Volume 22, No 4 | International Journal of Radiation Research, October 2024

Comparative analysis of the efficacy of transanal endoscopic microsurgery and endoscopic submucosal dissection in the treatment of rectal tumors

Zh. Wuqiang[1], Zh. Haiyong[2], C. Yahong[1], F. Yingke[1], Zh. Juping[1]*

[1]Department of surgery, Shexian Hospital, Handan, Hebei, P.R. China
[2]The Second Hospital of Hebei Medical University, Shijiazhuang, China

► ***Original article***

***Corresponding author:**
Zhang Juping,
***E-mail:** Jupingzh@163.com*

Received: January 2024
Final revised: January 2024
Accepted: February 2024

Int. J. Radiat. Res., October 2024; 22(4): 1059-1065

DOI: 10.61186/ijrr.22.4.1059

Keywords: *Rectal neoplasms, endoscopic submucosal dissection, transanal endoscopic microsurgery, antibiotic usage.*

ABSTRACT

Background: The purpose of this study was to compare the efficacy of endoscopic submucosal dissection (ESD) and transanal endoscopic microsurgery (TEM) in the treatment of rectal cancers. ***Materials and Methods:*** Between January 2021 and January 2023, one hundred patients with rectal tumors came to our hospital. They were randomized into two groups: the ESD group (n = 50) and the TEM group (n = 50). We made comparisons between hospital stay, antibiotic usage rate, intraoperative hemorrhage, and surgery time. Additionally, we assessed the complete tumor resection rate, tumor residual rate, recurrence rate, time of first anal discharge, and serum levels of motilin (MTL) and gastrin (GAS). A 6-month follow-up period was also used to compare the two groups' complication occurrence. ***Results:*** In the ESD group, surgical time, antibiotic usage rate, and hospital stay were significantly reduced compared to the TEM group ($P < 0.05$). No statistically significant difference in intraoperative bleeding was observed ($P > 0.05$). Complete tumor resection rate, tumor residual rate, recurrence rate, first anal discharge time, serum MTL and GAS levels, and incidence of complications showed no significant differences between the two groups ($P > 0.05$). ***Conclusion:*** TEM and ESD demonstrate comparable efficacy in treating rectal tumors. However, ESD exhibits advantages over TEM, including shorter surgical and hospitalization times and lower antibiotic application rates. These findings offer valuable insights for the clinical management of rectal tumors.

INTRODUCTION

Rectal tumor refers to a tumor with the rectum as the pathogenesis site. Most of them are primary tumors, including benign tumors and malignant tumors. The former includes non-epithelial tumors and epithelial tumors, while the latter mainly refers to rectal cancer [1]. The etiology of rectal cancer has not been fully elucidated clinically at present, but some scholars have shown that its onset is a multi-step and multi-factor process and it is a process of interaction between external factors (living habits, diet, environment, *etc.*) and internal factors (genetic susceptibility) [2]. As a result of changes in people's lifestyles, eating habits and living conditions brought about by modernization, the rate of rectal cancer is rising steadily [3]. Rectal tumors have no significant clinical manifestations in the early stage, and intestinal obstruction, abdominal mass, abdominal discomfort and changes in fecal traits may occur when the disease develops, which has seriously affected the health and quality of life of patients [4]. The efficiency of clinical treatment can be greatly enhanced by detecting, diagnosing and treating rectal cancers early on. With the rapid development of modern medicine, clinical treatment options are becoming more and more diversified. Endoscopic therapy has become the main clinical treatment at present, which can effectively avoid skin stoma and incision, guarantee the complete resection and obtain the ideal tumor margin and is conducive to specimen fixation and pathological staging [5]. Transanal endoscopic micro surgery (TEM) summarizes the advantages of traditional surgical transanal rectal surgery and laparoscopic surgery and solves the problems of traditional local surgery that it is difficult to achieve the middle and upper parts of the rectum and it is difficult to obtain a satisfactory field of view. With the advantages of high complete resection rate of the annular layer, small trauma and good exposure, it has better clinical efficacy in the early stage of rectal cancer, rectal neuroendocrine tumors and benign rectal adenomas [6,7]. Endoscopic submucosal dissection (ESD) is a new extended technology based on endoscopy mucosal resection (EMR). It can collect large specimens for clinical examination through surgery and then identify the depth and scope of the lesion. It is conducive to the operation and plays an important role in improving the surgical resection rate [8]. With the help of Hook knife, Dual knife or IT knife, ESD completely resects the lesions in a patient and completely strips the diseased mucosa together.

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

The wide and deep resection results in a very low residual rate of ESD [9]. However, there are still not many studies on which surgical method of TEM or ESD has the better treatment effect for rectal tumors, which deserve further study. Hence, this study aimed to assess the effectiveness of TEM and ESD in managing rectal cancers, with the intention of offering more insights for the clinical treatment of such tumors.

