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TRANSANAL ENDOSCOPIC MICROSURGERY FOR RECTAL TUMORS : A SYSTEMATIC REVIEW

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ABSTRACT

Background: *Tumors of the rectal region are common. Originally, transanal endoscopic microsurgery (TEM) was intended as a substitute therapy for these lesions.*

Methods: *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2014 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *In the PubMed database, the results of our search brought up 832 articles, whereas the results of our search on SagePub brought up 75 articles. The results of the search conducted for the last year of 2014 yielded a total 7 articles for PubMed and 9 articles for SagePub. In the end, we compiled a total of 5 papers, 4 of which came from PubMed and 1 of which came from SagePub. We included five research that met the criteria.*

Conclusion: *In summary, TEM has proven to be a dynamic technology and essential platform in treating diseases of different disciplines, despite its initial introduction 38 years ago. We assume that its primal indication of small benign adenomas was comparatively mature yet the application of TEM could be expanded to larger ones, its application in rectal cancer could be more flexible and early-stage cancer should not limit the popularization of TEM in large medical institutions, especially in selected patients after neoadjuvant chemoradiotherapy.*

Keyword: *Transanal endoscopic microsurgery, Rectal tumors*

INTRODUCTION

Together, colon and rectal cancers (CRC) rank second in terms of mortality and are the third most prevalent type of cancer diagnosed in the US. Compared to colon cancer, rectal cancer is associated with different environmental variables and genetic risk factors. Over the course of 10 to 15 years, a combination of genetic changes, either somatic (acquired) or germline (inherited), is needed to change the normal rectal epithelium into a dysplastic lesion and ultimately an invasive cancer. The most crucial rectal cancer prognostic factors are response to pre-operative therapy and pathological staging.[1]

Initial workup starts with a careful history and physical examination, including a digital rectal exam. An endoscopic examination with rigid sigmoidoscopy is required; this is important to measure the distance from the lesion to the anal verge and for tissue biopsy to confirm rectal cancer. Once rectal cancer has been established pathologically, an MRI or transrectal ultrasound can accurately determine local tumor extension and node status. Baseline computed tomography of the chest, abdomen, and pelvis rules out metastatic lesions. It is crucial to have an interdisciplinary assessment conducted by medical oncology, radiation oncology, and surgical oncology to determine the optimal postoperative chemo-radiotherapy regimen (together with potential surgical resection) to increase the likelihood of cure, especially for high-risk patients. Multimodality therapy may still be able to cure people with rectal cancer who have local recurrence or oligo-metastatic disease to the liver and lung. For patients who are not candidates for surgery, palliative systemic therapy is used to reduce symptoms, enhance quality of life, and extend life.[2–4]

Cancers and adenomas of the rectal region are common. Small adenomas can be removed colonoscopically, whereas larger polyps are removed with conventional transanal excision. Adenomas of the mid- and upper rectum necessitate radical resection due to technical challenges. Originally, transanal endoscopic microsurgery (TEM) was intended as a substitute therapy for these lesions. Since its creation, though, TEM has also been applied to a range of rectal pathologies, including as carcinoids, diverticula and prolapse in the colon, early-stage carcinomas, and palliative excision of rectal malignancies.[5]

Buess et al. originally described transanal endoscopic microsurgery (TEM) in 1983 as a method that combined aspects of microsurgery with endoscopy to get full-thickness excisions with disease-free margins. Surgeons could not only see the tumor more clearly thanks to stereoscopes' enlarged eyesight and carbon dioxide insufflation's increased endoluminal space, but they could also readily reach lesions in the middle to upper rectum without requiring a laparotomy. Moreover, owing to its lower surgical consequences, TEM was reported to be a palliative technique for advanced cancers, too. There have also been documented benefits such as acceptable localized recurrence, quicker discharge, and less perioperative problems.[6]

TEMS was also offered as an alternative to TME in the treatment of early rectal cancer and in instances where a major operation would have a much higher risk of complications. Through the use of adjuvant medicines, there have been experimental attempts to expand the indications of a TEMS to even more advanced rectal tumors. A number of observational studies, meta-analyses, and randomized controlled trials (RCTs) have evaluated the efficaciousness of TEMS and radical TME in the treatment of rectal cancer.[7–9]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we review published literature about the transanal endoscopic microsurgery in patients with rectal tumors. This is done to provide an explanation and improve the handling of treatment at the patient. As the main purpose of this paper, to show the relevance of the difficulties that have been identified as a whole.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "transanal endoscopic microsurgery" and "rectal tumor" as keywords.The search for studies to be included in the systematic review was carried out using the PubMed and SagePub databases by inputting the words: *(("transanal endoscopic microsurgery"[MeSH Terms] OR ("transanal"[All Fields] AND "endoscopic"[All Fields] AND*

