A New Reusable Platform for TransAnal Minimally Invasive Surgery: First Experience

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ABSTRACT

Introduction: TransAnal Minimally Invasive Surgery (TAMIS) has generated interest and attracted research in the last decade. This approach is used to treat primary benign and malignant diseases, but it can also be adopted to resolve colorectal complications, such as leak and fistula, bleeding and stenosis. A new reusable transanal platform formed by a new port and monocurved instruments has been invented and here presented.

Materials and Methods: The first experience included 13 patients submitted to TAMIS for rectal adenocarcinoma (8), immediate colorectal leak (1), early rectovaginal fistula (1), late colorectal fistula (1), immediate colorectal bleeding (1), and benign stenosis (1). Mean age was 62.3 years (38-74), and mean BMI was 25.2 kg/m^2 (20.5-32.1).

Results: Mean operative time for transanal total mesorectal excision (TME) was 149.2 minutes (96-193) and for the other procedures 80.6 minutes (15-163). Mean operative bleeding was 51.1 cc (0-450). Mean hospital stay was 5.0 days (2-8). The 3 patients with coloanal anastomosis presented diarrhea postoperatively. No other early postoperative complications were registered. Pathologic report in the oncologic diseases showed that a mean number of 14.7 nodes (16-20) were removed. After a mean follow-up of 8 months (1-14), there were no late complications in any of the 13 patients treated.

Conclusion: TAMIS is a feasible alternative approach to treat rectal cancer and a completely new technique to manage colorectal complications. Moreover, this new transanal platform offers surgeons a satisfactory working ergonomy, with no increase in cost of the procedures, because entirely reusable materials are adopted.

INTRODUCTION

In the last decade thanks to the Natural Orifice Translumenal Endoscopic Surgery (NOTES), laparoscopic surgery through the anus has drawn attention and investment in both surgical and research endeavors. Because the anus is a natural orifice, it has already been used to extract specimens from the abdominal cavity, a procedure that avoids enlarging the abdominal trocar scar or performing a supplementary abdominal incision.[1,2] Consequently, this approach reduces abdominal trauma and the risk of postoperative incisional hernias.

TransAnal Minimally Invasive Surgery (TAMIS) represents a recent innovation in conventional laparoscopy, one which adopts the instruments and scopes of general abdominal laparoscopy for procedures performed

Table I

ONCOLOGIC

PATIENTS	Sex	Age (years)	BMI (kg/m²)	Anal margin distance (cm)	Neoadjuvant chemoradiation	Post-therapy TNM stade	Protective stoma	Anastomosis type
1	F	69	24.6	10	yes	T2N1M0	No	ColoRectal
2	M	65	23.6	4	yes	T3N1M0	Yes	ColoRectal
3	M	58	22.8	2	yes	T3N0M0	No	ColoAnal
4	F	58	21.4	10	yes	T3N1M0	No	ColoRectal
5	M	63	23.6	1	yes	T3N1M0	No	ColoAnal
6	M	69	28.4	2	yes	T3N0M0	No	ColoAnal
7	M	64	20.5	6	yes	T2N0M0	Yes	ColoRectal
8	F	69	27.3	5.5	yes	T2N0M0	Yes	ColoRectal

NON-ONCOLOGIC

PATIENTS	Sex	Age (years)	BMI (kg/m²)	Anal margin distance (cm)	Disease	Radius (cm)	Protective stoma
9	F	50	27.6	4	intraoperative anastomotic leak	0.5	Yes
10	F	74	22.3	12	early anastomotic fistula	2.0	Yes
11	M	65	32.1	11	late anastomotic fistula	1.0	Yes
12	M	38	27.1	2.5	stenotic ulcer	0.8	No
13	F	69	27.3	2.5	intraoperative anastomotic bleeding	0.5	Yes

through the anus. This approach allows the surgeon to perform the total mesorectal excision (TME) with autonomic nerve preservation through a different and new route called "down-to-up" TME.[1] TAMIS is advantageous because it pinpoints the exact location of the rectal lesion and initiates dissection just below it, to reveal the so-called "holy plane" with a magnification of the operative field's exposure. Magnified exposure reveals a bloodless plane of dissection with more evidence of the lateral sacral nerves, thereby avoiding firings of the stapler to transect the rectum. The specimen can then be removed transanally. On the other hand, a high learning curve is required, as has been the case with Transanal Endoscopic Microsurgery (TEM).[4]

Additional applications of TAMIS include the resection of endoluminal benign rectal lesions or early stage rectal adenocarcinoma,[5,6] and treatment of complications such as leak and fistula,[7] bleeding,[8] and stenosis.[9]

TAMIS can be performed using disposable ports developed for Single Incision Laparoscopy (SIL), such as the flexible SILS Port (Covidien, New Haven, Connecticut), the flexible GelPOINT Path (Applied Medical, Rancho Santa Margarita, California), the flexible KeyPort (Richard Wolf GmbH, Knittlingen, Germany), the flexible TriPort (Advanced Surgical Concepts, Wicklow, Ireland), the flexible Lap Disc Mini (HAKKO Group, Nagano, Japan), the rigid Endorec (Aspide Medical, Saint-Étienne, France), the rigid Single Site Laparoscopy (SSL) Access System (Ethicon Endo-Surgery, Cincinnati, Ohio); or reusable platforms developed for TEM, such as the rigid Transanal Endoscopic Operation (TEO) System (Karl Storz - Endoskope, Tuttlingen, Germany) or the rigid Wolf TEM System (Richard Wolf GmbH, Knittlingen, Germany). Finally, the instruments implemented through the transanal port can be dedicated instruments for transanal platforms, SIL-dedicated instruments, or conventional instruments for general laparoscopy.

