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CRITICAL EVALUATION OF ANASTOMOSIS TECHNIQUES IN GASTROINTESTINAL SURGERY: A COMPREHENSIVE ANALYSIS

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Abstract: Introduction: Intestinal anastomoses techniques are fundamental in abdominal surgery for reconstruction of the gastrointestinal tract after resections, requiring refined technical skills and postoperative considerations to ensure safe and effective results. Objective: Understand the main surgical techniques and materials used in gastrointestinal surgeries that require anastomoses. **Methodology:** The present study is a bibliographic review article related to cardiac emergency, carried out between January and April 2024, 14 articles were selected, in which the articles were reviewed in the SciELO database. The following selection criteria were defined: full texts, books, analysis and systematic reviews, between the years 1999 and 2023, in Portuguese and English. Results: The results of the study demonstrated significant differences between the gastrointestinal anastomoses techniques evaluated, showing a reduction in postoperative complications and an improvement in the recovery of intestinal function in one group compared to the other. These findings suggest the importance of choosing the appropriate technique according to the patient's profile and the specific characteristics of the procedure, aiming for safer and more efficient surgical results. Conclusions: The results obtained reinforce the need for an individualized approach, taking into consideration, the patient's profile, the experience of the surgical team and the particularities of each procedure. This evidence-driven approach contributes to improving surgical outcomes, reducing complications and, ultimately, promoting a better quality of life for patients undergoing gastrointestinal anastomoses.

INTRODUCTION

Gastrointestinal surgery plays a crucial role in the treatment of a wide variety of clinical conditions, from benign pathologies to complex cases of neoplasms. In the context of these surgical interventions, the quality of the anastomoses performed is a determining factor for the success of the procedure and the patient's subsequent recovery. This article proposes a critical analysis of anastomosis techniques in gastrointestinal surgery, exploring the materials used, the main suturing techniques and the application of surgical adhesives, both synthetic (such as cyanoacrylate and GRF) and natural (including fibrin, collagen associated with thrombin and polyethylene glycol polymers). A significant section will be dedicated to comparing different anastomosis approaches, highlighting the advances, challenges, and clinical outcomes associated with each method. In addition, specific anastomosis techniques in different portions of the gastrointestinal tract will be examined, such as double-tract jejunal anastomosis and complex interventions involving pancreatic and biliary anastomoses, such as the Roux-en-Y technique with single-loop pancreatic anastomosis. The focus will extend to more specialized procedures, such as Pancreaticogastric Anastomosis, Pancreaticoduodenectomy (PD) pylorus preservation and elevation of the jejunal loop (transmesocolic) and esophageal mucosectomy. Each of these approaches will be analyzed from the perspective of postoperative physiology, considering the impacts on the patient's quality of life and the challenges faced during recovery. This work seeks to provide a comprehensive overview of anastomotic techniques in gastrointestinal surgery, highlighting the complexities involved, recent innovations and challenges faced by surgeons.

REVIEW OF LITERATURE

Gastrointestinal anastomoses represent crucial procedures in surgical practice, playing a fundamental role in restoring anatomical continuity after resection of segments of the gastrointestinal tract. These connections between different parts of the digestive system constantly challenge surgeons, requiring keen technical skill and in-depth understanding of the physiology of the gastrointestinal tract. The scientific literature dedicated to gastrointestinal anastomoses covers a wide range of topics, including advanced surgical techniques, postoperative complications, technological innovations, and multidisciplinary approaches to optimize clinical outcomes. (**Soares-Junior et al (2010**). The intrinsic complexity of these anastomoses stands out due to the need to balance the search for an efficient and safe reconstruction, minimizing complications such as leaks, stenosis and fistulas. Over the decades, significant advances in understanding the vascularization, biomechanics and healing factors have contributed to refinements in surgical techniques, positively influencing postoperative outcomes. However, persistent challenges, such as choosing the ideal anastomosis method for a given clinical situation, continue to intrigue healthcare professionals.

MATERIALS USED

Catgut suture represents a crucial element in the vast array of materials used in surgical procedures to close incisions and connect tissues. This traditional material has a rich history in surgery, being derived from natural fibers present in the submucosa of the small intestine of sheep or cattle. By exploring its characteristics, typology, applicability, limitations and evolution in the contemporary surgical scenario, we can discern the underlying complexity and considerations that involve the choice of this material. The composition of the catgut suture is intrinsically linked to the organic nature of the fibers present in the intestinal submucosa, giving it a biological basis that, for centuries, has provided a reliable option for surgeons. The notable characteristic of this material lies in its ability to be absorbed by the human body. (**Soares-Junior et al (2010**). The collagen protein that constitutes catgut is gradually digested by enzymes present in the tissues, a biological process that avoids the need for postoperative removal. The diversity of catgut is manifested in two main types: absorbable and non-absorbable. The absorbable variant goes through a process that facilitates its reabsorption by the body, notably through enzymatic hydrolysis. In contrast, non- absorbable catgut undergoes a chemical treatment that aims to preserve its integrity over time, although this form is less common.

