

## Review

Giovanni Dapri\*

# Transanal TME – really needed?

<https://doi.org/10.1515/iss-2017-0044>

Received November 11, 2017; accepted December 12, 2017; previously published online December 28, 2017

**Abstract:** In the last decade, thanks to natural orifice transluminal endoscopic surgery, the application of laparoscopy through the anus has gained interest from both research and clinical point of views. Therefore, an increased number of transanal procedures have been reported, from the resection of a large rectal polyp to total mesorectal excision, and for controlling perioperative complications like leak, bleeding, and stenosis. Currently, the most popular surgical trend remains transanal total mesorectal excision. In this article, the technique, advantages, and disadvantages are discussed.

**Keywords:** laparoscopy; TAMIS; TaTME; total mesorectal excision; transanal.

## Introduction

In the last decade, thanks to natural orifice transluminal endoscopic surgery [1], the application of laparoscopy through the anus has gained interest from both research and clinical point of views. The transanal approach was introduced in 1985 by Buess et al. [2] with transanal endoscopic microsurgery. Recently, it underwent an evolution with the application of laparoscopy to surgery of the rectum and rectal diseases, named transanal minimally invasive surgery [3]. Different transanal procedures have been described, like resection of large rectal polyps [4], total mesorectal excision (TME) [5], and the control of perioperative problems like leak, bleeding, and stenosis [6–8].

Currently, the most popular surgical trend remains transanal TME (TaTME). Probably the main reason for this increased trend is the multiple advantages of this innovative technique. This technique offers the exact

identification of the location of the intraluminal tumor; the precise distance between the tumor and the anal margin; starting the transmural rectal resection just a few centimeters below the tumor; the non-use of a linear stapler to transect the rectum; the exposure of the magnified operative field; the bloodless plane of dissection; increased evidence of the lateral sacral nerves to be preserved; the removal of the specimen transanally while avoiding additional scar or trocar enlargement, consequently reducing the ventral hernia rate; and finally improved surgeon's ergonomies.

However, some disadvantages are still present, like the availability of the transanal platform at the operative theater, the surgeon's learning curve, the tumor selection, and the application of the transanal approach to only the rectal diseases and not the remnant colic tracts.

Finally, as other new surgical techniques, TaTME is preferably performed using dedicated transanal platforms and instruments [9, 10] instead of classic instruments for conventional laparoscopy [11].

## Surgical technique

### Patient and team positioning

The patient is placed in a supine position, with the arms alongside the body and the legs apart. The arms, ankles, and legs are secured and protected. The ankles and legs are well secured to the operative table, and the left leg is positioned further up.

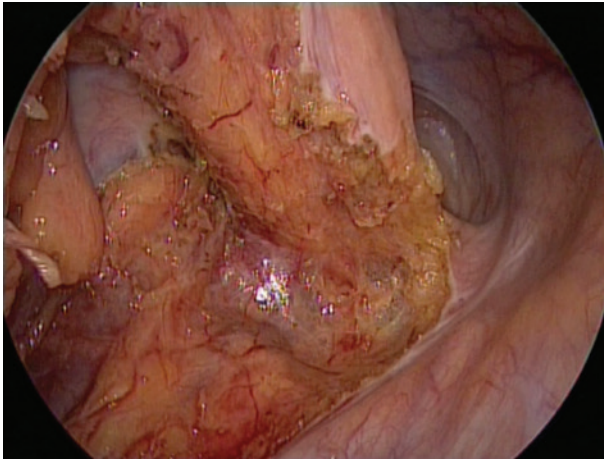
For the abdominal step, the surgeon stands to the patient's right and the camera assistant to the surgeon's right. The scrub nurse stands between the two surgeons. The video monitor is placed in front of the surgical team. The operative table is placed in the Trendelenburg position, with an increasing right-sided tilt.

For the transanal step, the surgeon stands between the patient's legs, the camera assistant to the surgeon's right, and the scrub nurse to the surgeon's left. The video monitor is placed in front of the surgical team. The Trendelenburg positioning and the right-sided tilt are rather reduced.

