

## CURRENT TRENDS IN ADVANCED SURGICAL STRATEGIES FOR THE TREATMENT OF RECTAL TUMORS: A COMPREHENSIVE REVIEW OF THE MOST RECENT DEVELOPMENTS

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**Abstract:** Objective: This study aims to explore and summarize the latest advanced surgical strategies used in the treatment of tumors in the rectum. Method: To achieve this purpose, we carried out a literature review using the PVO strategy criteria, with searches in the PubMed database. After applying these criteria, we identified and selected a total of 10 relevant articles. Results: The results of the review highlight the importance of surgical strategies, with an emphasis on videolaparoscopy, associated with a less complicated postoperative period. Although randomized studies present controversial results, they indicate practical advantages for the laparoscopic approach. It is worth mentioning that divergences persist in the choice of surgical technique, highlighting the lack of a unique approach for each type of tumor. The decision on the surgical strategy to be adopted must take into consideration, individual factors, such as clinical condition, age, risks, life expectancy, as well as the hospital and surgical context. Final considerations: We emphasize the imperative need for a personalized approach to optimize favorable outcomes in patients with rectal tumors.

**Keywords:** Rectal Tumors; Surgical Strategies; Videolaparoscopy.

## INTRODUCTION

In the last two decades, drastic improvements have been observed in the prognosis, quality of life and life expectancy of patients diagnosed with rectal tumors. Such improvements are attributed to advances in surgical technique, such as mesorectal excision and distal resection greater than 1 mm, as well as advances in imaging exams. A deeper understanding of the factors that contribute to relapse and the widespread use of neoadjuvant therapy also play key roles in this positive scenario (Smith, 2015).

However, this progress has generated

controversy regarding the superiority of different surgical approaches, such as open surgery and laparoscopy. Several randomized studies suggest the non-inferiority of laparoscopy, highlighting its faster recovery, lower risk of surgical site infections, reduced hospital stay and lower incidence of perioperative pain. In this context, it is undeniable that surgery for rectal tumors presents challenges, especially when affecting intestinal functioning, as well as urinary and sexual functions. This highlights the need for a comprehensive review with regard to all multimodal aspects involving surgical approaches to rectal neoplasia (Nocera, 2020a).

However, as it is an extremely current topic, there are some divergences between conduct. The end-to-end anastomosis technique, for example, is considered to help reduce neorectal volume, especially after mesorectal excision, which presented a risk for the development of irritable bowel syndrome (IBS) in the lower region, while in the lower region superior, a postoperative clinical improvement is observed with this technique (Nocera, 2020b).

Given the nature of divergences in the choice of surgical technique for rectal tumors, a comprehensive review that considers current evidence and potential complications is essential for clinical practice. It is important to revisit and evaluate these surgical approaches, as selection of the appropriate surgical technique plays a crucial role in the management of these cases. Therefore, review of all multimodal issues related to surgical approaches to rectal tumors is warranted (Nocera, 2020a).

The objective of this literature review article is to explore and synthesize the most recent advanced surgical strategies for the treatment of rectal tumors, in addition to analyzing recent developments in this area.

## METHODOLOGY

This is a bibliographic review developed following the criteria of the PVO strategy, which stands for Population or Research Problem, Variables and Outcome. This approach was used to answer the following guiding question: “What are the most recent and effective advanced surgical approach strategies for treating rectal tumors, and how do these advances impact the management of these neoplasms?” Within the scope of this methodology, the population or research problem examined refers specifically to patients with rectal tumors. We seek to analyze the most advanced, recent and effective surgical strategies for the treatment of these neoplasms and understand their impact on the management of these clinical cases. The searches were carried out by searching the PubMed Central (PMC) database. We used descriptors combined with the Boolean term “AND”, resulting in the following combination: “Rectal Neoplasms” and “Surgical Procedures”. The initial search resulted in a total of 91 articles, which were subsequently subjected to selection criteria. The inclusion criteria considered for the selection of articles included: articles published in English; published between 2022 and 2023, which addressed the themes proposed for this research; randomized, meta-analysis, retrospective and cross-sectional studies and made available in full. On the other hand, the exclusion criteria covered articles that did not directly address the study proposal and that did not meet the other inclusion criteria. After applying these criteria, a total of 10 articles were selected to compose the present study, contributing to the analysis of the most recent and effective advanced surgical strategies for the treatment of rectal tumors and their impact on the management of these neoplasms.

## DISCUSSION

### SURGICAL TECHNIQUES IN THE TREATMENT OF RECTAL CANCER

The treatment of rectal cancer demands a meticulous therapeutic approach, coordinated by a multidisciplinary team, which considers aspects such as staging, neoadjuvant treatment and the patient's comorbidities. The application of advanced surgical strategies is central in this context, especially in cases of resectable disease with curative intent, aiming to prevent locoregional recurrences.