A new reusable transanal platform consisting of a new port and monocurved instruments has been invented and is here presented. The first experience of transanal rectal resection and management of colorectal complications is described as well.

Figure 1. Transanal reusable DAPRI Port or D-Port (Karl Storz - Endoskope, Tuttlingen, Germany).

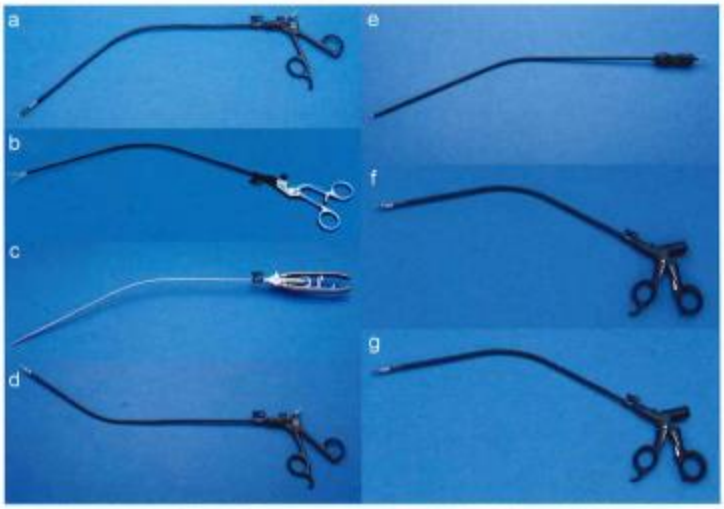
MATERIALS AND METHODS

Patients

Between February 2015 and January 2016, 13 patients underwent TAMIS. Eight patients were affected with rectal adenocarcinoma (Table I), 1 patient presented with an immediate colorectal anastomotic leak at leak test after laparoscopic anterior rectal resection (LARR), 1 patient presented with an early recto-vaginal fistula after 3 weeks of LARR plus hysterectomy, 1 patient presented with a late colorectal fistula after 4 weeks of LARR, 1 patient presented an immediate colorectal anastomotic bleeding after circular mechanical anastomosis, and 1 patient presented with a benign circumferential stenosis due to rectal ulcer. The following procedures were performed: 8 transanal TME, 3 leak/fistula repairs, 1 bleeding repair, and 1 total mucosectomy.

If the outcome of a procedure required it, a temporary protective stoma was created by ileostomy.

The mean age of the patients was 62.3 years (38-74), and mean BMI was 25.2 kg/m^2 (20.5-32.1). The patients with rectal adenocarcinoma and preoperative TNM stage > T2N0 underwent neo-adjuvant chemoradiation.



Figures 2a-g. Monocurved reusable instruments according to DAPRI (Karl Storz - Endoskope, Tuttlingen, Germany): grasping forceps (a), anvil grasping forceps (b), needle holder (c), scissors (d), coagulating hook (e), bipolar forceps (f), bipolar scissors (g).

Figure 3. Parts of the D-Port: tube.

Figure 4. Parts of the D-Port: obturator.

Figure 5. Parts of the D-Port: silicon cap.

During the transanal TME, abdominal laparoscopy (for the vascular dissection, sigmoid and left colons mobilization, splenic flexure download) was performed before the transanal dissection.

Operative time was measured in minutes, between insertion of the D-Port and its removal at the end of the procedure. Operative bleeding was observed at the end of the transanal approach.

Transanal port and instruments

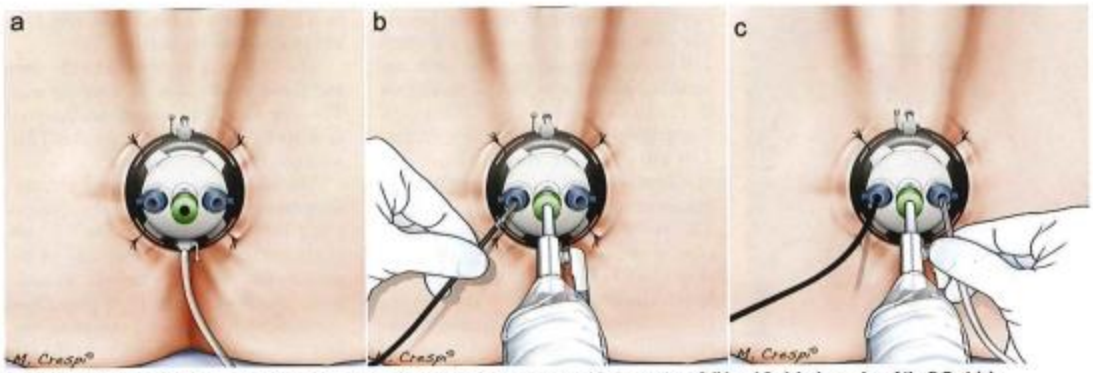
The transanal platform is formed by the reusable DAPRI Port or D-Port (Karl Storz - Endoskope, Tuttlingen, Germany) (Fig. 1) and the DAPRI monocurved reusable instruments (Figs. 2a-g) (Karl Storz - Endoskope, Tuttlingen, Germany).

