# The Approach to Transanal Total Mesorectal Excision

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## Introduction

The gold standard treatment for curative locally advanced rectal cancer is radical resection with a complete mesorectal excision. Combined with neoadjuvant chemoradiation therapy, total mesorectal excision (TME) has been demonstrated to reduce tumor recurrence, as the complete removal of the mesorectum limits the radial spread of cancer cells [1]. The TME technique has evolved from open to minimally invasive approaches, including laparoscopic and robotic. The superiority of one approach over another is still under debate.

Due to the difficulty of working in the low pelvis, especially in male and obese patients, which may increase the risk of incomplete mesorectal excisions or positive margins, the transanal TME (TaTME) technique has emerged as a valid alternative to the previous approaches. TaTME allows for potential increased quality of the TME, especially in mid and low rectal tumors. This has been shown in recent studies and meta-analyses [2, 3]. The real long-term oncological benefits of TaTME are still under investigation, but the enormous potential of TaTME have opened the door to global use [4, 5].

TaTME can be technically challenging; thus structured training and standardization of the technique are necessary for its appropriate implementation [6]. In this chapter, we present a detailed description on how to approach TaTME, based on our experience from more than 400 cases.

## Operative Setup

### Patient Preparation

According to current guidelines, all patients with rectal cancer suitable for radical resection should undergo thorough preoperative staging that includes complete study of the colon (colonoscopy or virtual colonoscopy in cases of obstructive tumors), thoracic and abdominopelvic computed tomography, pelvic magnetic resonance imaging, and serological analysis of carcinoembryonic antigen. In patients whose tumor is not palpable by digital rectal examination, a rigid proctoscopy should be performed to measure its distance from the anal verge or anorectal junction. After appropriate staging, surgeons, medical and radiation oncologists, radiologists, and pathologists should discuss each case assessing the benefits of multidisciplinary treatment.

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Once surgery is indicated, it is recommended that the patient meets an enterostomal nurse, for appropriate physical and mental education. The day before surgery, our routine practice is to perform mechanical bowel preparation, together with the administration of oral antibiotics and one dose of subcutaneous unfractionated heparin for thromboprophylaxis. Before the induction of anesthesia, intravenous antibiotic prophylaxis is given with cefazolin and metronidazole. Intermittent pneumatic compression devices are placed, and the patient is set in modified lithotomy (Lloyd-Davies) position.

## Operative Room Preparation

TaTME can be performed by a one-team or a two-team approach ("Cecil approach"). The one-team approach should start with the abdominal phase of the procedure, finishing the dissection just before entering the peritoneal reflection. Then the surgical team should move to the transanal phase. The reason is that performing the transanal portion of the procedure first can cause pneumoretroperitoneum that may challenge the abdominal dissection.

If personnel are available, we strongly recommend the two-team approach. Working simultaneously allows for shorter operative time and better traction and counter-traction to facilitate the resection. Both teams should have different monitors and insufflator systems. The procedure starts with occlusion of the distal sigmoid by the abdominal team until the transanal team completes the intraluminal rectal purse-string. Until both fields are connected, the pressure should be higher in the transanal field to avoid pneumoretroperitoneum and to facilitate rectal distention.

## Abdominal Phase

The abdominal approach can be determined by surgeon preference, although we favor a conventional laparoscopic medial-to-lateral colonic mobilization. The operative table is tilted in Trendelenburg position with slight patient's right side down (Fig. 33.1). A 12-mm trocar is inserted at the umbilicus for the camera; a 5-mm trocar is inserted in the right flank, a 5-mm trocar in the right lower quadrant, and a 5-mm trocar in the left lower quadrant. Additional trocars can be added, generally in the epi- or hypogastrium for further retraction (Fig. 33.2).

