly structured form of medical care. Their contributions include the early documentation of anorectal conditions and the first known references to this anatomical region.[1]

Several papyri survive from ancient Egypt, fourteen of which are considered scientific treatises covering anatomy, physiology, diagnosis, prognosis and treatment. The Edwin Smith, Ebers and Chester Beatty VI papyri are of particular relevance to surgery. Dated to around 1600 BCE, the Edwin Smith Papyrus is widely regarded as the earliest surgical manual in human history. It presents 48 clinical cases with detailed descriptions and a logical structure that anticipates the scientific method. The text demonstrates a rational, empirical approach to medicine, emphasizing physical examination, diagnosis, and therapy. It is believed to be a copy of an earlier text attributed to Imhotep, the architect of the first pyramid and a renowned physician.[2]

In the context of colorectal surgery, the Chester Beatty VI Papyrus is especially notable. Entirely dedicated to anorectal diseases, it describes conditions that correspond to modern ailments such as anal itchiness, perianal abscesses, rectal prolapse and hemorrhoids. Recommended treatments include the rectal administration of substances such as honey, salt, human milk and myrrh.[3]

Some historical and mythological accounts describe the existence of figures referred to as "Guardians of the Anus" or officials dedicated to rectal care in ancient Egypt, allegedly

Figure 1. Chester Beatty VI Papyrus.

Source: Meisterdrucke, The Chester Beatty Medical Papyrus, New Kingdom, c.1200 BC[5]

responsible for administering enemas with reed tubes. These reports, however, are not supported by robust academic evidence and should be interpreted cautiously. Thoth, the Egyptian god of wisdom, is at times mentioned in ritual contexts, where his beak is symbolically represented as an instrument, reinforcing the idea of purification.[4]

Despite their advanced knowledge of anatomy and embalming, their understanding of abdominal function in the living body remained limited. Nevertheless, the papyri document symptoms such as abdominal pain, constipation and distension, indicating an empirical grasp of gastrointestinal pathology.

CLASSICAL GREECE

As the Egyptian civilization declined, the center of medical knowledge shifted to Ancient Greece, where medicine moved away from magical and religious beliefs, adopting an approach based on observation and rational analysis. A key figure in this transition was Hippocrates of Kos in the 5th century BCE. Regarded as the father of Western medicine, he argued that diseases had natural and observable causes, thus laying the foundations of scientific medicine.

Hippocrates's legacy is preserved in the Corpus Hippocraticum, a collection of texts including detailed descriptions of gastrointestinal disorders. These texts provide dietary guidance and recommendations on intestinal hygiene using enemas, as well as outlining basic surgical procedures informed by anatomical knowledge.

Management of anal fistulas in this period showed notable innovation. Linen threads and horsehair soaked in fat were inserted into the fistula tract to promote drainage, an early precursor to the modern seton, named after the Latin word for bristle, seta.[6]

Greek physicians also used instruments such as specula and cauteries made of bronze or iron. Despite the absence of anesthesia and limited understanding of infection, surgical procedures demonstrated a sound knowledge of anatomy and practical skill developed through observation and, later, dissection.[7]

During the Hellenistic period, the medical school of Alexandria, with notable figures such as Herophilus and Erasistratus, pioneered the systematic dissection of human cadavers. Although controversial, these practices enabled accurate anatomical descriptions and supported more precise surgical interventions, despite the technical limitations of the time.[8]

The rational organization of medical knowledge in Greek medicine established the first theoretical and practical principles of colorectal surgery. The human body was viewed as a natural system that could be studied and intervened in. This perspective, coupled with the organization of medical schools and a rigorous written tradition, paved the way for clinical medicine to flourish across the Western world.

ROMAN PERIOD

Inheriting the Greek tradition, Roman civilization incorporated medicine into civil and military life, establishing its practical and institutional role. While the Greeks established the theoretical basis for rational medicine, the Romans built on this knowledge and applied it in the service of the Empire. Public health, hygiene and medicine became central to Roman society.