This study is unique in that it is the first to directly assess the impacts of two distinct approaches - transrectal minimally invasive surgery (TEM) and endoscopic submucosal resection (ESD) - in the treatment of rectal cancers. By randomly grouping one hundred patients with rectal tumors, we compared these two surgical methods in detail on multiple aspects, including operative time, intraoperative bleeding, antibiotic use rate, hospital stay, complete tumor resection rate and recurrence rate, *etc*. The study findings indicated that in the ESD group, there was a substantial reduction in operation time, antibiotic consumption rate, and hospitalization time. However, there was no significant difference in intraoperative hemorrhage compared to the TEM group. In addition, there were no significant differences between the two groups in terms of complete tumor resection rate, residual rate, recurrence rate, time to first anal flatus, serum dynamin (MTL) and gastrin (GAS) levels, and complication rates. With regard to the evident benefits of ESD over TEM in terms of surgery, hospital stay and antibiotic application, this study offers a thorough comparison of several surgical techniques for the treatment of rectal tumors. This provides new references and options for clinical treatment of rectal tumors.

MATERIALS AND METHODS

General material

Using a random number system, 100 patients with rectal cancer who came to our hospital between January 2021 and January 2023 were chosen as research subjects and split into two groups: the TEM group (50 cases) and the ESD group (50 cases). The TEM group was treated with TEM, while the ESD group was treated with ESD. This study was approved by the Hospital Ethics Committee (Ethics Committee of the Second Hospital of Hebei Medical University, 20231476, 2023-01-28). Table 1 shows that neither group differed significantly from the other with respect to gender, age, tumor type, tumor diameter, distance from tumor to anal boundary, or any other demographic variable.

Criteria of inclusion and exclusion

Inclusion criteria: 1: Medical imaging tests including endoscopy, CT scans and MRI confirmed the presence of rectal tumors in all of the patients. 2: The patient is diagnosed for the first time and received treatment. 3: Patients who met the indications of TEM and ESD surgery; ④ patients whose liver, kidney, and heart are functioning normally. 4: Informed consent forms were signed by patients or their relatives.

Exclusion criteria: 1: people who couldn't tolerate the surgery in this trial or who weren't candidates for TEM or ESD surgery. 2: patients with lymph node metastasis and distant metastasis; 3: patients with familial adenomatous polyposis; 4: patients with other malignant tumors; 5: Patients with ulcerative colitis. 6: patients with abnormal coagulation function; 7: Pregnant or lactating women.

Table 1. Comparison of general data.

General material		Control group	Observation group	t/χ^2 value	*P* value
Gender [n (%)]	Male	29 (58.00)	27 (54.00)	0.023	0.887
	Female	21 (42.00)	23 (46.00)		
Average age (years)		55.48±11.35	54.78±10.76	0.372	0.708
Average tumor diameter (cm)		2.32±1.64	2.23±1.70	0.459	0.639
Mean distance from tumor to anal margin (cm)		7.82±3.32	6.97±3.48	0.454	0.501
Type of tumor [n (%)]	Rectal adenoma	24 (48.00)	25 (50.00)	0.473	0.492
	Early rectal cancer	16 (32.00)	17 (34.00)		
	Rectal neuroendocrine tumor	10 (20.00)	8 (16.00)		

Method

Related instruments and drugs

TEM anoscope and endoscopic imaging system and operating instruments (Karl Storz GmbH & Co. KG, Karl Storz, Germany), ESD enteroscopy (Olympus, model GIF-H260), high-frequency therapeutic forceps (Olympus, model FD-410LR), Dual knife (Olympus, model KD650L), high-frequency electrical devices (Albar, Germany, Model: VIO200D), endoscopic injection spray tube (Shanghai Wilson Optoelectronic Instrument Co., Ltd., model: WF-2423PB), compound polyethylene glycol electrolyte powder (Shenzhen Wanhe Pharmaceutical Co., Ltd., approval number: GuoYaoZhunZi H20030828), medical sodium hyaluronate gel (Shandong Boshlun Frida Pharmaceutical Co., Ltd., Approval documentNo.: Guoxie Zhun 20173160847), methylene blue injection (Jichuan Pharmaceutical Group Co., Ltd., approval documentNo.: GuoYaoZhun Zi H32024827), and norepinephrine bitartrate (Shanxi Zhendong Taisheng Pharmaceutical Co., Ltd., approval document No.: GuoYaoZhun Zi H14020819).

Surgical method

First, the patients in both groups received liquid food one day before surgery, and were forbidden to eat and drink the night before surgery. Meanwhile,

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

the patients were applied with compound polyethylene glycol electrolyte powder to clean the intestinal tract on the night and day before surgery.

