DYNAMIC MANUSCRIPTS

Safety and long-term results of endoscopic transanal resection in treating rectal adenomas: 15 years' experience

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Abstract

Background Endoscopic transanal resection (ETAR) is a scarcely used technique to treat large or sessile rectal adenomas not amenable to polypectomy. The purpose of this study was to evaluate safety and long-term results of ETAR in treating rectal adenomas in three hospitals over 15 years.

Methods Patients who underwent ETAR during 1996–2010 were retrospectively analyzed with respect to patient, adenoma, and operative characteristics, earlier operations, complications, follow-up time, recurrence rates, recurrence treatment, and cancer incidence.

Results Ninety-two patients underwent a total 111 ETARs to treat rectal adenoma. The mean age of patients was 71 years, and the median ASA class 3. Twenty-eight patients previously had received other treatments for rectal adenoma. Incidental carcinoma was found in eight patients. Sixty-seven adenomas were treated with only one ETAR and 17 with two or three ETARs. Sixty-seven patients did not have a recurrence, whereas 14 patients had an adenoma recurrence and 3 patients developed invasive carcinoma during a mean follow-up of 30 months. Complications occurred in 14 patients; all were minor, except for one explorative laparotomy without findings. No mortalities or conversions to open surgery occurred.

Conclusions ETAR is a minimally invasive and safe technique with inexpensive instrumentation to treat rectal adenomas that are not amenable to polypectomy. Adenoma recurrence rate was 15 % and cancer incidence 3 % in follow-up.

Keywords Rectal cancer · TEM · EMR · ETAR · Polyp · Urologic resectoscope

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Colorectal adenomas are benign lesions with the potential to transform into invasive carcinoma [1]. The incidence of colorectal cancer can be reduced by removing premalignant adenomas [2]. Most colorectal adenomas can be handled with a simple snare polypectomy, but large and sessile rectal adenomas pose a challenge for treatment [3]. Open or laparoscopic surgery, such as anterior or abdominoperineal resection, has high morbidity and costs, and thus, local treatment options have been developed. Conventional transanal excision has been used for decades; endoscopists have used piecemeal endoscopic mucosal resection (EMR), and transanal endoscopic microsurgery (TEM) was introduced even more recently. These techniques have limitations: only low lesions can be treated

using transanal excision, whereas technical complexity, high cost, and difficulty-to-treat low lesions limit the use of TEM [3, 4]. A few reports have demonstrated successful resection of rectal adenomas using the standard urologic resectoscope—a method called endoscopic transanal resection (ETAR). Safety, low cost of the instrumentation, relative ease of technique, and ability to treat low lesions are benefits of ETAR. Only two reports of more than 50 rectal adenoma patients have been published [5, 6]. We report our 15-year experience and follow-up of ETAR in 92 patients in three hospitals.

Materials and methods

Records of all patients treated using ETAR in South Karelia Central Hospital, Mikkeli Central Hospital, and Oulu University Hospital during 1996–2010 were retrospectively analyzed. All patients were intended to cure and had a preoperative diagnosis of rectal adenoma that was not amenable to polypectomy or low anterior resection because of anatomy of the adenoma, patient's old age, or multimorbidity. Patients were consecutive patients treated with ETAR with no exclusions.

Patients received rectal enema before the operation and were operated on with spinal anesthesia in a lithotomy position using a standard 28-Frenz 30° urologic resectoscope with continuos fluid (1.5 % glycine or Somanol/Ethanol solution) irrigation. In case of extra- or intraperitoneal perforation, glycine or Somanol may cause transurethral resection syndrome (TUR syndrome) similar to that seen following transurethral resection of prostate or bladder. Patients received intravenous prophylactic antibiotics (1.5 g of cefuroxime and 500 mg of metronidazole) ~30 min before the operation. A complete piecemeal resection of mucosa and submucosa of the lesion was performed (Fig. 1, Supplementary video). Approximately 1 cm of macroscopically healthy tissue was resected around the lesion. All samples obtained during the operation were sent for histopathological analysis. Follow-up of patients was individualized based on patient and adenoma characteristics, usually at 3- to 6-month intervals for up to 5 years. Follow-up time is defined as time from the first ETAR to the most recent endoscopic examination of the adenoma site.

