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Transanal endoscopic local resection versus radical excision in the treatment of massive rectal gastrointestinal stromal tumors: striving for therapeutic advantages

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Abstract

Objectives: To compare the therapeutic advantages of transanal endoscopic local resection (taLR) and transabdominal radical resection (tbRR) in the treatment of massive gastrointestinal stromal tumors (GIST).

Design: Single-center retrospective study.

Methods: From October 2012 to October 2022, the clinical, surgical, pathological, and prognostic data of patients with rectal GIST who underwent surgery were retrospectively collected. The patients were divided into the taLR group and the tbRR group according to the surgical methods, and the research indicators were compared.

Results: Thirty-five patients with rectal GIST larger than 5 cm were enrolled, including 17 cases in the taLR group and 18 cases in the tbRR group. The taLR group showed shorter intraoperative time ($p = 0.006$), shorter postoperative hospital days ($p = 0.035$), earlier postoperative drainage tube removal ($p = 0.007$), and a higher anus preservation rate ($p = 0.011$). There was no significant survival difference in the 5-year disease-free survival between the taLR group and the tbRR group (94.1% vs 100%, $p = 0.405$).

Conclusion: In conclusion, there were no significant differences in survival between taLR and laparoscopic radical resection for massive rectal GIST. Moreover, compared with transabdominal radical excision technique, the transanal endoscopy surgery provides a new method of anal preservation, thereby improving the patient's quality of life.

Plain language summary

Transanal endoscopic local resection may become a potential treatment method for massive rectal GIST

No significant survival differences exist between transanal endoscopic local resection and laparoscopic radical resection for massive rectal GIST. Versus transabdominal radial excision, transanal endoscopy surgery offers a novel anal - sparing approach, enhancing patients' quality of life.

Keywords: gastrointestinal stromal tumor, rectal tumor, transanal endoscope

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Introduction

At present, surgical resection is the crucial therapy for gastrointestinal stromal tumors (GISTs). The main goals of rectal GIST surgery are to obtain negative margins and preserve the anal sphincter.[1] To ensure complete resection of the tumor, transabdominal radical resection (tbRR) is one of the most common surgical approaches for rectal GIST, which is often suitable for the resection and treatment of upper-middle part rectal GIST, such as lower anterior resection (Dixon); and Abdomino-Perineal resection (APR) was performed frequently when the tumor was located at the lower part rectum.[2–4] However, radical resection usually involves some problems of organ preservation or function impairment such as permanent stoma or postoperative Low Anterior Resection Syndrome (LARS).[5]

By contrast, local excision is a feasible approach with minimal invasion to preserve the function of the anal sphincter because of the rarity of metastasis of lymph node (LN) in GIST.[6] Due to the unique location of low rectal GISTs, local excision by the transsacrococcygeal, transanal, transvaginal, or transperineal approach was performed. Transanal endoscopic microsurgery is feasible in the GIST less than 5 cm, the transanal direct vision approach or transsacrococcygeal approach was also feasible when the GIST was located at the posterior wall of the rectum.[7,8] Only a few studies reported the utilization of transanal endoscopic surgery by local resection in the treatment of rectal GIST, transanal endoscopic surgery can enlarge the microscopic view of the rectum, achieve complete tumor removal with less trauma and maximal preservation of the function of anus.[9–12] However, these above local excision techniques have not been reported in rectal GIST larger than 5 cm. In the context where abdominal radical surgery is prevalent, the feasibility, safety, and effectiveness of transanal local excision in terms of organ preservation remain unclear.

According to data from over 10 years of experience at our center, 35 patients with massive rectal GIST who underwent surgical resection in our hospital were retrospectively collected. The patients with tumor size greater than 5 cm were divided into two groups: the transanal endoscopic local resection (taLR) group ($n = 17$) and the tbRR group ($n = 18$), the clinical pathological results, treatment, and long-term results including overall survival were compared between the two groups.