TEM group: High-experienced gastrointestinal surgeons were responsible for the TEM operation. For the tumors located at the anterior wall of the rectum, the folding knife position was selected, while for the rest, the lithotomy position was selected. After successful general anesthesia, routine disinfection and towel spreading were performed. Anal dilatation was performed gently, and a TEM rectoscope was inserted through the anus. After the position adjustment, fixation was performed, and various circuits were connected. Then carbon dioxide was injected into the rectal cavity to maintain the air pressure at 12–15 mmHg. Insert a tissue forceps and a needle-shaped electrotome from that rear panel of the rectoscope, mar the excised part around the tumor body by the electrotome, paying attention to the fact that a tangent is separated from the edge of the tumor by more than 1.0cm, cut the mucosa from the right edge of the tumor body until reaching the fat layer outside the intestinal wall, gently pulling up the side of the cut tumor body by the tissue forceps, and completely cutting the tumor body, including the whole intestinal wall, along a marking line; The specimens were taken out, and the rectal wounds were sutured continuously with absorbable slide wires in transverse direction.

ESD group: The senior endoscopist in the center was responsible for ESD. First, the lesion scope was clarified and marked. The peripheral marks were made at 0.5–1.0 parts of the outer edge of the lesion with Dual knife. Submucosal injection of fructose containing 0.1% epinephrine and 0.2% indigo carmine glycerine at multiple points outside the labeling point elevated the lesion and separated the muscular layer from the mucosal layer. The mucosa was incised from the periphery of the marked point at the edge of the lesion, and layer-by-layer peeling was performed along the gap, and timely hemostatic treatment was performed at the same time. The samples were immersed in 10% formalin solution for preservation and submission for examination. Two groups were followed up for 6 months.

Observational index

① Surgical-related indicators: We compared the two groups' operating times, intraoperative bleeding volumes, antibiotic usage rates, and lengths of hospital stays. ② Specific treatment: The complete resection rate (complete resection refers to that the vertical and horizontal margins of the resected specimen were negative) and residual tumor rate (residual lesion refers to that a new lesion was found at the resected site and within 1cm adjacent to the site within six months after surgery) as well as the recurrence rate within six months after surgery (recurrence refers to that a new lesion was found through reexamination such as gastroscopy) of the two groups were compared [10]. ③ Gastrointestinal function: The first time of anal exhaust was compared between the two groups. And respectively draw 6 mL of fasting elbow venous blood of the two groups of patients before and after the operation, place the 6 mL fasting elbow venous blood in an EP tube, standing for 1 h at normal temperature, centrifuging the blood sample by using a VM-1400-2KB centrifuge at 3000rmp for 10min to separate serum, storing the serum at-80 ℃ for test, and determining whether the serum is detected by enzyme-linked immunosorbent assay (ELISA) or not by using enzyme-linked immunosorbent assay (ELISA). ELISA) was used to test motilin (MTL) and gastrin (GAS) levels. The kit was provided by Shanghai Tongwei Biotechnology Co., Ltd. The specific detection operation steps of ELISA were as follows: MTL and GAS monoclonal antibodies were coated into an ELISA plate and serum to be tested, a negative control and a dilution standard with multiple ratios were added into the plate. Incubate, washing is complete and that corresponding enzyme-labeled antibody is added thereto, followed by incubate and washing again. After coloration occurred in the substrate developing solution, the reaction was stopped and the absorbance (optical density, OD) at 450 nm was measured using an enzyme-labeled detector (Beijing Pronnew Technology Co., Ltd., model: DNM-9602A). The standard curves of MTL and GAS were plotted, with the abscissa as the diluent concentration of the standard and the ordinate as the OD value of the standard. Calculate the corresponding MTL and GAS contents according to the OD value of sample. Sample concentration = reading of standard curve × dilution multiple. ④ Complication incidence: The incidence of postoperative complications such as hemorrhage, obstruction, stenosis and perforation was recorded and compared between the two groups.

Statistical methods

We used the SPSS 18.0 program for our statistical study. Data were analyzed using a t-test statistic, and the average ± standard error ($\bar{x} \pm s$) was given; Data reported as either the number of occurrences (N) or a percentage (%) was analyzed using the $\chi 2$ test, $P < 0.05$ indicated that the difference had statistical significance.

