



## Original article

# Transanal endoscopic surgery with conventional laparoscopy materials: is it feasible?☆

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## A B S T R A C T

**Introduction:** Transanal endoscopic surgery with conventional laparotomy materials may be an alternative to transanal endoscopic microsurgery (TEM) for the excision of rectal lesions susceptible to local resection.

**Material and method:** We prospectively analysed 27 patients included consecutively between 1999 and 2009, on whom a Transanal endoscopic operation (TEO) was performed by total resection of the rectal wall. All procedures were performed with a 40mm rectoscope, initially designed by us and later with the Storz rectoscope, using conventional laparoscopic tools and material.

**Results:** We operated on 27 patients with a mean age of 69.4 years: 23 due to benign lesions and 4 malignant. The medium distance of the tumour to the anal margins was 8.2 cm (range 5–15) and a mean tumour diameter of  $3.38 \pm 1.2$  cm. There were 4 postoperative complications, 3 due to bleeding and one case of perforation. The mean hospital stay was  $6 \pm 3.75$  days. There was no perioperative mortality or recurrences.

**Conclusion:** Performing transanal endoscopic surgery with conventional laparoscopy material is feasible, with a reduction in costs and accessible to laparoscopy surgeons.

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## Cirugía endoscópica transanal con material convencional de laparoscopia, ¿es factible?

## R E S U M E N

**Introducción:** La cirugía endoscópica transanal con material convencional de laparoscopia puede ser una alternativa a la microcirugía endoscópica transanal (TEM) para la exéresis de lesiones rectales susceptibles de extirpación local.

**Material y método:** Analizamos prospectivamente 27 pacientes incluidos de forma consecutiva entre 1999 y 2009 a los que se les practicó una operación endoscópica transanal (TEO), mediante resección de pared total rectal. Todos los procedimientos se realizaron con un rectos-

## Palabras clave:

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copio de 40 mm inicialmente diseñado por nosotros y posteriormente con el rectoscopio de Storz, utilizando el equipo y el material convencional de laparoscopia.

**Resultados:** Hemos intervenido a 27 pacientes con una edad media de 69,4 años. 23 por lesiones benignas y 4 malignas. La distancia media del tumor a los márgenes anales ha sido de 8,2 cm (rango 5-15) y el diámetro medio tumoral de  $3,38 \pm 1,2$  cm. Se presentaron 4 complicaciones postoperatorias, 3 por sangrado y un caso de perforación. La estancia hospitalaria promedio fue de  $6 \pm 3,75$  días. No hubo mortalidad perioperatoria ni se han demostrado recidivas.

**Conclusión:** Es factible la realización de cirugía endoscópica transanal con material convencional de laparoscopia, con reducción de costes y accesible a cirujanos laparoscopistas.

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## Introduction

Transanal endoscopic microsurgery (TEM) plays an important role in the treatment of benign rectal lesions and some selected malignant lesions.<sup>1,2</sup> However, the instrumentation required is specific and expensive and therefore the procedure is limited to highly specialised reference centres. Moreover, the techniques are difficult and require a long learning curve to master.

The use of a rectoscope channelling conventional laparoscopic instruments with a standard laparoscopy tower is accessible to laparoscopic surgeons, without significant investment in instrumentation and training being required.

Our aim is to evaluate its feasibility from the results of 10 years of use in our department.

## Material and methods

A prospective study of 27 patients operated upon consecutively in our hospital between 1999 and 2009 for rectal lesions which were candidates for local excision. They underwent a Transanal Endoscopic Operation (TEO), which is our technique of choice for this condition. The inclusion criteria were rectal lesions located below 10-12 cm in the anterior part and 15cm in the posterior, which were not subject to conventional endoscopic excision, as well as pathologic findings of the following:

- 1) adenoma,
- 2) carcinoma in situ (Tis),
- 3) T1 adenocarcinoma at low risk (less than 4 cm, well or moderately differentiated, without suspicion of lymphatic spread),
- 4) other tumours with impaired locoregional spread (carcinoid, etc.).