The components of the D-Port are completely reusable; as a result, the procedure does not increase cost.

The D-Port consists of 3 parts:

1. Tube (Fig. 3): 30 mm diameter and 7.5 cm length, facilitating its introduction through the anal verge without any anal dilatation. It allows the use of a 10-mm scope and two 5-mm instruments, without any clushing of the two instruments' tips during dissection, resection and suturing. It permits contemporary insufflation and desufflation of CO_2, evacuating the smoke created during the dissection. It is supported by 4 oval holes, which allow the port to rotate if necessary. Finally, 4 cardinal points are marked inside the tube to orientate the surgeon during the operation.
2. Obturator (Fig. 4): used for the introduction of the tube through the anal verge. It is removed before the silicon cap is placed.
3. Silicon cap (Fig. 5): formed by 3 orifices (6-mm, 11-mm, 6-mm) aligned on the same horizontal line. It permits the instruments to move freely outside the port. The orifices permit the introduction of the 10-mm scope in the middle and of the two ancillary 5-mm tools on both sides. This disposition follows the principle of conventional laparoscopy, which is to maintain the optical system in the center as the bisector of the working triangulation formed by two ancillary tools.[10]

The monocurved reusable instruments are similar in shape and allow a



Figures 6a-c. Insertion of the D-Port into the anal canal (a); insertion of the monocurved instruments at 9 (b) and 3 o'clock opening of the D-Port (c).

certain degree of freedom in intraluminal work, thereby providing an ergonomic benefit to the surgeon.

Transanal TME with colorectal anastomosis

This procedure is initiated with a laparoscopic approach through the abdomen, permitting vascular dissection (inferior mesenteric vein and artery), sigmoid and left colons mobilization, and splenic flexure download. The abdominal laparoscopy ends when the dissection reaches the promontory. Then TME begins with the insertion of the transanal D-Port through the anus (Fig. 6a). The port is fixed to the skin by four sutures. A 10-mm, 30° scope is inserted in the middle opening of the D-Port. The rectal lumen is checked to identify the rectal tumor. A gauze is pushed beyond the rectal tumor, to prevent the stools from flowing out. The monocurved grasping forceps (Fig. 2a) and the anvil grasping forceps (at the end of the procedure) (Fig. 2b) are inserted at the 9 o'clock orifice of the D-Port (Fig. 6b). The other instruments, like the monocurved needle holder (Fig. 2c), the monocurved scissors (Fig. 2d), the monocurved coagulating hook (Fig. 2e), the monocurved bipolar forceps (Fig. 2f) and scissors (Fig. 2g), are inserted at the 3 o'clock orifice of the D-Port (Fig. 6c).

A safe margin, distally from the tumor, is chosen and a purse-string suture using Prolene 2/0 is placed into the rectal mucosa and submucosa, using the monocurved grasping forceps and the monocurved needle holder (Fig. 7). Then the mucosa directly under the purse-string suture is incised until the entire rectal wall is perforated, reaching the perirectal fatty tissue. The TME is performed from bottom-to-top, first

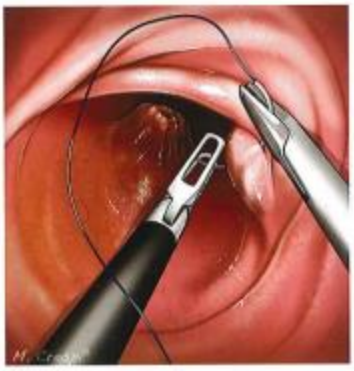
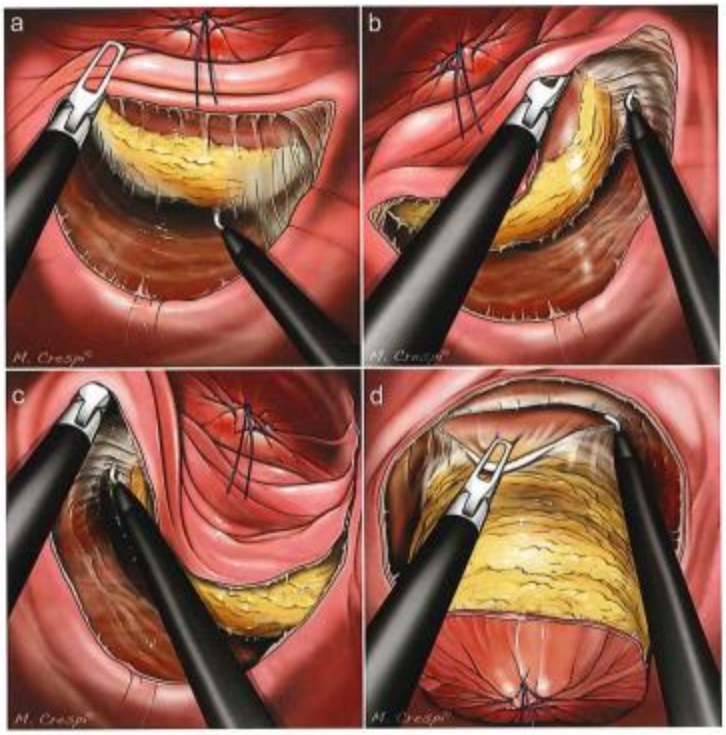