RESULTS

Comparison of surgical related indicators

Endoscopic submucosal dissection (ESD) offers clear benefits over transanal endoscopic microsurgery (TEM) for the treatment of rectal cancers, as shown by the notable differences detected in the ESD group and other important characteristics. The operation time, reflecting the duration of the

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

surgical procedure, was markedly reduced in the ESD group compared to the TEM group, signifying a more time-efficient approach to rectal tumor management. Similarly, the antibiotic utilization rate in the ESD group demonstrated a significant decrease, suggesting a potentially more streamlined and judicious use of antibiotics in this context. Furthermore, the hospital stay for patients undergoing ESD was notably shorter than those in the TEM group, indicating a potential for enhanced postoperative recovery and cost-effectiveness associated with the endoscopic approach. These findings, as illustrated in table 2, substantiate the statistical significance ($P < 0.05$) of these differences, emphasizing the clinical relevance of opting for ESD in terms of reduced operation time, antibiotic usage, and hospitalization duration. Importantly, the comparable intraoperative blood loss between the two groups ($P > 0.05$) implies that the superior efficiency of ESD does not compromise on the safety aspect, making it a compelling alternative for rectal tumor resection.

Table 2. Comparison of surgical related indicators.

Index	TEM group	ESD group	t/χ^2 value	*P* value
Operation time (min)	109.33±8.18	79.41±3.41	35.225	0.000
Intraoperative bleeding volume (mL)	16.91±2.73	17.27±2.03	1.075	0.284
Antibiotic utilization rate [n (%)]	50 (100.00)	16 (32.00)	7.365	0.000
Hospital stay (d)	5.55±1.39	4.03±1.31	7.848	0.000

Comparison of specific treatment situations

Table 3 shows that there were no statistically significant differences in the complete tumor resection rate, tumor residual rate or recurrence rate ($P > 0.05$) between the two groups when comparing critical clinical outcomes. These results highlight the similarity in effectiveness between endoscopic submucosal dissection (ESD) and transanal endoscopic microsurgery (TEM) in the management of rectal cancers. The comparable rates of complete tumor resection imply that both TEM and ESD are proficient in achieving thorough tumor removal. Similarly, the absence of notable distinctions in tumor residual rate indicates that both techniques demonstrate effectiveness in minimizing residual tumor tissue post-surgery. Furthermore, the similarity in recurrence rates suggests that neither method exhibits a significant advantage or disadvantage in preventing tumor recurrence within the specified follow-up period. These results contribute to the overall understanding of the comparable clinical outcomes between TEM and ESD in the context of rectal tumor treatment, supporting the notion that both procedures can achieve satisfactory results in terms of complete tumor removal, minimal residual tissue, and prevention of recurrence.

Table 3. Comparison of specific treatment situations [n (%)].

Item	TEM group	ESD group	χ^2 value	*P* value
Complete tumor resection rate	50 (100.00)	50 (100.00)	0.000	1.000
Tumor residual rate	4 (8.00)	3 (6.00)	0.559	0.454
Reoccurrence rate	0 (0.00)	1 (2.00)	1.161	0.463

Comparison of specific treatment situations between two groups

As shown in table 4, there were no statistically significant differences ($P > 0.05$) when comparing the initial anal exhaust time and serum motilin (MTL) and gastrin (GAS) levels between the groups that underwent transanal endoscopic microsurgery (TEM) and those that underwent endoscopic submucosal dissection (ESD). The first anal exhaust time, representing postoperative recovery, exhibited comparable outcomes in both groups, emphasizing the similar patient recovery experiences following TEM and ESD procedures.Furthermore, the analysis of serum levels of motilin (MTL) and gastrin (GAS) yielded no significant disparities between the TEM and ESD groups. This suggests that the two procedures did not exert markedly different effects on gastrointestinal hormones, indicating a similar physiological response to the interventions. These findings are crucial as they underscore the equivalence in postoperative recovery and hormonal responses associated with TEM and ESD, adding valuable insights into the overall patient experience and potential physiological impacts of these interventions.

Table 4. Comparison of specific treatment situations.

Index	TEM group	ESD group	*t* value	*P* value
First anal exhaust time (d)	3.33±0.48	3.27±0.57	1.352	0.245
MTL (motilin) (μg/mL)	78.44±10.24	77.37±10.15	0.424	0.675
GAS (gastrin) (μg /mL)	238.34±42.14	236.44±45.16	1.381	0.167

Comparison of the incidence of complications

The analysis showed no significant difference in the occurrence of problems between the TEM and ESD groups, as evidenced by a P-value greater than 0.05, as shown in table 5. This suggests that both transanal endoscopic microsurgery (TEM) and endoscopic submucosal dissection (ESD) are associated with comparable safety profiles in the context of rectal tumor treatment. The findings further emphasize the feasibility and safety of these procedures, contributing valuable insights to the overall assessment of their clinical applicability and reinforcing their potential as viable options in the surgical management of rectal tumors.

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

Table 5. Comparison of the incidence of complications [n (%)].

