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Transanal minimally invasive surgery (TAMIS) for local excision of selected rectal neoplasms: efficacy and outcomes in the first 11 patients

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ABSTRACT

Disposable single-port surgery devices have been used for transanal minimally invasive surgery (TAMIS) with benefits, when compared to local resection and transanal endoscopic microsurgery (TEM).

Objective: To show outcomes and details of the technique.

Method: A series of patients with indication for local resection of rectal tumors were submitted to surgery using the TAMIS platform.

Results: Eleven patients have been submitted to TAMIS. Distance from anal verge was from 1.5 to 8 cm and maximum tumor diameter was 6 cm. Initial diagnosis of adenoma was the most frequent indication for resection. One partial dehiscence was the only complication seen. Minimal setup time, low cost and the possibility of using regular laparoscopic instruments make TAMIS a good option for transanal resection. The results of this technique are encouraging, concerning the feasibility, maneuverability, upfront cost, setup time, resectability and complication rate. Because of its simplicity and similarity with conventional laparoscopic surgery, it can be learned easily. Although at the present time the appropriate use of local excision is still under debate, TAMIS is a technique that still expects a lot of growing and much remains to be learned.

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Cirurgia Trans-anal Minimamente Invasiva (CTAMI) para excisão local de neoplasias retais selecionadas: eficácia e desfechos nos primeiros 11 pacientes

Palavras-chave:
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RESUMO

Dispositivos cirúrgicos de porta única descartáveis têm sido utilizados para a Cirurgia Trans-anal Minimamente Invasiva (CTAMI) com benefícios, quando comparados com ressecção local e microcirurgia endoscópica trans-anal (MET).

Objetivo: Apresentar os desfechos e detalhes da técnica.

Método: Uma série de pacientes com indicação para ressecção local de tumores retais foi tratada cirurgicamente pela plataforma CTAMI.

Resultados: Onze pacientes foram tratados por CTAMI. A distância a contar da margem anal variou de 1,5 até 8 cm, e o diâmetro máximo do tumor foi 6 cm. Um diagnóstico inicial de adenoma foi a indicação mais frequente para a ressecção. A única complicação ocorrida foi uma deiscência parcial. Mínimo tempo para preparação, baixo custo e a possibilidade do uso de instrumentos laparoscópicos convencionais fazem de CTAMI uma boa opção para a ressecção trans-anal. Os resultados dessa técnica são animadores, no que diz respeito à exeqüibilidade, manobrabilidade, custos iniciais, tempo de preparação, ressectabilidade e percentual de complicações. Graças à sua simplicidade e semelhança com a cirurgia laparoscópica convencional, CTAMI tem uma fácil curva de aprendizado. Embora atualmente ainda seja motivo de discussão o uso apropriado da excisão local, CTAMI é uma técnica que ainda provavelmente ainda crescerá muito–e há muito a ser aprendido.

Introduction

As screening has substantially increased the early diagnosis of tumors, there is a need for local treatments that are oncologically equivalent to radical surgery, but safer and functionally superior.[1] Local excision of rectal tumors has been performed since early 1800, when Lisfranc described a local resection for rectal carcinoma.[2]

Transanal endoscopic microsurgery (TEM) was described initially by Gerhard Buess in 1983 to provide a means for removing benign lesions of mid and upper rectum not easily accessible by conventional methods.[3]

Compared to local excision, TEM provides superior quality of resection, decreased local recurrence, and improved survival, particularly among patients with adenomas[4] and histologically favorable stage I rectal cancer.[3,5] In long-term follow-up, TEM excision of rectal tumors has proven to be safe and effective, with morbidity and mortality similar to that of conventional transanal excision.[6,7]

However, although TEM has been in use for more than 20 years, it has been slow to become universally adopted by colorectal surgeons, partly due to a long learning curve, but also because of the significant cost of the highly specialized equipment.[2–4]

As technology continues to undergo rapid evolution, the minimally invasive surgeons' skills develop quickly. Recently the Natural Orifice Transluminal Endoscopic Surgery (NOTES) has provided technology for developing permanent and disposable equipment and instruments that can be used for both abdominal and pelvic operations through a single incision. These devices have facilitated a wide range of operations, including bariatric and all sorts of colorectal surgeries using a single-incision mutiport device.