This pragmatic approach also benefited colorectal surgery. Rome excelled in the construction of sanitary infrastructure, such as public baths, aqueducts, latrines and sewage systems, which promoted collective health and enabled medical observation and intervention. Running water and shared hygiene facilities demonstrated an understanding of the importance of defecation and anorectal hygiene for overall health and well-being.

A notable figure from this period was Claudius Galen, a Greek physician from the 2nd century who was the personal physician to Emperor Marcus Aurelius. Galen systematized contemporary medical knowledge by combining Hippocratic principles with clinical experience. His anatomical observations, based on animal dissection as dissection of human cadavers was prohibited, included descriptions of the colon and rectum. Although some of his ideas are now outdated, his influence persisted for over a millennium.[9]

In colorectal care, the Romans combined basic surgical techniques with strict hygiene practices. Instruments such as specula, probes, and cauteries were used to treat hemorrhoids, fistulas, and anorectal abscesses. Treatment focused on removing visible sources of pain or infection through incision, drainage, or cauterization, despite the lack of anesthesia and understanding of microbiology. In public latrines, which were common in cities and military camps, the tersorium, a sponge on a stick soaked in vinegar or saltwater, was used for post-defecation hygiene, demonstrating the integration of anorectal care into daily life.[10]

Military medicine also played a significant role. Roman surgeons treated abdominal and perineal injuries caused by warfare. Opening the abdominal cavity was usually avoided due to the high mortality rate associated with it. Nevertheless, Galen recognized the danger of intra-abdominal fecal contamination, describing penetrating colon wounds as frequently fatal.

Rome preserved and applied Greek medical knowledge in a systematic and functional manner. Medicine became part of urban and military routines and extended beyond the elite. Galen's work remained a dominant reference for centuries, even after the fall of the Empire. However, the collapse of the Roman order marked the beginning of a period of stagnation, during which time medical knowledge was mainly preserved through manuscript tradition.

MIDDLE AGES

Following the fall of the Western Roman Empire in the 5th century, Europe entered a period of political, social and economic instability that had a profound impact on medicine. The decline of urban areas, the shift to rural living, and the collapse of educational institutions led to a significant decline in scientific knowledge. Medical practice largely became the preserve of monasteries. Monks preserved and copied classical texts, often reinterpreting them through a Christian lens that viewed illness as a form of penance.[11]

Surgery was considered a lowly and impure craft, holding a marginal status. The abdominal cavity was considered sacrosanct, and surgical intervention was viewed with suspicion. Surgery was mainly performed by barber-surgeons, who were practical men with empirical training. Nevertheless, treatments for anorectal diseases such as hemorrhoids, fistulas and abscesses persisted. These included poultices, bloodletting, warm baths and enemas.

While medical knowledge in the West remained dormant, Islamic medicine flourished. Centers such as Baghdad, Córdoba, Damascus and Cairo became hubs of learning. Physicians such as Avicenna, Al-Razi and Albucasis built upon and organized Greco-Roman medical knowledge.

Albucasis, in particular, made significant contributions. His work Al-Tasrif gave systematic attention to surgery. He described techniques for treating anal fistulas and hemorrhoids and introduced the use of sheep gut as suture material, which was an innovation in intestinal surgery. He also developed specialized instruments for anorectal procedures. His writings were widely translated and had a strong influence on medieval European medicine. Maimonides, who practiced in Islamic Egypt, also advocated light diets and conservative treatments for hemorrhoids, thus anticipating a more holistic approach to intestinal health.[12]

By the late Middle Ages, classical knowledge had begun to re-emerge. Translation schools and the establishment of European universities, such as those in Salerno, Montpellier and Bologna, helped to revive medical education. Surgery, which had previously been considered inferior, was gradually

