Editorial Commentary

Does laparoscopy decrease incisional hernia and bowel obstruction rates after rectal cancer surgery?—results of 5 years follow-up in a randomized trial (COLOR II)

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In the management of rectal cancer, surgical resection remains the most important management modality in terms of curative resection, staging, prognosis and subsequent treatment decisions (1). However rectal cancer surgery is technically challenging because of the limited boundaries and the complex nature of the pelvis with close proximity to the presacral veins, autonomic nerves (2). Colorectal surgery practice has dramatically changed over the last three decades by growing use of minimally invasive techniques since the introduction of laparoscopic colectomy by Jacobs (3). Minimally invasive surgery was shown to improve post-operative recovery time, reduced morbidity and length of stay after colorectal surgery compared to open surgery (4).

The recognized benefits of laparoscopic surgery which include; reduced wound-related complications, reduced post-operative pain, earlier return of bowel function, earlier commencement of adjuvant chemotherapy when required and earlier discharge from hospital have been the driving force for the development of the technique (5). In academic centers, laparoscopic surgery is now progressing to the next stage with the introduction of robotic surgery and transanal minimally invasive techniques.

Given the preference for minimally invasive surgery for rectal cancer management in many centers, other presumed long-term benefits such as a decreased rate of incisional hernia (IH) when compared to the open approach remain an area of controversy (6-8). Literature on this topic is not yet clear as it seems there may be several contributing factors, such as specimen extraction site, hand-assisted laparoscopic approach, increased body mass index (BMI), and preoperative other comorbidities, etc. (9,10). Recently, long-term secondary outcomes including IH and bowel obstruction following laparoscopic versus open surgery for rectal cancer within the framework of COlorectal cancer Laparoscopic or Open Resection (COLOR)-II were released (11). We read this paper with great interest since it is the largest multicenter randomized clinical trial comparing laparoscopic and open approach for rectal cancer and provides long and accurate prospective follow-up for IH and bowel obstruction.

The aim of this study was to assess the risk of bowel obstruction as well as incisional and parastomal hernia after laparoscopic and open surgery for the management of rectal cancer from the previously enrolled randomized controlled trial. This study constitutes a preplanned analysis of secondary outcomes in the COLOR II trial.

COLOR II, a non-inferiority, open-label, randomised trial, was conducted in 30 centers and hospitals in eight countries (Belgium, Canada, Denmark, Germany, The Netherlands, Spain, South Korea, and Sweden). Patients with stage I-III rectal cancer (cT1-cT3) who underwent elective surgery were eligible and enrolled in this study. Secondary end-points included bowel obstruction, IH and parastomal hernia within 5 years.

Long-term data were collected for a total of 1,044 randomized patients undergoing rectal cancer surgery with a median follow-up of 5 years. Overall study results showed that laparoscopic rectal cancer surgery is not associated decreased rates of IH and bowel obstruction. Especially, the incidence of IH and bowel obstruction with hospital admission and the rate of patients undergoing surgery were comparable between the two techniques. Authors conducted intention to treat and also as treated analysis which confirm similar outcomes.

The standardization of the surgical approach is one of the critical factors needs to be considered in the design of these important trials. Type of laparoscopic approach including hand-assisted technique, laparoscopic-assisted technique where suprapubic incision is used to insert the stapler to transect the bowel or create the anastomosis and totally laparoscopic, have an important impact on hernia and adhesion formation. Most of the studies has compared open and laparoscopic-assisted procedures where the long-term results are similar. The authors did not explain the details of the surgical technique in the current study and also previously published initial COLOR-II papers, which might affect the outcomes (11).