Figure 7. Intraluminal purse-string suture into the rectal mucosa and submucosa, distally to the tumor.



Figures 8a-d. TME performed first going posteriorly and respecting the presacral fascia (a); then on the left side (of the patient) (b); then on the right side (of the patient) (c); finally anteriorly between the rectum and the prostate (male) or the vagina (female) (d).

Figure 9. Removal of rectal-sigmoid colon transanally.

proceeding posteriorly and respecting the presacral fascia (Fig. 8a). Then the TME is completed laterally, on the left side of the patient (Fig. 8b), and on the right side of the patient (Fig. 8c). The dissection is finally performed anteriorly, taking care to dissect the correct plane between the rectum and the prostate (male) or the vagina (female) (Fig. 8d). The dissection continues upward, respecting the presacral fascia, reaching the seminal vesicles (male) or the uterine cervix (female), using both monocurved coagulating hook and monocurved bipolar scissors. Finally, the transanal dissection joins the previous dissection performed by abdominal laparoscopy (Fig. 8d).

The rectal-sigmoid colon is encircled by a plastic protection and removed transanally, after the D-Port is removed (Fig. 9). The level of the colic transection is found, the left colon is sectioned, and the specimen is sent for pathology examination. The anvil of the circular stapler is introduced into the lumen. The colic lumen is closed by a Prolene 2/0 purse-string suture. The colon and anvil are pushed into the pelvis and the D-Port is repositioned. The rectal stump is closed transanally by a Prolene 2/0 purse-string suture, using the monocurved grasping forceps and the monocurved needle holder (Fig.10a). The monocurved anvil grasping forceps is introduced to grasp the anvil (Fig.10b) before pushing the rectal knot. Then, the suture is cut and the D-Port is removed. The circular stapler is introduced transanally, and the anvil is attached to it, through the monocurved anvil grasping forceps. The anastomosis is performed under abdominal laparoscopic view (Fig.10c).

Through the abdomen, the pelvis is immersed under physiologic solution, and the anastomotic leak test is performed.

Transanal TME with coloanal anastomosis

This procedure is initiated with a laparoscopic approach through the abdomen, permitting vascular dissection (inferior mesenteric vein and artery), sigmoid and left colons mobilization, and splenic flexure download. The abdominal laparoscopy ends when the dissection reaches the promontory. Then TME is begun. A gauze is inserted into the anal canal, to avoid potential fecal contamination. The Lone Star retractor (Cooper Surgical, Trumbull, Connecticut) is positioned, and the anal mucosa is injected with lidocaine 1%. The pectineal line is incised by monopolar electrode (Fig.11a). Once freed circumferentially, the anal mucosa is closed by a 0 silk purse-string suture (Fig.11b) and pushed into the pelvis.

The D-Port is inserted into the anus and fixed to the skin by four sutures. The scope and instruments are inserted as described above in "Transanal TME with colorectal anastomosis".

The anal canal is mobilized circumferentially from down-to-up, proceeding first posteriorly, to the left side of the patient, to the right side of the patient, and finally anteriorly. In addition, the lower rectum is mobilized circumferentially from bottom-to-top, first proceeding posteriorly, to the left side, then to the right side, and finally anteriorly, using the monocurved coagulating hook and the monocurved grasping forceps. The dissection is performed posteriorly taking care to respect the presacral fascia, and anteriorly searching the correct plane between the rectum and the prostate (male) or the vagina (female).

The middle rectum is freed, taking care to respect the presacral fascia posteriorly, and the correct plane between the rectum and the seminal vesicles (male) or uterine cervix (female) anteriorly. Either the monocurved coagulating hook or monocurved bipolar scissors can be used. Finally, the transanal dissection joins the previous dissection performed by abdominal laparoscopy.

The rectal-sigmoid colon is encircled by a plastic protection, and removed transanally, after the D-Port has been removed. The level of the colic transection is found and the left colon is sectioned, removing the specimen. The coloanal anastomosis is performed (Fig.11c).