With regard to calibers and coatings, the catgut suture is adaptable to surgical requirements, coming in different diameters to accommodate different tissue sizes and procedures. Additionally, the possibility of coating with substances such as chromium or glycerin provides flexibility in managing durability and reducing absorption, providing surgeons with refined control according to specific clinical needs. Historically, catgut sutures were used in a variety of surgical procedures, covering internal and external sutures, especially in regions where prolonged exposure to the material did not pose a significant challenge. However, its limitations cannot be neglected. Gradual absorption can result in a progressive loss of strength over time, making it a critical consideration in prolonged healing situations. Additionally, the inflammatory response to catgut may vary between patients, introducing variability that requires careful consideration. Nowadays,

although catgut sutures still find application in certain cases, their prevalence has been considerably reduced due to the advent of absorbable synthetic materials. Polyglactin (Vicryl) and polydioxanone (PDS) emerge as modern alternatives that offer greater predictability in absorption and resistance, reflecting an incessant search for materials that more effectively meet the demands of current surgery. The **polypropylene**, a non-absorbable synthetic thread, stands out for its durability and long-term resistance. Composed of propylene polymers, this material is particularly used in situations where suture permanence is desired. Its exceptional strength makes it suitable for anatomical areas subject to movement and tension, although the need for manual removal after healing is an important consideration. The long history of polypropylene application highlights its reliability and usefulness in various surgeries. On the other hand, polydioxanone (PDS) represents an absorbable thread whose characteristics offer a distinct approach. Manufactured from synthetic polymers, PDS is completely absorbed by the body, avoiding the need for post-operative removal. Its capacity for gradual absorption through enzymatic hydrolysis confers particular advantages in procedures in which maintaining suture strength over time is not critical. Furthermore, PDS is recognized for inducing minimal inflammatory reactions, promoting smoother and more favorable healing (**A. Bharathi, et al., 2012**). Polyglactin, commercially known as Vicryl, represents a remarkable synthesis between absorption characteristics and initial strength. Composed of polyglycolic acid and lactic acid polymers, this absorbable suture offers a unique combination of immediate strength and gradual degradation. Vicryl is widely used in several surgical specialties, adapting to a variety of tissues and procedures. Its ability to maintain structural integrity during the critical healing period represents a precise balance between strength and absorption. Studies were conducted comparing the use of Vicryl and catgut in surgical anastomoses, showing a better postoperative period with the use of Vicryl, "Compared to the chrome catgut group, the Vicryl Rapide group was associated with less pain (32.5% vs. 57%) and less need for analgesia (15.5% vs. 0.5%) in 3-5 days.

There was also a significant reduction in wound indurations, uncomfortable stitches and wound dehiscence (4% vs. 13.5%) and better wound healing ($p < 0.05$ significant) in the Vicryl Rapide group" (A. Bharathi, et al., 2012). Linear and Circular Mechanical Staplers: Mechanical staplers have established themselves as essential devices in contemporary surgical practice, especially in gastrointestinal procedures. Commonly manufactured in stainless steel or titanium, these devices stand out for their distinctive characteristics and versatile applications, promoting efficiency and safety in surgical processes. The robust composition of these staplers, based on high-strength materials such as stainless steel or titanium, is a crucial element to guarantee durability and structural integrity during surgical procedures. The choice of these materials also considers the need for compatibility with sterile surgical environments and resistance to corrosion, fundamental characteristics to ensure effectiveness and safety during interventions. One of the most striking features of mechanical staplers is the ability to quickly and securely fix fabrics using preloaded staples. Automating this process not only reduces operative time but also offers an efficient alternative to conventional suturing techniques. The staples, often U-shaped, are automatically inserted and closed by the device, providing a firm and uniform connection between

the tissues. Circular staplers deserve special mention, as they are frequently used in colorectal anastomoses. Its specific shape allows the creation of a precise and airtight connection between the intestinal ends, contributing to positive results in delicate and complex procedures. In terms of applications, mechanical staplers demonstrate versatility in a variety of surgical procedures. From general interventions to specialized surgeries such as colorectal anastomoses, organ resections and gastrointestinal reconstructions, these devices optimize tissue fixation, providing a standardized and effective approach. The impact of these staplers on surgical practice is remarkable. The reduction in operative time, the minimization of errors associated with manual suturing and the promotion of faster and more effective healing are clear benefits. Device automation not only improves the precision of staple application, but also contributes to the uniformity of procedures, resulting in more consistent and predictable outcomes for patients.