Materials and methods

Population

The data in this study were retrospectively collected. The clinical, surgical, pathological, and prognostic data of patients with rectal GIST who underwent surgery in The Sixth Affiliated Hospital of Sun Yat-sen University from October 2016 to October 2022 were collected. Inclusion criteria are as follows: rectal GIST confirmed by histopathology and immunohistochemistry, with complete clinical data and follow-up results. Exclusion criteria are as follows: history of other malignancies; metastatic or non-primary rectal GIST; the presence of other serious uncontrollable diseases; deaths from unrelated causes; and cases not involving transanal endoscopic or laparoscopic resection. All procedures in this study were conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the Sixth Affiliated Hospital, Sun Yat-sen University. All patients signed an informed consent. The reporting of this study conforms to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[13] The specific workflow of this study is detailed in Figure 1.

The data of 35 patients with primary rectal GIST who underwent surgical resection in our hospital from October 2016 to October 2022 were retrospectively collected. The workflow of this study is shown in Figure 1. All patients with tumor sizes larger than 5 cm were divided into two groups: the taLR group ($n = 17$) and the tbRR group ($n = 18$), the clinical pathological results, treatment, and prognosis were compared between the two groups.

Observational indicators and follow-up

All the cases were followed up from 2 to 8 years, and the 6-month follow-up rate was 100%. Data were collected from each patient's clinical data, surgical records, and subsequent pathological reports, and follow-up data were collected through outpatient and telephone follow-up. Data were retrospectively analyzed for age, gender, body mass index (BMI), symptoms, adjuvant

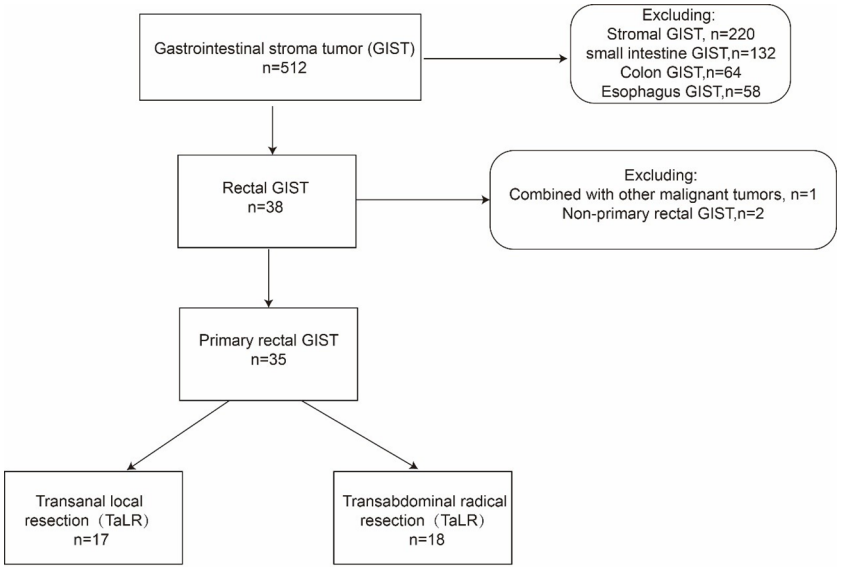

Figure 1. Workflow of this study.

therapy, surgical and postoperative outcomes, and pathological findings. The survival curve was drawn according to the prognostic data of follow-up, and the survival rate of the two groups was compared. Disease-free survival was defined as the time from the date of surgery to disease recurrence or death due to disease progression. Tumor tissue samples were diagnosed by pathologists in our hospital according to the guidelines and the modified criteria of the National Institutes of Health.[14]

Surgical procedures of local resection by transanal endoscopic surgery

The patient was placed in the lithotomy position. After disinfecting the perineum and dilating the anus with fingers, the anorectum was fully exposed using a Lone Star retractor (Figure 2(a)). The intestinal lumen was flushed with iodophor and saline, followed by a port placed in the anus, through which carbon dioxide was insufflated, and a pressure of 12–15 mmHg was maintained (Figure 2(b)). Traditional laparoscopic instruments, such as high-definition laparoscopic lenses, ultrasonic scalpels, electric hooks, and duck beak pliers, were inserted into the surgical area through the SILS port. An electric hook was used to mark the mass in a circle (Figure 2(c)) to allow complete resection of the tumor. The tumor was subsequently clamped with duck beak forceps, and an ultrasonic scalpel was used to separate the tumor along the marked point (Figure 2(d)). After the tumor was completely separated and removed (Figure 2(e)), the wound was closed by continuous suture with 3–0 barbed sutures (Figure 2(f)), and finally the intestinal cavity was flushed again with iodophor and saline, and the anal canal was indwelling.

