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WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, *etc.*

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## Advances in beyond total mesorectal excision surgery: Behind the scenes

Roberto Peltrini

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### Abstract

The management of locally advanced rectal cancer involving adjacent organs and extending beyond the surgical planes of total mesorectal excision has evolved over the past few decades both in terms of the effectiveness of preoperative treatments and surgical innovation. The use of a robotic platform is increasing, even in complex surgery such as pelvic exenteration together with the advantages of minimally invasive procedures. However, satisfactory surgical, oncological, and functional outcomes are achieved not only minimizing the impact of a demolitive surgery but also when a multidisciplinary specialized team focuses on experienced surgeons, mandatory rules of surgical oncology, appropriate medical treatments, accurate preoperative planning, and an acceptable quality of life.

**Key Words:** Robotic surgery; Locally advanced rectal cancer; Pelvic exenteration; T4; Multivisceral resection

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**Core Tip:** A minimally invasive robotic approach is a promising alternative to open procedures in rectal cancers requiring beyond total mesorectal excision surgery. Combined with specialists and resources, the contemporary management of advanced rectal cancer scheduled for pelvic exenterations requires a structured surgical management based on shared decision-making.

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## INTRODUCTION

When locally advanced rectal cancers (LARCs) extend beyond the mesorectal envelope, involving the circumferential resection margin or contiguous organs, a multivisceral pelvic exenteration beyond conventional total mesorectal excision (TME) surgical planes is required. Currently, approximately 6% to 10% of patients with rectal cancer present with locally advanced disease without metastasis at the time of diagnosis and may be eligible for exenterative surgery[1].

Pelvic exenteration was first described in 1948 by Brunschwig[2] as a palliative procedure for recurrent carcinoma of the cervix. Subsequently, Thompson and Howe[3] reported the first case of complete pelvic evisceration for locally advanced rectal cancer in 1950. Over time, a growing number of patients have undergone pelvic exenteration, with progressive improvements in postoperative morbidity and mortality[4]. However, the operative procedures are challenging, and highly demolitive surgery can result in considerable morbidity and impaired functional outcomes[5,6], with 5-year overall survival rates ranging between 22% and 66% after pelvic exenteration for LARC[7].

In 2013, the Beyond TME Collaborative Group provided a consensus statement for patients with primary or recurrent advanced rectal cancer. Given the significant global variability in the management of major exenterative multivisceral resections, experts and specialists from centers around the world developed recommendations regarding classification, staging, neoadjuvant strategies, and surgical approaches[8]. Similarly, the PelvEx collaborative group has provided large volume "real-world" data in the last few years[7,9-12]. Additionally, international guidance was provided by the same group of experts to overcome wide variations in clinical practice and improve surgical outcomes[13,14].

In a recent issue of the *World Journal of Gastrointestinal Surgery*, Chan *et al*[15] published an interesting paper titled "Feasibility and Safety of Minimally Invasive Multivisceral Resection for T4b Rectal Cancer: A 9-Year Review." Despite an unbalanced and underpowered cohort of 46 patients, the authors demonstrated the benefits of a minimally invasive approach in terms of postoperative morbidity and length of hospital stay after multivisceral resection in patients with rectal cancer. Furthermore, overall survival and recurrence-free survival were significantly better for patients who underwent robotic surgery compared to those who had laparoscopic resection.

## ROBOTIC APPROACH IN THE SETTING OF PELVIC EXENTERATION

Minimally invasive surgery can be performed in highly selected patients with LARC requiring pelvic exenteration and is associated with reduced intraoperative blood loss, shorter hospital stays, and reduced morbidity[16]. The benefits offered by robotic surgery over laparoscopic procedures may be greater for complicated and extended rectal resections. However, data on this are still limited. Robotic pelvic exenteration has shown a lower rate of complications within 30 d compared to laparoscopic pelvic exenteration in patients with locally advanced and recurrent pelvic tumors[17]. By contrast, no significant difference was found in long-term oncological outcomes between the two approaches in a recent comparative study[18].

The first reports describing robotic pelvic exenteration for LARC were published in 2014[19,20]. The use and experience of robotic platforms in beyond TME multivisceral pelvic exenteration have increased over time[21-23], not only to improve perioperative outcomes by reducing the effects of a highly invasive procedure but also to exploit the advantages of robotic surgery. Procedural challenges of pelvic open surgery include reduced access to a narrow and deep surgical field, unsatisfactory lighting, difficulty recognizing anatomical structures involved by the tumor, and limited sharing of the intervention with the team. Robotic surgery can enhance three-dimensional visualization with magnification of anatomical planes using a stable surgeon-controlled camera for safer and more ergonomic pelvic navigation. Wristed instruments, which eliminate the potential tremor of the hands, can increase the precision of the dissection, reducing blood loss.

However, the introduction of robotic systems should be considered only as further implementation of the complex management of patients undergoing multivisceral resection for LARC. Behind the console, structured training and collaborative support are essential for achieving favorable outcomes. Thorough knowledge of anatomy is crucial for reducing postoperative complications and achieving satisfactory oncological and functional outcomes. Seven pelvic compartments (peritoneal reflection, anterior above peritoneal reflection, anterior below peritoneal reflection, central, posterior, lateral, and inferior) based on anatomical landmarks and key structures have been identified by magnetic resonance imaging (MRI)[24] and cadaveric dissection[25]. Therefore, although standardization of techniques in exenteration surgery is challenging due to the wide variety of tumor and patient presentations, a compartmental approach to pelvic exenteration has been adopted by referral centers to optimize surgical strategies and provide a more systematic approach[26,27].

Additionally, patient selection plays a pivotal role because bone or major vascular involvement may limit the robotic approach. A comprehensive preoperative assessment and imaging workup help assess the extent of the tumor and plan surgical strategies for pelvic exenteration. In this setting, the diagnostic performance of preoperative MRI appears the most accurate[28], and future directions involve both augmented reality[29] and fluorescence-guided surgery[30] to recognize anatomical structures and tumor involvement more easily.

Negative resection margins (R0) are the single most important prognostic factor in predicting survival and quality of life after surgery[31,32]. R0 resection has been reported in 72% to 91% of advanced and 55% to 63% of recurrent rectal cancer[25], representing the main endpoint of the multidisciplinary team. To achieve the "en bloc" radical excision according to surgical oncology rules, cross-disciplinary expertise involving urologists, gynecologists, orthopedists, vascular and plastic surgeons may be fundamental to achieve the curative intent and prevent or treat complications.

Finally, neoadjuvant chemotherapy and radiotherapy play a crucial role in increasing the likelihood of negative resection margins. Likewise, total neoadjuvant therapy has shown an increase in complete pathological response of up to

20% and an improvement in survival rate compared to standard chemoradiation[27].

## CONCLUSION

Robotic surgery is a promising implementation for the complex management of LARC with significant advantages, though limited to selected patients. However, as in theater, surgery can be successful only if trained surgeons, dedicated specialists, and structured units work behind the scenes.

## FOOTNOTES

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