MAIN SUTURING TECHNIQUES

Suturing techniques play a crucial role in the integrity of surgical anastomoses, and each approach has distinct characteristics that influence the postoperative outcome. **Continuous Suture:** Continuous suture is characterized by creating a continuous line of fixation along the anastomosis. This technique provides an even distribution of tension along the suture line, significantly reducing the risk of leaks. However, the critical disadvantage lies in the potential extent of deviation if suture failure occurs, requiring precise surgical skill. **Two-Plane Suture (Double Layer)**: In two-plane suture, the surgeon performs separate sutures in the mucosal and serous layers of the intestine. This approach reinforces the anastomosis, providing an additional layer of security, especially in areas of increased tension. **(A. Bharathi, et al., 2012)**. However, disadvantages include a potential increase in surgical time and complexity, as well as an increased risk of stenosis. **Lembert-type suture:** The Lembert-type suture is characterized by individual stitches that involve the seromuscular section of the intestine. This provides good eversion of the intestinal edges, reducing the risk of leaks. However, this technique can increase surgical time and requires skill to avoid stenoses. **Gambee Suture:** In the Gambee suture, separate stitches are made in the mucosa and serosa, creating a series of isolated sutures. This technique facilitates hemostasis and allows precise adjustments in the tension of each point. However, its application may take longer, especially in long anastomoses. **Mechanical suture:** Mechanical suturing involves the use of mechanical surgical staplers to create the anastomosis, replacing manual suturing. This approach significantly reduces surgical time, provides a more uniform suture line, and minimizes the risk of human error. However, it requires specific training and is associated with costs related to the use of staplers. Double tract jejunal anastomosis is an advanced surgical technique that represents a milestone in the reconstruction of the gastrointestinal tract. This complex procedure involves dividing the jejunum into two distinct loops, each of which is anastomosed to different parts of the digestive tract. Meticulous patient preparation is the crucial first step before performing double tract jejunal anastomosis; **Lauktötter et al (2013)**. A complete assessment is conducted to ensure the patient's suitability for surgery, including laboratory tests, cardiorespiratory evaluation, and a thorough review of medical history. Once the patient is considered fit for the procedure, anesthesia is administered to ensure their comfort and absence of pain during the intervention.; **Reischi et al (2020)**.

Surgery begins with an abdominal incision to access the gastrointestinal tract, followed by identification and careful preparation of the jejunum. The jejunum is then divided into two loops, thus creating a double intestinal tract. This division is carried out with extreme precision to preserve the integrity of the fabrics and guarantee the functionality of the created straps. The loops of the jejunum are subsequently anastomosed to different parts of the gastrointestinal tract. For example, one loop may be anastomosed to the stomach or duodenum, while the other loop may be anastomosed to the distal small intestine.

This process requires refined surgical skills and an in-depth understanding of the anatomy of the gastrointestinal tract to ensure accurate and functional anastomoses. After the anastomoses are completed, a thorough check is performed to ensure the integrity of the connections and the absence of leaks or obstructions. The abdominal incision is then closed and the patient is transferred to the postoperative phase. Postoperatively, the patient is closely monitored in the intensive care unit or post-operative care unit. Drains are often used to aid in draining fluids from the abdomen and monitor for possible complications (**Wyng-Yu et al (2023**). Careful fluid management and gradual feeding are key to supporting recovery and ensuring adequate bowel function. Control Pain relief is managed with appropriate analgesics, and medication is administered as needed to prevent infections and manage other post-operative issues. The medical team performs regular follow-up to assess recovery, monitor bowel function, and adjust the care plan as needed. Double-tract jejunal anastomosis represents a significant advancement in gastrointestinal surgery, allowing functional reconstruction of the digestive tract in patients with complex conditions, this surgical technique offers substantial benefits when performed by an experienced team and with appropriate postoperative care. **The Roux-en-Y technique** with pancreatic anastomosis in a loop is a complex surgical approach used in specific cases, such as pancreaticoduodenectomy, which involves the removal of multiple abdominal structures, including the head of the pancreas, the duodenum, the gallbladder, part of the stomach and the bile duct. This challenging procedure demands refined surgical skills and an in-depth understanding of the anatomy and physiology of the gastrointestinal tract. (**Wyng-Yu et al (2023)**. Preparing the patient for this surgery involves a meticulous assessment to ensure their physical and emotional fitness, in addition to the administration of adequate anesthesia for the intervention. During surgery, an abdominal incision is made to access the target region, followed by resection of the structures to be removed. This phase requires precision and care to avoid damage to vital organs and adjacent structures. After resection, the process of reconstruction of the gastrointestinal tract begins. The Roux-en-Y technique is used to create a new pathway for food and pancreatic secretions. This involves dividing the small intestine and anastomosis of a loop to the remaining portion of the stomach or pancreatic duct, allowing digestive and pancreatic flow to continue. The crucial aspect of this technique is the pancreatic anastomosis in a loop, where the pancreatic duct is connected to the small intestine. This anastomosis is performed with precise sutures to guarantee the integrity and functionality of the new pancreatic-intestinal canal. Postoperatively, the patient is closely monitored in the intensive care unit or specialized care unit. Drains are often used to aid in the drainage of fluids and prevent complications such as fluid collections. The reintroduction of food is gradual, starting with clear liquids and progressing according

