ORIGINAL ARTICLE

Transanal endoscopic microsurgery (TEM) for rectal tumor: The first French single-center experience

Exérèse transanale par microchirurgie endoscopique (TEM) des tumeurs du rectum : première expérience unicentrique française

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Summary

Objective. — Transanal endoscopic microsurgery (TEM) allows complete local excision of rectal tumor, especially in the middle and upper part of the rectum, and provides an alternative to conventional surgery. This is a report of the first French single-center experience to assess the feasibility and postoperative results for rectal tumor excised by TEM.

Methods. — From October 2007 to December 2008, 27 patients underwent TEM for excision of either rectal adenoma (n = 19) or carcinoma (n = 8). The median distance from the anal verge was 60 mm (range: 10–140).

Results. — TEM excision was performed in 26/27 patients. Intraoperative technical difficulties were recorded in two patients (peritoneal perforation and gas leakage, respectively). The morbidity rate was 22% (n = 6), including two patients (7%) with major complications (delayed rectal bleeding) requiring readmission to hospital for both, and surgical hemostasis for one. R0 resection rates for adenoma and carcinoma were 84% and 75%, respectively. Immediate salvage surgery was performed in one patient because of a T2R1 carcinoma. At the time of the median follow-up at nine months (range: 2.5–17.5), no patient had experienced a recurrence.

Conclusion. — TEM is a safe and effective procedure with low morbidity for local rectal tumor resection. It allows local excision of benign tumors, especially those that are inaccessible to conventional local surgery resection, thereby avoiding radical surgery. In cases of carcinoma, its role in local surgery remains controversial and is yet to be defined.

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Introduction

Benign and malignant rectal tumors are traditionally managed by abdominal open surgery or, more recently, by laparoscopic procedures, including anterior and abdominoperineal resection [1,2]. Such radical surgical procedures are usually associated with recognized perioperative mortality and morbidity, especially in frail patients with co-morbidity [3]. In addition, most patients postoperatively complain of defecatory disorders (such as frequent defecation, urgency and incontinence) associated with urinary or sexual dysfunction, whereas those with tumors close to the anal sphincter carry a risk of definitive stoma [4].

However, an alternative is to perform local transanal tumor resection, which has the potential advantages of anal sphincter preservation even in patients with very low-lying rectal lesions, low mortality and morbidity rates, and no risk of genitourinary or functional postoperative disorders [5,6].

Transanal endoscopic microsurgery (TEM) was first introduced by Buess et al. [7] in 1988 as an alternative to the conventional local transanal and posterior proctectomy approaches. While the conventional transanal approach is hampered by a limited view of mid- and upper-rectal lesions, the posterior proctectomy approach is highly invasive, with high morbidity, which means that it is rarely used. Compared with other methods of local surgery, TEM has resolved many of the technical problems associated with conventional transanal excision. Although technically complex and so requiring substantial training, the TEM procedure nevertheless enables the removal of tumors located up to 20 cm posteriorly and 12 cm anteriorly from the anal verge. The procedure allows local full-thickness tumor excision under direct magnified vision along with sufficient tissue margins. In contrast, with conventional transanal techniques, proximal lesions are difficult to resect because of their distance from the surgeon’s hand, the tendency of the rectum proximal to the anal retractor to collapse and the area that is inevitably obscured by the retractor. This may be partly responsible for the higher rates of local recurrence of benign and malignant disease despite the procedure [8,9].

Although TEM was initially developed for removal of large rectal adenomas, local surgery is now widely proposed for the treatment of early rectal cancer [10,11]. Its main limitation is that potentially metastatic lymph nodes are not removed. Although there are some accepted criteria, such as depth of wall invasion and lesion grade, that can provide the ‘best-estimate’ probability of regional lymph node metastasis, the role of local treatment with curative intent in rectal cancer remains controversial [5]. The question remains as to whether or not the TEM approach offers local control and survival rates equivalent to those with radical surgery [12].

The TEM procedure is not widely used in France for reasons unknown, but perhaps because it is a complex and expensive technique requiring a substantially trained and experienced colorectal surgeon. In our own colorectal department, experience with TEM began in October 2007 as part of our surgical strategy for selected benign and malignant rectal tumors.

