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Giant adenomas of the rectum: complete resection by transanal endoscopic microsurgery (TEM)

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Abstract *Background:* Large sessile adenomas of the rectum, with a diameter greater than 5 cm, have a high risk to undergo malignant transformation. Transanal endoscopic microsurgery (TEM) offers an alternative operation method to low-anterior rectum resection in this potentially benign tumor situation. *Patients:* We retrospectively investigated patients with giant adenomas of the rectum (>5 cm) who were treated by TEM over the last 10 years. A total of 33 patients met the criteria and were analyzed for postoperative complications, histology, and incidence of occult adenocarcinoma; residual tumor status; and tumor recurrence. *Results:* Partial suture-line insufficiency ($n=5$, 15%) was the major postoperative complication, but could be managed conservatively in four cases. The residual adenoma status was 18% ($n=6$), especially in patients with tumors sizes more than 30 cm². In case of adenoma recurrence ($n=4$,

12%), a conventional transanal excision (Parks) was applicable, as these tumors were mostly located within the suture-line region of the lower rectum. Incidentally, five carcinomas were found in the specimens. In case of advanced tumors (1×pT2, 1×pT3), anterior rectum resection was carried out, whereas for the early tumors (2×pT1 low risk, 1×1 pTis), no further therapy was added. All patients (adenomas and carcinomas, $n=33$) were without recurrence during follow-up. *Conclusion:* TEM is an alternative method for the resection of large benign rectal tumors located in the mid- and upper third of the rectum. The main postoperative complication is suture-line insufficiency, which generally heals by conservative treatment.

Keywords Rectal tumors · Giant rectal adenomas · Transanal endoscopic microsurgery · Local excision

Introduction

Adenomas of the rectum are one of the most common neoplasms of the large intestine [1]. The incidence of occult adenocarcinoma in these allegedly benign adenomas rises proportionally with the rate of villous histology and tumor size [2, 3]. The percentage of villous tumors occurring in the rectum is reported from 40 to 66% of all tumor entities of the colorectum [1, 3]. The malignant potential of these adenomas mandates complete resection and accurate his-

tological evaluation to determine further treatment in case of high-risk pT1 or locally advanced adenocarcinoma.

Small sessile adenomas of the rectum qualify for endoscopic snare excision [4], and large adenomas of the lower rectum can be resected by conventional transanal excision as described by Parks and Stuart [5] or, recently, by Featherstone et al. [6]. Giant adenomas (>5 cm diameter) of the upper and mid-third of the rectum remain a challenge to these techniques. Radical resections, like low-anterior resection with total mesorectal excision (TME),

inherit a considerable morbidity (from 30 to 50%) and thus have to be well justified in this potentially benign tumor setting. An appropriate alternative method for local resections of the rectum is the endoscopic microsurgery technique [7].

Transanal endoscopic microsurgery (TEM) offers a secure, radical, and minimal invasive method for local tumor excision of the upper and midrectal third [7–9].

In the present retrospective study, we focus on patients with giant adenomas of the rectum who were treated by TEM over the last 10 years. The specific aims were to determine the rate of postoperative complications and its management, the definite histology and size of the specimen, the incidence of occult adenocarcinomas, the residual adenoma status, and the risk for local tumor recurrence.

Patients and methods

Within the last 10 years (1994–2004), 33 patients (male, $n=24$; female, $n=9$), with rectal adenomas larger than 5 cm in diameter, were referred to our clinic and were treated by TEM. The mean age of these patients was 70 years, with a range from 48 to 85 years.