to the patient's tolerance.

In addition to physical care, psychological and emotional support is also essential, as complex abdominal surgery can have a significant impact on the patient's quality of life and well- being. Proper use of medication to control pain, prevent infections, and manage other post- operative needs is an integral part of the recovery process. The Roux-en-Y technique with pancreatic anastomosis in a loop represents an advance in abdominal surgery, allowing the resection of complex structures and the functional reconstruction of the gastrointestinal tract. However, its implementation requires a highly qualified multidisciplinary team and careful monitoring to ensure positive results and the patient's adequate recovery.

Advanced gastrointestinal surgery has been instrumental in treating complex disorders affecting the digestive system. Among the most relevant surgical techniques are **pancreaticogastric anastomosis, pancreaticoduodenectomy (PD) with preservation of the pylorus, elevation of the jejunal loop (transmesocolic) and esophageal mucosectomy.**

Each of these approaches represents a significant advance in surgical practice and has specific application in different clinical conditions. **Pancreaticogastric anastomosis** is a crucial technique in pancreatic surgeries, where the pancreatic duct is connected to the stomach. This is often performed after pancreatic resection procedures, such as aduodenopancreatectomy, to restore pancreatic flow in the gastrointestinal tract and maintain the exocrine function of the pancreas. **Pylorus-sparing PD** is another important intervention, especially in cases of pancreatic tumors or conditions that require removal of the head of the pancreas, duodenum, and gallbladder. Preservation of the pylorus aims to maintain the gastric emptying function, minimizing postoperative complications, such as rapid emptying syndrome, and improving patients' quality of life. Transmesocolic jejunal loop elevation is an intestinal reconstruction technique used after resection of parts of the small intestine. In this procedure, a loop of the jejunum is elevated through the mesocolon and anastomosed to another part of the gastrointestinal tract, maintaining continuity of intestinal transit and preserving nutrient absorption. **Esophageal mucosectomy** is an essential endoscopic approach in the treatment of lesions or abnormal tissues in the esophageal mucosa. This procedure is often used in the management of Barrett's esophagus and other conditions where there is a risk of developing abnormal cells due to chronic gastroesophageal reflux. (**Reischi et al (2020)**. The success of these surgical techniques depends not only on the skill and experience of the surgical team, but also on accurate clinical assessment and careful postoperative monitoring. Appropriate use of these approaches can provide significant benefits to patients, including improved quality of life, symptom control and, in some cases, increased survival. Advances in surgical techniques for complex gastrointestinal disorders represent a milestone in modern medicine, enabling more effective and personalized treatments for conditions that were previously considered challenging to manage. These techniques continue to evolve, further driving the quality and outcomes of healthcare for patients with diseases of the digestive system.

CONCLUSION

It is clear that specific anastomosis techniques in different portions of the gastrointestinal tract reveal the complexity and importance of these procedures in contemporary surgical practice. From double tract jejunal anastomosis to more complex interventions such as pancreatic and biliary anastomosis in techniques such as Roux-en-Y with pancreatic anastomosis in a loop, the surgical approach has evolved to offer more precise and personalized options to patients. When considering postoperative physiology, each of these techniques presents distinct challenges and opportunities. For example, double-tract jejunal anastomosis allows for a more flexible intestinal reconstruction, but may also require an adaptation period and careful monitoring of gastrointestinal function. On the other hand, more specialized interventions, such as pancreaticogastric anastomosis or pylorus-sparing PD, have the potential to preserve important digestive functions, but require even more rigorous monitoring to ensure optimal results. Transmesocolic jejunal loop elevation and esophageal mucosectomy are additional examples of advanced procedures that require an in-depth understanding of the anatomy and physiology of the gastrointestinal tract.