Statistical analysis

SPSS 26.0 software was used for statistical analysis. Numerical variables were described as medians and quartiles, continuous variables were expressed as mean ± standard deviation and were compared using the Student's *t*-test, and categorical variables were compared by Chi-square test or Fisher's exact test. Overall survival rates were calculated using the life-table method, and survival curves were estimated using the Kaplan–Meier method and analyzed by the log-rank test. $p < 0.05$ was considered statistically significant.

Results

Clinical date

A total of 35 primary rectal GIST patients with tumor sizes larger than 5 cm were enrolled in this study, including 22 males (62.9%) and 13 females (37.1%). The patients were divided into the taLR group and the tbRR group. The taLR group included 17 patients and the tbRR group included

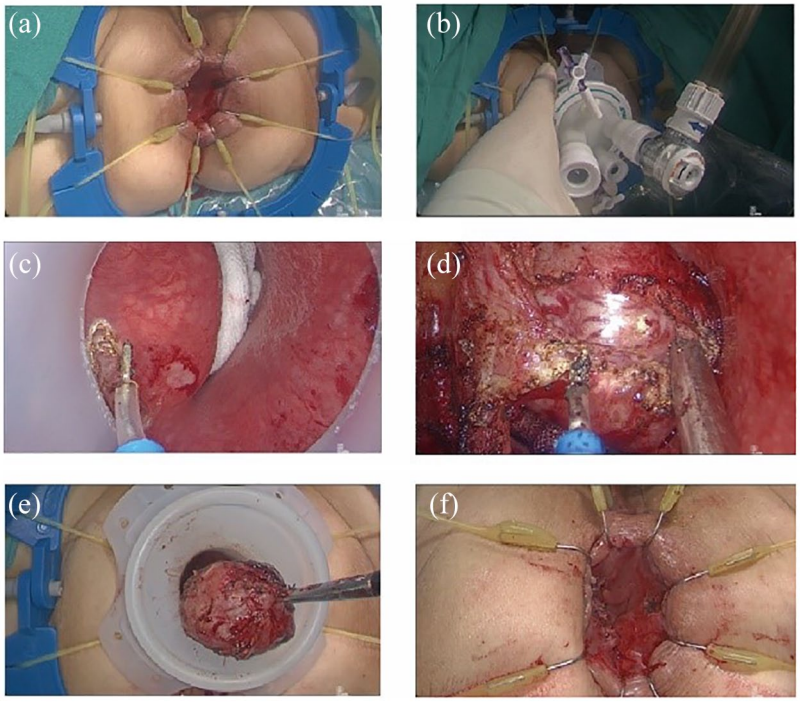

Figure 2. Transanal endoscopic resection of rectal GIST. (a) The anus was dilated and the intestinal lumen was exposed by Lone Star retraction. (b) Insert into the SILS port. (c) Electric hook surround the mass mark. (d) Complete tumor separation. (e) Take out the tumor. (f) The wound was closed by a continuous suture.
GIST, gastrointestinal stromal tumor.

18 patients. Table 1 shows no significant differences between the two groups in age ($p = 0.282$), gender ($p = 1$), BMI ($p = 0.526$), tumor size ($p = 0.28$), or tumor distance to the anal verge ($p = 0.333$). Tumor location also showed no significant difference ($p = 0.6$). However, there was a significant difference in preoperative adjuvant therapy ($p = 0.041$).