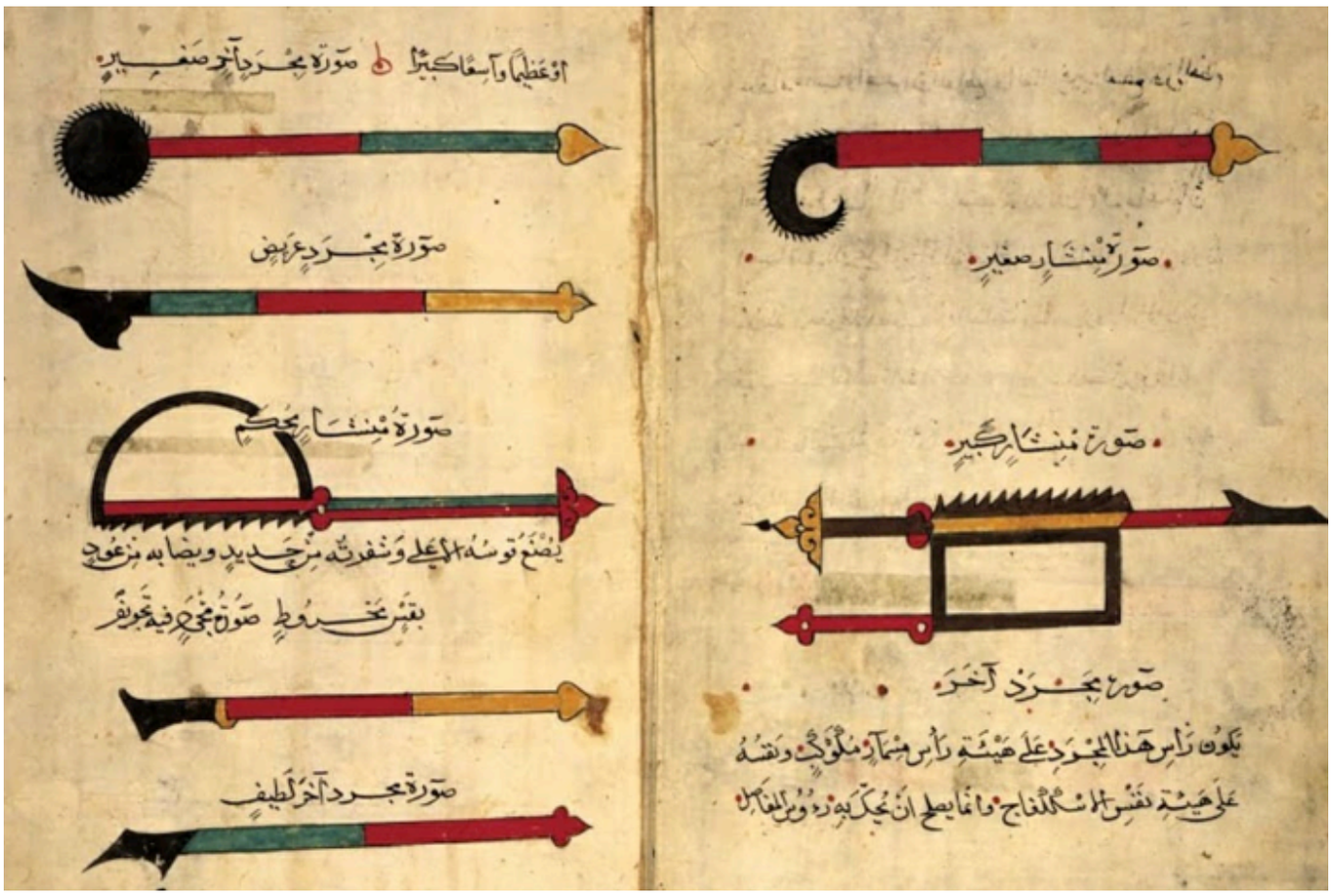

Figure 2. Al-Zahrawi surgical instruments.

Data sourced from: Heritage Times, Father of modern surgery: Al-Zahrawi[13]

reintegrated into formal education. Anatomical knowledge slowly began to be rediscovered.

However, abdominal surgery remained taboo in Europe due to high mortality rates and a lack of aseptic conditions. Conservative treatments such as purgatives, specialized diets and enemas were favored for treating abdominal disorders.

The Middle Ages were not a monolithic period of darkness, but rather a time of resilience, adaptation and intercultural exchange. Thanks to the preservation of knowledge in European monasteries and the scientific advances of Islamic cultures, our understanding of the digestive system survived.

