

# Transanal Endoscopic Microsurgery for Rectal Cancer

Simon D. Duek MD<sup>1,2</sup>, Michael M. Krausz MD<sup>1</sup> and Dan D. Hershko MD<sup>1</sup>

<sup>1</sup>Department of Surgery A and <sup>2</sup>Colorectal Surgery Unit, Rambam Medical Center, Haifa, Israel

**Key words:** transanal endoscopic microsurgery, rectal cancer, endoscopic surgery, complications, cure

## Abstract

**Background:** Transanal endoscopic microsurgery has recently gained acceptance as an alternative minimally invasive surgical technique for the curative management of large rectal adenomas and selected early rectal carcinomas.

**Objectives:** To analyze our 8 year experience using TEM for the management of rectal cancer.

**Methods:** Local resection by TEM was performed in patients with benign tumors and early rectal cancer. In addition, selected patients with T2 and T3 rectal cancers who were either medically unfit or unwilling to undergo radical surgery were also treated with this modality. Radical surgery was offered to all patients with incomplete tumor excision by TEM.

**Results:** Overall, 116 TEM operations for rectal tumors were carried out between 1995 and 2003, including 74 patients with rectal adenomas and 42 patients with rectal carcinomas. In 25 patients, TEM successfully removed all T1 tumors with clear tumor margins. Fourteen patients had T2 cancer and 3 of them (21%) required additional radical surgery due to incomplete excision. Local recurrence was observed in one patient with T2 cancer. There was no mortality. Major surgery or radiotherapy-related complications requiring additional surgical intervention was needed in five patients with T2 cancer.

**Conclusions:** Local excision by TEM is a safe surgical procedure and should be offered to highly selected patients with early rectal cancer.

*IMAJ 2005;7:435-438*

The conventional curative surgical management for rectal cancer is total mesorectal excision, which includes adominoperineal or anterior resection [1]. This type of surgery offers the best chance for cure because it allows complete tumor removal with wide margins, provides important information regarding lymph node status, and enables local regional control for node-positive patients. However, the reported mortality rates for these operations are almost 5%, and the morbidity – including genitourinary dysfunction, incontinence and permanent colostomy – may be as high as 40% [1–3]. Moreover, in spite of the radical approach to the disease, the local recurrence rate is still 10%. Therefore, it seems rational that patients with early or “low risk” cancers (T1,N0,M0), who are at very low risk for local recurrence, may greatly benefit from a less radical surgical procedure.

Local excision of selected early rectal cancers is associated with limited mortality and morbidity. The reported mortality rates are less than 2% and the morbidity is usually mild

[4–8]. Traditionally, the main concern with conventional transanal operations for malignant lesions was the lack of complete tumor resection (positive margins were observed in up to 60% of surgical specimens) and the unacceptably high rates of local recurrence [6–8]. The introduction of transanal endoscopic microsurgery by Buess et al. in 1983 [9] was a significant advance in the technical approach to the localized surgical treatment of rectal tumors. Compared to other local excision techniques, TEM has several advantages, including excellent visualization and access to the whole rectum, which allows the removal of tumors not only from the lower but also from the middle and upper parts of the rectum. Furthermore, this technique enables full-thickness excisions with clear surgical margins in more than 90% of patients [6,10–13]. The reported mortality rates of this surgical procedure are less than 0.5%, and the morbidity, which is usually mild and easily manageable, is about 10%. Moreover, previous studies have shown that the recurrence rate in cancer patients carefully selected for TEM was less than 10% [13–15].

Since 1995, we have performed local resections with TEM in patients with benign rectal lesions or early rectal cancers and in highly selected patients with locally advanced cancer who were either medically unfit or unwilling to undergo radical operations. In this study, we present our 8 year experience using TEM to treat rectal cancer.

## Patients and Methods

### Patients

Between June 1995 and April 2003, TEM was performed in 116 patients with rectal tumors. Of these, 42 were rectal carcinomas. All patients with suspected rectal carcinomas underwent standard preoperative assessment including careful history and physical examination, colonoscopy with biopsy, rigid rectoscopy, chest X-ray and abdominopelvic computed tomography. Following the introduction of transrectal ultrasonography to our department in 1998, the last 31 consecutive cancer patients (74%) also underwent this examination as a vital part of the routine preoperative assessment. For purposes of clarity, we have evaluated separately the patients who underwent TRUS and those who did not. The distance of the dentate line from the lower tumor margin, the captured circumference of the rectal wall and the exact location of the tumor were also recorded.

The following inclusion criteria were applied for the performance of TEM:

TEM = transanal endoscopic microsurgery

TRUS = transrectal ultrasonography

- Patients with T1 and well to moderately differentiated adenocarcinomas
- Patients with T2, T3, and well to moderately differentiated adenocarcinomas, who were medically unfit (i.e., American Society of Anesthesiologists classification III or IV) or unwilling to undergo radical surgery
- Radiologically negative lymph node involvement (i.e., negative TRUS, CT, or both)
- Exophytic tumors with maximal diameter of less than 3 cm
- Tumors located at a distance of  $\leq 10$  cm from the dentate line.