Complication	TEM group	ESD group (n=50)	χ^2 value	*P* value
Postoperative haemorrhage	1 (2.00)	1 (2.00)	-	-
Obstruction	0 (0.00)	1 (2.00)	-	-
Narrow	1 (2.00)	0 (0.00)	-	-
Perforation	1 (2.00)	2 (4.00)	-	-
Total incidence	3 (6.00)	4 (8.00)	0.044	0.997

DISCUSSION

With the economic development and improvement of living standard, obesity and high-fat diet are increasing, and the pressure of life and work is increasing, the incidence of rectal cancer is increasing and gradually tends to be younger, which has posed a great threat to human health and living standard [11]. In their early stages, rectal tumors are highly covert, develop slowly and show no outward signs of disease. By the time most patients' tumors have progressed to an advanced stage, it has been definitively diagnosed [12]. However, due to the popularity of colonoscopy in clinical practice, the early diagnosis rate of rectal cancer has increased significantly, people have become increasingly demanding in the quality of life and there is an increasing demand for minimally invasive and anal conservation. As a result, many minimally invasive treatments have emerged [13]. TEM promotes partial middle-low early rectal cancer to avoid transabdominal surgery; it is a minimally invasive, anus-saving method of local rectal tumor removal through the anal channel through the endoscope. With the characteristics of microscopic, laparoscopic and endoscopic surgery, it not only has good surgical field exposure, but can accurately and completely resect the lesions, but also can obtain high-quality specimens through full-thickness resection for accurate pathological staging [14]. ESD is a therapeutic method developed based on EMR, which can completely remove the cancerous lesion and achieve the effect of one-time complete peeling, with a wide resection range [15]. On the other hand, research evaluating the relative merits of TEM and ESD for the treatment of rectal cancers is sparse. The results of this study have shown that TEM is equivalent to ESD in the treatment of rectal tumors. However, compared with TEM, ESD has shorter operation time, shorter hospital stay and less application of antibiotics. The reasons are now analyzed as follows.

The results of the research by Marin *et al*. [16] showed that after a 60-year-old patient with suspected T1 rectal cancer with deep mucosal infiltration was treated by TEM with flexible enteroscopy, the histopathological examination showed negative incisal margin and no serious complications occurred. Kim *et al.* [17] found that patients treated with ESD for early rectal cancer had a shorter hospital stay, but no significant difference in lump resection rate or tumor recurrence rate when compared to patients treated with TEM. The results of McCarty *et al.* [18] have shown that for patients with rectal tumors, the resection rates of ESD and TEM, as well as the incidence and recurrence rate of adverse events are similar. But ESD can cut down on surgery time and hospital stays considerably. In this study, the operation time, antibiotic utilization rate and hospital stay of the ESD group were significantly shorter than those of the TEM group. There was no significant difference in bleeding volume, complete tumor resection rate, tumor residual rate, recurrence rate and complication rate between the two groups, which was basically consistent with the results of the studies by Marin, Kim and McCarty. It indicated that the efficacy of TEM and ESD in the treatment of rectal tumors was comparable. However, the operation time and hospital stay of ESD were short and the application of antibiotics was less. Analysis of the causes: with the social progress, endoscopic technology has been greatly developed and is used in clinical surgical treatment with the characteristics of low cost, less complications, minimally invasive and the like. TEM is an effective means for local resection of early rectal cancer, which is a single-hole surgery with the minimally invasive nature of natural-lumen endoscopic surgery and the accuracy based on fibroendoscopic resection. It is the optimal surgical assistance system that can provide direct feedback to the intraluminal pressure device and the hinged device. The most significant point of TEM is that it can ensure complete resection. At the same time, it is designed for rectal tumors 8–10 cm from the anus, so it can be used to remedy the failure of treatment [19,20]. EMR first originated in the 1970s. It mainly injected 0.9% sodium chloride into the submucosa of digestive tract wall to promote the generation of water pad between the lamina propria and mucosa, so as to effectively and safely remove the mucosal lesions with electricity. It was widely used in clinical treatment. Along with the long-term clinical practice, it was found that EMR had a higher therapeutic effect on early cancer with a diameter of less than 2cm and the five-year survival rate reached more than 95%. However, for early cancer with a diameter of more than 2cm, the curative effect was not significant and the local recurrence rate was high [21]. ESD is a new extension technology based on EMR. IT can collect large specimens for clinical examination through surgery and clarify the depth and scope of the lesion, which is conducive to the operation and plays an important role in improving the surgical resection rate. In addition, ESD completely removes the lesions in patients' bodies with the help of Hook knife, Dual knife or IT knife and completely strips the diseased mucosa together. The wide and deep resection scope makes the residual rate very low [22,23]. There is no