Before the operation, all patients received a clinical examination, a colonoscopy with biopsy and rigid proctoscopy to evaluate the height and location of the lesion, as well as rectal ultrasound to stage and assess the infiltration of the lesion on the rectal wall. The MRI was included for cases of suspected malignancy to assess perirectal lymph nodes.

Surgical technique: a phospho-soda bowel preparation was carried out for all patients, as well as antibiotic and

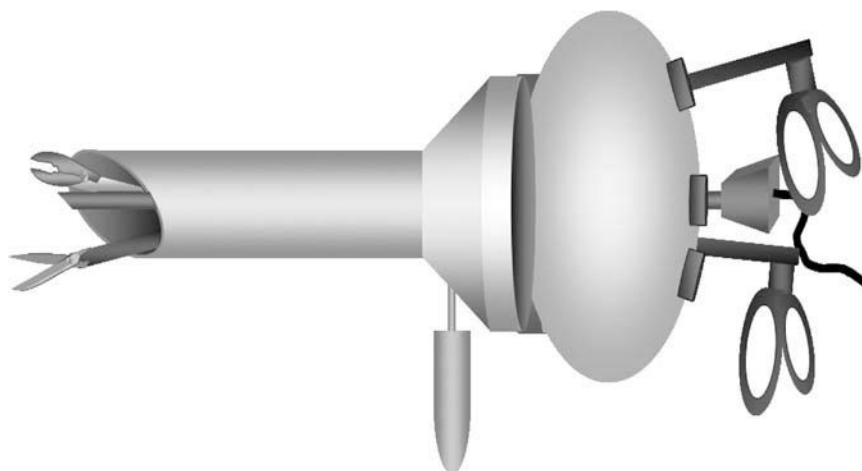
antithrombotic prophylaxis. General anaesthesia was used in all cases, due to the discomfort for the patient of continuous gas insufflation. The patient position on the operating table depended on the location of the lesion: the lithotomy position was used for posterior lesions, the jackknife position for anterior and lateral for side access.

The first interventions were performed with a prototype developed in our department by one of the authors, which consisted of a 40 mm rectoscope, closed with an airtight latex device that allowed gas insufflation as well as conventional laparoscopic material to be inserted through working valve channels (Figure). After 2004, a surgical rectoscope for TEO (Karl Storz, Tuttlingen, Germany) allowed our model to be seen in commercial operation and it was used in our department. It consists of a 40mm diameter rectoscope coupled with a "TEO work applicator." This had a fitting for the optics and three working channels: two for 5 mm instruments and a 12 mm channel sealed with silicone valves. The optics were 5 mm with 30° oblique vision, giving a good view of the side rectal walls, with a connection for insufflation and smoke aspiration.

After inserting the rectoscope and locating the lesion, the rectoscope was connected to the operating table by the attachment system and continuous CO<sub>2</sub> insufflation to 20 mm Hg started; this gives an extraordinary view inside the rectum. The intervention is started by making adequate resection margins around the lesion with coagulation, then performing total excision of the rectal wall to display and in some cases to resect the extrarectal fat. A harmonic scalpel (Ultracision®, Ethicon Endosurgery) was used for the excision as well as conventional laparoscopy. Once adequate haemostasis was established, in some cases the defect was closed with interrupted 3/0 Vicryl sutures with the help of a needle holder and extracorporeal knotting.

Once the specimens were removed, they were prepared on a cork by fixing the resection margins with needles to prevent shrinkage. The pathology report described the lesion and resection characteristics, with information on both lateral and deep margins.

A liquid oral diet was started on the first day after the operation, adding more solid elements from the third day. The patient was discharged on the fourth day if there were no complications. The first consultation follow-up was carried out at 2 weeks, at 6 weeks and then every 6 months with digital rectal examination and rigid proctoscopy.