Results

Adenoma and patient characteristics

Ninety-two patients that were identified based on procedure code search underwent 111 ETARs to treat suspected rectal adenoma. Patients were analyzed as intention-to-treat with no exclusions. Patients' mean age was 71.2 years; 50 % of the patients were female. The median ASA class was 3. Rectal adenoma had been treated earlier using polypectomy in 11 patients, transanal excision in 14 patients, endoscopic mucosa resection in 2 patients, and TEM in 1 patient. Thus, ETAR was used to treat recurrent adenoma in these cases.

Of adenomas, 72 % were sessile and 28 % exophytic. They were located a mean of 5.7 (range 0–15) cm from the anal verge, and their mean diameter was 3.7 (range 1–12) cm. Preoperative histology of the adenoma was tubular in 25 %, tubulovillous in 66 %, villous in 3 %, and serrated in 1 %. Dysplasia grade was low grade in 70 % and high grade in 21 %. In examination of the ETAR specimens, dysplasia grade remained unchanged in 76 %, whereas it was upgraded in 14 % (low grade to high grade or carcinoma), and downgraded in 6 % (high grade to low grade or no dysplasia). Details of patient and adenoma characteristics are shown in Table 1.

Four invasive carcinomas were revealed by histological examination of the ETAR specimens. Two of them were diagnosed before ETAR as low-grade and two as high-grade adenomas. One of these patients underwent subsequent anterior resection, but no carcinoma was detected in the operative specimen. The second patient's ETAR specimen showed a T1 adenocarcinoma, which seemed

Fig. 1 ETAR in progress. **A** Picture at beginning of procedure. Adenoma is still intact. **B** Picture at end of procedure. Note the exposed *red* muscle layer (Color figure online)
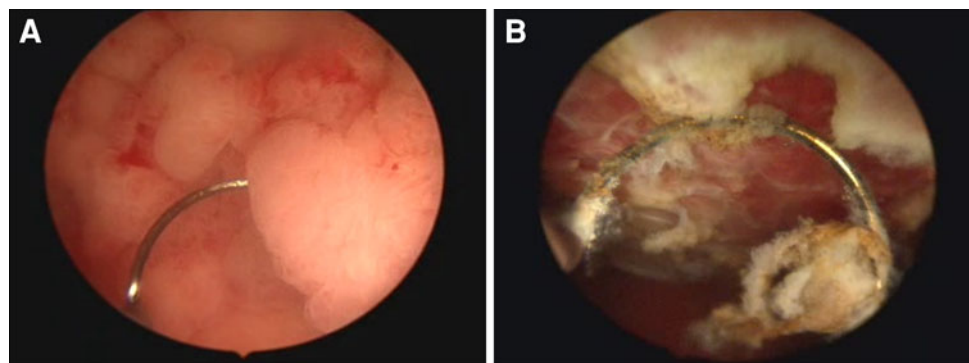
Table 1 Patient and adenoma characteristics

Patient characteristics	
No. of ETARs/patients	111/92
Male/female ratio	46/46
Mean age (yr)	71.2 (range 43–92)
Median ASA	3 (range 1–4)
Adenoma characteristics	
Mean distance from anal verge	5.7 (range 0–15) cm
Mean size	3.7 (range 1–12) cm
Preoperative histology	
Tubulovillous	61 pt (66 %)
Tubular	23 pt (25 %)
Villous	3 pt (3 %)
Serrated	1 pt (1 %)
N/A	4 pt (5 %)
Preoperative dysplasia	
Low grade	64 pt (70 %)
High grade	19 pt (21 %)
N/A	9 pt (10 %)
Postoperative histology	
No adenoma	0 pt (1 %)
Tubulovillous	62 pt (67 %)
Tubular	18 pt (20 %)
Villous	1 pt (1 %)
Serrated	2 pt (2 %)
Invasive carcinoma	4 pt (4 %)
N/A	4 pt (4 %)
Postoperative dysplasia	
No dysplasia	3 pt (3 %)
Low grade	56 pt (61 %)
High grade	25 pt (27 %)
Invasive carcinoma	4 pt (4 %)
N/A	4 pt (4 %)