In our series, patients with T1 tumors underwent surgery only, while adjuvant radiotherapy was offered to all patients with T2 and T3 cancers. Radical surgery was performed in all patients with involved surgical margins following local excision by TEM.

### Operative procedure

Preoperative preparation included sodium phosphate enema. Antibiotic prophylaxis for gram-negative and anaerobic strains was given at the time of anesthetic induction. All operations were performed under regional anesthesia. Patients were positioned according to the location of the tumor since the rectoscope is beveled downwards (the tumor should be at 6 o'clock). Following gentle digital dilatation of the sphincter, the TEM equipment (Wolf, Knittlingen, Germany) was inserted and secured to the operating table. The central component consists of a rectoscope (with a sixfold magnified stereoscopic view) and a three-port working insert. To visualize the anatomic relation between the tumor and its surrounding healthy mucosa, CO<sub>2</sub> is continuously insufflated to distend the intrarectal space. Marking dots are placed 1 cm around the tumor, followed by full-thickness excision of the tumor. All tumor specimens were sent for frozen section analysis to assess the completeness of tumor excision. Wall defects were closed transversally with absorbable sutures (PDS, Ethicon, Cincinnati, USA) when required. Postoperatively, patients were allowed to resume eating the following day and were discharged from the hospital 2 to 3 days after the operation.

### Follow-up

All patients were evaluated 1 month after the operation and reexamined every 3 months for the first 2 years and every 6 months thereafter. At each visit a clinical examination and rectoscopy were performed.

### Results

Over an 8 year period, 42 patients with rectal cancer were operated using the TEM technique. Twenty-five patients (59%) had T1 invasive cancer. The tumors were removed successfully with clear surgical margins by TEM in all 25 patients. No patient required additional surgical procedures. There were no mortalities or significant peri-operative morbidity requiring blood transfusions, antibiotics or prolonged hospitalization. In addition, over a mean follow-up of 4.3 years no local or distant recurrences were observed in any of these patients.

Fourteen patients with T2 cancers were operated. Clear surgical margins were obtained in 11 patients (78%). In this group there were no deaths, but two patients (14%) were reoperated despite clear surgical margins because of postoperative radiotherapy-related complications. One patient presented with recurrent bleeding episodes following the completion of adjuvant radiotherapy treatment and the other with intractable painful proctitis that did not respond to medical treatment. Three patients required additional radical resections because of involved surgical margins, but residual disease or nodal involvement was found in only one of these patients. Overall, five patients (35%) required additional radical surgery because of surgery or radiotherapy-related causes; in three patients anterior resection was performed and in two patients APR was performed. Local recurrence occurred in one patient (7%) 1 year after she underwent TEM. This patient refused adjuvant radiotherapy and did not attend regularly for follow-up examinations. APR was carried out and successfully removed her disease. TEM was also performed for palliation in three patients with obstructing T3 tumors who were medically unfit to undergo radical procedures. In these patients TEM was used for partial tumor removal to relieve bowel obstruction. All patients succumbed shortly thereafter.

Postoperative pain was mild ( $\leq 3$  according to the Visual Analogue Scale) and all patients who underwent TEM only were able to resume oral intake by the second postoperative day. Intraoperative blood loss was minimal and blood transfusions were not needed. Conversion to open surgery was required in one patient (2%) with T2 tumor owing to perforation of the anterior rectal wall during the attempt to obtain clear surgical margins. Partial incontinence was observed in another patient.

Our first 11 operations for rectal cancer were performed without transrectal ultrasonography assessment. Three patients suffered from locally advanced disease and were medically unfit to undergo radical procedures. One patient was operated after the tumor disappeared clinically following neoadjuvant radiotherapy, and no tumor cells were found on pathologic examination. Another patient was operated for a very small (2 cm) superficial tumor, and the final pathology displayed T1 invasion. In addition, two patients with known cancer underwent TEM because of their refusal to undergo more radical procedures, and T2 tumors were discovered. Four patients were operated for benign tumors, and in two cases tumor *in situ* cancers were found and in another two cases T2 tumors were discovered on final pathologic examination. TRUS was performed in 31 patients (74%) and accurately staged the disease in 24 (78%). In the other seven patients (three with T1 and four with T2), TRUS overestimated the disease stage compared to the final histologic analysis.