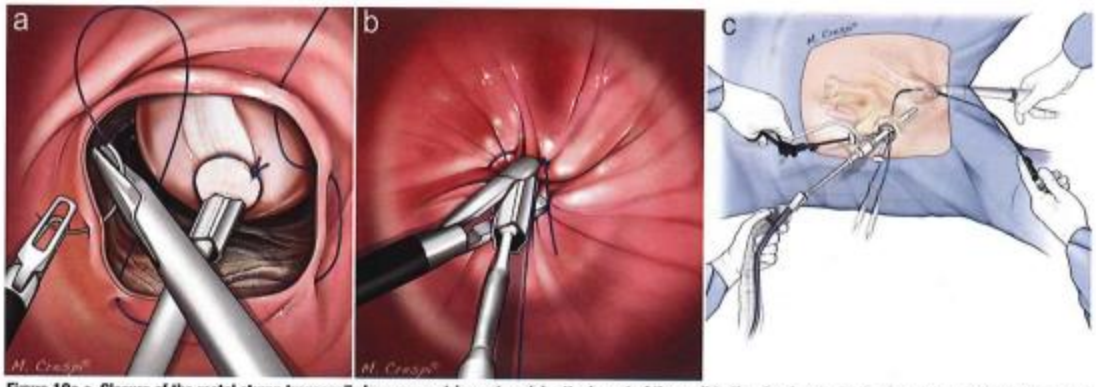
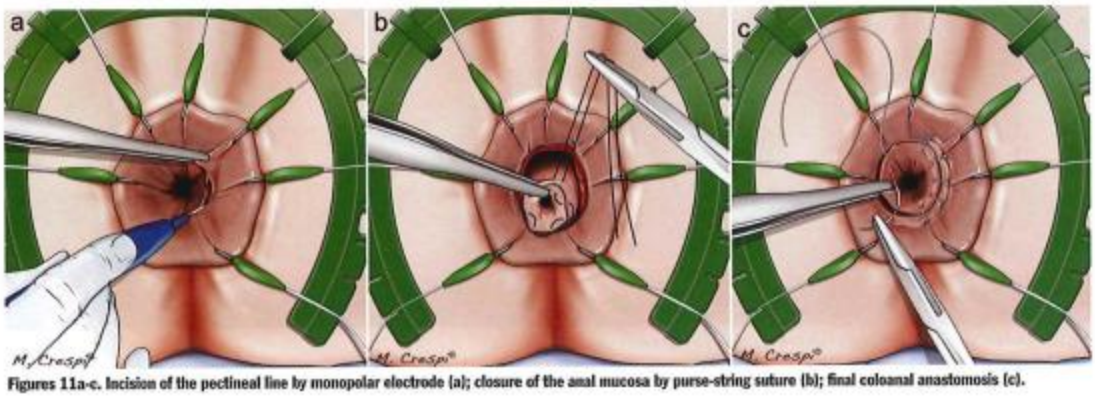
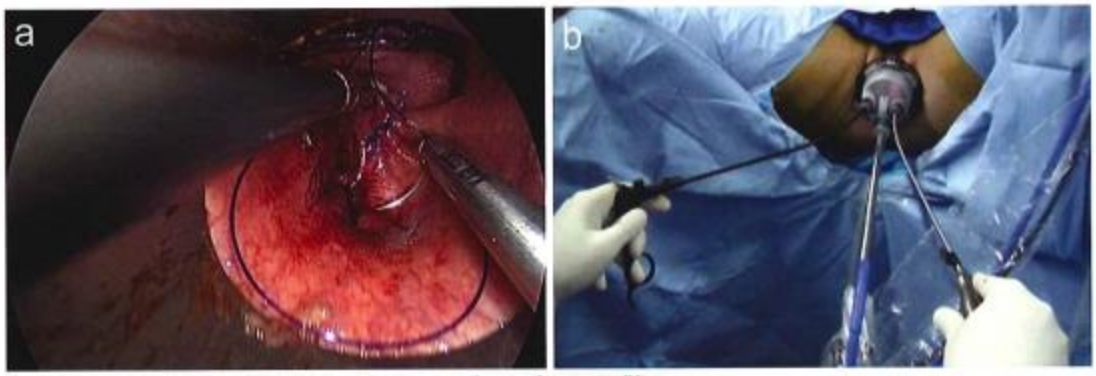


Figure 10a-c. Closure of the rectal stump transanally by a purse-string suture (a); attachment of the anvil to the circular stapler by the monocurved anvil grasping forceps (b); successive colorectal anastomosis (c).



Figures 11a-c. Incision of the pectineal line by monopolar electrode (a); closure of the anal mucosa by purse-string suture (b); final coloanal anastomosis (c).



Figures 12a,b. Endoluminal colorectal leak's suture (a); extracorporeal surgeon's ergonomy (b).