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

significant difference in complete resection rate and tumor residual rate of tumors between TEM and ESD, which may be due to the high-speed development of endoscopic-related diagnosis and treatment technologies such as ultrasonic endoscopy, magnifying endoscopy and staining endoscopy, which can effectively improve the accurate diagnosis of the lesion depth and lesion range. The operation time and hospital stay for ESD were shorter than those for TEM and the reasons were analyzed as follows: General anesthesia for TEM required consideration of anesthesia and postoperative awakening; some patients treated with TEM may have adverse inflation phenomenon during the operation, which can cause interference to the surgical field of view and delay the operation process. For rectal operation, generally speaking, electronic colonoscopy is not affected by body position, and it is able to flexibly adjust the surgical field of view. However, TEM has a fixed position and it is difficult to adjust the field of view, which can increase the difficulty of operation to a certain extent and further prolong the operation time [24]. Antibiotics are routinely applied to patients receiving TEM before and after surgery to prevent infection, while antibiotics are not routinely applied to patients receiving ESD treatment and antibiotics are often selected according to the situation of patients after surgery.

Hormones produced by the pancreas and endocrine cells found throughout the gastrointestinal tract are bioactive substances with high performance. These hormones work in tandem with the neurological system to regulate the digestion process, including absorption, movement and secretion. When these hormones are disrupted, they can impact the function of the gastrointestinal system. MTL and GAS are excitatory gastrointestinal hormones. Surgery can stimulate the secretion of catecholamine, which in turn can inhibit the secretion of MTL and GAS and affect the gastrointestinal function of the body. Once the MTL and GAS are secreted too low, it will lead to gastrointestinal dysfunction and weakened power. In addition, the stress response generated by the body itself will lead to the excitation of the sympathetic nerve, which inhibits the movement of the small intestine and stomach to a certain extent [25,26]. The study's findings demonstrated that there was no discernible difference between the two groups' serum MTL and GAS levels, first anal exhaust time, or both. The above results indicated that TEM and ESD treatment of rectal tumors had similar effects on gastrointestinal function and the reasons were analyzed. With the help of equipment such as magnifying endoscopy and MRI, TEM could reduce the excessive staging or insufficient staging before operation as much as possible. The complete resection standard could be achieved through accurate preoperative evaluation and abdominal incision and ostomy were avoided. It not only relieved the postoperative pain severity and promoted postoperative recovery, but also reduced the damage to the gastrointestinal tract [27,28]. The treatment principles of ESD and EMR are basically the same, namely, submucosal injection is used to promote the separation of mucosal layer and submucosal layer and then the diseased mucosa is resected or stripped [29]. Compared with EMR, ESD can completely remove the lesion at one time, reducing the risk of recurrence. Simultaneously, it can guarantee the accuracy of the supplied medical records, elucidate the level of lesion infiltration, the extent of case type differentiation and blood vessel and lymphatic infiltration, all of which are useful in assessing the prognosis of patients, encouraging the restoration of associated functions, rectifying abnormal pepsinogen secretion, *etc*. [30].

A lack of long-term follow-up makes it impossible to assess the long-term therapy effects of TEM and ESD on rectal cancer patients, and the study's small sample size raises the possibility that the results may not be representative of the actual values. In order to confirm the findings of this investigation, further samples should be taken later on and long-term follow-up should be carried out.

To sum up, rectal cancers can be effectively treated with either TEM or ESD and the results are comparable. However, compared with TEM, ESD has certain advantages in terms of operation time, application of antibiotics, and hospital stay, which is worthy of clinical reference.

ACKNOWLEDGMENT

The authors would like to express their gratitude to The Effect of NOSES Surgery on Anal Function in Rectal Cancer (13010520201794) for their support and funding throughout the course of this research. Special thanks are extended to the participants who willingly took part in this study.

Funding: This research was financially supported by The Effect of NOSES Surgery on Anal Function in Rectal Cancer (13010520201794).

Conflicts of Interest: The authors declare no conflicts of interest related to this study.

Ethical Consideration: This study received ethical approval from the Ethical Committee. All procedures performed in this study involving human participants were conducted following the ethical standards outlined in the Ethical Guidelines]. Informed consent was obtained from all individual participants included in the study.

Author Contributions: Z.W.: Conceived and designed the study, collected and analyzed data, drafted the manuscript. Z.H.: Contributed to data analysis and interpretation, critically reviewed the manuscript. C.Y., F.Y., Z.J.: Assisted in data collection, provided

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

intellectual input, and critically reviewed the manuscript.