\*Corresponding author: Giovanni Dapri, Department of Gastrointestinal Surgery, European School of Laparoscopic Surgery, Saint-Pierre University Hospital, Université Libre de Bruxelles, Brussels, Belgium; and Laboratory of Anatomy, Faculty of Medicine and Pharmacy, University of Mons, Mons, Belgium, E-mail: [giovanni@dapri.net](mailto:giovanni@dapri.net)

## Abdominal laparoscopy

Although the pure transanal approach has been reported to be feasible [12], the common technique previews conventional abdominal laparoscopy or single-incision laparoscopy. During this step, the vascular dissection, left colosigmoid, and splenic flexure mobilization are performed. Moreover, in female patients, the uterine fundus



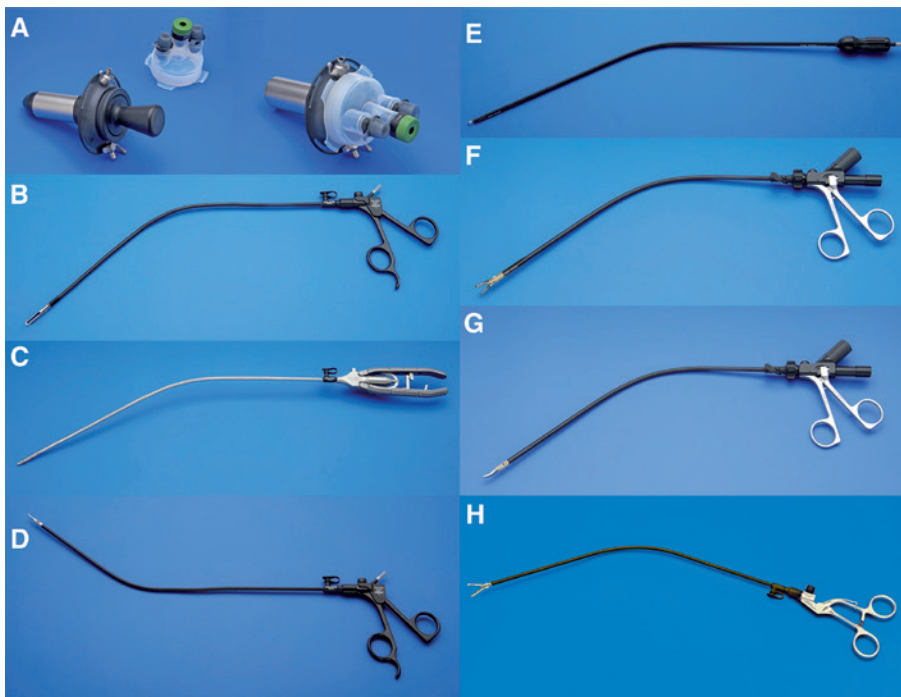
**Figure 1:** Mesorectal dissection stopped at 1 cm down the promontory.

is retracted using an atraumatic grasping forceps or a temporary percutaneous suture.

There is no consensus where the abdominal step has to be stopped. An option is to stop it 1 cm down the promontory, where the upper mesorectum is incised and dissected from the presacral fascia in an avascular plane (Figure 1).

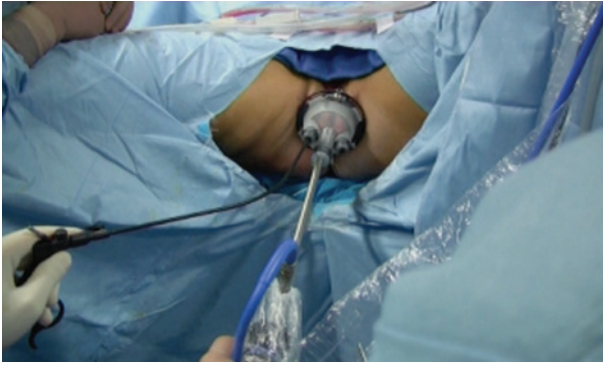
## TaTME with colorectal anastomosis

The transanal D-Port (Karl Storz-Endoskope, Tuttlingen, Germany) (Figure 2A) is inserted into the anal canal and fixed to the skin with four silk 0 sutures. A 10-mm, 30° scope is inserted in the middle opening of the D-Port, and the rectal lumen is checked to identify the rectal tumor. A gauze is pushed beyond the rectal tumor, to avoid too much insufflation of the colic lumen. The monocurved grasping forceps according to DAPRI (Karl Storz-Endoskope) (Figure 2B) is inserted at the 9 o'clock opening of the D-Port (Figure 3). The other monocurved instruments according to DAPRI (Karl Storz-Endoskope), such as the monocurved needle holder (Figure 2C), monocurved scissors (Figure 2D), monocurved coagulating hook (Figure 2E), monocurved bipolar forceps and



**Figure 2:** Transanal reusable platform according to DAPRI (Karl Storz-Endoskope, Tuttlingen, Germany).

D-Port (A), monocurved reusable grasping forceps (B), monocurved reusable needle holder (C), monocurved reusable scissors (D), monocurved reusable coagulating hook (E), monocurved reusable bipolar grasping forceps (F), monocurved reusable bipolar grasping scissors (G), and monocurved reusable anvil-grasping forceps (H).