"microsurgery"[All Fields]) OR "transanal endoscopic microsurgery"[All Fields]) AND ("rectal neoplasms"[MeSH Terms] OR ("rectal"[All Fields] AND "neoplasms"[All Fields]) OR "rectal neoplasms"[All Fields] OR ("rectal"[All Fields] AND "tumor"[All Fields]) OR "rectal tumor"[All Fields])) AND ((ffrft[Filter]) AND (clinicaltrial[Filter]) AND (2014:2023[pdat])) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

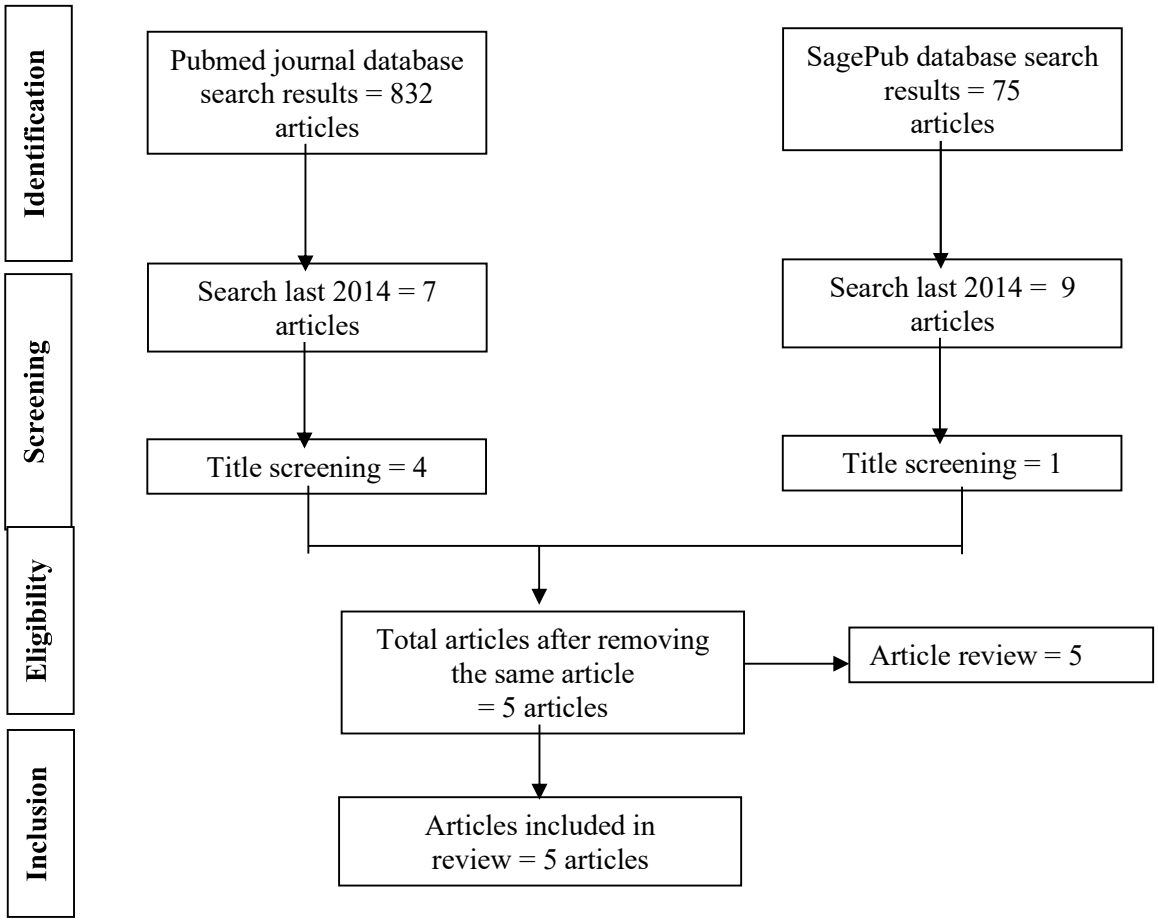

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting

papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 832 articles, whereas the results of our search on SagePub brought up 75 articles. The results of the search conducted for the last year of 2014 yielded a total 7 articles for PubMed and 9 articles for SagePub. In the end, we compiled a total of 5 papers, 4 of which came from PubMed and 1 of which came from SagePub. We included five research that met the criteria.

Gilbert, et al[10] (2022) showed that in older and more fragile patients, the organ-preservation approach of Transanal Endoscopic Microsurgery (TEM) and Short Course Radiotherapy (SCRT) was well tolerated, demonstrated good rates of organ preservation, and was linked to low rates of acute and long-term toxicity, with negligible effects on quality of life and functional status. The use of this strategy for patients deemed to be at high risk of undergoing radical surgery is supported by our findings.