The left colon should be mobilized with high ligation of the inferior mesenteric artery (preserving the pelvic nerve plexuses) and division of the inferior mesenteric vein at the lower border of the pancreas. The splenic flexure is typically mobilized to provide enough colonic length and limit anastomotic tension. Then the caudal dissection follows, as described in the traditional abdominal TME technique, while the transanal team progresses in the opposite direction. Once both teams are connected ("Rendezvous"), the abdominal team helps with traction and counter-traction and facilitates transanal dissection. At this point, the insufflation pressures of both fields are equalized, usually at 15 mmHg.

## Transanal Phase

Video 33.1

The transanal approach depends on the height of the tumor and whether the transanal endoscopic platform can be inserted while ensuring a safe distal resection margin. Three-dimensional cameras and insufflators with continuous flow and smoke evacuation have further optimized the safety and quality of transanal resection.

## Mid and Low Rectal Tumors Except 2–3 cm Above the Dentate Line

The transanal phase begins with rectal irrigation and placement of an anal retractor (Lonestar, CooperSurgical, Trumbull, CT, USA) to visualize the dentate line. After correct anal dilatation (Fig. 33.3), the endoscopic platform is introduced. We have considerable experience with the flexible Gelpoint Path (Applied Medical, Rancho Santa Margarita, CA, USA), which requires a shorter learning curve and provides better maneu-