FROM THE RENAISSANCE TO THE 19TH CENTURY

The Renaissance marked an intellectual and cultural awakening in Europe that also affected medicine. After centuries of religious and doctrinal restrictions, the human body became a subject of direct study, systematic observation and accurate representation once again. Gradually permitted and institutionalized, dissection corrected long-standing errors that had been inherited through the uncritical repetition of Galenic doctrine. This shift heralded a new empirical approach to anatomical knowledge.

Andreas Vesalius was a central figure in this period. In 1543, he published ***De humani corporis fabrica***, a landmark work of modern anatomy. For the first time, the human body was depicted with scientific precision and aesthetic value, breaking away from earlier models. Vesalius provided detailed illustrations of the gastrointestinal tract, including the large intestine and rectum. He described haustrations, flexures, the vascular relations of the colon and the morphology of the anal canal. All of these contributions laid crucial foundations for future colorectal surgery.[14]

Between the 16th and 18th centuries, surgery gradually shed its status as a mechanical trade formerly reserved for barbers and lay practitioners. It became a recognized discipline with

Figure 3. Instruments designed and used by Dr. Félix de Tassy for the anal fistula operation of Louis XIV in 1686.
Source: Colégio Brasileiro de Cirurgiões. The king's fistula and the recognition of surgery[16]

academic teaching and growing social prestige. Surgeons entered universities and royal courts, paying increased attention to anorectal diseases, which had previously been neglected.

A major turning point came in 1686 with the case of King Louis XIV of France. The monarch was suffering from a painful anal fistula and entrusted the operation to Charles-François Félix de Tassy. Recognizing the risks involved, Félix designed specialized surgical instruments and spent months studying anatomy and practicing on impoverished patients. The surgery, which was performed without anesthesia, reportedly lasted three hours and was successful. In return, Félix was awarded a noble title, 300 000 livres and a country estate. This event became famous in Versailles, where nobles would parade around in bandages, pretending to have undergone the same operation, as a show of loyalty to the king.[15]

Despite such achievements, abdominal surgery remained rare until the 19th century. It was considered a last resort due to the high risk of infection and the absence of anesthesia.

Throughout this period, treatments for hemorrhoids, fistulas and anorectal abscesses evolved. Though still rudimentary, these treatments became more refined. Cauterization, a long-standing practice, continued to be performed with greater precision and improved instruments. Surgeons such as Pierre Dionis in France and Lorenz Heister in Germany documented specific techniques for anal fistulas, including dilation, excision, ligature and the use of curved probes, specialized scalpels and progressive dilators.[17]

Academic medicine began to include the colon and rectum in medical textbooks. Anorectal symptoms were analyzed using a more scientific and less dogmatic approach, in line with Enlightenment thinking. Although not yet formally recognized, proctology was emerging as a technically demanding and autonomous field.

19TH CENTURY

The 19th century was a decisive turning point in the history of surgery. For the first time, surgery was now a possibility, as pain and infection, long-standing barriers to surgery, were no longer insurmountable. Surgery began to develop within a safer, more precise and scientifically grounded framework, which had a direct impact on the evolution of colorectal surgery.

The first major breakthrough came in 1846 with the introduction of general anesthesia, initially using ether and later chloroform. Pain was no longer an inevitable part of surgery, enabling longer procedures and more precise techniques.[18]

Figure 4. Drs. William James and Charles Horace Mayo performing surgery, circa early 1900s.

Source: International Museum of Surgical Science, Mayo Clinic anesthesia exhibition[24]

Soon after, aseptic technique transformed surgical practice. Inspired by Louis Pasteur's germ theory and implemented by Joseph Lister, the systematic disinfection of instruments, hands and wounds significantly reduced postoperative mortality rates. Together, anesthesia and asepsis ushered in the modern surgical era, replacing urgency with planning and precision.[19]

This new clinical environment enabled proctology to emerge as an independent medical specialty. Anorectal disease management, once the domain of empirical practitioners, entered academic and hospital-based medicine. Surgeons began to specialize in disorders of the rectum and anus, developing dedicated instruments and standardized evaluation methods.

Digital rectal examination and anoscopy became routine procedures. Documented and standardized procedures enabled technical training in hospitals and universities. The approach now aimed not only at treating disease, but also at preserving function and patient dignity.