The working angles in single-access laparoscopy are essentially identical to those used in TEM. Therefore, crossover exists between the skill set necessary to perform single-port laparoscopy and TEM. The considerable upfront cost of TEM instrumentation, however, remains a significant barrier to its widespread use.

Transanal minimally invasive surgery (TAMIS) has been described first by Dr. Attalah, Dr. Larach and Dr. Albert, from Orlando, FL,[3] who reported this technique to be effective and safe for early rectal cancer and adenomas, with excellent operative field visibility and not technically difficult. As the authors say, the TAMIS is a "giant leap forward" when compared to TEM. Mounting is easier and demands less time prior to beginning surgery; as it is a disposable device, the cost is much lower and manipulation is much more comfortable than TEM.

Recently, Ethicon™ (Cincinnati, OH) presented their Single Site™ (SSL) device for NOTES. It has been designed for single-incision laparoscopic abdominal surgeries, but has been also used successfully for TAMIS resection.[8] A little later, GelPoint Path™ has been launched by Applied Medical (Rancho Santa Margarita, CA), specifically for TAMIS.

Methods

Over a 24-month period TAMIS has been offered to all patients with rectal lesions who were candidates for transanal local resection or abdominal anterior resection when carcinoma was excluded. Informed consent was obtained and all patients

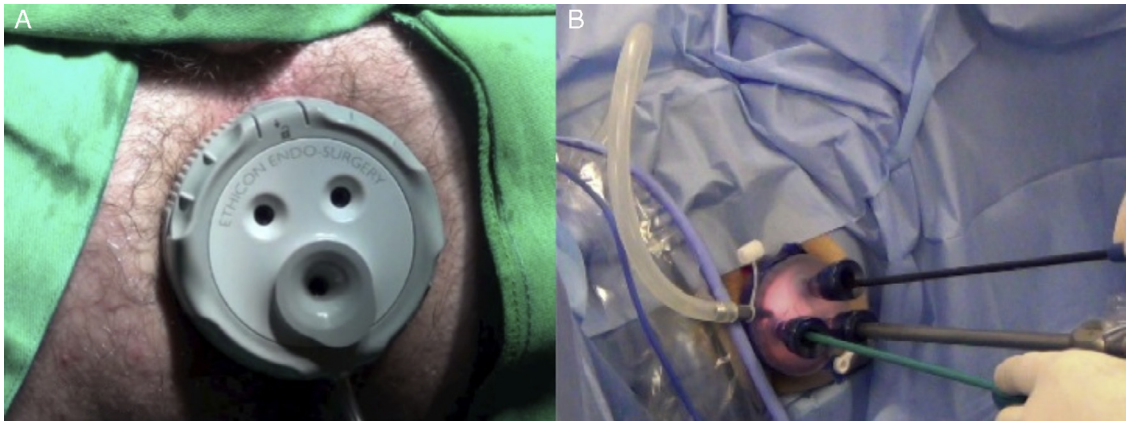

Fig. 1 – Ports placed. A, SSL™; B, GelPoint Path™.

were given the option to undergo conventional surgery. Patients with known malignant lesions were excluded.

From August 2010 to August 2013 all data of patients undergoing this surgical technique, using both SSL™ and GelPoint Path™, was collected prospectively. Follow-up was for up to 24 months. All patients had digital rectal examination or colonoscopy postoperativelly. Patients undergoing the technique of TAMIS patients had adenomas with dysplasia of low and high grade, only one of them had a scar after incomplete endoscopic resection, and one as adenocarcinoma in situ. Patients having previous diagnosis of adenocarcinoma underwent transrectal ultrasound to evaluate depth and nodal invasion.