The aim of the present study, including our preliminary experience, was to assess local TEM resection of benign and malignant rectal tumors in terms of feasibility and postoperative results.

Patients and methods

Patients

Between October 2007 and December 2008, 27 consecutive patients underwent a TEM procedure for rectal tumor. They included 15 men and 12 women with a median age of 70 years (range: 24–93), body weight of 70 kg (range: 53–130) and body mass index (BMI) of 24 kg/m² (range: 21–51). The preoperative diagnoses were benign rectal adenoma in 20 patients and carcinoma in seven.
For the benign tumors, the indications for TEM included all lesions that were deemed unsuitable for complete excision by either colonoscopic snare diathermy, endoscopic mucosal resection or conventional transanal resection. For rectal carcinoma, criteria for patient selection were those recommended by the recent updated French guidelines [13], including mobile tumors, those that were well to moderately differentiated and those that were stage T1 on rectal ultrasonography.

TEM was carried out with curative intent in five patients and as a “compromise” treatment in two. A compromise operation was defined as a TEM procedure that attempted to cure the cancer, but was not — because of the patient’s frailty, co-morbidity or personal wishes — the optimal operation in oncological terms. Before surgery, endorectal ultrasound (ERUS) had been performed in 25 patients and correctly staged tumors in 23 cases, but underestimated the stage in the remaining two patients.

A total of 21 patients had undergone no previous treatment prior to the TEM procedure. Four patients had residual lesions following incomplete colonoscopic polypectomy, and two further patients had recurrent local disease. The median lower edge of the tumor was 60 mm (range: 10—140) from the anal verge, and the median maximum lesion diameter was 50 mm (range: 10—130). Tumor location within the rectum was classified as posterior in eight patients, anterior in seven, left lateral in six, right lateral in two and circumferential in four.

Surgical technique

Preoperative bowel preparation included a sodium-phosphate enema 2 h before surgery. Antibiotic prophylaxis for Gram-negative and anaerobic strains was given at the time of anesthesia induction. Surgery was carried out in the Trendelenburg lithotomy position under general anesthesia. TEM was performed with equipment from KARL STORZ GmbH & Co (Tuttlingen, Germany) and followed the original procedure described by Buess et al. [7].

After gentle digital dilatation of the anal sphincter, an operative rectoscope—40 mm in diameter and 120 or 200 mm in length, with a sixfold-magnification stereoscopic view—was introduced into the rectum and secured to the operating table. To visualize the anatomical relationship between the tumor and surrounding healthy mucosa, CO₂ was insufflated into the rectum to enlarge the intrarectal space and facilitate dissection. This was combined with a non-stop suction unit to ensure a constant high flow of gas and evacuation of the smoke resulting from coagulation. A standard 10-mm laparoscope was connected to a video system to give the surgeon an adequate view of the operating field on a TV monitor (Fig. 1).

The margin of clearance was defined by coagulation marks; adenomas were removed with a 5-mm margin of normal mucosa and known carcinomas with a 10-mm margin. Full-thickness, complete, en bloc tumor excision was achieved using either a diathermy knife or ultrasonic dissection scissors (Ultracision®; Johnson and Johnson Medical BV, Amersfoort, The Netherlands), and graspers were introduced through gas-tight operating ports on the occlusive operating faceplate of the rectoscope. The defect in the rectal wall was left open and unsutured. In all patients, the residual defect was irrigated with physiological serum. Postoperatively, patients were allowed to resume eating the following day and were discharged from the hospital two to three days after the operation.

Pathological assessment

The TEM specimen was placed by the surgeon on a corkboard and spread out with pins inserted at 1- to 2-mm intervals throughout the normal mucosa margin (Fig. 2). For benign tumors, resection was considered complete (R0) when the specimen was in one piece and pathological assessment confirmed clear margins. For carcinomas, the tumor (T) stage was recorded, with T1 tumors further subclassified as sm1, sm2 or sm3, according to the Kikuchi staging system [14]. Resection was classified as microscopically complete (R0) when the margins were > 1 mm.
Management and follow-up

Patients were evaluated by clinical and digital examination 1 month after the operation. In accordance with the recent French guidelines for local surgery [13], patients with a T1 lesion and favorable pathological features underwent local excision alone, whereas those with unfavorable criteria—such as T1sm3 or T2 lesions, lymphatic or vascular invasion, or poorly differentiated lesions—were proposed for immediate radical proctectomy within the month following the local procedure.