The creation of intestinal stomas represented a major milestone in surgery. The first references to colostomy are attributed to Alexis Littré in 1710, who proposed performing an artificial anus in a newborn with an imperforate anus; however, the child did not survive.[20] Subsequent attempts followed, such as Dubois in 1783, but it was Pierre-Joseph Duret, in 1793, who is generally credited with the first successful colostomy, performed in a newborn who survived for many years. During the 19th century, colostomies became progressively more standardized and were increasingly adopted in the treatment of obstruction, trauma, and congenital anomalies.[21]

Ileostomies were described much later, with the first report credited to Baum in 1879. Early ileostomies, however, were associated with considerable morbidity, including high-output

stomas, severe peristomal skin irritation, dehydration, and electrolyte disturbances, which limited their widespread acceptance.[22]

Meanwhile, the first colectomies were performed. By the end of the century, surgeons such as Frederick Treves and William Mayo had systematized segmental colon resections and attempted the first methods of re-establishing intestinal continuity, despite technical limitations.[23]

In 1835, Frederick Salmon founded St Mark's Hospital in London, one of the first and most influential institutions dedicated to diseases of the colon and rectum. This center played an important role in the transition of colorectal surgery from an empirical practice to a structured medical discipline with academic, clinical, and research objectives.[25]

The 19th century thus represented a significant shift in colorectal surgery. Pain and infection ceased to be inevitable. Surgery became more planned and effective, and was built on solid foundations for the future development of the specialty.

THE MODERN ERA

The 20th century marked a period of unprecedented transformation. The introduction of antibiotics in the 1940s dramatically reduced the risk of postoperative infection, making surgery in high-risk areas, such as the colon and rectum, safer and more predictable.[26]

Coloproctology emerged as a recognized surgical specialty, supported by structured training programs, centers of excellence, and dedicated peer-reviewed publications. Surgical practice became evidence-based, following standardized protocols and a shared technical language.

Two figures stand out at the beginning of modern colorectal surgery. In 1908, William Ernest Miles introduced abdominoperineal resection for treating extraperitoneal rectal cancer. His technique incorporated oncological principles that remain relevant today. A few years later, Henri Hartmann in France developed an alternative approach, now known as the Hartmann procedure.[27]

During the same century, further innovation came with Bryce Brooke's description of the everted ileostomy in 1952 at St Mark's Hospital, London. By maturing the bowel with three everting ("tripartite") sutures opposite the mesentery, Brooke created a projected stoma that reduced peristomal complications and established the basis of modern ileostomy practice.[28]

This period also saw major advances in surgical instrumentation. Manual anastomoses, which were once time-consuming and technically demanding, were replaced by mechanical devices. In 1908, Hümér Hüttl, an Austro-Hungarian surgeon, created one of the first surgical staplers. In the 1950s and '60s, Soviet models built on this design to enable simultaneous cutting and stapling.[29]

Traditional electrocautery has been replaced by energy-based devices such as bipolar energy and ultrasonic devices, which allow for more precise dissection, less bleeding and shorter operative times.[30]

Laparoscopy represented one of the most significant surgical revolutions of the century. Offering minimally invasive access with smaller incisions, less postoperative pain, and quicker recovery, laparoscopic techniques became increasingly common in the early 1991s. In June of 1991, American surgeon Moises Jacobs performed the first laparoscopic colectomy in Miami, Florida, marking the beginning of minimally invasive colorectal surgery.[31]

In the United Kingdom, at the end of the 20th century, Richard J. Heald developed total mesorectal excision (TME), a technique that removes the mesorectum entirely and drastically reduces local recurrence in rectal cancer. Heald summarized the philosophy of the procedure: "If we respect the anatomy, it will guide us to the ideal treatment."[32]

In the early 2000s, Professor Werner Hohenberger from Erlangen, Germany, introduced the concept of complete mesocolic excision for the surgical treatment of colon cancer. This technique was inspired by the principles of TME, which had demonstrated significant improvements in oncologic outcomes.[33]

Robotic surgery was the next logical step. In 2002, Weber performed and documented the first robotic colectomy at Hackensack University Medical Center in New Jersey, USA. The following year, Pier Giulianotti performed and described the first robotic low anterior resection at Misericordia Hospital in Grosseto, Italy. Since then, robotic surgery has become a key reference point, offering three-dimensional vision, micrometric precision and improved preservation of urinary and sexual function.