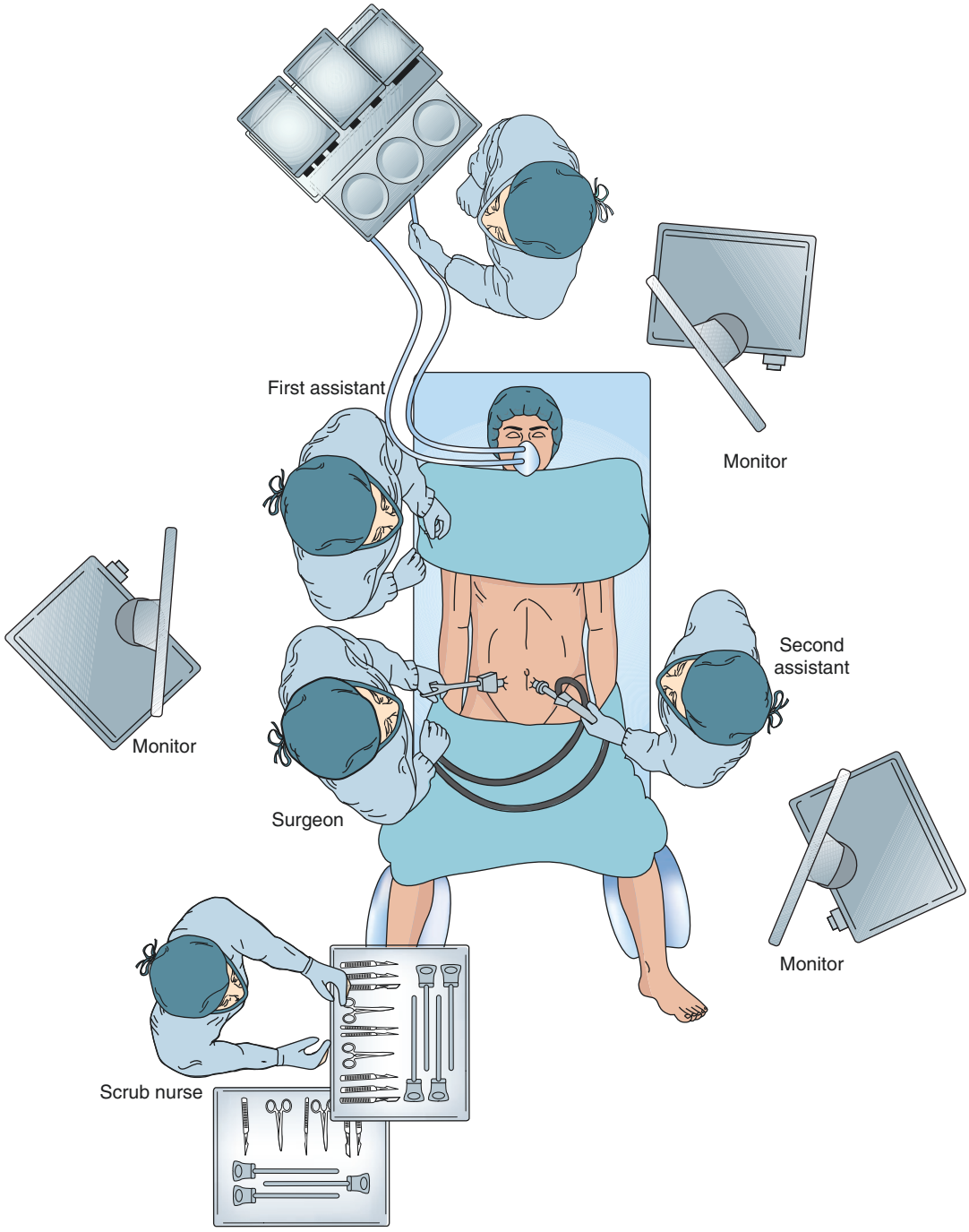


**Fig. 33.1** Theater organization for abdominal phase of laparoscopic low anterior resection

verability. Three trocars are inserted in an inverted triangle (Fig. 33.4), with the camera placed at the 6-o'clock position. The abdominal team then occludes the distal sigmoid, and the pneumorectum is established at a pressure of 15 mmHg. The distal edge of the tumor is located, and, at the desired distance, a purse-string suture with a 26-mm needle and a size 0 polydioxanone suture

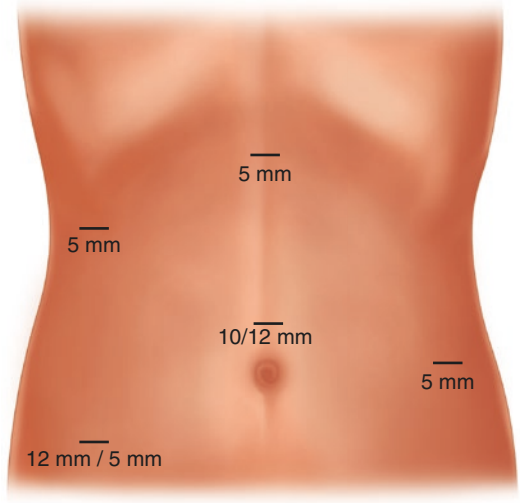


**Fig. 33.2** Trocar positions for abdominal phase of laparoscopic low anterior resection

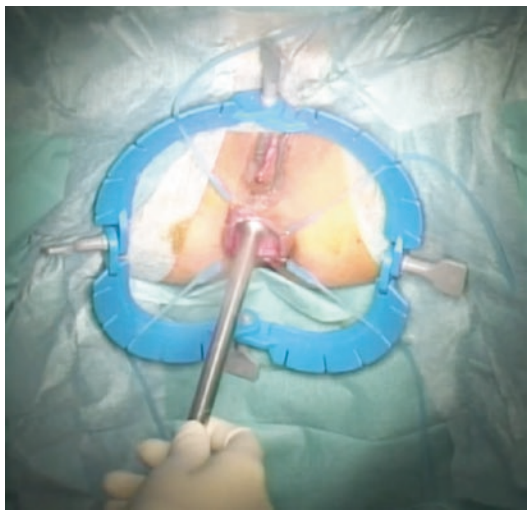

**Fig. 33.3** Intraoperative image showing anal dilatation following placement of the Lonestar retractor

is made to close the rectal lumen (Fig. 33.5), with small equal bites at the same rectal level. The purse-string stitching is a crucial step of the procedure, as its tightness is imperative to prevent translocation of liquid stool and cancer cells during the dissection, which may increase the risk of pelvic abscess and locoregional recurrence.