The formation of adhesion is a complicated process that is related to the peritoneal tissue repair. Studies about adhesion formation showed that laparoscopic surgery decreases surgical trauma by reducing the peritoneal incision size, keeping the environment closed, introducing fewer foreign bodies, causing less tissue trauma and hemorrhage (12,13). The overall observed rates of bowel obstruction in this study were higher compared to previous studies (14). This could be related to higher previous abdominal surgery and conversion rate for the laparoscopic group. The authors reported the overall previous abdominal surgery rate was 67%, which was comparable between the two groups. The details regarding for the previous abdominal procedures and incisions were not reported. About two third of study population had at least one abdominal procedure before the surgery, which may contribute the higher overall bowel obstruction as well as IH rates compared to previous studies (6,8). Also the large denuded area after total mesorectal excision can explain the higher rate of bowel obstruction in this particular condition compared with previous study results after colorectal surgery per the authors in the present study (15). Although this could be a reason after abdominoperineal resection, the dissected area will be covered with the peritoneum around the colon and will not put a high-risk of bowel obstruction after low anterior resection.

The length of incision is directly related to the hernia formation (16). Other risk factors include wound infection, obesity, age and poor nutrition (9). Previous reports for the impact of laparoscopy on IHs is controversial (6,8,9,12,17). The discrepancy among these findings can be related to the study design and follow-up period. The study results are similar with the long-term results of the CLASICC trial. Other studies on hernia after laparoscopic colorectal surgery also showed a low IH rate after a Pfannenstiel incision compared to the midline extraction site (6,9).

Regarding for parastomal hernia formation, the incidence was higher after laparoscopic surgery and especially for patients with colostomy (permanent) in the present study. Overall parastomal hernia rates was reported between 30% and 50% (17). In laparoscopic surgery, the use of the specimen extraction from the stoma site may be associated with higher parastomal hernia rates (18). But overall parastomal hernia rates in this study were lower than previous reports after abdominoperineal resection which could be explained with the use of laparoscopic surgery. With respect to incisional and parastomal hernia, the present study was focused on specific surgical procedure but confirms the results from other series indicating a lack of significant benefits associated with laparoscopic colorectal resections (6,9), including data from three prospective randomized trials (8,19).

The causes of an increased IH rate associated with midline incisions are likely multifactorial. On the other hand, it is postulated that Pfannenstiel incisions, or other transverse incisions cutting or splitting the abdominal wall muscles along the direction of their fibers, preserve the blood supply originating from the muscle bed upon which they are situated, unlike the avascular tissue of the midline incision (20). Such incisions would be subject to reduced wound tension from the oblique muscle contraction and ultimately result in a decreased hernia rate (21). The high IH incidence when using the stoma aperture as extraction site is somewhat puzzling, considering that the patient population of this particular subgroup is relatively healthy and comparable in many respects to the subgroup of patients with Pfannenstiel extraction site. It is possible that closure of a stoma site is associated with greater inflammation of the tissue surrounding the fascia, which might confuse the identification of the fascia for appropriate tissue reapproximation.

With respect to the other independent factors associated with IH rate in the current study, the adverse effect of an

increased BMI on IH rates is not surprising and concurs with the findings reported in a number of studies (9,22). Obesity has been linked to increased intra-abdominal pressure and abdominal wall tension, which might weaken tissues and promote hernia formation. While the selection of thinner patients for laparoscopic surgery could likely result in a reduced IH rate, this would exclude a number of obese patients from all the recovery benefits associated with laparoscopic surgery (23). The authors also conducted as treated analysis which showed similar IH and bowel obstruction rates between the groups.

Thirty-day complications were not reported and assessed in the current study which might affect on long-term complications including bowel obstruction and IH rates.