ASA American Society for Anesthesiologists physical status classification system; *ETAR* endoscopic transanal resection; *N/A* not available; *pt* patients

Table 2 Number of complications

Complications	No. of patients
None	78
Postoperative hemorrhage requiring blood transfusion	4
Pyrexia	3
Extraperitoneal perforation, managed with antibiotics	2
TUR syndrome	1
Air embolus	1
Stricture	1
Exploratory laparotomy	1
Urinary retention	1

TUR transurethral resection

agreed to abdominoperineal resection, one declined of further treatment, one was found to have ovarian carcinoma that was infiltrating the rectum, and one was considered unfit for radical operation.

Details of ETAR, hospital stay, and complications

Mean operative time for the first ETAR was 43 (range 10–132) min. There were complications in 15 % of patients (14 patients). All complications were minor, except for one case, where laparotomy was performed because patient developed abdominal tenderness and perforation was clinically suspected (Table 2). However, no intraperitoneal perforation was found and the procedure remained exploratory.

There were no perioperative mortalities or conversions to open procedures. The mean hospital stay was 4.4 (range 2–17) days. Most patients came to the hospital the day before the operation and left on the first postoperative day.

Adenoma was unresectable using ETAR in two cases. ETAR was supplemented with transanal excision in one of these patients. This patient developed invasive carcinoma in follow-up and underwent abdominoperineal resection. The other patient declined of operative treatment and further follow-up.

Reoperations, recurrences, and follow-up

Sixty-seven adenomas (80 %) were treated with only one ETAR, 15 adenomas (17 %) required two ETARs, and 2 adenomas (2 %) required three ETARs. These were planned reoperations and are not classified here as recurrences. Mean follow-up was 30 (range 0–116) months. Patients with no follow-up were considered too comorbid or declined to participate in follow-up. Recurrences of adenoma were detected in follow-up in 15 % of patients (14 patients). Adenoma recurrence was treated in five patients with ETAR, in one patient with electrocoagulation, in two

completely resected. The patient was considered too frail for radical resection and was followed endoscopically for 35 months with no signs of recurrence. The third patient underwent abdominoperineal resection, with no carcinoma found in the operative specimen. The fourth patient also underwent abdominoperineal resection revealing T1N0 rectal cancer.

Invasive growth was noticed macroscopically during ETAR in four patients, although resections samples showed only high-grade dysplasia. Preoperative dysplasia was high-grade in three cases and low-grade in one case. These treatments were not considered curative. Later histological analyses confirmed the carcinoma diagnosis. One of the patients underwent several local treatments until he

patients with transanal excision, in three patients with polypectomy, in one patient with EMR, in one patient with abdominoperineal resection, and in one patient with an unknown method (lost in follow-up).

Invasive carcinoma was found in follow-up in three patients (3 %) who were treated with "curative" resection. The first patient had been treated previously by using transanal excision and electrocoagulation. Adenoma recurrence at 2-year follow-up was treated with ETAR. Preoperative and postoperative histology was tubular adenoma with low-grade dysplasia. Small adenoma recurrences were thereafter treated using electrocoagulation, and at 8-year follow-up endoscopy a large adenoma was found and treated using ETAR again. Invasive carcinoma was detected 1 year later and the patient underwent abdominoperineal resection. The second patient had been treated previously with transanal excision. Recurrence at 6-month follow-up was treated using ETAR. Preoperative and postoperative histology was tubulovillous adenoma with severe dysplasia. No recurrence was detected at 1-year follow-up, and further follow-up was ceased due to old age and other metastatic disease. Rectal carcinoma was found 7 years later. No treatment was planned, because the patient was in the terminal phase. The third patient had an adenoma that intermingled with hemorrhoids and could not be completely removed using ETAR. Thus, ETAR was supplemented with transanal excision. Preoperative and postoperative histology was tubulovillous adenoma with severe dysplasia. Invasive carcinoma was found in follow-up at 16 months, and the patient underwent abdominoperineal resection.