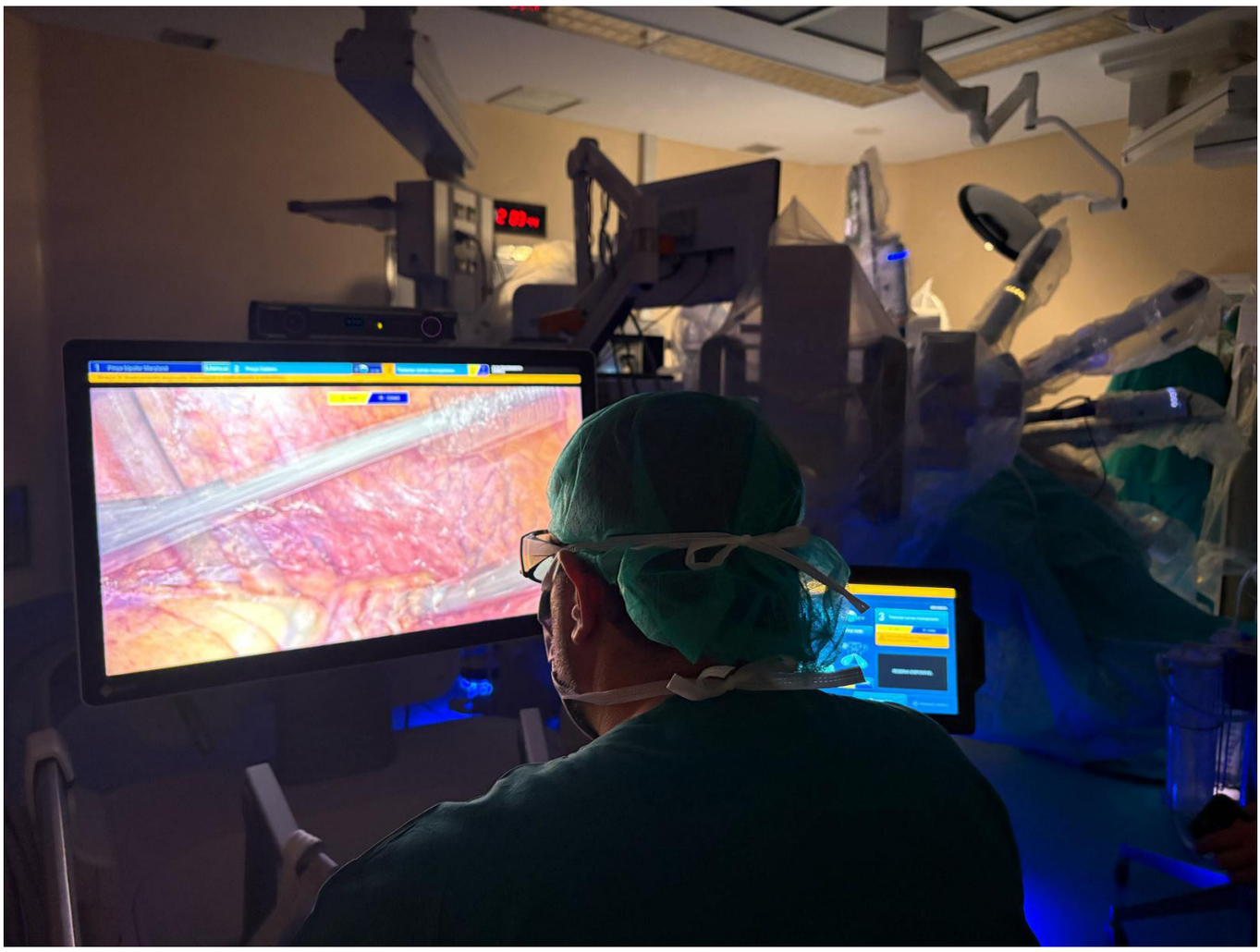

Figure 5. Robotic colorectal surgery in practice (original photograph captured by the authors).