REFERENCES

1. Baker EJ, Waters PS, Peacock O, McCormick JJ, Heriot AG, Warrier SK (2019) Advanced application of taTME platform for a T4 anterior rectal tumor. *Surg Laparosc Endosc Percutan Tech,* ***29(4):*** *e45-e9.*
2. Dou M, Chen Z, Tang Y, Sheng L, Zhou J, Wang X, *et al*. (2023) Segmentation of rectal tumor from multi-parametric MRI images using an attention-based fusion network. *Med Biol Eng Comput,* ***61(9):*** *2379-2389.*
3. Rosa C, Caravatta L, Delli Pizzi A, Di Tommaso M, Cianci R, Gasparini L, *et al*. (2019) Reproducibility of rectal tumor volume delineation using diffusion-weighted MRI: Agreement on volumes between observers. *Cancer Radiother,* ***23(3):*** *216-221.*
4. Bates DDB, Fuqua JL, Zheng J, Capanu M, Golia Pernicka JS, Javed-Tayyab S, *et al*. (2021) Measurement of rectal tumor height from the anal verge on MRI: A comparison of internal versus external anal sphincter. *Abdom Radiol (NY),* ***46(3):*** *867-872.*
5. Hyun JH, Han KS, Kim BC, Hong CW, Oh JH, Park SC, *et al.* (2019) Preoperative endoscopic clipping for rectal tumor localization in laparoscopic anterior resection. *Minim Invasive Ther Allied Technol,* ***28(6):*** *326-331.*
6. Rizzo G, Pafundi DP, Sionne F, Pietricola G, D'Agostino L, Gambacorta MA, *et al*. (2022) Transanal endoscopic microsurgery versus total mesorectal excision in ypT0-1 rectal cancer after preoperative radiochemotherapy: Postoperative morbidity, functional results and long-term oncologic outcome. *Dis Colon Rectum,* ***65(11):*** *1306-1315.*
7. Li Y, Qiu X, Shi W, Lin G (2022) Adjuvant chemoradiotherapy versus radical surgery after transanal endoscopic microsurgery for intermediate pathological risk early rectal cancer: A single-center experience with long-term surveillance. *Surgery,* ***171(4):*** *882-889.*
8. Hihara D, Takamaru H, Sekiguchi M, Yamada M, Sakamoto T, Matsuda T, *et al*. (2023) Factors associated with increased duration of endoscopic submucosal dissection for rectal tumors: A 22-year retrospective analysis. *Gastrointest Endosc,* ***98(3):*** *420-427. e1.*
9. Liu HR, Feng J, Li R (2022) Endoscopic submucosal dissection for ultra-low large rectal stromal tumor after preoperative imatinib therapy: A case report and review. *J Dig Dis,* ***23(12):*** *720-723.*
10. Eshaghi M (2020) The effect of pain management on pain reduction in women with breast cancer. *Sjmshm,* ***2(2):*** *1-5.*
11. Hodges N, Battersby N, Rao S, Brown G (2023) Relationship between baseline rectal tumor length and magnetic resonance tumor regression grade response to chemoradiotherapy: A subanalysis of the trigger feasibility study. *Ann Surg Oncol,* ***30(8):*** *4729-4735.*
12. Goto S, Hida K, Hoshino N, Hisamori S, Kawada K, Sakurai T, *et al*. (2019) Laparoscopic rectal tumor surgery after administration of a new sclerosing therapy (aluminum potassium sulfate and tannic acid injection) for internal hemorrhoids: A report of three cases. *Asian J Endosc Surg,* ***12(4):*** *473-477.*
13. Gilbert A, Homer V, Brock K, Korsgen S, Geh I, Hill J, *et al*. (2022) Quality-of-life outcomes in older patients with early-stage rectal cancer receiving organ-preserving treatment with hypofractionated short-course radiotherapy followed by transanal endoscopic microsurgery (TREC): Non-randomised registry of patients unsuitable for total mesorectal excision. *Lancet Healthy Longev,* ***3(12):*** *e825-e38.*
14. Serra-Aracil X, Lucas-Guerrero V, Mora-López L (2022) Complex procedures in transanal endoscopic microsurgery: Intraperitoneal entry, ultra large rectal tumors, high lesions and resection in the anal canal. *Clin Colon Rectal Surg,* ***35(2):*** *129-134.*
15. Holzwanger EA, Mahmood S, Igbinedion S, Sawhney MS, Pleskow DK, Berzin TM, *et al*. (2023) Use of a novel articulation arm device for endoscopic submucosal dissection of a rectal laterally spreading tumor. *VideoGIE,* ***8(4):*** *172-174.*
16. Marin FS, Abou Ali E, Belle A, Beuvon F, Coriat R, Chaussade S (2023) "Transanal endoscopic microsurgery" with a flexible colonoscope (F-TEM): A new endoscopic treatment for suspicious deep submucosal invasion T1 rectal carcinoma. *Surg Endosc,* ***37(7):*** *5714-5718.*
