Transanal total mesorectal excision: current East Asian perspectives for the future

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Transanal total mesorectal excision: current East Asian perspectives for the future

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Abstract

Transanal total mesorectal excision (TaTME) is widely performed for the resection of rectal cancer around the world. However, due to lower body mass index and a lack of necessity, TaTMEs have not been accepted in East Asia as generally as in Western countries. In East Asia, conventional laparoscopic surgeries have been performed with lower rates of open conversions and robotic surgery has been considered as an acceptable option for patients with narrow pelvis. This review article discusses TaTMEs from an East Asian perspective.

Keywords: Transanal total mesorectal excision, East Asia, robotic surgery, laparoscopic surgery, difficult pelvis

INTRODUCTION

The evaluation and management of rectal cancer has evolved remarkably over the last few decades since Heald *et al.*[1] proposed and reported on total mesorectal excisions for rectal cancer in the reduction of local recurrences. Total mesorectal excision (TME) became the gold standard for curative resection from the standpoint of control and survival. In addition to increased anatomical knowledge, surgical instruments have also improved. In the early 1990s, laparoscopic surgery was introduced and gradually used in colon and rectal cancer treatments. Since several multicenter randomized trials reported potential short-term benefits with oncological outcomes comparable to open surgeries, laparoscopic TMEs were adopted for rectal cancer[2,3]. However, several prospective trials failed to prove the non-inferiority of laparoscopy, citing several reasons[4,5]. Most of the reasons were attributed to the difficulty in ensuring a sufficient surgical field in a narrow space. The three most common reasons for open conversions in the Colorectal Cancer

Laparoscopic or Open Resection (COLOR) II trial were a narrow pelvis (22%), obesity (10%), and tumor fixation (9%)[6].

To overcome the technical difficulties associated with laparoscopic TMEs, which resulted in poor visualization of the mesorectal planes and difficulty introducing instruments, the concept of a "bottom-up" alternative technique (from the distal to the proximal mesorectal plane), was proposed with the first transanal TME (TaTME) procedure performed in patients with rectal cancer in 2010 by Sylla *et al*.[7]. Before TaTME was introduced, new minimally invasive devices and innovations using the Natural Orifice Transluminal Endoscopic Surgery technique and the Transanal Endoscopic Microsurgery method were initiated, which made the concept possible[8]. The transabdominal transanal proctosigmoidectomy (TATA), which is similar to TaTMEs and was developed by Marks[9] in 1984, introduced the bottom-up technique, in contrast to the traditional top-down technique typically used in abdominal procedures.

In this review article, we focus on current and future East Asian perspectives. Since severely obese rectal cancer patients are still rare in East Asian countries, there is less need for TaTMEs compared to Western countries. The low rate of high body mass index (BMI) may be one of the reasons for the low conversion rate of laparoscopic surgery for rectal cancer and even for mid and low rectal cancers after neoadjuvant chemoradiotherapy compared to the high conversion rates in the COLOR II (16%) and the American College of Surgeons Oncology Group (ACOSOG) Z6051 (11.3%) trials.

ROBOTIC TME: EFFORTS TO OVERCOME THE DIFFICULTIES OF LAPAROSCOPIC TMES

Technical limitations exist with the laparoscopic approach, especially during the distal transection of the rectum due to limited visibility and working restrictions associated with the confined space of a narrow pelvis[10]. Recently, robotic surgery has been proposed as a solution to this problem. Although there is no concrete evidence that robotic surgery has an advantage in difficult cases, robotic-assisted surgery was introduced to address the limitations of laparoscopy, and gained acceptance due to improved visualization, lower conversion rates, better TME quality with lower positive circumferential resection margin (CRM) rates, and earlier recovery of genitourinary functions[11-13].

According to our experience at Severance Yonsei University Hospital in South Korea, the robotic group showed a lower conversion rate (0% *vs*. 7.1%, P = 0.003) when patients with upper rectal tumors were enrolled[14]. In addition, when we compared patients who only underwent robotic surgery *vs*. laparoscopic surgery with coloanal anastomosis, with or without intersphincteric resections, including patients with mean tumor heights of 5.5 cm and 4.4 cm from the anal verge, the conversion rates were 2.1% *vs*. 16.2%, P = 0.020, respectively[15]. The robotic groups showed better results in terms of open conversion rates. In addition, when we compared patients who had robotic TMEs according to pelvimetry, there were no differencess among easy, moderate, and difficult groups in terms of operative times, which were used as surrogate markers for TME difficulty[16].

