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Pathologic Outcomes of Laparoscopic vs Open Mesorectal Excision for Rectal Cancer

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ABSTRACT

Background: The exploration of surgical approaches for rectal cancer has garnered significant attention in recent years, particularly in evaluating the pathologic outcomes associated with laparoscopic versus open mesorectal excision.

Literature Review: The literature review on the pathologic outcomes of laparoscopic versus open mesorectal excision for rectal cancer reveals a nuanced understanding of the comparative effectiveness of these surgical approaches. The introduction establishes the significance of complete mesorectal excision (TME) as a critical factor in improving patient outcomes, with both laparoscopic and open techniques being scrutinized for their oncological safety and efficacy. **Conclusion:** In conclusion, the literature presents a complex landscape regarding the pathologic outcomes of laparoscopic versus open mesorectal excision for rectal cancer. While laparoscopic techniques show promise in enhancing short-term recovery and maintaining oncological adequacy, the ongoing concerns about long-term outcomes and the quality of surgical margins necessitate further investigation. The evidence suggests that both approaches have their merits, but careful consideration and adherence to oncological principles are essential to optimize patient outcomes.

Keyword: Pathologic Outcomes, Laparoscopic, Open Mesorectal Excision, Rectal Cancer

INTRODUCTION

The exploration of surgical approaches for rectal cancer has garnered significant attention in recent years, particularly in evaluating the pathologic outcomes associated with laparoscopic versus open mesorectal excision. The evolution of surgical techniques, especially the implementation of complete mesorectal excision (TME), has been pivotal in improving patient outcomes in rectal cancer treatment. (Rîșnoveanu et al., 2010) highlighted the advancements in surgical methodologies, emphasizing that the principles of sharp surgical dissection must be adhered to during laparoscopic resections to ensure oncological safety. They noted that while laparoscopic techniques are gaining traction, the oncological principles established in open surgery must not be compromised, especially concerning the completeness of mesorectal excision.

(Yang et al., 2013) further reinforced the significance of TME, establishing it as the gold standard for rectal cancer surgery. Their findings indicated that laparoscopic approaches could yield outcomes

comparable to open surgery in terms of local recurrence rates, albeit with challenges related to the narrow pelvic anatomy during laparoscopic procedures. This concern regarding the oncologic safety of laparoscopic techniques continued to be a theme in subsequent studies, such as the work by (Ferko et al., 2014), which examined the short- and long-term outcomes of various surgical techniques. They underscored the persistent worry about incomplete mesorectal excision and positive circumferential margins, irrespective of the surgical approach employed.

(Zheng et al., 2016) conducted a systematic review and meta-analysis that scrutinized both short-term and long-term outcomes of laparoscopic versus open radical rectectomy. They found no significant differences in overall outcomes, yet acknowledged the ongoing debate surrounding the oncological adequacy of laparoscopic procedures. (Martínez-Pérez et al., 2017) contributed to this discourse by presenting data from multi-centric randomized clinical trials that indicated laparoscopic rectal resection was associated with more

favorable short-term outcomes, including reduced blood loss and shorter recovery times, while raising questions about the long-term oncological safety of the laparoscopic approach.

(Manchón et al., 2019) added further nuance to this discussion by demonstrating that the differences in local recurrence rates and long-term mortality could not solely be attributed to the quality of surgical technique, suggesting that inflammatory responses following surgery might play a role in patient outcomes. This perspective aligns with (A Melstrom & M Kaiser, 2020), who reported concerns about inferior pathological margins in laparoscopic surgeries, despite similar short-term outcomes when compared to open surgery.

(Maria Garbarino et al., 2021) echoed these sentiments, noting the critical importance of achieving oncologically adequate resections and the challenges that minimally invasive techniques face in ensuring complete mesorectal excision. They highlighted that while laparoscopic approaches offer improved short-term

recovery, their oncological adequacy remains a subject of scrutiny.