Inclusion criteria were giant adenoma of the middle and upper rectum, which was defined as an adenoma more than 5 cm in diameter, measured postoperatively by the pathologist. The tumor was assigned to the middle (5–10 cm from linea dentata) or upper rectum (10–15 cm from linea dentata) if the main tumor mass was situated there. Preoperative multiple biopsies were obtained by rectoscopy and histologically evaluated. They demonstrated benign lesions in all selected patients. Preoperative staging routinely comprised total colonoscopy, rectoscopy combined with endosonography, abdominal ultrasound, and serum tumor markers [carcinoembryonic antigen (CEA), cancer antigen (CA) 19-9]. All tumors were located in the upper or mid-third of the rectum and were resected by full-thickness bowel-wall resection via TEM. The resected specimens were pinned to a corkboard for better orientation and to investigate the resection margins macroscopically by the surgeon and microscopically by the pathologist. The tumor extension was measured by multiplying the length and width of the tumor. The specimens were fixed in formaldehyde solution for complete histopathological evaluation. The defect of the rectum was closed by TEM technique with an absorbable running suture (3-0 Maxon) in three to six steps to avoid complete suture-line dehiscence in case of suture failure. In case of very large defects, the rectal wall was mobilized by separating carefully the wall from the perirectal tissue until tension-free suturing was possible. To facilitate suturing, a fixation suture was placed in the middle of the defect, which was followed by running sutures to the left and to the right of the wound defect. If the distal margin of the tumor extended to the dentata line, TEM technique and transanal resection were combined in

nine cases. Transanal nonendoscopic closure of the defect was performed if the distal excision margin was stated not more than 1 cm proximal of the dentata line. Postoperatively, patients were allowed to drink and eat from day 1. The suture line was controlled by rectoscopy before dismissal. In case of partial suture-line insufficiency, follow-up rectoscopies were performed every 7 days. Hospital stay ranged from 6 to 22 days, depending on the patients' clinical course and dimension of suture-line dehiscence mandating parenteral nutrition. Follow-up rectoscopies were performed every 3 months in the first year, every 6 months in the second year, and yearly afterwards up to the fifth year.

Histology

After fixation in formaldehyde solution, resection margins were evaluated microscopically, and cross sections were made to obtain a representative complete histology for detection of microfocal adenocarcinoma according to Morson [10] and Hermanek [11].

Results

Thirty three cases with giant rectal adenomas, which were treated by TEM during the past 10 years, were included in this study. Follow-up data were available for all patients from routinely performed endoscopic follow-up in our department or from gastroenterologists, which were contacted concerning their endoscopic findings. The median follow-up was 36.4 months. The sizes of the resected specimens ranged from 5.6×2.5 cm to 13.5×5.5 cm in diameter, spanning an area of 14–74 cm² (mean 37 cm²). Twenty eight tumors were located with their main tumor mass in the posterior and/or in the lateral position, whereas only five tumors were located mainly at the anterior rectal wall. No tumors were excluded from this series due to their position in the rectum.

Postoperative complications

The postoperative complications comprised suture-line dehiscence, fever, and transient fecal incontinence. As the incidence of postoperative complications rose with the size of the excised area, a cutoff area was set at 30 cm², and patients were divided into two groups (group I, $n=16$; group II, $n=17$), respectively (Table 1).

Suture-line insufficiency was detected by rectoscopy in five patients (15%) and led one patient to fever ($n=1$, 3%) and consecutive reanastomosis by TEM ($n=1$, 3%). A second suture-line dehiscence occurred in this patient, and finally, protective ileostoma was placed ($n=1$, 3%). In general, suture line-dehiscence was managed by parenteral

Table 1 Postoperative complications

Group	<30 cm ² , n=16	>30 cm ² , n=17	Total (N=33)
Suture dehiscence	1	4	5
Fever	0	1	1
Reoperation	0	1	1
Stoma	0	1	1
Transient fecal incontinence	2	2	4
Total	3	9	12

nutrition for 5–8 days and combined with intravenous antibiotics in three cases. In this series, no intra-abdominal perforation, retroperitoneal emphysema, sepsis, or postoperative fistula occurred. Four patients complained of transitional fecal incontinence (flatulence or liquid stool) which disappeared completely during hospital stay ($n=2$) or within the first 3 months after the operation ($n=2$) without requiring further therapy.