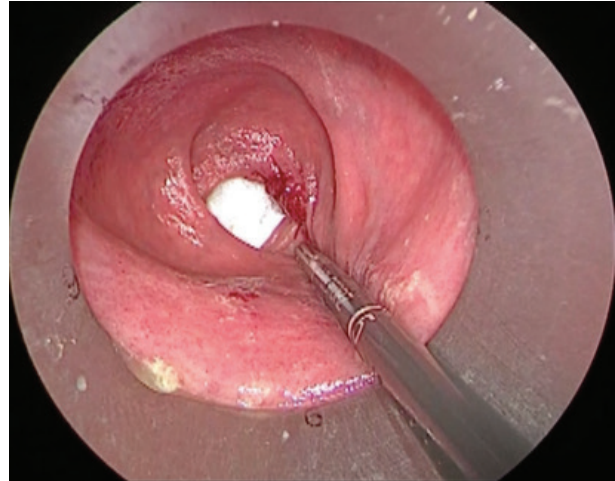
**Figure 3:** Insertion of monocurved grasping forceps at the 9 o'clock opening.

scissors (Figure 2F,G), suction and irrigation cannula, and straight graduated grasping forceps are inserted at the 3 o'clock opening of the D-Port (Figure 4).

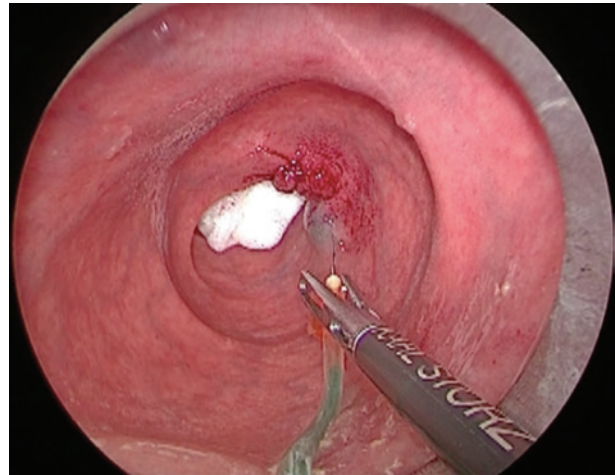
The distance between the tumor and the anal margin is measured (Figure 5). Indocyanine green (ICG) is injected into the mucosal layer, because it is reported to help in finding the correct plane of the dissection [13] (Figure 6). A safe margin down to the tumor is chosen, and a purse-string suture using Prolene 2/0 is placed into the rectal mucosa/submucosa closing the rectal lumen, with the monocurved grasping forceps and the monocurved needle holder (Figure 7). The mucosa around the purse-string suture is firstly scored using the coagulating hook. Then, it is incised using the full-thickness method until passing the entire rectal wall and reaching the perirectal fatty tissue (Figure 8). TME is performed from bottom to top, first going posteriorly and respecting the presacral fascia (Figure 9). Then, mobilization of the rectum is completed going laterally on the left side (of the patient) (Figure 10) and on right



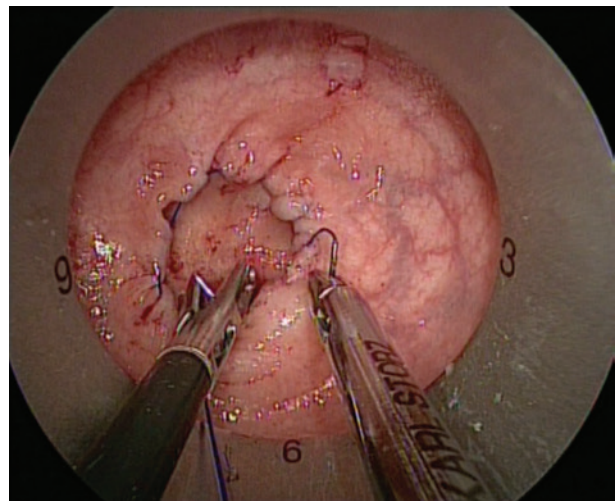
**Figure 4:** Insertion of the monocurved instruments at the 3 o'clock opening.