Surgical procedures were performed at a tertiary-care Hospital. All patients were administered general anesthesia. To perform the procedure the patient's preferable position is one in which the lesion is in the rectum wall that is closer to the operating table. When the lesion is in the posterior rectal wall, the patient is in lithotomy position, with legs up; when the tumor is in the right lateral wall, the patient can be turned with the right side down. Although not mandatory, this is the most comfortable way to perform this procedure. Mechanical bowel preparation was administered preoperatively and received a single 3 g-dose of intravenous Unasyn® (Pfizer, Brazil), at anesthetic induction.

After insertion of the transanal port (either the SSL™ or GelPoint Path™, Fig. 1), the pneumorectum was gained using CO_2 insufflation with an initial pressure set a 12 mmHg and flow set at 40 mmHg per minute. Standard straight laparoscopic instruments were used. Full-thickness excision was performed on all lesions aiming a 1 cm minimum negative margin (Fig. 2). All defects were closed completely with absorbable suture material (Fig. 3).

Patients had a planned discharge for the next day of surgery.

Results

Eleven patients aged 50–86 years (average 67.4 y) underwent TAMIS resection of rectal lesions (Table 1). The average distance from anal verge was 47.7 mm (15–80 mm) and the mean tumor diameter measured by pathology was 35 mm (10–60 mm). Eight patients had an initial diagnosis of adenoma. One patient had a previous endoscopic resection of a T1 adenocarcinoma (case C), made with mucosectomy

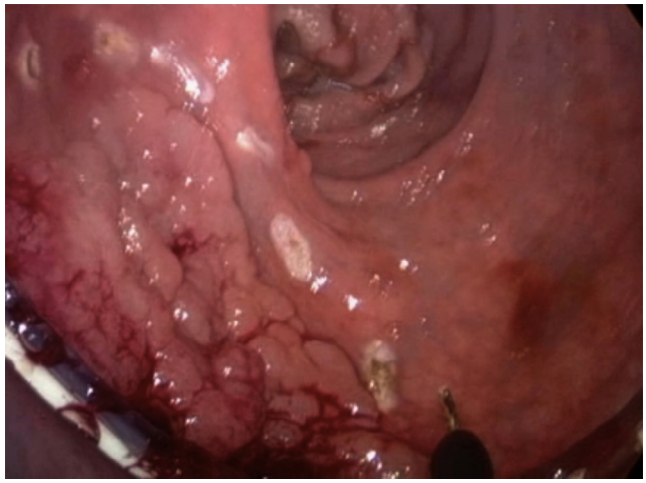

Fig. 2 – Adenoma with central focal pT1 after monopolar marking.

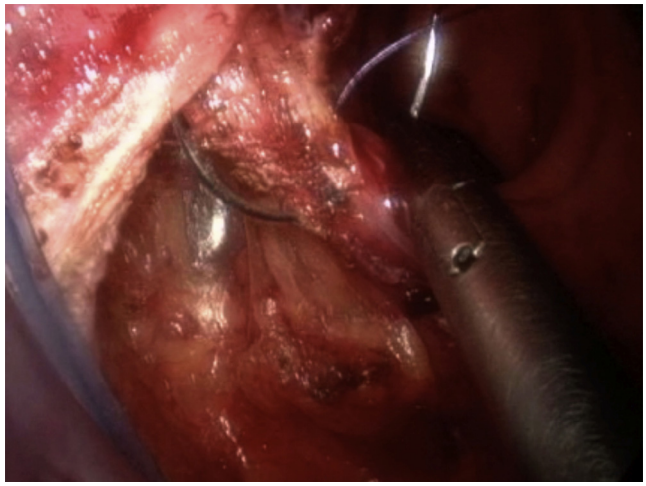

Fig. 3 – Suturing after full-thickness resection of a 5 cm tumor.