Statistical analysis

Quantitative data are given as medians (range).

Results

Operative outcomes

Intraoperative technical difficulties were recorded in two cases (7%). In one patient, the peritoneal cavity was breached. In this case, the distance of the tumor from the anal verge was 70 mm, and the tumor was lying anteriorly. The defect was sutured. The patient presented with postoperative abdominal pain and pneumoperitoneum confirmed by CT. Intravenous antibiotics were administered for 7 days, and the patient was discharged on day 7 with no further complications.

In the other patient, the TEM procedure failed because of a gas leak. The patient had a very low-lying tumor, with its lowermost edge lying within 2 cm of the anal verge. This made it difficult to retain the rectoscope in place and maintain satisfactory insufflation of the rectal cavity because of gas leakage. The surgical procedure was converted to conventional transanal excision.

Two other patients, who had tumors with their lowermost edges lying 10 mm and 40 mm from the anal verge, respectively, and large diameters (80 mm and 130 mm, respectively), underwent combined TEM and conventional transanal excision because of gas-seal difficulties.

For all patients, the median operating time was 55 min (range: 25–90), and the median postoperative hospital stay was 4 days (range: 2–22).

Mortality and morbidity

None of our study patients died, and there were no cases of postoperative pelvic sepsis. Six patients (22%) experienced postoperative complications and four presented with pulmonary infection, urinary retention, transient ischemic attack and acute rectal bleeding that settled spontaneously, respectively. Two patients (7%) had major complications with secondary hemorrhage, requiring readmission to hospital on day 7 and day 15, respectively. Both patients needed blood transfusions, and one required examination under general anesthesia for hemostasis. Both of these patients had a past history of myocardial infarction treated with coronary stents requiring anticoagulant therapy that was maintained during the TEM procedure.

At the median follow-up period of 9 months (range: 2.5–17.5), one patient (out of 27) had an asymptomatic rectal stricture, as diagnosed on rectal endoscopy. Radical surgery was avoided in all patients (11/11) who had tumors with a lowermost edge lying > 80 mm from the anal verge.

Patients with adenoma

Nineteen patients had a histologically proven diagnosis of benign adenoma. One patient thought to have a benign tumor before surgery was found to have invasive cancer on the definitive pathological assessment and was excluded postoperatively from the benign group.

R0 tumor resection was confirmed in 16 patients (84%) but, in two patients, the stage was classified as ‘unknown’ because of piecemeal resection. In both cases, there was a large villous tumor with a maximum lesion diameter of 90 mm and 50 mm, respectively. One patient (5%) had an R1 resection with focal microscopically positive margins.

At the median follow-up time of 9.5 months (range: 3–17.5), all patients showed no signs of recurrence.

Patients with carcinoma

Eight patients had a postoperative diagnosis of invasive carcinoma. The pathological stage was pT1sm1 in five patients and pT2 in three. R0 resection was confirmed in six patients (75%). The postoperative specimen showed adverse pathological features in four patients: R1 resection was achieved in two; tumor stage was T2 in three; and lymphovascular invasion was present in two. Also, immediate salvage surgery was required in one of these patients, who had a pT2 carcinoma with R1 resection (focal positive margin) that had been preoperatively understaged. A month after the local surgery, this patient underwent laparoscopic rectal resection with intersphincteric resection. On the rectosigmoid specimen, the definitive pathological assessment showed a pT3n2 lesion with proven metastases in the lymph nodes and a circumferential margin < 1 mm (R1). The patient received postoperative adjuvant chemotherapy. The other two patients with T2 tumors had agreed to compromise surgery and refused postoperative treatment.

At the median follow-up time of 9 months (range: 5.5–16.8), all patients were alive with no evidence of disease.