**Figure 5:** Measurement of the distance between the tumor and the anal margin.

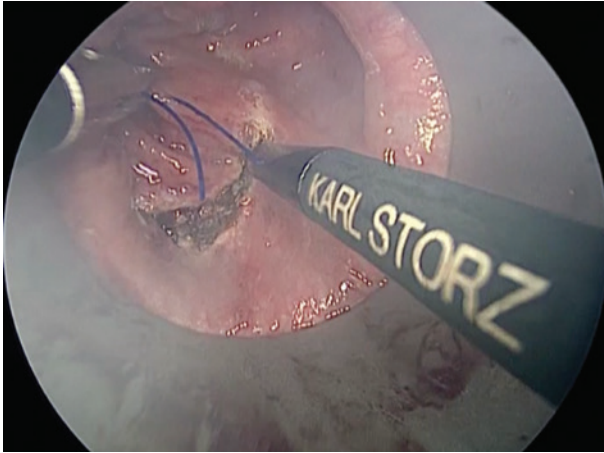


**Figure 6:** Injection of ICG into the mucosal layer around the tumor.

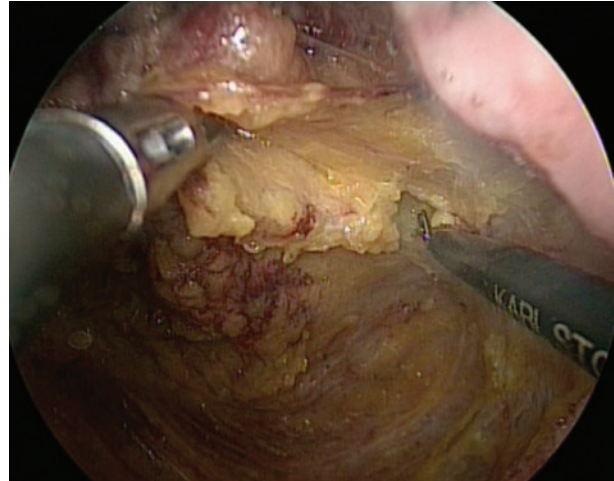


**Figure 7:** Endoluminal closure of the rectum a few centimeters under the tumor.

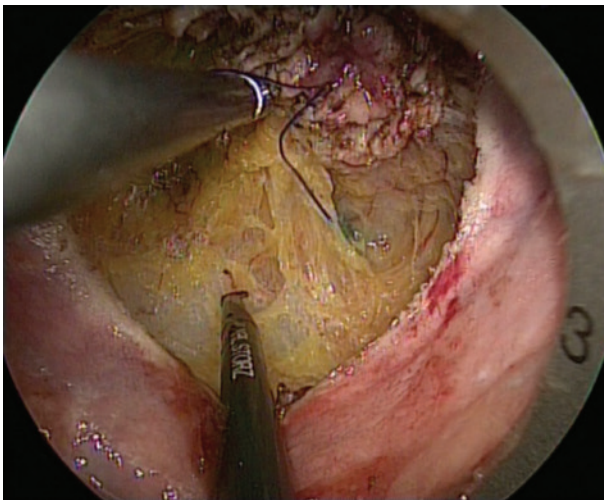




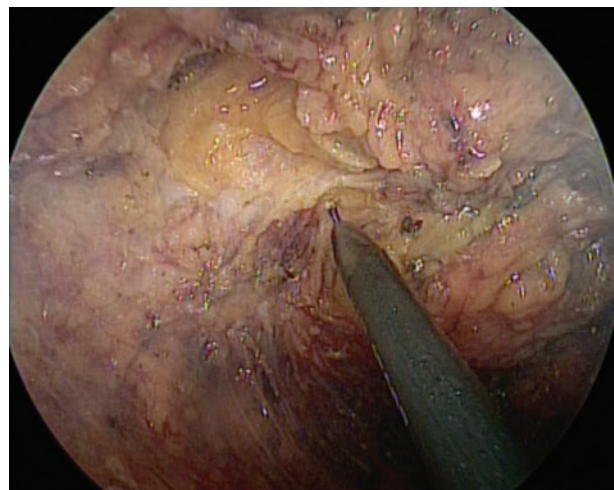
**Figure 8:** Transanal rectal incision.



**Figure 10:** Left (of the patient) lateral dissection of TaTME.



**Figure 9:** Posterior dissection of TaTME.



**Figure 11:** Right (of the patient) lateral dissection of TaTME.

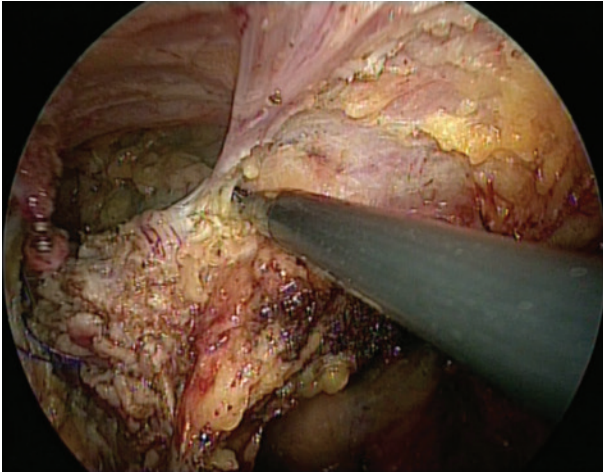
side (of the patient) (Figure 11). The dissection is finally performed anteriorly (Figure 12), taking care to dissect the correct plane between the rectum and the prostate (male), and the vagina (female). The dissection is continued up, respecting the presacral fascia, until reaching the seminal vesicles (male) or the uterine cervix (female), using both a monocurved coagulating hook and monocurved bipolar grasping forceps and scissors. Finally, the transanal dissection joins the previous dissection started down to the promontory through abdominal laparoscopy (Figure 13).