In the surgical scenario, several techniques are used for tumor resection, with traditional open surgery gradually being replaced by minimally invasive approaches due to superior results in the quality of oncological resection (DEHLAGHI et al., 2022). Laparoscopy, in particular, has stood out, showing significant advantages compared to open surgery.

Open surgery, although historically used, demonstrates inferior performance in terms of oncological resection when compared to minimally invasive techniques, as indicated by recent studies (DEHLAGHI et al., 2022). This transition is motivated by the superior results offered by techniques such as laparoscopy, which are not only more effective, but also associated with lower postoperative morbidity.

In line with the literature (BARRAQUÉ et al., 2019), surgical approaches for tumor resection in rectal cancer include abdominal, perineal, posterior, abdomino-sacral laparotomy or combinations thereof. The choice between these approaches is guided by specific tumor characteristics, such as histology, size, and location, as well as the extent of involvement of surrounding structures.

Specifically, laparoscopy has emerged as a preferred alternative to open surgery, standing out in recent studies that demonstrate its superiority, especially in terms of 5-year

survival (DEHLAGHI et al., 2022). This preference is supported by laparoscopy's ability to deliver robust oncologic results while minimizing functional and orthopedic complications associated with more invasive approaches.

Technological advances have introduced new possibilities in laparoscopic surgery for rectal cancer resection, sparking controversy regarding its effects. The comparison between robotic and conventional laparoscopic surgery reveals important nuances, highlighting the study by (FENG et al., 2022) that highlights the advantages of robotic surgery for medium and low rectal cancer, although long-term information is limited.

The study conducted by (FENG et al., 2022) shows that robotic surgery may be preferable in cases of medium and low rectal cancer. Benefits such as superior quality in resection, less trauma and optimized postoperative recovery stand out. However, the lack of long-term information is highlighted, indicating the need for additional investigations to address the durability of these benefits.

On the other hand, the study by (DEHLAGHI et al., 2022) opposes the idea of inferiority of laparoscopic surgery in relation to open surgery. By demonstrating a 5-year survival without significant impairment, it reinforces the effectiveness of this approach, providing results comparable to those of open surgery.

The single-port technique, associated with 3D laparoscopy, as explored by (TANG et al., 2023) (article 9), stands out for its high safety and postoperative satisfaction. Despite the perceived advantages, the limitation lies in the small number of cases and short-term follow-up. Thus, the need for long-term multicenter studies is highlighted for a comprehensive understanding of outcomes and durability.

In recent years, robotic surgery has emerged as a promising approach in surgical

interventions for rectal cancer, especially in the context of minimally invasive approaches. This technological advance aims to provide significant benefits, and it is crucial to evaluate its effectiveness, costs and associated challenges. Robotic surgery, highlighted by (GIESEN et al., 2022), offers superior flexibility due to robotic instruments with multiple angles, providing free movement. The magnified and 3D view in the surgical field contributes to precise details, facilitating an effective macroscopic tumor resection (FENG et al., 2022).

However, implementing robotic surgery programs faces significant challenges, including high costs and a slower learning curve. Studies, such as (FENG et al., 2022), highlight the need for more solid evidence to justify the superiority of robotic surgery over other minimally invasive approaches, such as laparoscopy.

The oncological quality of resection surgery for rectal cancer is a crucial point, considering several aspects, such as resection margin, regional adenectomy, conversion to open surgery and postoperative recovery. The studies highlight that robotic surgery, when compared to laparoscopy, provides significant advantages, including a lower incidence of positive margins, a greater number of lymph nodes removed and a lower conversion rate, translating into a better oncological quality of resection and reduced risk of locoregional recurrence and distant metastases (FENG et al., 2022).

Innovations, such as the use of intraoperative angiography with indocyanine green to evaluate local perfusion, contribute to improving the quality of robotic surgery, reducing the risk of complications, such as anastomotic leak (WATANABE et al., 2023).

Despite the benefits, robotic surgery faces significant challenges, including high costs, prolonged surgical time and a lengthy

learning curve, limiting widespread global implementation for now (GIESEN et al., 2022).

In the context of treating T1 rectal cancer, the choice between different surgical approaches is complex and influenced by several factors. The study by LI et al. (2023) and DEKKERS et al., (2022) offer valuable insights into recurrence risk, oncological outcomes, and benefits associated with specific approaches, providing a comprehensive view to guide clinical decisions.

LI et al. (2023), focusing on the analysis of the risk of recurrence after local and endoscopic surgical resection, highlights an approximate risk of 9%. It emphasizes the importance of the resection technique, preferring TEM/TAMIS, and discusses the influence of histological status on recurrence, especially in low-risk tumors. In contrast, "Article 8" performs a direct comparison between TEM and RS approaches in the treatment of early rectal cancer. Despite the higher risk of recurrence associated with TEM, it highlights significant benefits, such as lower perioperative mortality, reduced need for stomas and reduced postoperative complications. Both studies recognize limitations, such as study heterogeneity and variable inclusion criteria. Furthermore, they highlight the need for prospective studies with larger samples to obtain more robust evidence and inform clinical decisions.