**Figure 1 – Authors' prototype instrument (1998).**

## Results

There were 27 patients (13 men and 14 women) who underwent TEO, with a mean age of 69.4 years (range 40-87), and with 30% of the patients over 80 years. Our indications were: 23 lesions with preoperative biopsy of adenoma and 4 malignant rectal neoplasms diagnosed as a rectal carcinoid tumour, two T1N0 adenocarcinomas and a T2N0 adenocarcinoma in a patient of 81 years; all at low risk (Table).

The mean tumour diameter was  $3.38 \pm 1.25$  cm and the mean distance of the tumour to the anal margin was  $8.2 \pm 1.9$  cm (range 5-15).

We sutured the defect in 14 cases (52%), leaving the rest without suturing. The mean hospital stay was  $6 \pm 3.75$  days.

Postoperative complications occurred in 4 cases (14.8%) of which 3 (11%) were due to bleeding, with two of them requiring transanal surgical revision for haemostasis. The fourth case was an intraperitoneal rectal perforation in the immediate postoperative period of an 81-year old patient with a 15 cm anal margin adenoma. Early repeat surgery by laparotomy was performed with a suture of the perforation without any other consequences. The postoperative period in the remaining patients had a remarkably good outcome.

The final pathologic diagnosis confirmed the successful staging of the 4 cases of malignant tumours, with a disease-free follow up in all of them, without recurrence. In patients with preoperative pathologic diagnosis of adenoma ( $n=23$ ), the final study showed adenocarcinoma foci in eight (35%), 7 of them with free margins and staged well either *in situ* or with focal invasion of the submucosa (T1). The eighth case was an invasive adenocarcinoma in muscularis propria (T2), with margins that were not assessable due to a thermal artefact and absence of metastasis in a sampled lymph node. This patient was indicated with radical surgery, which was very difficult due to residual scar tissue and an abdominoperineal amputation was required. This patient is disease-free at four years.

Mention must be made of the follow-up in a psychiatric patient of an adenomatous injury with focal infiltration of the submucosa due to an adenocarcinoma and free resection margins. During the follow-up rectoscopy, no recurrence was detected. Five years later the patient developed a rectal carcinoma, which could not be demonstrated as being a very late recurrence or a metachronous tumour.

## Discussion

When conventional endoscopic resection of rectal lesions which are local resection candidates is not possible, there are other approaches for their removal. Parks described transanal access to lesions located in the lower third of the rectum, which provided very good results in terms of disease recurrence and morbidity,<sup>3,4</sup> and this is still a widely used approach. However, when the lesions are located in the middle and upper third, they are difficult to address through this pathway. This leads to the use of other surgical options, such as the Kraske or Mason posterior approach or low anterior resection. These are associated with high morbidity, which has led to their gradual abandonment.<sup>5</sup> Endoscopic transanal resection using a urological resectoscope (ETAR

**Table 1 – Tumour characteristics**

	n=27 (range)
Tumour height, cm	$8.2 \pm 1.9$ (5-15)
Upper third	1
Middle third	25
Lower third	1
Size, cm	$3.3 \pm 1.2$ (1.2-6.5)
Preoperative histological diagnosis	
Adenoma	23
Adenocarcinoma	3
Carcinoid tumour	1

technique) was described by Lindenschmidt in 1977<sup>6</sup> and appears to offer good results in terms of morbidity in the hands of expert urologists.<sup>7,8</sup> However, the need for multiple sessions and the fragmented resection of lesions prevents proper histological assessment and the inability to study the resection margins, so it is used little by colorectal surgeons.

In 1984, Buess developed TEM via a complex system giving continuous insufflation of the rectum with three-dimensional binocular vision.<sup>1,2</sup> This technique enjoyed widespread application and today is considered the gold standard for excision of rectal adenomas and selected tumour cases.<sup>9,10</sup> It has low morbidity and mortality when compared with transabdominal resections.<sup>10,11</sup> Comparison of TEM with other local procedures<sup>12,13</sup> has revealed that it is more effective in reducing the rate of positive margins, complications and recurrence rate. However, the equipment required for this system is very sophisticated, specific, expensive and has a long learning curve, which has meant TEM has become a highly specialised procedure in the hands of a few surgeons.