The rectal-sigmoid colon is inserted in a plastic protection and removed transanally, after having removed the D-port (Figure 14). The level of the colic transection is found, the left colon is sectioned, and the specimen is sent to the pathology laboratory. The anvil of the circular stapler is introduced into the colic lumen, closing this latter with a Prolene 2/0 purse-string suture. The anvil

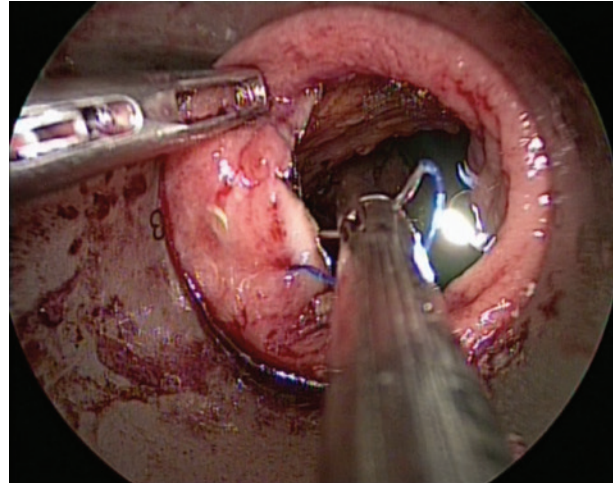
is pushed inside the pelvis and the D-Port is replaced. The rectal stump is closed transanally with a Prolene 2/0 purse-string suture, using the monocurved grasping forceps and the monocurved needle holder (Figure 15). The anvil is kept transanally (Figure 16) by the monocurved anvil grasping forceps (Figure 2H). The D-Port is removed and the circular stapler is introduced through the anus (Figure 17). The anvil is attached to the circular stapler under abdominal laparoscopic view, and the stapler is closed and fired (Figure 18).

### TaTME with coloanal anastomosis

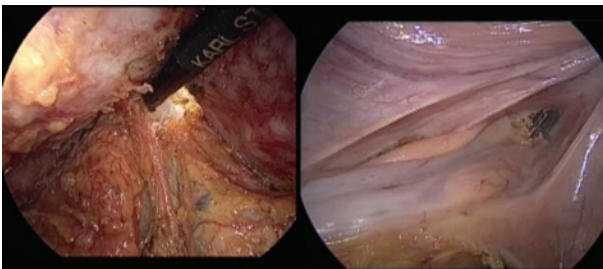
A gauze is inserted into the anal canal to avoid potential fecal contamination. The Lone-Star retractor is positioned



**Figure 12:** Anterior dissection of TaTME.



**Figure 15:** Rectal stump closure using a purse-string suture performed transanally.



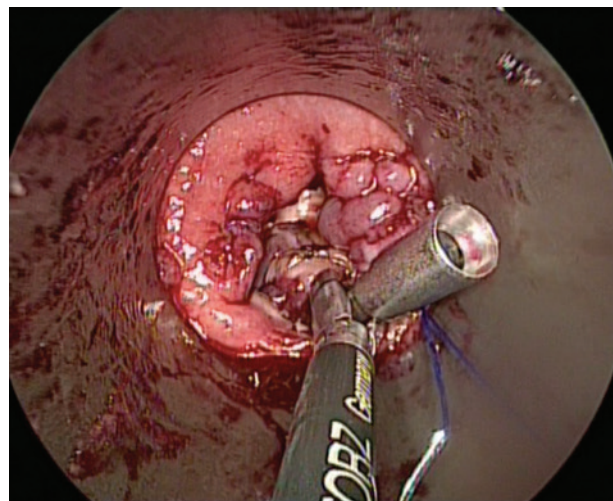
**Figure 13:** Douglas' pouch opening: transanal view (left) and transabdominal view (right).



**Figure 14:** Extraction of the transanal specimen under plastic protection.

and the anal mucosa is injected with lidocaine 1%. The pectineal line is incised using the monopolar electrode (Figure 19). Once freed circumferentially from the anal canal, the anal mucosa is closed using a silk 0 purse-string suture, and pushed into the pelvis.