Discussion

We present our 15 years of experience with ETAR in 92 patients. We also reviewed all previous publications that reported using ETAR to treat rectal adenomas in more than ten patients, and collected the data from these publications in Table 3. All of these publications were retrospective series, and they collectively report a total of 424 patients with rectal adenoma treated with ETAR. There also are reports of palliative procedures to treat rectal cancer. These were not included, however, because modern endoscopic stenting has largely removed the need for such procedures.

Our data show that ETAR is a minimally invasive technique to treat adenomas with low morbidity and a short hospital stay. Hospital stay is nowadays even shorter than reported here, because patients will arrive on the operative day and usually leave on the first postoperative day. However, during the study period it was customary for the patient to arrive at the hospital the day before the operation, thus extending the hospital stay. Because most patients in our material had severe comorbidities (median ASA class 3), ETAR seems to be a safe technique even in old and frail patients. In our series, the complication rate was 15 %; all were minor complications, except for one case with severe lower abdominal pain. Exploratory laparotomy was performed due to suspicion of intraperitoneal perforation but could have been avoided had a CT scan been available. The complication rate was slightly higher than in earlier reports of ETAR (mean 7.3 %; Table 3). A recent systematic review comparing EMR and TEM reported complication rate of 8.1–9.5 and 9.8–17 % for EMR and TEM, respectively [7]. No mortalities were associated with ETAR in our series, and only 0.4 % has been reported in earlier series (Table 3); 0.46 and 0.5 % mortality rates have been reported for TEM and EMR, respectively [7].

Adenoma recurrence rate was 15 % in our material, whereas recurrence rates of 0–20 % have been reported previously for ETAR (Table 3). This also is comparable with reported recurrence rates following treatment of adenomas using TEM (0–36 %) [3, 4, 8], whereas recurrence rates after transanal excision are more variable, 3–50 % [3, 9]. A recent systematic review estimated early recurrence rate of 11.2 % for EMR and 5.4 % for TEM and late recurrence rate of 1.5 % for EMR and 3 % for TEM [7]. However, in case of EMR these numbers are for both colonic and rectal adenomas combined. Furthermore, it should be noted that in our study ETAR was used to treat recurrent adenoma that had already been treated using another method in 30 % of cases (28 patients), potentially affecting adenoma recurrence rate.

The main concern with any technique treating adenomas is its oncological safety. Cancer incidence in follow-up after ETAR has been 0–3 % in previous publications (Table 3), whereas cancer incidence in the two largest series was 0 % [5, 6]. Three cancers were detected in the follow-up of "curative" ETAR, resulting in 3 % cancer incidence in mean 30-month follow-up. Two patients had low-lying recurrent adenomas that had been treated previously using transanal excision. One cancer case was found following a low-lying adenoma that was unresectable using ETAR and was supplemented with transanal excision. Eight incidental carcinomas were found from the ETAR treated suspected adenomas. Four carcinomas were found in the histological analyses of the resection samples, whereas four were macroscopically invasive. This demonstrates that patients considered for ETAR should undergo rectal magnetic resonance imaging or endoscopic ultrasound to reduce the possibility of invasive carcinoma.