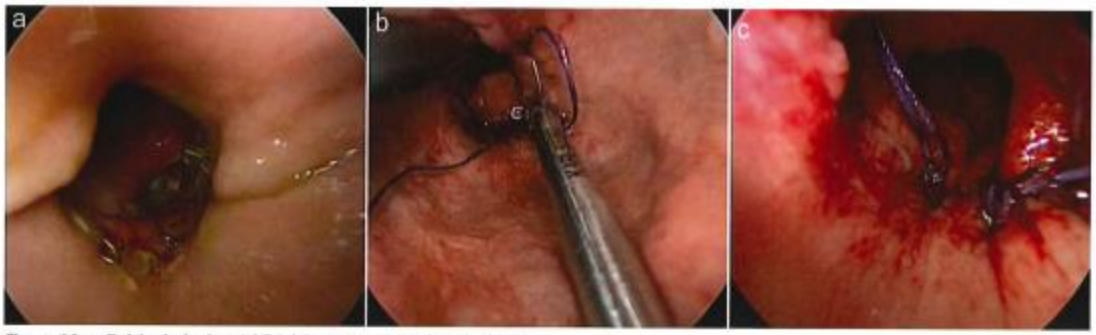
Figures 13a-c. Endoluminal rectovaginal fistula's exposure (a) and suture (b,c).

Repair of immediate colorectal leak

At the end of the rectal resection operation, the colorectal anastomosis is tested. If the leak test appears positive, immediate repair can be performed using the transanal approach. Hence the D-Port is inserted into the anus and fixed to the skin. The colorectal leak is made evident; in the case reported, the leak was located 4 cm from the anal margin. The repair was performed using the monocurved grasping forceps and the monocurved needle holder (Fig.12a). During the entire procedure the surgeon worked under satisfactory ergonomy (Fig.12b).

Repair of early rectovaginal fistula

Once the defect is diagnosed, transanal repair can be proposed to the patient. The D-Port is inserted into the anus, and the rectal lumen is explored, making evident the level of the fistula; in the case reported, the fistula was located 12 cm from the anal margin (Fig.13a). Local debridement and lavage were then performed. Different absorbable figure of 8 sutures (using Vicryl 2/0) were placed to close the defect (Figs.13b,c), and the surgeon worked ergonomically with monocurved grasping forceps and monocurved needle holder.



Figures 14a-c. Endoluminal colorectal fistula's exposure (a) and suture (b,c).

Repair of late colorectal fistula

The D-Port is inserted into the anus and fixed to the skin. The previous colorectal anastomosis is localized and the defect is revealed; in the case reported, the defect was located 11 cm from the anal margin (Fig.14a). Local debridement and lavage were performed. The repair was performed using the monocurved grasping forceps and the monocurved needle holder. Different figure of 8 sutures using Vicryl 2/0 were positioned (Figs. 14b,c).

Repair of immediate colorectal bleeding

If a bleeding is apparent after a circular colorectal mechanical anastomosis, the D-Port is inserted into the anus and fixed to the skin. The anastomosis is inspected; in the case reported, the bleeding was located anteriorly on the staple line at 2.5 cm from the anal margin (Fig.15a). The blood was aspirated and the repair was performed, using the monocurved grasping forceps and the monocurved needle holder, with intracorporeal knotting technique (Figs. 15b,c).

Total mucosectomy

The D-Port is introduced into the anus and fixed to the skin. The circumferential rectal stenosis is identified; in the case reported it was at 2.5 cm from the anal margin (Fig.16a). The mucosectomy was initiated, with the dissection first proceeding posteriorly, then laterally and finally anteriorly, taking care to respect the muscolar fibers (Fig.16b). Once the stenosis was completely removed, the superior and the inferior mucosal edges were joined by separated Vicryl 2/0 sutures (Figs.16c-f).

RESULTS

The results are summarized in Table II.

Mean operative time for transanal TME was 149.2 minutes (96-193) and for the other procedures 80.6 minutes (15-163). Mean operative bleeding was 51.1 cc (0-450). Mean hospital stay was 5.0 days (2-8).

In all oncologic patients, the specimen's quality was complete, the circumferential resection margin was clear as well as the distal or proximal margins. The anastomosis performed was colorectal in 5 patients, and coloanal in the remaining 3 patients.

In non-oncologic patients, TAMIS was applied for a defect or lesion distant from the anal margin by 2.5 cm to 12 cm.

Temporary protective ileostomy was performed in 3 of the 8 oncologic patients and in all patients with a leak.

Only one early postoperative complication was registered and it was diarrhea in the 3 patients submitted to coloanal anastomosis. Medical therapy together with perineal kinesitherapy improved this complication.

Pathologic report on the 8 oncologic diseases showed a mean number of 14.7 nodes (16-20) removed.

The radiologic (gastrografiin enema) or the colonoscopic control at 2 months of the patients submitted to leak or fistula repair showed complete healing of all the defects. At this time, the patients underwent reversal of the protective stoma procedure.

After a mean follow-up of 8 months (1-14), there were no late complications in any of the 13 patients.