The D-Port is inserted and fixed to the skin with four silk 0 sutures. The procedure is performed as above. At the end, the coloanal anastomosis is created using Vicryl

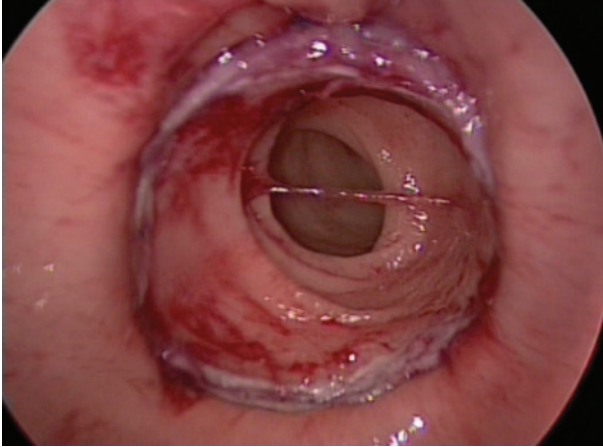


**Figure 16:** Anvil of the circular stapler kept in place by the mono-curved anvil-grasping forceps.

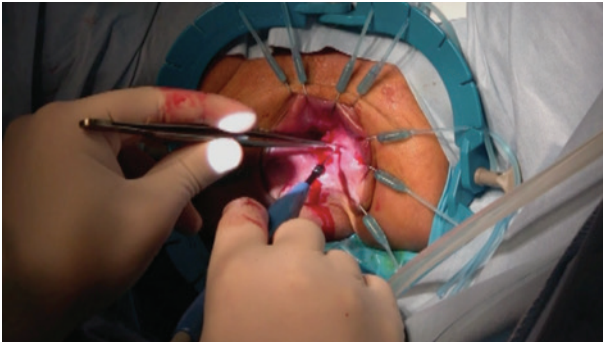


**Figure 17:** Transanal insertion of the circular stapler.





**Figure 18:** Endolumenal view of the colorectal anastomosis.



**Figure 19:** Anal mucosa dissection.



**Figure 20:** Coloanal anastomosis.

Rapid 3/0 sutures (Figure 20) and the Lone-Star retractor is taken out.

### End of the procedure

Through the abdomen, the pelvic parietal peritoneum is closed and attached to the left colon with Vicryl 2/0

running sutures. The left mesocolic window is closed as well with a Vicryl 2/0 running suture. If necessary, a suprapubic drain is placed into the pelvis.

The operating room table is set without any Trendelenburg position and tilt, and the small bowel is gently moved out of the right abdominal quadrants and over the left colon.

The distal bowel loop and the ileocecal valve are searched. A loop, roughly 20 cm before the ileocecal valve, is grasped and extracted out of the abdomen, creating a temporary ileostomy (optionally).

## Discussion

The utility of laparoscopic low anterior resection can be extremely challenging when dealing with low/middle rectal tumors and especially in patients with the following characteristics: deep and narrow pelvis, male gender, obesity, following neo-adjuvant chemo-radiation, and those with a bulky tumor. The technical challenges derived from these characteristics include a limited exposure of the TME surgical planes and difficulty of stapling across a low rectal tumor. These may lead to breaches in the quality of the mesorectal fascia and incorrect identification of the distal resection margin. The distal transection in the deep and narrow pelvis using the currently available laparoscopic staplers can be difficult and may require multiple linear stapler firings, which is associated by some authors with increased rates of anastomotic leak [14]. The above-mentioned challenges result in considerable laparoscopic to open conversion rates as high as 34%, consequently linked to increased postoperative morbidity and worse oncologic outcomes [15, 16].

Based on these relevant concerns, the concept of TaTME utilizing a “bottom up” approach has been proposed, and it became more and more popular. TaTME has clear benefits over the laparoscopic or open transabdominal TME in achieving a clear distal resection margin, as the dissection starts distal to the tumor and is developed cephalad. Moreover, it enables better exposure of the mesorectal planes exactly at the point where the traditional approach struggles to, especially in obese male patients. It also often allows for a single stapled anastomosis and a natural orifice for specimen extraction. This latter aspect allows avoiding an abdominal scar and reduces the risk of incisional hernia.

Since the first TaTME was reported by Sylla et al. in 2010 [5], the procedure has grown in popularity, reflected by the rising number of scientific publications. Reports

have shown promising results regarding TME specimen quality, high rates of sphincter preservation while achieving a clear distal resection margin, and comparable postoperative morbidity [17–20]. In a meta-analysis comparing TaTME and transabdominal TME [21], TaTME is favorable for a longer circumferential resection margin (CRM), lower rate of positive CRM, and complete TME rate.

Anastomotic leakage is a devastating postoperative complication after low anterior resection reported with an incidence up to 31.6% [22]. With the adoption of TaTME, this incidence is reduced to 6.7% [23].