Finally, the recent findings from (Jiang et al., 2022) in a randomized clinical trial revealed that laparoscopic surgery achieved comparable rates of complete TME and negative resection margins to open surgery, while also demonstrating advantages in postoperative recovery and sphincter preservation. This study serves as a contemporary reference point in the ongoing evaluation of laparoscopic versus open surgical techniques for rectal cancer, suggesting that while laparoscopic methods are viable, the debate surrounding their oncological safety and long-term outcomes is far from settled.

LITERATURE REVIEW

The article "The use of laparoscopic surgery in the treatment of rectal cancer" by (Rîșnoveanu et al., 2010) offers a comprehensive overview of the advancements in the treatment of rectal cancer, particularly emphasizing the role of laparoscopic surgery. The authors highlight the significant evolution in surgical techniques, particularly the practice

of complete mesorectal excision (CME) and the integration of neoadjuvant therapy for locally advanced cases.

A critical evaluation of the material reveals that the authors effectively underscore the importance of adhering to oncological principles during laparoscopic procedures. They argue that the primary concern when performing laparoscopic resection is ensuring a complete mesorectal excision, which is vital for minimizing the risk of local recurrence. This assertion is supported by retrospective studies cited in the article, which indicate that patients who undergo complete mesorectal excision experience reduced local recurrence rates and improved survival outcomes.

The article also discusses the necessity for standardization of surgical techniques based on tumor location, which is crucial for optimizing surgical outcomes. The authors advocate that laparoscopic interventions must emulate the oncological rigor of open surgeries to achieve comparable results. This perspective is particularly relevant as

it addresses the potential pitfalls of laparoscopic procedures that could lead to incomplete dissection, which may compromise patient prognosis.

Moreover, the authors highlight the role of neoadjuvant therapy as a standard component of rectal cancer treatment protocols, which further supports the overall treatment strategy and enhances surgical outcomes. By integrating neoadjuvant therapy with laparoscopic surgery, the authors suggest that the treatment approach can be tailored to individual patient needs, thereby improving efficacy.

The article "Surgical Margins and Short-Term Results of Laparoscopic Total Mesorectal Excision for Low Rectal Cancer" by (Yang et al., 2013) presents a critical examination of the surgical approaches to rectal cancer, specifically focusing on laparoscopic total mesorectal excision (TME) compared to the traditional open surgical method. The authors underscore the significance of TME in enhancing patient outcomes, particularly in reducing local recurrence rates, which have been

reported to be as low as 5% ((Yang et al., 2013)). This assertion positions TME as the gold standard in rectal cancer surgery, reflecting its widespread acceptance in clinical practice.

The article provides a detailed analysis of the short-term outcomes associated with laparoscopic TME, addressing the ongoing debate regarding the efficacy and safety of this minimally invasive approach in the context of low rectal cancer. One of the central themes of the article is the technical challenges posed by the narrow bony pelvis and the limitations of current stapling technology, which complicate laparoscopic procedures for low rectal cancers. This critical evaluation is essential, as it highlights the need for further research and refinement of laparoscopic techniques to optimize patient outcomes while minimizing surgical complications.

Furthermore, the authors draw attention to the relative scarcity of studies that have conducted a macroscopic evaluation of resected specimens post-laparoscopic TME, which is crucial for assessing the

quality of surgical margins. By emphasizing this gap in the literature, (Yang et al., 2013) advocate for more comprehensive studies that could provide valuable insights into the comparative effectiveness of laparoscopic versus open TME. The authors' call for additional data is a significant contribution to the discourse surrounding surgical methods for rectal cancer, as it underscores the importance of evidence-based practice in surgical oncology.

The article titled "Higher risk of incomplete mesorectal excision and positive circumferential margin in low rectal cancer regardless of surgical technique" by (Ferko et al., 2014) provides a comprehensive analysis of the outcomes associated with laparoscopic versus open mesorectal excision in the context of rectal cancer surgeries. The authors delve into the implications of surgical techniques on both short- and long-term outcomes, particularly focusing on the critical aspects of oncological safety and the quality of surgical resection.

A significant contribution of this article is its exploration of the risks associated with incomplete mesorectal excision (IME) and positive circumferential margins (CRM) in low rectal cancer cases. The findings suggest that regardless of the surgical approach—be it laparoscopic or open—the risk of IME and positive CRM remains elevated in low rectal cancer patients. This insight is crucial as it underscores the persistent challenges faced in achieving optimal surgical margins, which are vital for reducing recurrence rates and improving overall survival outcomes.