ETAR is a relatively easy method to learn if one has expertise in the use of a (urologic) resectoscope. Both

Table 3 Summary of publications with more than ten patients reporting use of ETAR in treating rectal adenomas

Study	N	Age (year)	OR time (min)	Incidental carcinoma (%)	Complications/ mortality (%)	Size (cm)	Distance from anal verge (cm)	Total oper/ patient	Adenoma recurrence/ cancer incidence (%)	Stay (days)	Follow-up (mo)
Berry et al. [11]	23	76	ns	0	21 / 4	5.2[a]	5[a]	1.7	ns	ns	ns
Kockelbergh and Nash [5]	14	ns	ns	7	7 / 0	ns	ns	ns	ns	ns	ns
Wetherall et al. [6]	28	71	25	14	4 / 0	ns	9	1.5	9 / 0	4	4.5
Dickinson et al. [13]	38	73	ns	13	27 / 3	3.5[a]	5.5[a]	1.6	0 / 3	ns	ns
Sutton et al. [3]	74	68.5[b]	25[b]	19	1 / 0	ns	10	1.7	5 / 0	3	30
Tuech et al. [14]	28	64	35	11	38 / 0	5.6	8.2	1.4	7 / 0	3	60
Beattie et al. [15]	11	74[b]	25[b]	0	0 / 0	ns	ns	2.8	0 / 0	1	42
Tsai et al. [8]	131[b]	74	30	5	5 / 0	2	10	1.4	20 / 0	ns	32
Bujanda et al. [1]	13	68	ns	8	16 / 0	4.5	8	1.1	8 / 0	5	15
Shaikh et al. [9]	24	71	34	0	25 / 0	2.8[a]	7	2.3	ns / 0	1.5	58
Modarai et al. [2]	40	72	26	12.5	12.5 / 0	4[a]	6.9[a]	ns	10.4 / 2.6	ns	47
Total (weighted mean by N)	424	71.6	28.5	9.3	7.3 / 0.4	3.2	8.5	1.6	11.4 / 0.5	3	34.8
This study	92	71.2	43	8.7	15 / 0	3.7	5.7	1.4	15 / 3	4.4	30

Cancer patients are excluded

ns Not stated

[a] Approximated from data given in the original report

[b] Includes some cancer patient statistics that could not be excluded due to presentation in the original report

colorectal surgeons and urologists have been performing ETAR in earlier reports. A few studies have advocated collaboration between colorectal surgeons and urologists [6, 10, 11]. We have employed an interdisciplinary approach in which a colorectal surgeon is responsible for diagnosis, choice of treatment method, and follow-up, while a urologist provides technical expertise and perioperative surveillance. There are several positive aspects to this arrangement. First, urologists are familiar with handling resectoscope due to their training. Second, the number of ETARs per operator is very small. In our material, three urologists performed a total of 111 operations over 15 years, which is on average 2.5 operations per urologist per year. This number is too small to gain expertise in using the resectoscope if a surgeon uses it solely for ETAR. On the other hand, urologists use the resectoscope for transurethral resection of the prostate and bladder (TURP and TURB) and thus can develop a routine. Another option would be to centralize ETARs into one large center (and to one surgeon) to ensure sufficient volume.

From the economic viewpoint, TEM requires expensive special instrumentation, whereas ETAR is an inexpensive option because most hospitals already have the equipment needed (i.e., urologic resectoscope). This is especially important in developing countries with lower resources.

ETAR is applicable to the extraperitoneal part of the rectum, while lesions in the lower rectum may be problematic to treat using TEM due to difficulties to maintain the carbon dioxide seal [8]. Large low sessile rectal adenomas are ideal for ETAR. Although some authors have even suggested the use of ETAR to treat T1 rectal cancers [12], we discourage the use of ETAR for rectal cancer due to the lack of a complete sample, and thus, uncertain safety margins. However, ETAR may be considered in cases where no other treatment options are suitable or available.

Conclusions

ETAR has a niche in the armamentarium of treating rectal adenomas. It is minimally invasive, inexpensive, safe, and a relatively easy method for treating rectal adenomas not amenable to polypectomy or for patients who are not fit enough for major surgical resection. The adenoma recurrence rate was 15 %, and cancer incidence was 3 % in mean 30-month follow-up.

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