Despite the potential benefits of the procedure, there is concern about widespread and unmonitored adoption of TaTME, as it is a challenging operation even in the hands of experienced laparoscopic surgeons [24], requiring considerable comfort with other transanal techniques. Nevertheless, it is reasonable to select easier cases at the beginning of the learning curve, including female and normal-weight patients, and those with early-stage tumors located posteriorly. McLemore et al. acknowledged six key elements that may facilitate introduction of TaTME into clinical practice [25]. The surgeon should have expertise in TME for rectal cancer, minimally invasive (laparoscopic and/or robotic) TME, transanal endoscopic surgery, intersphincteric dissection for very low rectal tumors, and has practiced TaTME techniques in human cadaver laboratories. Institutional review board-approved data collection with publication of outcomes and/or participation in a clinical registry is also recommended.

The TaTME consensus group has stated that at least 14 procedures should be performed annually to ensure optimal quality of the procedure [26]. This hypothetical learning curve is supported by the systematic review of Deijen et al. [20], who performed a subgroup analysis of low-volume (<30 patients per year) vs. high-volume centers. The results showed that high-volume centers enjoyed a shorter operative time (222 vs. 282 min), more two-team approach (51% vs. 13%), lower conversion rate (2.7% vs. 4.3%), more “complete” TME (89.7% vs. 80.5%), lower major complication rate (12.2% vs. 10.5%), and lower rates of local recurrence (2.8% vs. 8.9%). Furthermore, low-volume centers had a higher rate of colostomy.

The operative time during TaTME has to be considered as well; however, in case of a two-team approach, the procedure is initiated simultaneously from both the abdominal and perineal approaches, and consequently the operative time is reduced. In the systematic review by Deijen et al. [20], the two-team procedure took 209.8 min instead of 264.5 min with the single-team procedure. Certainly, the operation has to be started with laparoscopic

exploration, in order to rule out any intra-abdominal carcinomatosis.

Technically speaking, the TME plane has to be started posteriorly, going deeply in the direction of the coccyx. The anterior dissection, which includes the recto-prostatic fascia (Denonvilliers’ fascia) or the recto-vaginal septum sectioning, has to be performed only after the posterior and lateral dissections have been realized. This strategy permits avoiding potential injuries to the urethra, prostate, and vagina, and overall allows maintaining a pneumorectum. The anterior dissection and rectal mobilization have to be performed keeping in mind that the anatomical length of the anterior segment is 2 cm longer in male patients than in female patients. Hence, the Douglas’ pouch opening in female patients is reached rather quickly, and, if opened, difficulties appear to go forward transanally.

For surgery of the rectum, the entire colorectal tract is recommended to be cleaned preoperatively; thus, it makes sense to perform a temporary stoma at the level of the last small bowel and not of the descending colon. Moreover, this approach allows maintaining the descending colon intact, which sometimes can become shortened after rectal resection. Placement of a temporary ileostomy remains indicated in patients submitted to chemo-radiation, with comorbidities, with advanced age, and with perioperative complications. Placement of abdominal drainage in the pelvis is recommended as well after colorectal anastomosis and if some perioperative complications have occurred. Patients with coloanal anastomosis can avoid a temporary stoma because the anastomosis is usually at the level of the perineum and out of the pelvis.

Finally, since the transanal platform is required, it is better to apply instrumentation that permits working under ergonomic positions and respecting one of the rules of general laparoscopy, which is using the telescope as the bisector of the working triangulation [27]. Application of reusable platform with monocurved instruments as described above allows attaining these objectives.

## Conclusion

TaTME is surely a new innovative approach for treating rectal tumors, especially in patients with deep and narrow pelvis, bulky lesions, male gender, obesity, and after neoadjuvant chemo-radiation. Therefore, this technique permits to exactly localize the intraluminal lesion, to start the dissection a few centimeters below, and to avoid multiple firings of stapler in the rectal section.

### Author Statement

Research funding: Author states no funding involved. Conflict of interest: G. Dapri is consultant for Karl Storz-Endoskope, Tuttlingen, Germany, but states no conflict of interest. Informed consent: Informed consent is not applicable. Ethical approval: The conducted research is not related to either human or animals use.

### Author Contributions

Giovanni Dapri: conceptualization; data curation; formal analysis; methodology; project administration; supervision; validation; writing – original draft; writing – review and editing.

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**Supplemental Material:** The article (<https://doi.org/10.1515/iss-2017-0044>) offers reviewer assessments as supplementary material.