Artificial intelligence is beginning to support surgical planning with algorithms that analyze imaging, estimate risks and help select the best therapeutic strategy. Three-dimensional printing enables the creation of personalized anatomical models for training and preoperative planning. Augmented reality and intraoperative navigation systems overlay radiological images onto the surgical field, thereby increasing procedural accuracy.

Beyond technical innovation, the 21st century has redefined how care is delivered. Medicine is now centered on the patient. In colorectal surgery, genetic knowledge and individual preferences are incorporated to deliver safer, more effective and personalized interventions.

CONCLUSION

Colorectal surgery in the 21st century represents the culmination of centuries of accumulated knowledge with the power of emerging technologies. From the use of rudimentary bamboo tubes in ancient Egypt to the micrometric precision of robotic-assisted arms, this surgical specialty exemplifies the continuous evolution of medical practice driven by human curiosity, innovation, and compassion.

Today, coloproctology extends beyond disease treatment. It aims to preserve patient dignity, safeguarding quality of life, and honoring the human body as an essential and inseparable aspect of personal identity.

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SF: Supervision and guidance, language revision, critical review.
FS: Literature search, critical review.
CSA: Literature search.
MA and DJ: Supervision and guidance.
TP and RE: Supervision and Guidance, critical revision for intellectual content.
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FS: Pesquisa bibliográfica, revisão crítica.
CSA: Pesquisa bibliográfica.
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REFERENCES

1. Chen TS, Chen PS. Gastroenterology in ancient Egypt. J Clin Gastroenterol. 1991;13:182-7. doi: 10.1097/00004836-199104000-00013
2. Nunn JF. Ancient Egyptian medicine. Norman: University of Oklahoma Press; 1996.
3. Banov L. The Chester Beatty medical papyrus: the earliest known treatise completely devoted to anorectal diseases. St. Louis: C.V. Mosby; 1965.
4. Maksimović J, Maksimović M. From history of proctology. Arch Oncol. 2013;21:28-33. doi: 10.2298/AOO1301028M.
5. Meisterdrucke. The Chester Beatty Medical Papyrus, New Kingdom, c.1200 BC [Internet]. Egyptian 19th Dynasty; [cited 2025 Apr 10]. Available from: https://www.meisterdrucke.uk/fine-art-prints/Egyptian-19th-Dynasty/374808/The-Chester-Beatty-Medical-Papyrus,-New-Kingdom,-c.1200BC.html
6. Daikos GK. History of medicine: our Hippocratic heritage. Int J Antimicrob Agents. 2007;29:617-20. doi: 10.1016/j.ijantimicag.2007.01.008.
7. Bliquez LJ. The tools of Asclepius: surgical instruments in Greek and Roman times. (Studies in Ancient Medicine, vol. 43). Leiden: Brill; 2014.
8. Bynum W. História da medicina. São Paulo: Editora Contexto; 2011.
9. Mansur S. The study of Claudius Galen as a source of knowledge of human anatomy. Khronos. 2019;17. doi: 10.11606/khronos.v0i7.159295.
10. Charlier P, Brun L, Prêtre C, Huynh-Charlier I. Toilet hygiene in the classical era. BMJ. 2012;345:e8287. doi: 10.1136/bmj.e8287.
11. Graney MJ, Graney CM. Colorectal surgery from antiquity to the modern era. Dis Colon Rectum. 1980;23:432-41. doi: 10.1007/BF02553684.

12. Albucasis (Abu al-Qasim al-Zahrawi). On surgery and instruments. Spink MS, Lewis GL, translators. London: Kegan Paul International; 2008. Original work published in the 11th century.

13. Heritage Times. Father of modern surgery: Al-Zahrawi [Internet]. Heritage Times; [cited 2025 May 2]. Available from: https://www.heritagetimes.in/father-of-modern-surgery-al-zahrawi

14. Brenna CTA. Post-Mortem Pedagogy: A Brief History of the Practice of Anatomical Dissection. Rambam Maimonides Med J. 2021;12:e0008. doi: 10.5041/RMMJ.10423.