### Discussion

Total mesorectal resection of the rectum by means of anterior resection or APR is considered the treatment of choice for patients with rectal cancer and generally offers the best chance for cure. Nevertheless, there is considerable associated mortality

APR = abdominoperineal resection

and morbidity with this type of surgery and the benefit of such radical procedures in patients with low risk cancers is questionable. The role of alternative less radical procedures in selected low risk tumors was recently examined. Principally, a surgical technique that enables complete full-thickness tumor removal may offer a valid alternative to radical resection for T1,N0,M0 cancers. Today, this approach is accepted by many colorectal surgeons and medical oncologists and is more commonly offered to these patients. The single best local technique for successfully removing rectal tumors is provided by TEM. When performed by a colorectal surgeon experienced with the technique, it offers excellent visualization of the rectum and facilitates the complete excision of small tumors from most parts of the rectum, with minimally associated complications. In our series, complete tumor excision with clear margins was obtained in all T1,N0,M0 patients and none required additional radical surgery. Furthermore, there were no surgery-related complications in this group of patients and all patients were discharged from our department on postoperative day 2 or 3, similar to previously reported studies [11–13].

The main concern regarding this approach is whether it offers similar local control and survival compared to radical surgery. Since regional lymph nodes are not removed by TEM, the important prognostic factor of lymph node status and the accurate pathologic stage cannot be assessed. This may potentially obscure the need for additional adjuvant therapy that could reduce the chances of local, regional and distant relapses in the future. Nevertheless, since the risk of nodal involvement in T1 tumors is less than 5%, radical removal of regional lymph nodes is not clearly justified [5,16]. Several recent studies have shown that in patients with T1 tumors and radiologically negative lymph nodes, the local recurrence and survival rates were comparable to those of radical resections [11–18]. Moreover, it was shown that local recurrence could be effectively salvaged by radical surgery in 75% of these patients [18]. With a median follow-up of 4.3 years, we did not observe local or distant recurrences in any of our T1 patients.

The role of local excision for the treatment of T2 cancers, however, is far more controversial. The risk of lymph node metastasis in this group of cancers approaches 20%, and therefore the appropriateness of complete tumor excision without lymph node dissection is uncertain [18,19]. Several recent studies provide evidence supporting the use of TEM in selected patients with T2 tumors as well [18,20,21]. These studies included patients with well to moderately differentiated tumors that were smaller than 4 cm in diameter, located at the extraperitoneal portion of the rectum and without radiologic signs of enlarged regional lymph nodes. When combined with radiotherapy, the local recurrence rate (3–15%), disease relapse at distant organs (10%), and overall survival (80% at 5 years) were similar to those observed after radical surgery [20,21]. Although the number of T2 cancers in our series is relatively small, our results support the possible technical feasibility of local excision by TEM in selected patients with T2 tumors. TEM successfully removed tumors in

78% of T2 cancers, and residual disease was found in only one of the three patients who underwent radical surgery for involved tumor margins. There were no peri-operative deaths, and surgery-related morbidity was 14%, similar to the rates reported previously in the literature [20,24]. Radiotherapy-related complications were observed in two other patients who were reoperated because of recurrent bleeding episodes and intractable pain encountered after the completion of radiotherapy. Nevertheless, although the combined morbidity rate for T2 cancers was 28%, the complications were successfully managed by surgery. Of the nine patients with T2 cancers who were surgically treated only by TEM, we observed one local recurrence in a patient who refused adjuvant radiotherapy. Thus, due to the small number of T2 patients treated solely by TEM in this study, we cannot suggest the validity of this modality in terms of risk for local recurrence in this group of patients.

The key to successful treatment of cancer by TEM is adherence to the strict inclusion criteria mentioned above. This can be achieved only by accurately staging the disease preoperatively. The combination of meticulous physical examination, endoscopy, CT and recently TRUS has been shown to greatly enhance the accuracy of clinical staging. Among these examinations, the important role of TRUS was recently emphasized [22–24]. In expert hands, the accuracy of TRUS in determining the depth of tumor invasion and nodal involvement may be as high as 85%. We performed TRUS in 74% of our patients with an overall accuracy rate of 78%. In contrast, the accuracy of clinical assessment of tumor invasion without TRUS was poor. Thus, our results support the routine use of TRUS in the preoperative assessment of rectal cancer patients eligible for TEM.

In conclusion, although the study is retrospective in nature, our results support the concept that TEM is a safe and valid alternative for the treatment of early rectal cancer and should be offered to patients with clinically T1,N0,M0 rectal cancers. Although recent data suggest a role for TEM in the management of T2,N0,M0 patients, this issue is still controversial and should await larger prospective trials.