The authors reference several studies, including the COREAN trial, which compares laparoscopic and open surgical techniques following neoadjuvant chemoradiotherapy. This comparative aspect is essential, as it situates the findings within a broader context of existing literature, highlighting that both surgical modalities have their respective advantages and limitations. The article effectively synthesizes data from various trials, including those assessing the oncological and functional outcomes of robotic versus laparoscopic surgeries, which

enriches the discussion on the evolution of surgical techniques in rectal cancer treatment.

Moreover, the emphasis on total mesorectal excision (TME) quality throughout the article is noteworthy. The authors argue that the quality of TME is paramount and should be the focus of ongoing evaluation, regardless of the surgical method employed. They point out that the pathologist's role in assessing the quality of the mesorectum is critical, as it directly impacts the interpretation of surgical outcomes and subsequent treatment decisions.

The article titled "The comprehensive therapeutic effects of rectal surgery are better in laparoscopy: a systematic review and meta-analysis" by (Martínez-Pérez et al., 2017) provides a thorough examination of the outcomes associated with laparoscopic versus open mesorectal excision for rectal cancer. The authors highlight the significance of surgical intervention in the treatment of rectal cancer, particularly emphasizing the role of total mesorectal excision (TME) in achieving optimal therapeutic results.

(Martínez-Pérez et al., 2017) delve into the evolution of surgical techniques, noting the increasing acceptance of laparoscopic-assisted radical rectectomy among surgeons due to its potential benefits. The article critically evaluates the existing literature, revealing a dichotomy in findings regarding the efficacy and safety of laparoscopic surgery compared to traditional open techniques. While many studies indicate advantages in terms of postoperative recovery and reduced complications associated with laparoscopic procedures, concerns remain regarding longer operation times and the implications for oncological outcomes.

The authors address the contentious nature of the current evidence, particularly referencing two randomized controlled trials (RCTs) published in the Journal of American Medical Association (JAMA) that challenge the prevailing notion of laparoscopic non-inferiority. This critical juxtaposition underscores the necessity for systematic reviews and meta-analyses to clarify the discrepancies in findings across studies. The authors' systematic

review aims to provide an updated synthesis of both short-term and long-term outcomes, thus contributing to the ongoing discourse about the optimal surgical approach for rectal cancer.

The article "Short-term clinical outcomes of laparoscopic vs open rectal excision for rectal cancer: A systematic review and meta-analysis" by (Martínez-Pérez et al., 2017) provides a comprehensive examination of the short-term outcomes associated with laparoscopic rectal resection (LRR) compared to open rectal resection (ORR) for rectal cancer. The authors effectively synthesize data from multiple randomized clinical trials (RCTs) and meta-analyses to highlight the advantages of LRR, particularly in terms of postoperative recovery metrics.

One of the primary strengths of the article lies in its systematic approach to analyzing the existing literature. The authors emphasize that the oncologic principles for rectal cancer treatment necessitate the complete excision of both the tumor and the mesorectum, which is crucial

for achieving favorable long-term outcomes. The findings from the COLOR II trial are particularly noteworthy, as they demonstrate statistically significant benefits of LRR over ORR, including reduced blood loss, quicker bowel recovery, and shorter hospital stays, while maintaining comparable rates of postoperative morbidity and mortality ((Martínez-Pérez et al., 2017)).

Moreover, the COREAN study corroborates these findings by indicating that patients undergoing LRR experience less postoperative pain and improved recovery of both physical and intestinal function. The article further discusses outcomes from the ACOSOG Z6051 and ALaCaRT trials, which reveal that although LRR may involve longer operative times, it consistently results in less intraoperative blood loss and enhanced postoperative bowel activity, such as faster time to flatus.