Table 1 – Tumor characteristics.

Case, age/sex	Tumor location (mm from anal verge)	Initial tumor pathology	Position	Tumor diameter (mm)	Resection margin	Final tumor pathology
A, 51/M	15	Vilous adenoma	Posterior	30	Free	Adenocarcinoma T1
B, 76/M	25	Vilous adenoma	Left lateral	50	Free	Tubule-vilous adenoma
C, 50/F	40	Adenocarcinoma T1, ressected with endoscopic mucosectomy, focally compromised margins	Left lateral (no visible tumor, only scar)	20 (scar)	Free	Free from tumor
D, 63, F	10	No AP inicial	Left posterior	20	Free	Free from tumor
E, 78/M	60	Tubule-vilous adenoma	Posterior	60	Free	Adenocarcinoma T2
F, 81/M	50	Tubulo-vilous adenoma, high grade dysplasia	Circumferential[a]	Circumferential	Partially resected	Tubulo-vilous adenoma
G, 66, F	30	Vilous adenoma	Right posterior	50	Free	Tubulo-vilous adenoma
H, 86, F	40	Vilous adenoma	Right posterior	50	Positive	Adenocarcinoma Tis
I, 52, M	10	Tubule-vilous adenoma	Anterior	40	Not resected (a)	
J, 65, M	50	Vilous adenoma	Left posterior	40	Positive	Adenocarcinoma Tis
K, 74, F	80	Adenocarcinoma in situ	Anterior	40	Free	Vilous adenoma

[a] After positioning the patient the device could not be positioned and the technique was changed to standard local resection.

technique and had positive margins. This patient was eligible for scar resection with larger margins. No tumor was found by the pathologist in this patient.

One patient (case D) could not be operated by the described technique. Expansion of the SSL™ retractor into rectal lumen was not possible. The size of the prostate occupying the rectal lumen was probably responsible for not allowing the device to open toward the anterior rectal wall and thus a conventional local excision was used instead.

Another patient (case F) was under evaluated during preoperative colonoscopy, as the tumor was described as lateral, and during surgery it showed as circumferential. In this case it was resected partially, only for ensuring pathologic diagnosis, and further taken to laparoscopic anterior resection with colonic pouch-anal anastomosis. Pathologic specimen showed tubulo-vilous adenoma.

Setup time varied from 1 to 45 min (average 9.8 min), and total surgery time was from 38 to 80 min (average 51 min). Two of the ten resected specimens contained early stage adenocarcinomas. All margins were free (Table 2).

Once the resection was completed, the defect was approximated with intraluminal suture. In nine patients the option was to place metallic clips on both edges of the suture, instead of tying. One patient had ties done on the suture's edges.

All patients stayed overnight and were discharged the next morning.

As the only known complication, one patient had a partial dehiscence of the suture line in distal rectum diagnosed on ninth post-operative day, and was treated without surgical re-intervention. In this patient, scar completion took about 45 days.

Table 2 – Clinical and operative results.

Case	Operative time (min)	Hospital stay (days)	Morbidity/ mortality
A	55	1	None
B	50	1	None
C	45	1	None
D	45	1	None
E	80	1	None
F	40	1	None
G	47	1	None
H	60	1	None
I	Not performed	Not operated	None
J	50	1	None
K	38	1	None

Discussion

Although TEM has been proven to be an effective alternative for local excision and is being performed for more than 30 years, which is before the widespread use of laparoscopic techniques for abdominal surgeries, the advancements in the TEM technique remained almost the same and did not follow what happened to abdominal laparoscopy. Before TAMIS was presented in 2010, the only evolution in transanal surgery was the development of rigid metal or transparent[9] proctoscopes

for TEM. When TAMIS was first described, the world became aware of a completely new technique using an affordable, simple, easy-to-use and effective device.