The closed rectal stump is flooded with cytocidal solution to eliminate potential tumor cells,

**Fig. 33.4** The Gelpoint endoscopic platform has been inserted into the anal canal

and subsequently, the transection of the rectal wall starts under endoscopic visualization. This rectal transection or rectotomy is carried out with electrocautery in a circumferential fashion from inside to outside (Fig. 33.6). The rectotomy is usually started on the anterior surface of the rectum, at 12-o'clock in counterclockwise direction, and full-thickness dissection is performed until reaching the avascular TME plane. An acute dissection is carried out cranially, following the embryologically defined principles of the TME technique described by Heald [7]. The transanal approach seems to offer a more natural dissection through the "Holy plane," recognizing and dissecting inside Denonvilliers' and Waldeyer's fascias (Fig. 33.7). This is the plane where intraoperative complications (hemorrhage, autonomic nerve injury, prostate dissection, and urethral injury) can be minimized while producing optimal TME specimens.

Cephalad dissection is performed with electrocautery. Bipolar forceps can be used to control small vessels. Due to increased low pelvic space inherent to the transanal dissection, enhanced by cranial rectal retraction, the risk of damaging the pelvic sidewall is increased compared to abdominal TME. The improved visualization by laparoscopic instruments may help the surgeon identify the correct lateral planes and avoid dissecting laterally to the endopelvic fascia.

Although not the routine practice of all surgical units, we favor circumferential dissection,

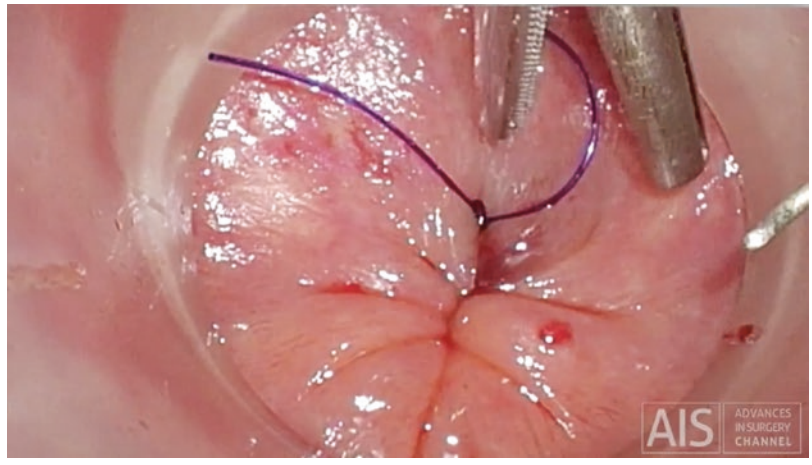


**Fig. 33.5** Endoscopic suturing was performed to create purse-string closure of the rectal lumen


**Fig. 33.6** Intraoperative image showing rectotomy that is performed with electrocautery in a circumferential fashion from inside to outside. The assistant is holding the purse-string suture

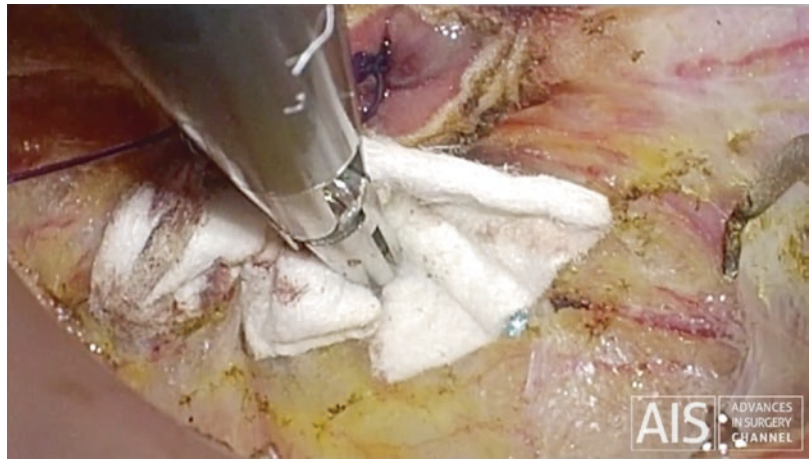


**Fig. 33.7** Intraoperative image showing dissection through the "holy plane," recognizing and dissecting inside Denonvilliers' and Waldeyer's fascias

trying to maintain symmetry. Our platform allows pelvic insufflation to help to find the mesorectal innermost correct plane. It is always easier to find the TME plane at the anterior and posterior sides, so connecting them may help if any doubt arises while dissecting the lateral boundaries.