Surgical result

All patients underwent transanal endoscopic or laparoscopic surgery. As shown in Tables 2 and 3, there was no significant difference in conversion to open surgery ($p = 0.514$) between the tbRR and taLR groups. Patients undergoing tbRR had higher ostomy rates (32.5% vs 72.2%, $p = 0.007$), longer operation time (167.06 vs 273.44 min, $p = 0.006$), delayed drainage tube removal (3.5 vs 8.7 days, $p = 0.007$), longer postoperative hospital stay (7.9 vs 15.2 days, $p = 0.035$), and higher reoperation rate within 30 days (0% vs 22.2%, $p = 0.058$) compared to those undergoing taLR. Overall, postoperative complications occurred in 17.6% of taLR and 22.2% of tbRR patients ($p = 0.534$), including anastomotic leakage (11.8% vs 5.6%) and other complications like intestinal obstruction and poor wound healing. Except for the patients who were lost to follow-up, all the remaining patients in both groups were still alive at the end of follow-up.

Survival outcomes

As shown in Figure 3, only one patient experienced local recurrence during the follow-up time, the patient was found to have recurrence at 21 months after surgery, and was subsequently treated with sunitinib and regorafenib, but refused further surgery, and so far, the case still maintains tumor-free survival. No death was found in the two groups during the follow-up period. There was no significant difference in 5-year disease-free survival (DFS) between the taLR group and the tbRR group (94.1% vs 100%, $p = 0.405$).

Table 1. General clinical information of patients with rectal GIST.

Clinical baseline data	Total number (*N* = 35)	taLR group (*N* = 17)	tbRR group (*N* = 18)	*p* Value
Sex				1
Male	22 (62.9%)	11 (64.7%)	11 (61.1%)	
Female	13 (37.1%)	6 (35.3%)	7 (38.9%)	
Age (year)	57.31 (51.5–65)	55.29 (47–65)	59.22 (55.75–64.5)	0.282
BMI (kg/m^2)	24.03 (20.71–27.35)	24.4 (21.86–26.94)	23.67 (19.71–27.63)	0.526
Distance from tumor lower margin to anal verge (cm)	3.18 (2.23–4.13)	3.01 (2.792–3.23)	3.33 (3.09–3.57)	0.333
Tumor size (cm)	4.79 (2.79–6.79)	5.18 (4.73–5.63)	4.43 (3.92–4.94)	0.28
Tumor location				0.6
Anterior wall	19 (54.3%)	9 (52.9%)	10 (55.6%)	
Posterior wall	7 (20%)	3 (17.6%)	4 (22.2%)	
Lateral wall	9 (25.7%)	5 (29.4%)	4 (22.2%)	
Neoadjuvant therapy				0.041
Yes	27 (77.1%)	16 (94.1%)	11 (61.1%)	
No	8 (22.9%)	1 (5.9%)	7 (38.9%)	

BMI, body mass index; GIST, gastrointestinal stromal tumor; taLR, therapeutic advantages of endoscopic local resection; tbRR, transabdominal radical resection.

Table 2. Intraoperative data of patients with rectal GIST.

Surgical outcome	Total number (*N* = 35)	taLR group (*N* = 17)	tbRR group (*N* = 18)	*p* Value
Intraoperative blood loss (ml)	50 (20–150)	50 (20–100)	150 (35–237.5)	0.397
Operation time (min)	221.77 (105.89–337.65)	167.06 (142.62–191.5)	273.44 (247.33–299.55)	0.006
Stoma				0.007
Yes	17 (48.6%)	4 (23.5%)	13 (72.2%)	
No	18 (51.4%)	13 (76.5%)	5 (27.8%)	
Laparoscopic conversion to open				0.514
Yes	1 (2.9%)	0 (0%)	1 (5.6%)	
No	34 (97.1%)	17 (100%)	17 (94.4%)	
Preservation of anus				0.011
Yes	29 (82.9%)	17 (100%)	12 (66.7%)	
No	6 (17.1%)	0 (0%)	6 (33.3%)	

GIST, gastrointestinal stromal tumor; taLR, therapeutic advantages of endoscopic local resection; tbRR, transabdominal radical resection.

Table 3. Postoperative data of patients with rectal GIST.