In the Robotic *vs*. Laparoscopic Resection for Rectal Cancer (ROLARR) trial[17], the overall conversion rates were 12.2% and 8.1% for laparoscopic and robotic TME surgeries, respectively. However, 27.8% of obese patients undergoing laparoscopic TMEs and 18.9% in the robotic TME group required conversions. Although the robotic TME group showed better results than the laparoscopic TME group, the conversion rates were still high. In addition to high BMI, lower rectal cancers and the male gender were associated with increased conversion rates. Moreover, accurate identification of the distal margin and the application of the endoscope at right angles to the rectum can be challenging in a narrow pelvis.

TATME: EFFORTS TO OVERCOME THE DIFFICULTY OF LAPAROSCOPIC TMES

Risk factors in the ROLARR trial could be diminished using TaTMEs as constraints and challenges posed by anatomical features are minimized when approached from below. TaTMEs also showed lower conversion rates. Penna *et al*.[18] reported conversion rates from laparoscopic to open or transanal as 6.3% within the TaTME registry. Veltcamp Helbac *et al*.[19] reported a conversion rate of 5% for 80 TaTME cases. Moreover, Lacy *et al*.[20] reported no conversions in 140 cases. TaTME procedures overcome difficulties frequently encountered in trans-abdominal rectal transections and anastomosis-stapling techniques such as narrow pelvic anatomy, oblique stapling angles, rectal-tearing secondary to vigorous manipulation, and multiple staple firings.

Robotic surgery and transanal surgery have been developed to overcome some of the limitations of conventional laparoscopic surgery for rectal cancer. However, there are only a few studies comparing robotic and TaTME[21-23]. Those studies showed comparable results for robotic TME and TaTME. Among the studies, Lee *et al*.[21] compared, out of a total of 730 patients (277 TaTME and 453 robotic TME patients), matched groups of 226 TaTME and 370 robotic TME patients. The mean tumor height from the anal verge was 5.6 cm, and 70% received preoperative radiotherapy. There were no differences in TME specimen quality and CRM.

However, the evidence on TaTME is still lacking in many aspects with many still unanswered questions. Retrospective studies and meta-analysis showed that TaTME seems to achieve comparable technical success with acceptable oncologic and perioperative outcomes in comparison with laparoscopic TME[24]. However, there is no multicenter randomized controlled trial at present. The COLOR III trial, which compares TaTME and laparoscopic TME, is currently in the recruitment phase.

PREVIOUS EAST ASIAN STUDIES ON TATME

There have been a few reports describing the use of TaTMEs in Asian patients. One study from Taiwan[25] compared 50 patients with middle or lower rectal cancer and post-neoadjuvant chemoradiotherapy (nCRT) who underwent TaTMEs using 100 matched control cohorts who received conventional laparoscopic rectal surgeries. Seventy-six percent of the patients were male with a mean BMI of 24.2 kg/m^2 and had low (< 7 cm) tumor heights. There was only one conversion. Another prospective, single-arm phase II trial from Korea[26] enrolled 49 patients (65.3% male, a mean BMI of 23.3 kg/m^2, and a mean tumor height of 6.3 cm) with their rectal cancers located 3-12 cm from the anal verge and no conversions to open surgery. A study from Hong Kong[27] compared a TaTME group (n = 40) to a robotic group (n = 80) using propensity score matching. In the TaTME group, 72.5% of the patients were male and the median tumor height was 5.0 cm. There was a 5% conversion rate. All three of these studies concluded that TaTMEs were safe and feasible with acceptable results based on the perioperative and pathologic outcomes. Although conversion rates were higher than in the Comparison of Open *vs*. Laparoscopic Surgery for mid or low Rectal Cancer after Neoadjuvant Chemoradiotherapy (COREAN) trial, they are quite low compared to previous laparoscopic TME results.

Recently, studies by Chinese surgeons using TaTMEs have begun. After a preliminary study[28] with 20 patients that confirmed the safety and feasibility of the procedure, they began randomized controlled trial (RCT) enrollment in June 2019 to compare laparoscopic TMEs with TaTMEs (NCT03413930). They will only include patients with middle or lower rectal cancers similar to the East Asian studies.

ARE TATMES NECESSARY FOR EAST ASIA?