## Reviewer Assessment

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Received November 11, 2017; accepted December 12, 2017

**\*Corresponding author: Giovanni Dapri**, Department of Gastrointestinal Surgery, European School of Laparoscopic Surgery, Saint-Pierre University Hospital, Université Libre de Bruxelles, Brussels, Belgium; and Laboratory of Anatomy, Faculty of Medicine and Pharmacy, University of Mons, Mons, Belgium, E-mail: [giovanni@dapri.net](mailto:giovanni@dapri.net)

## Reviewers' Comments to Original Submission

### Reviewer 1: anonymous

Nov 13, 2017

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**Reviewer Recommendation Term:** Revise with Major Modification  
**Overall Reviewer Manuscript Rating:** 30

Custom Review Questions	Response
Is the subject area appropriate for you?	4
Does the title clearly reflect the paper's content?	1 - Low/No
Does the abstract clearly reflect the paper's content?	3
Do the keywords clearly reflect the paper's content?	3
Does the introduction present the problem clearly?	2
Are the results/conclusions justified?	2
How comprehensive and up-to-date is the subject matter presented?	3
How adequate is the data presentation?	2
Are units and terminology used correctly?	3
Is the number of cases adequate?	2
Are the experimental methods/clinical studies adequate?	2
Is the length appropriate in relation to the content?	1 - Low/No
Does the reader get new insights from the article?	2
Please rate the practical significance.	2
Please rate the accuracy of methods.	2
Please rate the statistical evaluation and quality control.	2
Please rate the appropriateness of the figures and tables.	2
Please rate the appropriateness of the references.	3
Please evaluate the writing style and use of language.	3
Please judge the overall scientific quality of the manuscript.	2
Are you willing to review the revision of this manuscript?	Yes

**Comments to Authors:**

This manuscript aims to provide a brief description of the surgical technique for TaTME.

For this purpose manuscript was divided into 5 sections: patient and team positioning; abdominal laparoscopy; TaTME with colorectal anastomosis; TaTME with coloanal anastomosis & end of the procedure. They ended up with 20 figures. Furthermore the authors discussed the literature to consider whether these procedures are really necessary. However, questions and concerns were raised.

Major points:

This is not an original article. On the other hand it is not a systematic review of the literature.

The question at the beginning of the article (title) cannot be answered with this manuscript! It should be a technical note. Otherwise the authors should bring clear positive clinical results with this technique.

It is certainly an interesting concept to operate with this D-Port. This is possibly a good alternative for those patients who had a really small anal canal. Since experience with this rigid port and the curved instruments is still limited your knowledge and experience (negative as well as positive) will be of interest to the readers. This could be the central point of the paper. However, the amount of figures should be reduced. A short video sequence can easily show the dissection better than the figures.

**Reviewer 2: anonymous**

Nov 29, 2017

**Reviewer Recommendation Term:** Reject  
**Overall Reviewer Manuscript Rating:** 15

Custom Review Questions	Response
Is the subject area appropriate for you?	5 - High/Yes
Does the title clearly reflect the paper's content?	1 - Low/No
Does the abstract clearly reflect the paper's content?	2
Do the keywords clearly reflect the paper's content?	2
Does the introduction present the problem clearly?	4
Are the results/conclusions justified?	2
How comprehensive and up-to-date is the subject matter presented?	1 - Low/No
How adequate is the data presentation?	2
Are units and terminology used correctly?	3
Is the number of cases adequate?	N/A
Are the experimental methods/clinical studies adequate?	N/A
Is the length appropriate in relation to the content?	2
Does the reader get new insights from the article?	1 - Low/No
Please rate the practical significance.	2
Please rate the accuracy of methods.	3
Please rate the statistical evaluation and quality control.	N/A
Please rate the appropriateness of the figures and tables.	3
Please rate the appropriateness of the references.	4
Please evaluate the writing style and use of language.	3
Please judge the overall scientific quality of the manuscript.	2
Are you willing to review the revision of this manuscript?	Yes

**Comments to Authors:**

The author(s) describe TaTME as an alternative to conventional laparoscopic TME and state the shortcomings of the conventional Approach. This is well-known in several publications and Consensus papers meanwhile also mentioned by the author(s). The manuscript is written as a technical note rather than an original article without any data of patient's series. There are some details like using of a specific transanal platform and fluorescence Administration which are recommended by the author, however, are not standardized or consented by any Consensus conference. I would rather prefer to submit it as a video-Vignette or technical note.



## Guest Editor's Comments to Decision

Dec 12, 2017

Dear Reader;

The manuscript „Transanal TME – really needed?“ by Giovanni Dapri was originally reviewed by two reviewers, who recommended major revisions and advised to present a video tape, instead or in addition. They also criticized that this was neither an original article nor a systematic review of the literature. Nevertheless, the Guest Editor had invited the author to write an article on transanal TME with special regards to the final need of this procedure to treat low rectal cancer just by this approach. This request was mainly based on the knowledge that quite a relevant number of surgeons in Europe had attended his operations in recent years personally, to learn from his outstanding experience. To compensate for eventual deficits of the paper to ask the questions posed, the Guest Editor comments on these specific questions in his editorial, in addition.

With best regards,  
Werner Hohenberger