Discussion

The present study, representing the first French TEM series, was designed to evaluate our preliminary results by assessing the feasibility and safety of TEM local resection of benign and malignant rectal tumors. The present data show that the technique was successful in all patients except one, who required conversion to the conventional transanal approach because of a technical problem (gas leakage). Mortality and morbidity rates were 0% and 22%, respectively. The rate of major complications (n = 2, 7%) was low, including delayed hemorrhage requiring readmission to hospital for both patients, and transanal repeat operation for hemostasis in one. For adenoma and carcinoma cases, the TEM proce-
dure was oncologically safe, with R0 resection rates of 84% and 75%, respectively.

The TEM technique is not a new procedure, but was introduced in Germany by Buss et al. in 1988 [7]. The procedure is widely used as part of the surgical strategy for selected benign and malignant rectal tumors in other countries. However, the technique is currently not widespread in France, but used in only a few specialized colorectal departments for reasons that remain unclear. Nevertheless, the procedure is technically challenging, and requires considerable operator experience and equipment that is still relatively expensive (around 20,000 euros).

In our preliminary experience, intraoperative technical difficulties were recorded in only two patients (7%): one had a gas leak that required conversion in the conventional transanal approach; the other had a peritoneal breach during the dissection. Such a low rate may be explained by our considerable experience with laparoscopic colorectal procedures that has probably facilitated our learning curve. Kreissler-Haag et al. [15] reported, in a 16-year prospective study, a short learning curve for the TEM procedure in surgeons who had prior experience of minimally invasive surgery. Indeed, our median operative time (55 min) compares favorably with other data previously reported by surgical teams with a strong TEM experience of > 10 years [9,16–20]. In an Oxford report involving 200 patients operated on by TEM, intraoperative technical difficulties were reported in 12% of patients and included peritoneal perforation, bleeding and gas leak [9]. However, no conversion to a conventional approach was noted. In that study, the authors found that the risk of peritoneal perforation was greater when the tumor was anterior and lying above the peritoneal reflection. Only one of the seven patients (14%) with intraoperative perforation required postoperative laparotomy for repair. Only one of the seven patients (14%) with intraoperative perforation required postoperative laparotomy for repair. However, they each experienced postoperative complications (one, transient ischemic attack, and the other, severe bleeding requiring surgical transanal hemostasis).

Thus, the question remains as to whether or not local surgery offers local control and survival rates comparable to those with radical surgery. Careful patient selection is the key to success with local surgery. Precise evaluation of the depth of tumor invasion and lymph-node metastases is crucial, and ERUS appears to be the most accurate means of determining the depth of invasion, with an overstaging risk of 15% for T2 vs T1 [26]. The T stage also provides the best estimate of the probability of lymph-node metastasis, which varies from 0% to 15% for T1, and from 16% to 28% for T2, tumors. Other histopathological criteria that are important predictors of lymph-node metastasis are incomplete resection margins, invasion of the lower third of the submucosa (sm3), poorly differentiated histology and lymphovascular invasion [5]. As for adenoma excision, compared with conventional transanal surgery, TEM achieves a...
more complete, en bloc, anatomical resection — in other words, a “macrobiopsy” — thereby allowing more accurate pathological evaluation. Thus, any high-risk tumors that might benefit from further therapy may be identified. In the present study, the rate of R0 resection was 75%. Immediate surgery was advocated for one patient with a T2 lesion. On the other hand, it should be borne in mind that the results of local surgery for cancer do not reach the standard set by the multicentre Dutch trial in which the local recurrence rate following resection of T1–T2 lesions was < 1% [27].

Conclusion

The TEM technique offers a minimally invasive procedure for benign and malignant rectal tumor excision, especially those lying in the middle and upper parts of the rectum that are inaccessible to conventional transanal surgery. TEM is a safe and effective method for treating benign rectal tumors, as it comes with no mortality and low morbidity, and reduces the proportion of lesions requiring radical surgery. However, in cases of rectal carcinoma, its role as local surgery remains controversial and has yet to be ascertained.

Conflict of interest

None.

References