Presently, TaTMEs in East Asia are not as popular as in Western countries since few patients have BMIs above 30 kg/m^2. In females, even for those with lower rectal cancer, conventional laparoscopic TMEs can be accomplished without conversions. Additionally, robotic systems are used more frequently only in high volume centers. Another issue is the cost which patients should pay, especially in Korea where a two-team approach is not feasible due to the insurance system.

TATMES ARE NEEDED FOR EAST ASIA!

Even in East Asian patients, conventional laparoscopic TMEs are difficult for those with narrow pelvis. Several studies in Asia have found that a deep, narrow pelvis was an independent factor for intraoperative and postoperative outcomes[29-32]. Most studies using preoperative computed tomography and magnetic resonance pelvimetry have shown that the bones of the pelvis - the depth and length of sacrum, the pelvic inlet, and the pelvic outlet - are independent predictors for the operative times, which have been used as surrogate markers for determining TME difficulty[29,30,32]. Limited pelvic space impacts the quality of resected TME specimens[30,33]. Identifying the East Asian patients having normal BMIs with narrow pelvis before surgery has been beneficial for deciding if TaTMEs should be used. Often, we perform a transanal approach after transabdominal TMEs to ease resection and easily obtain quality resected TME specimens.

A study which utilized TaTMEs in challenging patients included a total of 12 patients (9 males and 3 females): 1 obese patient, 7 with large tumors, and 8 with threatened mesorectal fascias (four patients had multiple indications)[34]. The median tumor height was 5.5 cm from the anal verge, and all patients received preoperative chemoradiotherapy. There were no intraoperative complications. Only 1 patient required conversion to open surgery for ureterocystostomy after resection. Larger TaTME studies involving Asian patients are necessary to promote TaTMEs.

A CONCRETE INDICATION IS NECESSARY

Since TaTME has only just recently been introduced, the criteria of surgical candidates best suited for TaTME treatments are still evolving[35]. A recent consensus statement was published which listed the following indications for TaTME: (1) male gender; (2) narrow and/or deep pelvis; (3) visceral obesity and/or a BMI > 30 kg/m^2; (4) prostatic hypertrophy; (5) tumor height < 12 cm from the anal verge; (6) tumor diameter > 4 cm; (7) distortion of tissue planes secondary to neoadjuvant radiotherapy; and (8) an impalpable, lower primary tumor requiring accurate placement of the distal resection margin[36]. However, we believe that TaTMEs should be used in challenging cases to replace the transabdominal approach. In East Asia, challenging cases imply that patients are males with deep and narrow pelvis after preoperative chemotherapy. While TaTME was developed to assist in challenging middle to lower rectal cancer cases, its essential purpose should be initially adopted. In East Asia, a more concrete indication distinct from laparoscopic and robotic TMEs is required for transition to TaTMEs.

Moreover, the application of TaTMEs was recently extended to include benign tumor excisions, endopelvic surgeries, and pelvic exenterative surgeries[37]. In situations where robotic systems are used in high-volume centers, robotic TaTMEs can be a useful new technique as various robotic systems are developed.

PROBLEMS IN ADOPTING TATME IN EAST ASIA

The other issues for TaTME are the learning curve and training. The transition from laparoscopic TME to robotic TME is straightforward as the approach is the same. However, the technical complexity and unusual anatomy have led to the occurrence of rare complications such as urethral injury[38]. In terms of oncological outcome, Larsen *et al*.[39] reported 9.5% local recurrence, which led to a nationwide in norway halt of TaTME and thorough investigation. They suggested that the increase of local recurrences after TaTMEs might, to some extent, be due to the learning curve, which is inevitable in the introduction of a complex procedure. In addition, only a few centers in East Asia have accumulated much experience and have good results on TaTME. To adopt TaTME safely, a training strategy such as the detailed framework for a structured TaTME training curriculum proposed by the International TaTME Educational Collaborative Group is necessary[40].

CONCLUSION

TaTMEs are potential alternatives for East Asian male patients with rectal cancer who have deep and narrow pelvis. Many RCT and prospective studies (especially the RCT in China) are underway that could provide concrete indications for the usefulness and necessity of TaTMEs[41] in East Asia. To further promote TaTMEs in East Asia, further research with East Asian populations and training strategy are necessary.

DECLARATIONS

Authors' contributions

Conceptualized the topic and oversaw the direction and final edits: Kim NK
Drafted the manuscript: Kim HS

Availability of data and materials

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Conflicts of interest

All authors declared that there are no conflicts of interest.

Ethical approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

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