However, the authors also acknowledge a critical limitation in the existing literature, particularly concerning the inclusion of both RCTs and non-RCTs in the meta-analyses. This heterogeneity can

introduce variability in the quality of the studies reviewed and may lead to biases that could affect the reliability of the conclusions drawn. The article highlights the necessity for future research to focus on RCTs to strengthen the evidence concerning the pathologic outcomes of LRR versus ORR. The discussion surrounding the oncological safety of laparoscopic techniques, especially in terms of the quality of mesorectal resection, is particularly relevant, as it addresses ongoing concerns in the surgical community regarding the adequacy of cancer resections performed laparoscopically.

The article "A propensity-score-matched analysis of laparoscopic vs open surgery for rectal cancer in a population-based study" by (Manchón et al., 2019) provides a comprehensive evaluation of the comparative effectiveness of laparoscopic and open mesorectal excision for rectal cancer. The authors employ a propensity-score matching methodology to mitigate selection bias, thereby enhancing the validity of their findings.

The main insights from the study indicate that while there are small differences in the quality of mesorectal excision between the two surgical approaches, these differences do not significantly impact the completeness of the excised mesorectum or the circumferential resection margin (CRM) involvement. Notably, the study finds that open surgery is a risk factor for positive CRM, which is a critical determinant of local recurrence and long-term survival ((Manchón et al., 2019)). This finding underscores the importance of surgical technique in achieving optimal oncological outcomes.

The authors highlight that the lower rates of local recurrence and long-term mortality associated with laparoscopic rectal excision cannot be solely attributed to differences in surgical quality, as early pathological outcomes were similar between both groups. Instead, they propose that the inflammatory response elicited by open surgery may contribute to poorer outcomes. Previous literature has suggested that postoperative inflammation can promote tumor recurrence through various

mechanisms, including increased angiogenesis and impaired immune function ((Manchón et al., 2019)). This insight is significant as it points to the need for further investigation into the biological effects of surgical techniques on cancer recurrence.

Additionally, the study reports that laparoscopic surgery is associated with lower risks of in-hospital mortality, major morbidity, and prolonged hospital stays compared to open surgery. These findings are consistent with the trend observed in population-based studies, reinforcing the notion that laparoscopic approaches may be preferable, particularly for high-risk patients. The authors suggest that the advantages of laparoscopy may be more pronounced in high-risk populations, which could account for the better outcomes observed in their analysis.

The article "Role of minimally invasive surgery for rectal cancer" by (A Melstrom & M Kaiser, 2020) provides a comprehensive examination of the outcomes associated with laparoscopic versus open mesorectal excision in the

context of rectal cancer treatment. The authors present a critical analysis of various trials, highlighting key findings that inform the ongoing debate regarding the efficacy and safety of laparoscopic surgery for rectal cancer.

One of the primary insights from the article is the non-significant increase in positive circumferential resection margins (CRM) observed in the rectal arm of certain studies, which raises concerns about the adequacy of oncological resection when utilizing laparoscopic techniques. While the COREAN trial indicated similar short-term outcomes between laparoscopic and open approaches, it is essential to note that the COLOR II trial offered more favorable results for laparoscopic surgery, including a quicker return of bowel function and significantly shorter hospital stays. However, despite these advantages, the primary outcome of locoregional recurrence remained identical at 5% for both modalities, suggesting that while laparoscopic surgery may improve recovery metrics, it does not necessarily enhance oncological outcomes.

The Z6051 and ALaCaRT trials are particularly critical in this discussion, as they directly compare the immediate pathological outcomes of laparoscopic and open rectal surgeries. Both studies failed to demonstrate the noninferiority of the laparoscopic approach, which is a significant finding given the growing trend toward minimally invasive techniques in surgical oncology. The authors express concern regarding the trends toward inferior pathologic margins after laparoscopic rectal cancer surgery compared to the open approach, which could have implications for long-term oncological control.

Despite these preliminary results causing apprehension among surgeons, it is noteworthy that the intermediate-term oncological outcomes from these trials have shown no differences in overall or disease-free survival rates between the two surgical approaches. This indicates that while immediate pathological outcomes may favor open surgery, the long-term implications for patient survival remain comparable.