As early as 1999, in the absence of TEM in our area and after reading an article by Wise<sup>14</sup> describing the application of conventional laparoscopy for removing rectal lesions (without pneumorectum), we designed a large calibre (40 mm) rectoscope system with a latex seal providing continuous CO<sub>2</sub> insufflation, as in TEM. The multiple input arrangement, with sealed valves, normal laparoscopic material through a channelled input with 5 mm and 30° optics connected to our laparoscopic monitor gave us a proper view of the surgical field (5<sup>th</sup> National Meeting of Coloproctology. Madrid, 29-30 November, 2001). We used this arrangement on 11 patients until 2003. The appearance of the Storz rectoscope, which was very similar to our prototype, allowed us to continue with the same surgical technique in a more convenient and standardised manner. Like our model, the Storz instrument does not require specific equipment or instrumentation and is very accessible to surgeons accustomed to laparoscopic techniques. In addition, the use of a harmonic scalpel produces good haemostasis with minimal thermal injury, providing highly safe surgical haemostasis<sup>15,16</sup> with easy viewing of the section zone. We used the monopolar scalpel only to identify the section area, while the rest of the procedure is performed with an ultrasonic scalpel.

Regarding the surgical technique, our recommendation is to always carry out total wall resections, confirming the presence of fatty tissue at the bottom of the resected area, both in cases of malignancy, which would technically be required, and in presumed benign cases (adenomas); given that many of them will eventually become focal carcinomatous lesions. In 35% of our patients, the final histology demonstrated a higher degree of dysplasia than that demonstrated in the biopsy specimens, which is confirmed by other authors.<sup>4,17,18</sup> Although rectal ultrasound, performed on all our patients, helps to differentiate many of these cases,<sup>19,20</sup> performing total wall excision provides proper pathological study and good control of the resection margins, as well as allowing the injury to heal.<sup>21</sup> MRI is also an important supplementary test in malignancy cases, as it confirms the absence of metastatic lymph nodes that would contraindicate the procedure for

local excision, as well as providing information about the topography of the lesion.

Regarding the closure of the defect in the rectal wall, Ramírez<sup>22</sup> in a randomised trial showed it could be left open, with no postoperative clinical implications. We preferred to suture the large defects to prevent stenosis or bleeding problems, although we had no subsequent problems in cases where we did not suture. A suture is also required in lesions over 8-10cm from the anal margin, as the peritoneal reflection is not the same for all patients, and so could add to the risk of a perforation. As for the position, we increasingly support the lateral anterior lesions, as it allows better insufflation than the jackknife position, while reducing any problems due to the patient's weight.

The almost complete absence of discomfort immediately after surgery even in elderly patients with significant comorbidities is remarkable, and much lower than those produced by conventional colonoscopy, which we attribute to the rapid reabsorption of CO<sub>2</sub> and the absence of painful edges in the rectum. Complications were generally mild and very manageable, similar to those reported in other series.<sup>15,18,23</sup> The most common complication was postoperative bleeding, with one case of perforation in a patient of 81 years with a high injury that required reoperation. Procedure mortality was zero.

To date only two studies have been published<sup>15,23</sup> using a Storz rectoscope, which describe the technique and results in 18 and 31 patients, respectively. The feasibility of the technique was concluded, with results comparable to TEM and obvious advantages. We also believe that TEO is a valid alternative to TEM due to the reduced costs and for expanding its use to surgeons accustomed to laparoscopic techniques.

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## Comments

We conclude that our study shows it is feasible to implement transanal endoscopic surgery using conventional laparoscopy. The new Storz rectoscope eliminates the ergonomic and economic disadvantages of TEM, provides very satisfactory results and is capable of being used by laparoscopic surgeons.

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## Conflicts of interest

The authors affirm that they have no conflict of interest.

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