Surgical outcome	Total number (*N* = 35)	taLR group (*N* = 17)	tbRR group (*N* = 18)	*p* Value
Postoperative conversion to ICU				0.743
Yes	2 (5.7%)	1 (5.9%)	1 (5.6%)	
No	33 (94.3%)	16 (94.1%)	17 (94.4%)	
Postoperative complications				0.534
Total	7 (20%)	3 (17.6%)	4 (22.2%)	
Postoperative leakage	3 (8.6%)	2 (11.8%)	1 (5.6%)	
Intestinal obstruction	2 (5.7%)	0 (0%)	2 (11.1%)	
Wound infection/poor wound healing	1 (2.9%)	0 (%)	1 (5.6%)	
Postoperative anastomotic leakage				0.478
Yes	3 (8.6%)	2 (11.8%)	1 (5.6%)	
No	32 (91.4%)	15 (88.2%)	17 (94.4%)	
Second time surgery within postoperative 30 days				0.058
Yes	4 (11.4%)	0 (0%)	4 (22.2%)	
No	31 (88.6%)	17 (100%)	14 (77.8%)	
Postoperative exhaust time (d)	2.8 (1.2–4.4)	2.9 (0.9–4.9)	2.7 (1.6–3.8)	0.036
Time of postoperative drainage tube removal (d)	6.2 (0.4–12)	3.5 (1.6–5.4)	8.7 (1.7–15.7)	0.007
Postoperative hospital stay (d)	11.7 (1.5–21.9)	7.9 (5.4–10.4)	15.2 (2.1–28.3)	0.035

GIST, gastrointestinal stromal tumor; taLR, therapeutic advantages of endoscopic local resection; tbRR, transabdominal radical resection.

Discussion

The usual surgical procedure includes APR and lower anterior resection. However, because LN metastasis is relatively rare in rectal GIST, local excision is a feasible approach with minimal invasion to preserve the function of the anal sphincter. However, because of the narrow operative space and the limitations of pelvic anatomy, local resection becomes too difficult to implement when the tumor size is greater than 5 cm.[15,16] In this study, we reported the transanal endoscopic local excision of rectal GIST larger than 5 cm for the first time.

In our study, the median distance from the anal verge was only about 3 cm, and the tumor volume was large, the median diameter of the tumor was larger than 5 cm. The local excision had the advantages of shorter intraoperative time, lesser intraoperative blood loss, shorter postoperative hospital days, and earlier postoperative drainage tube removal than radial excision. At the same time, the taLR group had earlier drainage tube removal time and shorter postoperative hospital days. This is mainly due to its characteristics of local excision minimal invasive and less trauma.[17] These results were also consistent with previous studies.[16,18]

Despite the local excision with the advantages of less trauma and fast recovery, surgeons were also worried about the risk of local recurrence and the status of the resection margin.[19] During the follow-up period, no cases of tumor recurrence were

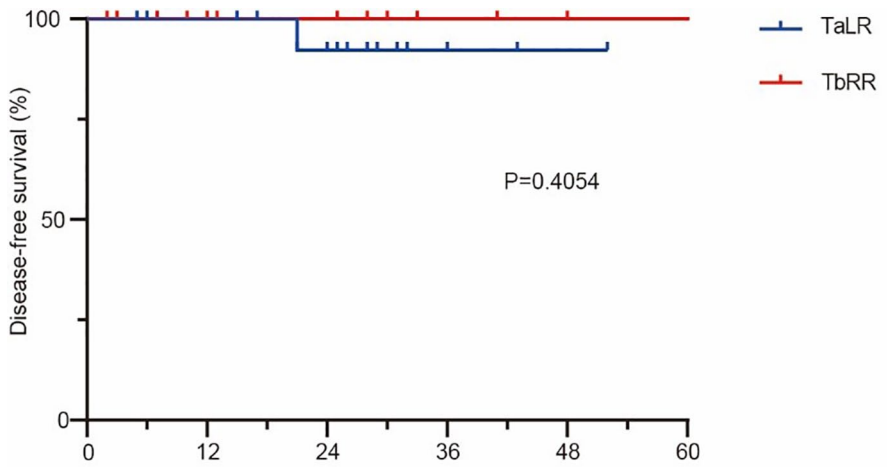

Figure 3. Survival curve of rectal GIST after transanal surgery.
GIST, gastrointestinal stromal tumor.