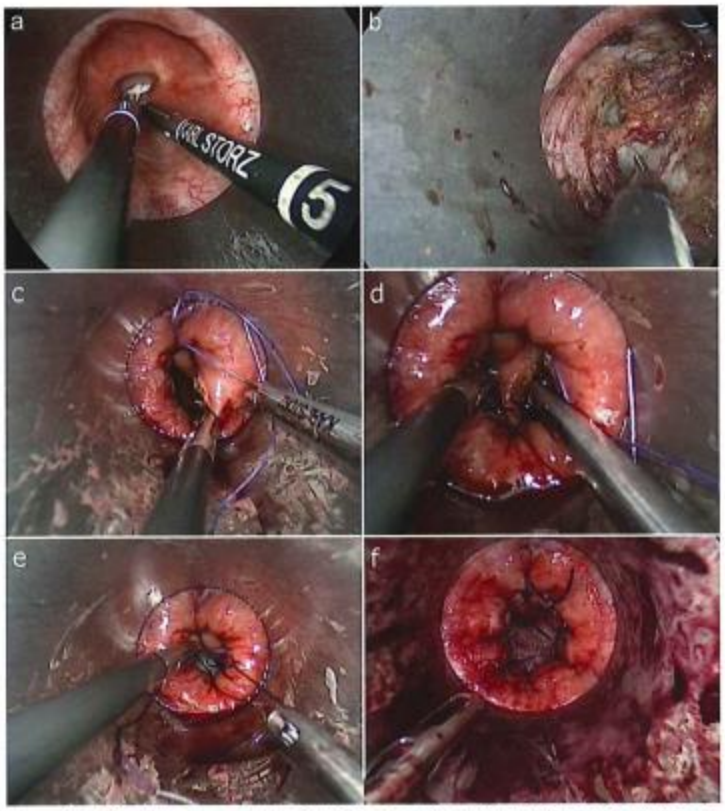
Figures 15a-c. Endoluminal colorectal anastomotic bleeding exposure (a) and suture (b,c).

DISCUSSION

Colorectal diseases treated by transanal laparoscopy were introduced by Buess et al. in 1983 with the TEM.[11] With the advent of NOTES this approach, using a natural orifice, has been re-evaluated and has generated interest and attracted research, thereby inaugurating a new era in laparoscopy called TAMIS.[12] The anus has not only been used as the natural orifice for the removal of a specimen from the abdomen,[1,2] but it has also become the access site to create retropneumorectum and to perform laparoscopy.

Major operations such as rectal resection with TME,[13] besides the resection of benign and early malignant rectal tumors,[14] began to be performed with this new approach. In general, TAMIS is a potentially beneficial treatment for the following conditions:

- ◆benign lesions located intraluminally in the low, middle and high rectum;
- ◆malignant lesions in the low, middle and high rectum;
- ◆leaks at colorectal anastomosis, located from 2 cm to 15 cm from the anal margin;
- ◆bleeding of colorectal anastomosis in the low, middle and high rectum;
- ◆benign stenosis in the low, middle and high rectum.



Figures 16a-f. Circular benign rectal stenosis at 2.5 cm from the anal verge (a); mucosectomy by coagulating hook (b); endoluminal suture (c-e); final result (f).

In addition, in patients for whom conventional abdominal laparoscopy may be difficult (for instance, male patients, obese patients, or patients with narrow pelvic bones and a bulky mesorectum), this procedure may be more easily implemented.

During rectal resection with TME, the main advantages of TAMIS over conventional abdominal laparoscopy include the possibility of localizing the position of the lesion intraluminally and initiating rectal resection a few centimeters down; easier opening of the "holy plane"; clearer exposure of the operative field; increased exposure of the lateral sacral nerves to be preserved; bloodless presacral dissection; a fewer number of firings of the stapler used to section the rectum; and finally the specimen's removal through the anus, thereby avoiding a mini-laparotomy. So far, in our preliminary experience, we encountered no difficulties finding a good plane of dissection, and we clearly identified the lateral sacral nerves. In only one case did we encounter operative bleeding of >50 cc, probably due to the short break-time between the end of the neoadjuvant therapy and the rectal resection operation. In one male patient with narrow pelvic bones, the transanal TME was performed under working conditions and exposure that were better than would have been the case under conventional abdominal laparoscopy.

The mean number of 14.7 nodes removed may appear low, but all our oncologic patients receive neoadjuvant chemoradiation; therefore the number of nodes can be further reduced.

Our mean operative time of 149.2 minutes for transanal TME, as well as our mean hospital stay of 5 days, are both comparable to the times reported in the literature.[15] However, operative time can be reduced if transanal TME is performed simultaneously with the abdominal laparoscopic steps.[16]

The registered early complication of diarrhea, solved during follow-up, probably stemmed from the preoperative sphincter function than from the pure TAMIS technique.[17]

Patients undergoing rectal resection with TME can be at risk of anastomotic leakage for several reasons. Among them, preoperative chemoradiation, weak quality of the tissues, presence of co-morbidities such as diabetes, vascular deficiences, obesity, and anatomical difficulties due to the narrow pelvic space, have an important impact. Hotta et al. reported that the colorectal anastomotic leak rate varied between 0 and 23%.[18] This perioperative complication can be repaired during the procedure of rectal resection using the transanal platform, as we did with one of our patients. This strategy enabled us to avoid a poor management of colorectal leaks.[19]

As was true of another patient of the series, a symptomatic late colorectal fistula can be repaired by TAMIS as

well. This option confirms that transanal repair of a persistent low colorectal anastomotic leakage is feasible in selected cases, even when chemoradiation has been performed.[20]

Rectovaginal fistula has been reported as solved using the TEM platform.[21] In our series, the new reusable platform allowed the fistula to be closed by suturing up into the rectum (12 cm).