Serra-Aracil, et al[9] (2023) showed that high CRT compliance rates (98.8%) and pathological full response rates (44.3%) are achieved with CRT-TEM treatment. Hospitalization rates and post-operative problems were substantially lower than in the TME group. We are awaiting the follow-up's findings regarding the prognosis and quality of life for cancer.

Stijns, et al[11] (2019) showed that approximately two-thirds of patients with favorable long-term oncological success and HRQL can have extra TEM surgery to preserve their organs in cases of early-stage rectal cancer (cT1-3N0M0). A considerable amount of bowel dysfunction is brought on by this multimodality treatment, and one-third of patients still experience drastic surgery and excessive CRT treatment.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Gilbert et al, 2022[10]	United Kingdom	Randomized controlled study	88 patients	Patients who were not randomly assigned were older than those who were (median age 74 years [IQR 67–80] vs 65 years [61–71]). Patients in the non-randomised registry reported that organ-preserving treatment was well tolerated, with only modest declines in fatigue, quality of life, physical, social, and role functioning, and bowel function three months after surgery as compared to baseline values. Most scores had recovered to baseline levels by six to twelve months, at which point they were identical to the data from the reference cohort. For patients in both groups, the only symptoms of faecal incontinence and urgency that remained at 36 months were mild ones, meaning less than one episode per week.
Sera-Aracil et al, 2022[9]	USA	Randomized controlled study	173 patients	Following randomization, eleven were eliminated (CRT-TEM: 5, TME: 6). 81 patients in each category were thus included in the modified intention-to-treat analysis. Following CRT, there was no mortality. Within the CRT-TEM cohort, 1/81 (1.2%) of the patients discontinued CRT.

				The morbidity rate associated with CRT was 29.6% (24/81). In the CRT-TEM group, post-operative morbidity was 17/82 (20.7%), but in the TME group, it was 41/81 (50.6%) (P < 0.001, 95% confidence interval 42.9% to 16.7%). In each group, one patient passed away (1.2%). 67 (82.7%) of the 81 patients in the CRT-TEM group who got the prescribed treatment had their organs preserved. In the CRT-TEM group, the pathological full response was 44.3% (35/79). Of the TME group, 17/81 (21%), had pN1 detected.
Stijns et al, 2019[11]	Netherlands	Randomized controlled study	55 patients	The mean (SD) age of the 55 patients who were included was 64 (39–82) years, with 30 (55%) of them being male. A median (interquartile range) follow-up period of 53 (39-57) months was spent with the patients. One patient (2%) stopped CRT, one patient (2%) was lost to follow-up, and two patients (4%) died during CRT. After CRT, TEM was performed on 47 patients (85%), 35 of whom (74%), were effectively treated with local excision alone. Sixteen patients had total mesorectal excision (4 with insufficient response, 8 with completion following TEM, and 4 with salvage for local recurrence). In addition to 5-year disease-free and overall survival rates of 81.6% and 82.8%, respectively, the actuarial 5-year local recurrence rate was 7.7%. Following treatment with local excision, patients' health-related quality of life was comparable to baseline, with a greater level of emotional well-being (mean score at baseline: 72.0; 95% CI: 67.1-80.1; mean score at follow-up: 86.9; 95% CI: 79.2-94.7; P =.001). In patients whose organ preservation was successful, major, minor, and no low anterior resection syndrome occurred in 50%, 28%, and 22%, respectively.
Quaresima et al, 2016[12]	Italy	Randomized controlled study	31 patients	In every instance, TAMIS was successfully finished. Four(13%) cases saw the

				conversion of TAMIS to the typical Park's transanal method. Three days was the median postoperative stay. One hemorrhoidal thrombosis, one subcutaneous emphysema, and one urinary tract infection were among the nine percent of complications that occurred overall. In 96.8% of cases (30/31 cases), TAMIS permitted a R0 resection; one case of local recurrence following a massive adenoma excision was seen.
Singh et al, 2014[13]	Austria	Retrospective study	244 patients	Regarding cardiovascular and pulmonary illnesses, the older age group had a significantly greater rate of co-morbidities than the control group (P =0.002, P =0.006). Transanal endoscopic microsurgery (TEM) and a Hartmann's operation were the most common procedures (P <0.0001) among older patients. 39% (n = 244) of the problems were overall (medical: n = 59 (9%), surgical: n = 185 (30%)), with 24 (44%) occurring in the older age group (medical: n = 6 (11%), surgical: n = 18 (33%)). The incidence of medical and surgical problems did not significantly differ between the control group and the patients (P = 0.58, P = 0.69). In the older age group, there was a higher chance of an eventful postoperative course in those with neurological and cardiovascular diseases (P =0.03, P =0.04).

Quaresima, et al[12] (2016) showed that compared to alternative techniques, transanal minimally invasive surgery is a safe method that has a low learning curve for laparoscopic surgeons who are experienced in single-port procedures and yields good oncological results.