Histology and incidence of adenocarcinoma

After histological classification, the vast majority of resected tumors were defined as tubulo-villous adenoma ($n=24$, 73%), whereas tubular adenoma was detected in one case (3%), and villous adenoma in three cases (9%). One patient (3%) showed a pTis carcinoma in situ (Table 2).

In four cases (12%), the definite histology showed an occult adenocarcinoma arising in a rectal adenoma. According to tumor node metastasis (TNM) classification [International Union Against Cancer (UICC)], two patients (6%) had a pT1 low-risk adenocarcinoma with R0-resection. In these cases, no further treatment was added. In both patients, no evidence of tumor recurrence was observed during follow-up. Two other patients (6%) had a pT2 or pT3 high-risk adenocarcinoma (R0). The T3 tumor was probably understaged due to its position in the upper rectum because only the distal margin of the tumor was reachable by the rigid ultrasound device. Both patients underwent low-anterior resection within 1 week. In the final specimens, no residual tumor or lymph node metastasis was found.

Table 2 Histopathological evaluation

Tumor histology	Patients, N=33 (%)
Tubular adenoma	1 (3)
Tubulovillous adenoma	24 (73)
Villous adenoma	3 (9)
Carcinoma in situ	1 (3)
Adenocarcinoma	4 (12)

Residual adenoma status

Residual adenoma at the resection margin was microscopically evident in six patients (18%). There was no statistically relevant relation between suture-line dehiscence and adenoma recurrence: one patient with suture-line dehiscence had adenoma recurrence (1/4); the other recurrences had been noted in patients without suture-line insufficiency (3/27).

Local tumor recurrence

By endoscopic follow-up, local recurrence of adenoma has been detected in four patients (12%). The recurrent adenomas occurred 6, 7, 11, and 18 months after initial resection by TEM. These adenomas were located in the lower rectal third, as the suture line moved aboral due to the mobility of the upper resection margin and fixation of the distal rectal wall. Thus, conventional transanal excision (Parks procedure) was applicable to these four adenomas. No recurrence during follow-up (2.1, 3.5, 5.7, and 7.5 years) was observed concerning the four adenocarcinomas.

Discussion

In this retrospective study, we analyzed 33 patients, with giant adenoma of the mid or upper rectal third which were resected by TEM, to evaluate whether this operation method is an alternative to low-anterior rectum resection. Our results show that the major complication of this large local tumor excision is partial suture-line insufficiency (15%). Most resection extents were semicircular or sleeve resections of the rectum wall. The incidence of suture-line insufficiency correlated with the size of the resected area if the resected area was more than 30 cm² (23.5%). The overall complication rate of 39.4% seems to be high, but due to the routinely carried out rectoscopy, every suture-line insufficiency, even the asymptomatic ones, were detected. Routine rectoscopy was carried out since, in our experience, large suture-line defects can lead to late rectal bleeding or disturbance during defecation. Even if serious complications in case of a suture-line insufficiency rarely occurred, patients had to be informed about the secondary wound healing because of the abovementioned possible disorders.

However, the resulting rectal-wall defect after resection of giant adenomas is large, and suture lines in general had been more or less under tension even if prior mobilization of the rectal wall had been carried out. Consequently, suture-line insufficiency was mainly related to the group with a tumor larger than 30 cm². Only one patient was reoperated by TEM technique and protective ileostoma after subsequent refailure. This patient was one of the first with TEM-resected giant adenoma in our series. All other

partial suture-line failures can be treated conservatively without reoperation. In our experience, parenteral nutrition for 3–5 days and endoscopic follow-up to verify wound healing seems sufficient. Intra-abdominal perforation, retroperitoneal emphysema, sepsis, and postoperative rectovaginal fistula are well-known complications of TEM, but these did not occur in our series. This result can be related to the favorable tumor location in our patient group, with adenomas mostly located in the posterior and lateral rectum wall. Furthermore, TEM offers a choice between a full-thickness bowel-wall resection and an intramural partial bowel-wall resection (mucosectomy). If the tumor is located high in the upper rectum third, the latter should be chosen to avoid intra-abdominal perforation [8, 12].