In our 3 cases of rectal leaks, a temporary protective stoma was performed and closed 2 months later. However, this procedure requires further investigation, because other authors have reported that the rectal fistula healed without the protective stoma.[22] In our experience, this strategy allowed us to discharge patients with rectal fistula within a reasonable time of hospital stay, thereby avoiding long hospitalization or takedown of the anastomosis and permanent colostomy or tentative suturing repair from the abdomen with proximal diversion.[23]

Furthermore, this new transanal platform can be regularly adopted at the end of each rectal resection performed also through conventional multitrocar laparoscopy or SIL. This platform thus allows each colorectal anastomosis to be inspected, as is done with intraoperative colonoscopy, but allows possible perioperative problems to be corrected immediately. One patient of this preliminary series presented an immediate bleeding at the control of the circular mechanical colorectal anastomosis located at 2.5 cm from the anus. The repair was performed transanally without any sequelae.

Other potential complications or diseases such as stenosis, can be approached transanally, as it was for one of our patients presenting a benign stenosis at 2.5 cm from the anal margin. Transanal mucosectomy offered good results comparable to those reported with the technique of TEM.[9]

The use of the D-Port together with the monocurved instruments, originally developed for SIL.[24] constitutes a new reusable transanal platform that allows surgeons to work under satisfactory ergonomic conditions. This feature differentiates this platform from others, reported in the literature, which are less ergonomically satisfactory; for under the latter conditions, which tend to be less flexible, conflict usually arises between the surgeon's hands and the hands of the camera assistant.[25]

On the other hand, as was the case for TEM,[4] one of the disadvantages of TAMIS is that it entails a steep learning curve for the surgeon, because the surgeon needs time to adjust to working through a unique entry point and with a limited endoscopic space.

Another general disadvantage of TAMIS lies in its increased cost, an increase that arises from the adoption of the disposable anal port and instruments.[15] However, this new platform avoids supplementary costs because the port and the instruments used are reusable.

Finally from a technical point of view, the structure of the D-Port is characterized by the following TAMIS features:

Table II

ONCOLOGIC

PATIENTS	Operative time (min)	Operative bleeding (cc)	Hospital stay (days)	Pathologic report	Follow-up (months)
1	114	0	8	pT2N0 (13 nodes)	14
2	145	50	5	pT2N0 (15 nodes)	14
3	96	10	8	pT3N0 (18 nodes)	11
4	182	10	5	pT3N0 (12 nodes)	10
5	193	450	6	pT3N0 (12 nodes)	5
6	180	10	6	pT3N0 (20 nodes)	4
7	160	50	3	pT2N0 (12 nodes)	3
8	124	50	5	pT1N0 (16 nodes)	1

NON-ONCOLOGIC

PATIENTS	Operative time (min)	Operative bleeding (cc)	Hospital stay (days)	Pathologic report	Follow-up (months)
9	60	0	5	/	14
10	120	5	6	/	3
11	45	5	2	/	12
12	163	5	2	benign stenosis	12
13	15	20	5	/	1

- The diameter is 3 cm, avoiding any type of anal dilatation, and smaller than platforms that are more rigid.
- The length is 7.5 cm, which allows TAMIS to treat lesions located close to the anal margin as well as distal into the rectum, because a stable pneumorectum is maintained when the port is retracted or pushed maximally.
- The cap is made of silicon, which allows the instruments to be flexibly moved both extracorporeally and intraluminally.
- The cap has a thickness of 1 cm and 3 orifices arranged at 6-mm, 11-mm, and 6-mm, and accomodating two 5-mm laparoscopic instruments and one 10-mm optical system.Moreover, the central orifice also allows the introduction of a linear stapler through a change of the 11-mm orifice into a 13-mm.
- One principle of general laparoscopy is respected: the optical system is situated in the middle of the two working ancillary tools.[10]
- The components include two lock connectors, which allow the insufflation of CO_2 with the simultaneous evacuation of the smoke created during the dissection.
- The 4 holes out of the tube allow the port to be fixated to the skin, but capable of rotating during some steps of the procedure.
- The 4 cardinal points inside the tube offer the surgeon a reliable orientation during the procedure.
- The absence of an articulated arm holder to secure the system to the operating table, allows the surgeon more liberty of movement.

CONCLUSION

TAMIS is a feasible alternative approach to treat rectal cancer and a completely new technique to manage colorectal complications. Moreover, this new transanal platform offers surgeons a satisfactory working ergonomy, with no increase in cost of the procedures, because entirely reusable materials are adopted. STI

AUTHORS' DISCLOSURES

Doctor Dapri is a consultant for Karl Storz - Endoskope,Tuttlingen, Germany.

Doctors Guta, Cardinali, Mazzetti, Febres, Grozdev, Sondji, Surdeanu and Cadiere have declared no actual or potential conflict of interest in connection with this paper.

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