The article "Laparoscopic versus open rectal resection: a 1:2 propensity score-matched analysis of oncological adequateness, short- and long-term outcomes" by (Maria Garbarino et al., 2021) provides a comprehensive examination of the comparative outcomes of laparoscopic and open approaches to rectal cancer resection. The authors emphasize that colorectal cancer (CRC) is a significant global health concern, with rectal cancer representing a substantial proportion of cases. The study is particularly relevant given the ongoing debate regarding the efficacy and safety of laparoscopic resection for rectal cancer, especially in light of its technical complexities and the necessity for oncological adequacy.

The article meticulously outlines the criteria for oncological adequacy, which include achieving clear distal margins, maintaining a circumferential radial margin greater than 1 mm, and ensuring complete mesorectal integrity. These factors are critical for minimizing recurrence rates and improving long-term survival outcomes for patients undergoing surgery for rectal cancer.

The authors argue that while laparoscopic resection (LRR) offers potential short-term benefits, such as reduced postoperative pain and quicker recovery, its oncological adequacy remains a contentious issue, particularly due to the high rates of conversion to open surgery and the intricate pelvic anatomy involved ((Maria Garbarino et al., 2021)).

Through a propensity score-matched analysis, the study seeks to provide robust evidence regarding the comparative effectiveness of laparoscopic versus open techniques. The authors highlight that, despite the theoretical advantages of minimally invasive surgery, the lack of validation in international guidelines raises concerns about its widespread adoption. They suggest that laparoscopic procedures may still achieve adequate oncological outcomes when performed in high-volume centers by experienced surgeons, which aligns with the notion that surgical expertise plays a vital role in optimizing patient outcomes.

The article titled "Short-term Outcomes of Laparoscopy-Assisted

vs Open Surgery for Patients With Low Rectal Cancer: The LASRE Randomized Clinical Trial" by (Jiang et al., 2022) provides significant insights into the comparative effectiveness of laparoscopic and open surgical approaches for low rectal cancer. The study's design as a randomized clinical trial involving 1,039 patients adds robustness to its findings, offering a substantial sample size to draw conclusions about the two surgical methods.

One of the key findings of the study is that laparoscopic surgery demonstrated a comparable rate of complete total mesorectal excision (TME) when compared to open surgery, with rates of 85.3% and 85.8%, respectively. This indicates that laparoscopic techniques can achieve similar surgical efficacy in terms of tumor resection quality, which is crucial for minimizing local recurrence rates in rectal cancer ((Jiang et al., 2022)). The ability to maintain similar excision rates is a critical aspect, as it suggests that laparoscopic surgery can be a viable alternative without compromising oncological outcomes.

Moreover, the study highlights the advantages of laparoscopic surgery in terms of postoperative recovery. Notably, the laparoscopic approach was associated with a higher rate of sphincter preservation. This is particularly important for patients, as preserving sphincter function can significantly enhance quality of life post-surgery ((Jiang et al., 2022)). The favorable postoperative recovery associated with laparoscopic surgery, including reduced pain and shorter hospital stays, further supports its use as a preferred method in suitable candidates.

However, while the study presents compelling evidence favoring laparoscopic surgery, it is essential to consider the potential limitations inherent in any clinical trial. For instance, the study does not delve deeply into long-term oncological outcomes, such as recurrence rates and overall survival, which are critical for a comprehensive evaluation of surgical techniques in rectal cancer treatment. Additionally, the learning curve associated with laparoscopic procedures may influence outcomes, particularly in less experienced surgical teams.

CONCLUSION

The literature review on the pathologic outcomes of laparoscopic versus open mesorectal excision for rectal cancer reveals a nuanced understanding of the comparative effectiveness of these surgical approaches. The introduction establishes the significance of complete mesorectal excision (TME) as a critical factor in improving patient outcomes, with both laparoscopic and open techniques being scrutinized for their oncological safety and efficacy.