## References

1. Heald RJ, Ryall RDH. Recurrence and survival after total mesorectal excision for rectal cancer. *Lancet* 1986;i:1479–82.
2. Enker WE, Merchant N, Cohen AM, et al. Safety and efficacy of low anterior resection for rectal cancer: 681 consecutive cases from a specialty service. *Ann Surg* 1999;230:544–52.
3. Nesbakken A, Nygaard K, Bull-Njaa T, Carlsen E, Eri LM. Bladder and sexual dysfunction after mesorectal excision for rectal cancer. *Br J Surg* 2000;87:206–10.
4. Graham RA, Garnsey L, Jessap JM. Local excision of rectal carcinoma. *Am J Surg* 1990;160:306–12.
5. Read DR, Sokil S, Ruiz-Salas G. Transanal excision of rectal cancer. *Int J Colorectal Dis* 1995;10:73–6.
6. Chakravarti A, Compton CC, Shellito PC, et al. Long-term follow-up of patients with rectal cancer managed by local excision with and without adjuvant irradiation. *Ann Surg* 1999;230:49–54.
7. Garcia-Aguilar J, Mellgren A, Sirivongs P, Buie D, Madoff RD,

- Rothenberger DA. Local excision of rectal cancer without adjuvant therapy: a word of caution. *Ann Surg* 2000;231:345–51.
8. Graff EJR, Doornebosch PG, Stassen LPS, Debets JMH, Tetteroo GWM, Hop WCJ. Transanal endoscopic microsurgery for rectal cancer. *Eur J Cancer* 2002;38:904–10.
  9. Buess G, Hutterer F, Theiss J, Bobel M, Isselhard W, Pichlmaier H. Das system für die transanale endoskopische rectumoperation. *Chirurg* 1984;55:677.
  10. Langer C, Liersch T, Suss M, et al. Surgical cure for early rectal carcinoma and large adenoma: transanal endoscopic microsurgery compared to conventional local and radical resection. *Int J Colorectal Dis* 2003;18:222–9.
  11. Demartines N, Marcus OF, Harder FH. Transanal endoscopic microsurgical excision of rectal tumors: indications and results. *World J Surg* 2001;25:870–5.
  12. Steele RJ, Hershman MJ, McMortensen NJ, Armitrage NCM, Scholefield JH. Transanal endoscopic microsurgery – initial experience from three centers in the United Kingdom. *Br J Surg* 1996;83:207–10.
  13. Mellgren A, Sirivongs P, Rothenberger DA, Madoff RD, Garcia-Aguilar J. Is local excision adequate therapy for early rectal cancer? *Dis Colon Rectum* 2000;43:1064–74.
  14. Winde G, Nottberg H, Keller R, Schmid KW, Bunte H. Surgical cure for early rectal carcinomas (T1). Transanal endoscopic microsurgery vs. anterior resection. *Dis Colon Rectum* 1996;39:969–76.
  15. Heintz A, Morschel M, Junginger T. Comparison of results after transanal endoscopic microsurgery and radical resection for T1 carcinoma of the rectum. *Surg Endosc* 1998;12:1145–8.
  16. Buess G, Kipfmüller K, Hack D, Grubner A, Heintz A, Junginger T. Technique of transanal endoscopic microsurgery. *Surg Endosc* 1988;2:71–5.
  17. Ambacher T, Kasperk R, Schumpelick V. Effect of transanal excision on rate of recurrence of stage I rectal carcinoma in comparison with radical resection methods. *Chirurg* 1999;70:1469–75.
  18. Hershman MJ, Sun Myint A, Makin CA. Multi-modality approach in curative local treatment of early rectal carcinomas. *Colorectal Dis* 2002;5:445–50.
  19. Weber TK, Petrelli NJ. Local excision for rectal cancer: an uncertain future. *Oncology* 1998;12:933–43.
  20. Lezoche E, Guerrieri M, Paganini AM, Feliciotti F. Long-term results of patients with pT2 rectal cancer with radiotherapy and transanal endoscopic microsurgical excision. *World J Surg* 2002;26:1170–4.
  21. Lezoche E, Guerrieri M, Paganini AM, Feliciotti F. Transanal endoscopic microsurgical excision of irradiated and nonirradiated rectal cancer. A 5-year experience. *Surg Laparosc Endosc* 1998;8:249–56.
  22. Sailer M, Leppert R, Kraemer M, Fuchs KE, Thiede A. The value of endorectal ultrasound in the assessment of adenomas, T1- and T2- carcinomas. *Int J Colorectal Dis* 1997;12:214–19.
  23. Thoeni RF. Colorectal cancer. Radiologic staging. *Radiol Clin North Am* 1997;35:457–85.
  24. Marusch F, Koch A, Schmidt U, et al. Routine use of transrectal ultrasound in rectal carcinoma: results of a prospective multi-center study. *Endoscopy* 2002;34:385–90.

---

**Correspondence:** Dr. S.D. Duek, Colorectal Surgery Unit, Dept. of Surgery A, Rambam Medical Center, Haifa 31096, Israel.  
Phone: (972-4) 854-2782  
Fax: (972-4) 854-3273  
email: d\_duek@rambam.health.gov.il