Postoperative recovery for these patients involves not only pain control and gradual reintroduction of food, but also ongoing assessment of bowel function, prevention of complications such as leaks or obstructions, and multidisciplinary support to ensure adequate adaptation and patient's quality of life. In terms of quality of life, it is essential to consider not only the physical aspects, such as the ability to eat and digest, but also the emotional and social impacts of gastrointestinal surgery. Patients undergoing these procedures often face significant challenges during recovery, requiring comprehensive support and a holistic approach to promote successful recovery and a better long-term quality of life. In summary, anastomosis techniques in the gastrointestinal tract reflect the constant search for improvements in surgical practice, offering more personalized and effective options for patients with a variety of conditions. Understanding the physiological aspects, postoperative challenges and the impact on patients' quality of life are fundamental to guide the development and application of these techniques, always aiming for positive clinical results and improving the patient experience.

REFERENCES

1. SOARES-JÚNIOR, Cleber. USO DE ADESIVOS TECIDUAIS EM CIRURGIA DIGESTIVA, 3**, ABCD Arq Bras Cir Dig,** 2010.

2. M. Betzler · Essen, Técnicas de anastomose no trato gastrointestinal, 1, Hospital Universitário de Münster, **Springer-Verlag Berlim Heidelberg,** 2013.

3. BRAGHETTO, Italo, RECONSTITUIÇÃO DO TRATO DIGESTIVO APÓS FALHA DE ESOFAGOGASTRO OU ESOFAGOCOLO ANASTOMOSE, 1, Departamento de Cirurgia, Faculdade de Medicina, Universidade do Chile, Santiago, Chile. **ABCD Arq Bras Cir Dig,** 2013.

4. Cerqueira, Marcel, NOVA TÉCNICA DE ANASTOMOSE GASTROJEJUNAL NO TRATAMENTO PALIATIVO DE CÂNCER DA CABEÇA DO PÂNCREAS.1 Hospital das clínicas- SP, **Revista do Colégio Brasileiro de Cirurgiões,** 1999.

5. Nari GN, Lopez A, Layun JL, Mariot D. Lopez F, De-elias ME. Is the anatomical sequence of gastric and biliary anastomosis in the pancreatoduodenectomy reconstruction the cause of an increase in the incidence of cholangitis? A technical variant presentation and initial results. **ABCD Arq Bras Cir Dig**. 2022

6. Reischl, S., Wilhelm, D., Friess, H. *et al.* Innovative approaches for induction of gastrointestinal anastomotic healing: an update on experimental and clinical aspects. ***Langenbecks Arch Surg* 406**, 971–980

7. Soares Júnior, Cléber, Fatores intervenientes e métodos de avaliação das anastomoses gastrointestinais, 3, **Rev Med Minas Gerais** 2010.

8. Sarhan Sydney, Saad, ESTUDO CLÍNICO COMPARATIVO ENTRE ANASTOMOSE COLOCÓLICA COM ANEL ANASTOMÓTICO BIOFRAGMENTÁVEL E COM SUTURA MANUAL NÃO ABSORVÍVEL, 27, Universidade Federal de São Paulo, **Revista do Colégio Brasileiro de Cirurgiões,** 2000.

9. Ahmad J, Martin J, Ikramuddin S, Schauer P, Slivka A. Endoscopic balloon dilation of gastroenteric anastomotic stricture after laparoscopic gastric bypass. **Endoscopy** 2003;

10. Chen K, Pan Y, Cai JQ, et al. Intracorporeal esophagojejunostomy after totally laparoscopic total gastrectomy: a single-center 7-year experience. **World J Gastroenterol**. 2016.

11. Aquino JLB, Camargo JGT, Said MM, Palu B, Leandro-Merhii,VA. Avaliação da anastomose esofagogastrica cervical com sutura mecânica e manual em pacientes com megaesofago avançado. **Rev Col Bras Cir**. 2009

12. Ahn SH, Jung DH, Son SY, Lee CM, Park DJ, Kim HH. Laparoscopic double-tract proximal gastrec-tomy for proximal early gastric cancer. **Gastric Cancer** 2014.

13. Upton A, Roberts CL, Ryan M, Faulkner M, Raynes GC. A randomized trial, conducted by midwives of perineal repairs comparing a polygly-colic suture material and chromic catgut. **Midwifery.** 2002.

14. Stephens A, Patel K, Davis J, Ghamande S. Bovine pericardial graft for second- trimester cesarean scar dehiscence. **Obstet Gynecol**. 2019.