17. Kim M, Bareket R, Eleftheriadis NP, Kedia P, Seewald S, Groth S, *et al.* (2023) Endoscopic submucosal dissection (ESD) offers a safer and more cost-effective alternative to transanal endoscopic microsurgery (TEM): An international collaborative study. *J Clin Gastroenterol,* ***57(5):*** *486-489.*
18. McCarty TR, Bazarbashi AN, Hathorn KE, Thompson CC, Aihara H (2020) Endoscopic submucosal dissection (ESD) versus transanal endoscopic microsurgery (TEM) for treatment of rectal tumors: A comparative systematic review and meta-analysis. *Surg Endosc,* ***34(4):*** *1688-1695.*
19. Rizzo G, Pafundi DP, Sionne F, D'Agostino L, Pietricola G, Gambacorta MA, *et al*. (2021) Preoperative chemoradiotherapy affects postoperative outcomes and functional results in patients treated with transanal endoscopic microsurgery for rectal neoplasms. *Tech Coloproctol,* ***25(3):*** *319-331.*
20. Serra-Aracil X, Pericay C, Badia-Closa J, Golda T, Biondo S, Hernández P, *et al.* (2023) Short-term outcomes of chemoradiotherapy and local excision versus total mesorectal excision in T2-T3ab, N0, M0 rectal cancer: A multicentre randomised, controlled, phase III trial (the TAU-TEM study). *Ann Oncol,* ***34(1):*** *78-90.*
21. Fukami N (2019) Surgery versus endoscopic mucosal resection versus endoscopic submucosal dissection for large polyps: Making sense of when to use which approach. *Gastrointest Endosc Clin N Am,* ***29(4):*** *675-685.*
22. Sun D, Ren Z, Xu E, Cai S, Qi Z, Chen Z, *et al*. (2023) Long-term clinical outcomes of endoscopic submucosal dissection in rectal neuroendocrine tumors based on resection margin status: A real-world study. *Surg Endosc,* ***37(4):*** *2644-2652.*
23. Gao X, Huang S, Wang Y, Peng Q, Li W, Zou Y, *et al*. (2022) Modified cap-assisted endoscopic mucosal resection versus endoscopic submucosal dissection for the treatment of rectal neuroendocrine tumors ⩽10 mm: A randomized noninferiority trial. *Am J Gastroenterol,* ***117(12):*** *1982-1989.*
24. Kimura CMS, Kawaguti FS, Nahas CSR, Marques CFS, Segatelli V, Martins BC, *et al*. (2021) Long-term outcomes of endoscopic submucosal dissection and transanal endoscopic microsurgery for the treatment of rectal tumors. *J Gastroenterol Hepatol,* ***36(6):*** *1634-1641.*
25. Lampropoulos C, Alexandrides T, Tsochatzis S, Kehagias D, Kehagias I (2021) Are the changes in gastrointestinal hormone secretion necessary for the success of bariatric surgery? A critical review of the literature. *Obes Surg,* ***31(10):*** *4575-4584.*
26. Fabulas F, Paisant P, Dinomais M, Mucci S, Casa C, Le Naoures P, *et al*. (2022) Pre-habilitation before colorectal cancer surgery could improve postoperative gastrointestinal function recovery: A case-matched study. *Langenbecks Arch Surg,* ***407(4):*** *1595-1603.*
27. González JEB, Lavernia HC, Fraga JGP, Lemus SQ (2022) Long-term outcomes of transanal endoscopic microsurgery for clinical complete response after neoadjuvant treatment in T2-3 rectal cancer. *Surg Endosc,* ***36(5):*** *2906-2913.*
28. Stipa F, Tierno SM, Russo G, Burza A (2022) Trans-anal minimally invasive surgery (TAMIS) versus trans-anal endoscopic microsurgery (TEM): A comparative case-control matched-pairs analysis. *Surg Endosc,* ***36(3):*** *2081-2086.*
29. Zhou C, Zhang F, We Y (2023) Efficacy of endoscopic mucosal resection versus endoscopic submucosal dissection for rectal neuroendocrine tumors ⩽10mm: A systematic review and meta-analysis. *Ann Saudi Med,* ***43(3):*** *179-195.*
30. Murakami Y, Tanabe H, Ono Y, Sugiyama Y, Kobayashi Y, Kunogi T, *et al*. (2023) Local recurrence after successful endoscopic submucosal dissection for rectal mucinous mucosal adenocarcinoma: A case report. *World J Gastrointest Oncol,* ***15(1):*** *186-194.*

[Downloaded from mail.ijrr.com on 2026-04-27]

[DOI: 10.61186/ijrr.22.4.1059]

[DOI: 10.61186/ijrr.22.4.1059] [Downloaded from mail.ijrr.com on 2026-04-27]