identified in the tbRR group, while one patient in the taLR group was diagnosed with tumor recurrence after surgery. There was no statistical difference in the local recurrence rate between these two groups. Another common concern is the status of resection margins and the risk of tumor rupture. R0 resection without pseudo-capsule injury is the most important treatment for GISTs.[20,21] In previous studies, 62.5%–96.0% of patients who underwent radical procedures such as Lower Anterior Resection (LAR), Intersphincteric Resection (ISR), and Abdominoperineal resection (APR) completed an entire R0 resection.[16,22–25] By contrast, all the patients in our study underwent R0 resection similarly.

Many studies have investigated the survival difference between local excision and radial excision. Hawkins et al. included a cohort of 333 rectal GIST patients to compare the treatment efficacy between local excision and radial excision. They have concluded that when a tumor is larger than 5 cm, radial excision may be the better treatment choice. For smaller GIST, no difference in 5-year survival influenced by the choice of surgical approach.[15] Another multicenter study summarized that the tumor size around 5 cm may be an appropriate cutoff value for the selection of surgical approach.[26] However, Shu et al.[22] also summarized that no difference in prognosis exists between local excision and segmental resection regardless of tumor size. In our study, there was no significant difference in 5-year DFS between the taLR group and the tbRR group which demonstrated the oncological safety of taLR for massive rectal GIST.

In addition to long-term survival, preserving anal function is also a significant issue. Although some patients with rectal GIST are treated by radical resection, the loss of anus and the consequent decline in quality of life were observed. Wang et al. found that in the local excision group, only 1 of the 39 patients had an anus resected. Compared with radical excision, 4 in 25 suffered anal resection.[16] In the multicenter study performed by Tao et al., the incidence of anal resection was obviously increased in radial excision compared with the local excision group. Interestingly, the anal resection proportion in the population of tumors beyond 2 cm was statistically significantly higher than tumors smaller than 2 cm. In our study, all of the 17 patients in the taLR group with anus preserved, but 33.3% (6/18) of patients in the tbRR group with anus resection. This indicates that compared with radical resection in our study, taLR can ensure the preservation of the anus of rectal GIST patients, which is a more appropriate method for the long-term quality of life of patients. However, due to the limitations of retrospective studies and sample size, further validation of these findings will require additional studies with larger cohorts and the inclusion of prospective research.

Recently, there have been new studies on the treatment of GIST, such as a recent study that confirmed the application of nanotechnology in

the treatment of GIST. Future research should explore more treatment methods for GIST.[27]

Conclusion

In conclusion, there were no significant differences in survival between taLR and laparoscopic radical resection for massive rectal GIST. Moreover, compared with the transabdominal radical excision technique, transanal endoscopy surgery provides a new method of anal preservation, thereby improving the patient's quality of life.

Declarations

Ethics approval and consent to participate

The ethics committee of the Sixth Affiliated Hospital of Sun Yat-sen University approved this study (Project number: 2024ZSLYEC-628). All patient information was kept confidential in this study, and the requirement for informed consent was waived because the data were anonymized.

Consent for publication

Not applicable.

Author contributions

Taixuan Wan: Conceptualization; Data curation; Software; Writing – original draft; Writing – review & editing.

Jingkun Xiao: Conceptualization.

Xingwei Zhang: Conceptualization.

Yunxing Shi: Formal analysis; Investigation; Methodology; Resources; Software; Supervision; Validation; Visualization.

Hao Xie: Data curation; Formal analysis; Visualization.

Fujin Ye: Data curation; Formal analysis.

Haoqi Zheng: Validation; Visualization.

Yihang Zhou: Software; Supervision.

Zhanzheng Liu: Investigation; Methodology; Supervision; Validation.

Liang Kang: Formal analysis; Funding acquisition; Supervision; Validation.

Liang Huang: Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Supervision; Validation; Visualization.

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Competing interests

The authors declare that there is no conflict of interest.

Availability of data and materials

All data are available from the corresponding author upon reasonable request (huangl75@mail.sysu.edu.cn).

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