Care must be taken in patient selection, as local excision must be considered only for early rectal cancer with no evidence of nodal metastasis,[5,10] parameters that can be predicted by clinical and radiological evaluation.[11,12] Even after adequate pre-operative evaluation, up to 44.3% of T1 tumors can be misevaluated pre-operatively.[1,13] Although all patients were submitted to surgery with a tumor thought to be benign, one had a T1 and the other a T2 tumor. As oncological safety for local resection for T2 tumors is not well stablished,[1,14–17] this last one was further taken to laparoscopic anterior resection with colo-anal anastomosis and pathology showed no residual carcinoma or positive lymphnodes (pT0 N0) in the surgical specimen.

A tip to be learned is that the prostate volume should be evaluated pre-operatively, as it can be limiting for the technique.

Considering the minimal setup time, low cost and specially the adaptation of regularly used laparoscopic instruments, TAMIS provides an ideal platform for transrectal or transanal resection.[18] It has also been used for other diseases, such as high fistulas and distal rectal mobilization for coloanal anastomosis[19] and carcinoid tumors resection.[20,21] Other indications that lack consensus are re-excision following endoscopic removal of malignant polyps[22] and excision of downstaged tumor or scar after complete response to neoadjuvant chemo/radiotherapy.[13,23–25] Recently, total mesorectal excision performed by TAMIS showed to be feasible and promises good future results.

In this series, maximum distance from tumor to anal verge was 8 cm. This patient had a 5 cm diameter tumor, so resection was up to 14 cm from anal verge, considering margins, without difficulties, showing that its use must not be restricted to low tumors, as suggested before.[26]

The advantages of TAMIS over TEM are well described:[3,27]

- Devices used for TAMIS are pliable and allow well-fitted positioning at the anal canal, possibly leading to less impairment of sphincter function than the 40 mm rigid scope used for TEM.
- Setup time is significantly lower for TAMIS.
- Possibility to use regular straight laparoscopic instruments and a standard 30° laparoscope, as opposed to the fixed eyepiece of the TEM rectoscope, which enables advancement of the scope into the proximal rectum and sigmoid, thereby allowing the surgeon to look beyond the tumor.
- It can be easily learned by surgeons not used to TEM technique due to its potential instrumental simplicity and similarity with conventional laparoscopic surgery. Larger ports, up to15 mm port are available only for TAMIS devices, and it can be very helpful when a 12-mm stapler is needed (e.g. for safe resection of a big pedunculated polyp).
- Cost makes SSL™ and GelPoint Path™ very comfortable, safe and cost-effective alternatives for TEM.[28] When abdominal resection is considered for adenomas or T1 tumors that are from dentate line up to higher rectum, or even if future studies show that selected T2 and T3 tumors can be locally controlled,[1,14,16,29] TAMIS devices can be a remarkable cost-effective alternative.
- The cap can be removed and re-located quickly, when needed. It can be removed for specimen retrieval and repositioned in less than 1 min for suturing.
- Positioning the device takes usually less than 1 min.
- Due to its design, there is no need for investment in special curved instruments. All regular laparoscopic instruments can be used.
- The repositionable cap allows changing of instrument position without having to reinsert the device.
- As the devices are basically a hollow sleeve with a cap in which the ports are located, there is no resistance when moving around the instruments. This makes the use of regular straight laparoscopic instruments easier than TEM or SILS™ (Covidien, Mansfield, MA).

Conclusions

Although at present time the appropriate use of local excision is still under debate, TAMIS is a technique that has a potential of increased application and much remains to be learned. Like others,[3,27] our group is optimistic that TAMIS came as a good alternative to TEM and also as one of the most important contributions for transanal surgery in the last decades years. Its reduced cost and simplicity shall allow surgeons to learn the technique quite easily. Despite simplicity, care must be taken in patient selection, as pre-operative staging is frequently an understaging of tumors.

Conflicts of interest

The authors declare no conflicts of interest.

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