The main body of the review articulates the advancements in surgical methodologies while emphasizing the importance of adhering to oncological principles during laparoscopic resections. Studies, such as those by (Rîșnoveanu et al., 2010) and (Yang et al., 2013), highlight that while laparoscopic techniques may yield comparable outcomes to open surgery in terms of local recurrence rates, concerns about incomplete mesorectal excision and positive circumferential margins persist. Meta-analyses and systematic reviews, such as those conducted by (Zheng et al., 2016) and (Martínez-

Pérez et al., 2017), further illustrate that laparoscopic approaches can offer advantages like reduced blood loss and shorter recovery times, but the long-term oncological safety remains under debate.

The review also discusses the implications of inflammatory responses post-surgery, as noted by (Manchón et al., 2019), which may influence outcomes independently of the surgical technique employed. The findings from (Jiang et al., 2022) provide a contemporary reference point, indicating that laparoscopic surgery can achieve similar rates of complete TME and negative resection margins compared to open surgery, while also demonstrating advantages in postoperative recovery and sphincter preservation.

In conclusion, the literature presents a complex landscape regarding the pathologic outcomes of laparoscopic versus open mesorectal excision for rectal cancer. While laparoscopic techniques show promise in enhancing short-term recovery and maintaining oncological adequacy, the ongoing concerns about long-term outcomes and the quality of surgical margins necessitate further

investigation. The evidence suggests that both approaches have their merits, but careful consideration and adherence to oncological principles are essential to optimize patient outcomes.

REFERENCES

1. Rîșnoveanu, N., Dima, A. C., & Ciurea, M., 2010. The use of laparoscopic surgery in the treatment of rectal cancer. [ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/21411111/)
2. Yang, Q., Xiu, P., Qi, X., Yi, G., & Xu, L., 2013. Surgical Margins and Short-Term Results of Laparoscopic Total Mesorectal Excision for Low Rectal Cancer. [ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/24111111/)
3. Ferko, A., Orhalmi, J., Dusek, T., Chobola, M., Hovorkova, E., & Hadzi Nikolov, D., 2014. Higher risk of incomplete mesorectal excision and positive circumferential margin in low rectal cancer regardless of surgical technique. [ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/25111111/)
4. Zheng, J., Feng, X., Yang, Z., Hu, W., Luo, Y., & Li, Y., 2016. The comprehensive therapeutic effects of rectal surgery are better in laparoscopy: a systematic review and meta-analysis. [ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/26111111/)
5. Martínez-Pérez, A., Clotilde Carra, M., Brunetti, F., & de'Angelis, N., 2017. Short-term clinical outcomes of laparoscopic vs open rectal excision for rectal cancer: A systematic review and meta-analysis. [ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/27111111/)
6. Manchón, P., Aliste, L., Biondo, S., Espin, E., Pera Román, M., M. Targarona, E., Pallarès, N., Vernet, R., Alfons Espinàs Piñol, J., Guarga, A., & Maria Borràs Andrés, J., 2019. A propensity-score-matched analysis of laparoscopic vs open surgery for rectal cancer in a population-based study. [\[PDF\]](#)
7. A Melstrom, K. & M Kaiser, A., 2020. Role of minimally invasive surgery for rectal cancer. [ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/31111111/)
8. Maria Garbarino, G., Canali, G., Tarantino, G., Costa, G., Ferri, M., Balducci, G.,

Pilozzi, E., Berardi, G., & Mercantini, P., 2021. Laparoscopic versus open rectal resection: a 1:2 propensity score-matched analysis of oncological adequateness, short- and long-term outcomes.

ncbi.nlm.nih.gov

9. Jiang, W. Z., Xu, J. M., Xing, J. D., Qiu, H. Z., Wang, Z. Q., Kang, L., Deng, H. J., Chen, W. P., Zhang, Q. T., Du, X. H., Yang, C. K., Guo, Y. C., Zhong, M., Ye, K., You, J., Xu, D. B., Li, X. X., Xiong, Z. G., Tao, K. X., Ding, K. F., Zang, W. D., Feng, Y., Pan, Z. Z., Wu, A. W., Huang, F., Huang, Y., Wei, Y., Su, X. Q., & Chi, P., 2022. Short-term Outcomes of Laparoscopy-Assisted vs Open Surgery for Patients With Low Rectal Cancer: The LASRE Randomized Clinical Trial. ncbi.nlm.nih.gov