15. Jørum E. The Sun King's anal fistula. Tidsskr Nor Laegeforen. 2016;136:1244-7. doi: 10.4045/tidsskr.15.0312.

16. Colégio Brasileiro de Cirurgiões. The king's fistula and the recognition of surgery [Internet]. Rio de Janeiro: CBC; 2025. [cited 2025 Apr 25]. Available from: https://cbc.org.br/a-fistula-do-rei-e-o-reconhecimento-da-cirurgia/

17. Tubbs RS, Loukas M. Pierre Dionis (1643–1718): surgeon and anatomist. Singapore Med J. 2009; 50:449.

18. Rezende JM. Breve história da anestesia geral. In À sombra do plátano: crônicas de história da medicina. São Paulo: Editora Unifesp; 2009. p.103-9.

19. Michaleas SN, Laios K, Charalabopoulos A, Samonis G, Karamanou M. Joseph Lister (1827–1912): A Pioneer of Antiseptic Surgery. Cureus. 2022;14:e32777. doi:10.7759/cureus.32777

20. Schärli WF. The history of colostomy in childhood. Prog Pediatr Surg. 1986;20:188-98. doi: 10.1007/978-3-642-70825-1_14.

21. Garmanova TN, Kazachenko EA, Krylov NN. History of surgery: the evolution of views on the formation of intestinal stoma. Hist Med. 2019;6:111-7. doi: 10.17720/2409-5834.v6.2.2019.07g.

22. Mithany RH, Shahid MH, Shahid R, Hannan A, Gill MU, Aslam S. Ileostomy 101: understanding the basics for optimal patient care. Cureus. 2023;15:e46822. doi: 10.7759/cureus.46822.

23. Raffensperger JG. Dr. Will and Dr. Charlie: William James Mayo (1861–1938) and Charles Horace Mayo (1865–1939). Hektoen Int. 2020. [cited 2025 Apr 25]. Available from: https://hekint.org/2020/10/08/dr-will-and-dr-charlie-william-james-mayo-1861-1938-and-charles-horace-mayo-1865-1939/

24. International Museum of Surgical Science. Mayo Clinic anesthesia exhibition [Internet]. Chicago: IMSS; [cited 2025 Jun 15]. Available from: https://imss.org/mayo-clinic-anesthesia-exhibition/

25. Dukes CE. Frederick Salmon: Founder of St. Mark's Hospital, London. Med History. 1959;3:312–6. doi:10.1017/S0025727300024819

26. Fry DE. The prevention of surgical site infection in elective colon surgery. Scientifica. 2013;2013:896297. doi: 10.1155/2013/896297.

27. Campos FG. The life and legacy of William Ernest Miles (1869-1947): a tribute to an admirable surgeon. Rev Assoc Med Bras. 2013;59:181-5. doi: 10.1016/j.ramb.2012.09.001.

28. Marsh P, Clark JS. The spouted colostomy. Ann R Coll Surg Engl. 2007;89:78. doi: 10.1308/003588407X160783.

29. Akopov A, Artioukh DY, Molnar TF. Surgical staplers: the history of conception and adoption. Ann Thorac Surg. 2021;112:1716-21. doi: 10.1016/j.athoracsur.2021.03.107.

30. Sutton C, Abbott J. History of power sources in endoscopic surgery. J Minim Invasive Gynecol. 2013;20:271-8. doi: 10.1016/j.jmig.2013.03.001.

31. Jacobs M, Verdeja JC, Goldstein HS. Minimally invasive colon resection (laparoscopic colectomy). Surg Laparosc Endosc. 1991; 1:144-50.

32. Heald RJ, Husband EM, Ryall RDH. The mesorectum in rectal cancer surgery—the clue to pelvic recurrence? Br J Surg. 1982;69:613-6. doi: 10.1002/bjs.1800691019.

33. Hohenberger W, Weber K, Matzel K, Papadopoulos T, Merkel S. Standardized surgery for colonic cancer: complete mesocolic excision and central ligation—technical notes and outcome. Colorectal Dis. 2009;11:354-64. doi: 10.1111/j.1463-1318.2008.01735.x.