As a conclusion, Petersson *et al.* reported on the long-term incidence of bowel obstruction and IH for patients who underwent rectal cancer surgery with a median follow-up of 5 years. Data fail to confirm advantages of the laparoscopic technique in the long-term reduction of IH and bowel obstruction.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Carlsen E, Schlichting E, Guldvog I, et al. Effect of the introduction of total mesorectal excision for the treatment of rectal cancer. Br J Surg 1998;85:526-9.
2. Memon S, Heriot AG, Murphy DG, et al. Robotic versus laparoscopic proctectomy for rectal cancer: a meta-analysis. Ann Surg Oncol 2012;19:2095-101.
3. Jacobs M, Verdeja JC, Goldstein HS. Minimally invasive colon resection (laparoscopic colectomy). Surg Laparosc Endosc 1991;1:144-50.
4. Lacy AM, García-Valdecasas JC, Delgado S, et al. Laparoscopy-assisted colectomy versus open colectomy for treatment of non-metastatic colon cancer: a randomised trial. Lancet 2002;359:2224-9.
5. Weeks JC, Nelson H, Gelber S, et al. Short-term quality-of-life outcomes following laparoscopic-assisted colectomy vs open colectomy for colon cancer: a randomized trial. JAMA 2002;287:321-8.
6. Ihedioha U, Mackay G, Leung E, et al. Laparoscopic colorectal resection does not reduce incisional hernia rates when compared with open colorectal resection. Surg Endosc 2008;22:689-92.
7. Klaristenfeld DD, McLemore EC, Li BH, et al. Significant reduction in the incidence of small bowel obstruction and ventral hernia after laparoscopic compared to open segmental colorectal resection. Langenbecks Arch Surg 2015;400:505-12.
8. Taylor GW, Jayne DG, Brown SR, et al. Adhesions and incisional hernias following laparoscopic versus open surgery for colorectal cancer in the CLASICC trial. Br J Surg 2010;97:70-8.
9. Benlice C, Stocchi L, Costedio MM, et al. Impact of the Specific Extraction-Site Location on the Risk of Incisional Hernia After Laparoscopic Colorectal Resection. Dis Colon Rectum 2016;59:743-50.
10. Singh R, Omiccioli A, Hegge S, et al. Does the extraction-site location in laparoscopic colorectal surgery have an impact on incisional hernia rates? Surg Endosc 2008;22:2596-600.
11. Petersson J, Koedam TW, Bonjer HJ, et al. Bowel Obstruction and Ventral Hernia After Laparoscopic Versus Open Surgery for Rectal Cancer in A Randomized Trial (COLOR II). Ann Surg 2019;269:53-7.
12. Gutt CN, Oniu T, Schemmer P, et al. Fewer adhesions induced by laparoscopic surgery? Surg Endosc. 2004;18:898-906.
13. Harris DA, Topley N. Peritoneal adhesions. Br J Surg 2008;95:271-2.
14. Bartels SA, Vlug MS, Hollmann MW, et al. Small bowel obstruction, incisional hernia and survival after laparoscopic and open colonic resection (LAFA study). Br J Surg 2014;101:1153-9.
15. Stommel MWJ, Ten Broek RPG, Strik C, et al. Multicenter Observational Study of Adhesion Formation After Open-and Laparoscopic Surgery for Colorectal Cancer. Ann Surg 2018;267:743-8.
16. Laurent C, Leblanc F, Bretagnol F, et al. Long-term wound advantages of the laparoscopic approach in rectal cancer. Br J Surg 2008;95:903-8.
17. Mishra A, Keeler BD, Maxwell-Armstrong C, et al. The

influence of laparoscopy on incisional hernia rates: a retrospective analysis of 1057 colorectal cancer resections. Colorectal Dis 2014;16:815-21.
18. Randall J, Lord B, Fulham J, et al. Parastomal hernias as the predominant stoma complication after laparoscopic colorectal surgery. Surg Laparosc Endosc Percutan Tech 2012;22:420-3.
19. Burns EM, Currie A, Bottle A, et al. Minimal-access colorectal surgery is associated with fewer adhesion-related admissions than open surgery. Br J Surg 2013;100:152-9.
20. Burger JW, van 't Riet M, Jeekel J. Abdominal incisions: techniques and postoperative complications. Scand J Surg 2002;91:315-21.
21. Thompson JB, Maclean KF, Coller FA. Role of the transverse abdominal incision and early ambulation in the reduction of postoperative complications. Arch Surg 1949;59:1267-77.
22. Lau B, Kim H, Haigh PI, et al. Obesity increases the odds of acquiring and incarcerating noninguinal abdominal wall hernias. Am Surg 2012;78:1118-21.
23. Khoury W, Stocchi L, Geisler D. Outcomes after laparoscopic intestinal resection in obese versus non-obese patients. Br J Surg 2011;98:293-8.

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