DEKKERS et al. (2022) and LI et al. (2023) significantly contribute to the understanding of the treatment of T1 rectal cancer. Although each focus on specific aspects, both highlight the complexity of the clinical decision, the importance of considering the risk of recurrence and the need for more robust studies. Together, they offer a comprehensive view that highlights the need for a personalized approach, balancing risks and benefits, and encourages continued research in this critical

area of oncology.

## POST-SURGICAL COMPLICATIONS

Post-surgical complications, particularly in rectal tumor surgery, represent significant challenges. Studies, such as DEKKERS et al. (2022) and NEGM et al., (2023), address these complications and highlight the need for consistent monitoring protocols and effective treatment strategies to improve postoperative outcomes.

DEKKERS et al. (2022) emphasizes the increasing use of exclusive local surgical interventions in stage T1 rectal cancer. However, it highlights the absence of consistent protocols for subsequent monitoring. Variation in monitoring after local surgery for T1RC requires improvement to optimize efficacy, considering the risk, nature, and prognosis of recurrences.

NEGM et al. (2023) addresses the specific complications of anastomotic leaks and fistulas after resection surgery for rectal cancer. It highlights the correlation of these events with high mortality rates, highlighting the variable incidence. It introduces endoscopic treatment as a less invasive option, reducing hospitalization time and accelerating recovery, but highlights the dependence on the clinical conditions and characteristics of the fistula.

Both articles address post-surgical complications, but from different perspectives. DEKKERS et al. (2022) focuses on local post-surgery monitoring for T1RC, highlighting the need for standardization. Meanwhile, NEGM et al., (2023) explores anastomotic leaks and fistulas, introducing endoscopic treatment as a less invasive alternative. The studies offer important insights into post-surgical complications in rectal tumor surgery. The lack of consistent monitoring protocols after local surgery, as evidenced in “Article 6”, highlights the need for improvements in this area. Meanwhile, the correlation

between anastomotic leaks and fistulas with high mortality rates, explored in “Article 10”, highlights the importance of endoscopic treatment. Together, these studies highlight the complexity of postoperative management and the importance of individualized strategies to optimize clinical outcomes.

The choice of surgical approach for rectal tumors requires careful consideration of factors such as benignity or malignancy, anatomical location, and possible involvement of neighboring organs. Different risks associated with each approach can impact the patient’s quality of life (BARRAQUÉ et al., 2019).

The abdominal surgical approach, indicated for higher tumors, presents risks, such as incomplete excision and injury to the hypogastric plexus, affecting pelvic functions. The perineal approach, although it avoids complications in benign tumors, is not indicated for malignant ones. The posterior route allows a controlled dissection, but resection above half of the second sacral vertebra presents risks (BARRAQUÉ et al., 2019). The combined approach (abdominosacral) is applied to high malignant tumors, providing advantages, such as clamping the iliac vessels, but is more traumatic.

Anastomotic stenosis is a postoperative complication that can result in intestinal dysfunction. Influencing factors include anastomotic distance, with a larger wound area being more prone to colonic ischemia, affecting healing. The presence of an anastomotic fistula contributes to intense inflammation and impaired healing in the surrounding tissues. Preservation of the left colic artery emerges as a crucial factor in avoiding this complication (HU et al., 2023).

The studies by Barraqué and Hu address different aspects of rectal surgery. Barraqué explores surgical approaches and their associated risks, while Hu focuses on

postoperative complications, specifically anastomotic stenosis. The choice of surgical approach for rectal tumors requires a careful assessment of the associated risks. The discussion of different surgical techniques and their implications, as presented by Barraqué et al., provides a comprehensive overview. Understanding postoperative complications such as anastomotic stenosis, as outlined by Hu et al., highlights the importance of considering specific factors to optimize clinical outcomes. Taken together, these studies highlight the complexity of the surgical decision and the need for an individualized approach to ensure the best outcome for the patient.

## FINAL CONSIDERATIONS

After analyzing the literature, we highlight significant advances in treatments and positive prognoses for patients with rectal tumors. The discussion emphasized surgical strategies, especially videolaparoscopy, associated with a less complicated postoperative period. Randomized studies, despite controversial results, point to practical advantages for the laparoscopic approach. Divergences persist in the choice of surgical technique, reinforcing the lack of a unique approach for each type of tumor. The decision must consider individual factors, such as clinical condition, age, risks, life expectancy, and hospital and surgical contexts. The need for a personalized approach to optimize favorable outcomes in patients with rectal tumors is highlighted.

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