The histological analysis revealed that residual adenoma was apparent at the resection margin in 18%. Local adenoma recurrence was detected in 12%. Incomplete resection was stated by the pathologist when adenoma was adjacent to the resection margin. Due to the operative technique and the use of electrocautery, the adenoma can be resected completely, but histological examination cannot verify this situation in all cases because of the coagulated margins. In one study of 286 adenoma resections with TEM, the authors found 1.2 and 7% recurrence rate at 1- and 5-year follow-up, respectively [7]. Positive resection margin is a significant factor for recurrent adenomas, which can be demonstrated by Galandiuk et al. [13]: 34% of adenomas with positive resection margins recurred, while only 3% of the tumors with negative margins showed recurrent adenomas during follow-up. In case of adenoma recurrence, endoscopic snare resection, reoperation with a conventional transanal excision technique (Parks procedure), or TEM technique is applicable to these patients and is easy to perform. As the suture line is moved aboral into the lower rectal third by the TEM method due to the mobile oral rectum wall, the recurrent adenomas were located in the lower rectal third. Recently, in two studies which includes a large amount of patients, it can be demonstrated that an anastomotic leakage was associated with a significant increase in local recurrence and survival [14, 15]. In our series, no significant relation between suture-line insufficiency and adenoma recurrence was demonstrable, which could be due to the small number of patients.

The majority of the resected lesions were of tubulovillous character (73%), whereas villous lesions (9%) and tubular adenomas (3%) were rarely found. The potential of

these lesions to undergo malignant transformation is very well known and rises with adenoma size and the presence of villous histology [13, 16].

The preoperative use of endorectal ultrasound (EUS), in combination with multiple endoscopic biopsies, resulted in a declined incidence of advanced occult adenocarcinoma in these allegedly benign giant lesions. In our series, adenocarcinoma was detected in five cases (15%) by histopathological evaluation, supporting the data of other studies that report incidental adenocarcinoma in villous polyps [1, 16]. In general, pTis (carcinoma in situ) ($n=1$) and pT1 low-risk ($n=2$, 6%) tumors can be curatively resected by the TEM technique, which was confirmed by recurrence-free follow-up in these three cases [8, 17, 18]. Even in more advanced carcinomas (pT2/pT3), no residual tumor was found in the final specimen after radical resection. Conventional surgery was added in these cases to achieve the best survival for the patients.

Recently, some authors reported about endoscopic snare resection of large colorectal polyps in the “piecemeal” technique. Recurrence rates of the benign polyps ranged from 16 to 28%: Repeated endoscopies were carried out to treat the polyp recurrences. In case of detected malignancies (R1/R2-resection, pT>1 and/or high-risk tumors); the patients were treated by surgery [19–22].

The main advantages of the TEM method are the complete en bloc resection of the tumor and the exact histopathologic examination of the resection margins. Minor postoperative complications can be managed conservatively in most cases. On the other hand, the TEM technique requires a prolonged learning curve, as it is not comparable to laparoscopic surgery [9]. In some instances, the difficult exposure of giant semicircular lesions affords a patient repositioning during operation.

In conclusion, our data suggest that in the case of an experienced TEM surgeon, the TEM technique is an adequate alternative to endoscopic snare resection and low-anterior rectum resection for treatment of giant adenomas of the mid and upper rectum third. Regarding indication, our primary approach for treatment of giant adenomas of the mid and upper rectum third is the TEM method, with no general restrictions to patient selection. Indispensable in these cases is exact preoperative local tumor staging with rectal endosonography and ample biopsy to detect infiltrating rectal malignancies (pT>1) which will not be treated by local excision.

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