TaTME carries potential pitfalls and new complications, such as urethral or pelvic sidewall injuries. As always, the surgeon must master anatomy and the relationships with neighboring structures: Denonvilliers' fascia, prostate, seminal vesicles, urethra, and vagina anteriorly; neurovascular bundles laterally; and Waldeyer's fascia and presacral vessels posteriorly. The surgeon must remember that dissecting too posteriorly, outside Waldeyer's fascia, might lead to hemorrhage but also dangerous confusion when coming along the lateral and anterior sides.

Upon reaching the "Rendezvous" with the abdominal team (Fig. 33.8), both teams work together until the rectum is ultimately released.

## Low Rectal Tumors up to 2–3 cm Above the Dentate Line

When the tumor is located so low that limits the endoscopic platform insertion, an intersphincteric dissection with conventional open instruments might be the first step. As suggested by Rullier et al. [8], a standard coloanal anastomosis may be performed in supra-anal tumors (>1 cm from the anal ring), a partial intersphincteric resection in juxta-anal tumors (<1 cm from the anal ring), and a total intersphincteric resection in intra-anal tumors, meaning that the internal anal sphincter is invaded. Once there is enough tissue to close the lumen, the purse-string suture with a size 0 polydioxanone suture is placed. Afterwards, the endoscopic platform can be inserted, and the dissection can be continued with laparoscopic instruments.

## High Rectal Tumors

When the tumor is located in the high rectum (10–15 cm from the anal verge), a partial mesorectal excision with transection of the mesorectum at least 5 cm below the distal edge of the tumor can be made. After the endoscopic platform is inserted, 5 cm are measured distally to the tumor and the rectal lumen is closed. Then, the rectum and mesorectum are transected perpendicularly until reaching the proper TME plane. Dissecting inside the mesorectum carries a higher risk of bleeding, which can be limited using sealing devices. Whether the transanal approach has a clear benefit in patients with high rectal tumors is still under debate, although advantages such as shorter operative times and lower conversion rates have been suggested.

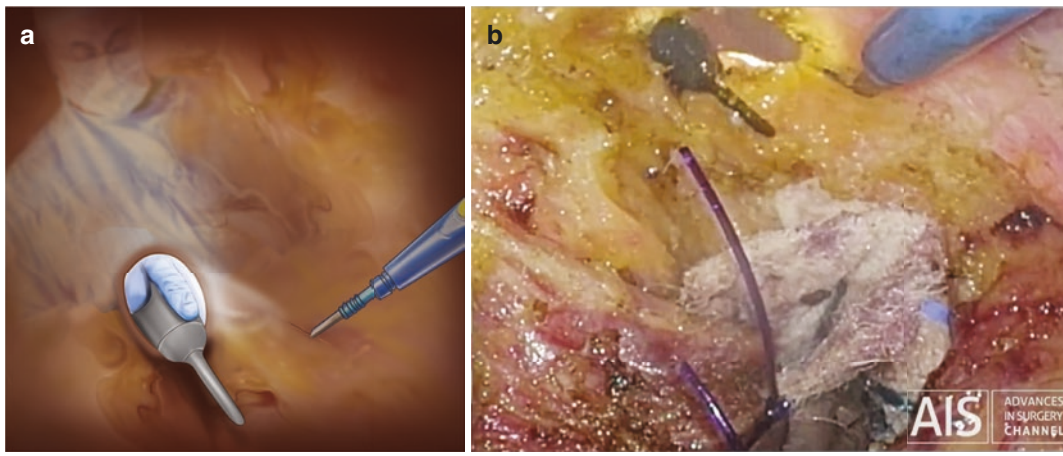


**Fig. 33.8** (**a**) Illustration showing the "rendezvous" point where the abdominal team meets the transanal team. (**b**) Paired intraoperative image showing when transanal dissection reaches the abdomen and electrocautery from the abdomen meets electrocautery from the perineum