Singh, et al[13] (2014) showed that resection of rectal cancer is safe for certain elderly people. It is not appropriate to include age as a risk factor for problems following surgery. Cardiovascular and neurological disorders should be closely monitored, since they may raise the likelihood of an interesting postoperative course.

DISCUSSION

This systematic review involved a total of 591 data of patients with rectal tumors and got the transanal endoscopic microsurgery in 5 observational studies.

Small adenomas can be removed colonoscopically, whereas larger polyps are removed with conventional transanal excision. Adenomas of the mid- and upper rectum necessitate radical resection due to technical challenges. Originally, transanal endoscopic microsurgery (TEM) was intended as a substitute therapy for these lesions. Since its creation, though, TEM has also been applied to a range of rectal pathologies, including as carcinoids, diverticula and prolapse in the colon, early-stage carcinomas, and palliative excision of rectal malignancies. This review's goal is to provide an overview of the state of TEM therapy for rectal lesions.[5]

If the lesion can be accessed with a rigid scope and is fully visible, most adenomas can be removed with TEM, regardless of their size, location, or degree of circumferential involvement. Perhaps TEM is not the best course of action if the lesion wraps around the rectosigmoid junction or if the sacrum's curvature prevents a stiff scope from passing up to the lesion. With the use of TEM, lesions across the entire circumference of the wall can be effectively eliminated, and intestinal continuity can be restored through a transanally conducted hand-sewn end-to-end anastomosis. The lesion must only have superficial penetration of the rectal wall in order to be eligible for removal of cancers; preoperative staging using endorectal ultrasound or magnetic resonance imaging [MRI] is crucial; it must also have well to moderately well differentiation; it must not have perineural or lymphovascular invasion; and it may also (controversially) lack a mucinous component.[14]

It is unlikely that TEM and traditional transanal excision will ever be the subject of a randomized prospective research that requires surgeons to enrol their own patients in either procedure. It will be challenging for a surgeon to switch back to a technique that is accompanied with inadequate margins, problematic visibility, and reach difficulties once they have mastered the TEM technique. A straight comparison is flawed since TEM and transanal excision using standard equipment are not the same procedure. Numerous published retrospective reports compare different local excision techniques within a particular institution with TEM.[14]

The majority of doctors concur that extra treatment is not necessary for suitably chosen, pT1 malignancies following TEM. good or fairly good differentiated, absence of lymphovascular invasion, absence of tumor blossoming at the leading edge, and the absence of a mucinous component (disputed) are all favorable histologic characteristics. Even if the lesion is limited to the submucosa, one should still think about receiving extra therapy if there are adverse aspects. Because of the very high recurrence rates, which are likely the result of untreated nodal metastases within the mesentery, TEM alone or any form of local excision is not a viable treatment for cancer that penetrates into the muscularis propria or beyond.[5]

TEM is a safe procedure that can be used for stricturplasty, the treatment of complicated rectal fistulas, and the removal of rectal neoplasms. This method can be used to remove almost any adenoma, however it should be used with caution while treating rectal cancer. It will be measured in relation to the benchmark of level-appropriate mesorectal excision. Most people would concur that favorable, low-risk pT1 tumors can be excised with TEM. It shouldn't be the only treatment utilized for deeper or pT2 tumors. For these locally advanced cancers, there is a lot of interest in combining TEM with postoperative radiation or neoadjuvant chemotherapy and radiation. Despite small trial sizes and a lack of prospective patient randomization, the results of publications examining combination therapy are compelling.[5]

TEM excision of favorable pT1 tumors is safe when used as the only treatment; the majority of patients who have a recurrence after TEM can be saved with radical surgery; the outcome is not always jeopardized if quick radical surgery is carried out following TEM; and T2 or larger lesions are not suitable candidates for TEM alone. Neoadjuvant therapy at the main site in the rectal wall may result in a full histologic response, saving many patients from undergoing major surgery and lymphadenectomy. How to accurately identify these patients is the issue. Transanal lymph node dissection or sampling, with or without the use of sentinel lymph node technology, may be future applications of TEM. Indeed, back in the 1980s, Buess himself had hinted to the possibility of node recovery. In addition, TEM can be utilized in conjunction with laparoscopic mobilization to accomplish a transanal complete mesorectal excision. Aims are being made to refine this method. Future technological advancements should lower the cost of the apparatus, which will increase TEM's appeal.[14]

CONCLUSION

In summary, TEM has proven to be a dynamic technology and essential platform in treating diseases of different disciplines, despite its initial introduction 38 years ago. We assume that its primal indication of small benign adenomas was comparatively mature yet the application of TEM could be expanded to larger ones, its application in rectal cancer could be more flexible and early-stage cancer should not limit the popularization of TEM in large medical institutions, especially in selected patients after neoadjuvant chemoradiotherapy.

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