## Specimen Extraction

The specimen may be extracted through the transanal or transabdominal routes. It is worth noting that transanal extraction provides greater integrity of the abdominal wall, decreasing the risk of surgical site infections and incisional hernias and improving postoperative pain and cosmesis. However, transanal extraction can be performed only when the size of the tumor, the mesorectum, and the pelvis allows it. Splenic flexure mobilization is recommended if transanal extraction is planned, to avoid excessive vascular tension during the specimen retrieval. In case of a single-stapled double-purse-string anastomosis, the purse-string on the opened distal rectal cuff should be performed before transanal extraction, preventing mucosal retraction that may increase the difficulty of specimen extraction. In case of a hand-sewn coloanal anastomosis, the transanal extraction must be performed after placing the four cardinal stitches.

In case of a large tumor, bulky mesentery, or excessively narrow pelvis, we believe that a transabdominal specimen extraction is safer than the transanal route. In the majority of these cases, a Pfannenstiel incision can be created that is tailored to the specimen size.

Regardless of the specimen extraction site, we have incorporated indocyanine green fluorescence angiography for real-time intraoperative evaluation of bowel perfusion before proximal colonic transection. If available, we strongly recommend its use, as it is considered a promising tool to reduce anastomotic leak rate [9]. Bowel perfusion may also be assessed after creation of the anastomosis.

## Anastomosis

When a stapled anastomosis is attempted, we favor the single-stapled, double-purse-string method. Once the specimen has been resected, the anvil is inserted into the proximal colon either to perform a side-to-end or an end-to-end anastomosis. A second purse-string, usually with a size 0 polypropylene suture, is placed in the opened distal cuff. In mid and low rectal tumors, this purse-string may be performed by hand after removing the endoscopic platform. In cases of higher tumors, suturing by hand might be extremely challenging, and its performance with the transanal platform and laparoscopic instruments is recommended. The rectal cuff purse-string is then tied around the anvil, and the stapler is connected. Our most significant experience is with regular colorectal EEA or hemorrhoidal staplers, the latter with longer spike and delivering wider doughnuts. A 10-Fr drainage catheter might facilitate the technique: inserted on the stapler spike if a regular EEA stapler is used and removed laparoscopically or on the proximal anvil for a more natural transanal extraction in cases of hemorrhoidal stapler use. Once the anvil and the pin are connected, the stapler is fired. Post-anastomosis exploration is recommended, either with direct or endoscopic view to rule out bleeding and assess for pneumoperitoneum leak through the staples.

In cases of hand-sewn coloanal anastomoses, four cardinal 2-0 polyglycolic stitches are placed in the opened rectal cuff, leaving the needles in place. After specimen extraction, the proximal colon is positioned back to the pelvis. The colonic lumen is then opened, and the four cardinal stitches are put through the desired site. Before knotting those four points, several 3-0 polyglycolic sutures are placed to complete the coloanal anastomosis. Each stitch must include a full-thickness bite of the colon.

After completion of the anastomosis, a closed-suction drain is typically left in the pelvis, and a decompressing tube is inserted transanally to decrease sphincter-resting pressure. The surgical team assesses the need for diverting ileostomy. In cases when anastomosis is not considered, always having been agreed upon preoperatively with the patient, the rectal stump may be closed and a terminal end colostomy may be performed.

## Postoperative Care

The postoperative care should follow the same principles as for any standard laparoscopic low anterior resection. With increasing adoption of enhanced recovery after surgery (ERAS) programs,

patients may be treated according to "fast-track" protocols. Early feeding, mobilization, and respiratory exercises are applied and the closed-suction drain is removed before the patient's discharge.

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