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Is it safe to leave rectal wound opened after transanal microsurgery? A systematic review and meta-analysis.

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ABSTRACT *INTRODUCTION: there is no consensus on the need for closure of rectal wounds after transanal endomicrosurgery (TEM). The results of studies on the treatment of patients using open and closed wound management are presented in this meta-analysis.*
AIM: to compare 2 methods of rectal wound management in patients after TEM.
MATERIALS AND METHODS: a systematic review and meta-analysis was performed in accordance with PRISMA guidelines.
RESULTS: six studies were selected for the period from 2002 to 2021. The meta-analysis included 808 patients: in 383 (47%) patients the rectal wound was managed openly, in 425 (53%) patients it was sutured. The incidence of postoperative bleeding was 6% (23/383) in the open wound management group vs. 3.3% (14/425) (OR 0.47; 95% CI 0.18–1.26). The infection rate was 3.3% (14/425) in the suturing group vs. 1.8% (7/383) in the open wound management group (OR 1.66; 95% CI 0.69–4.00). Mean operating time in the group with suturing of the rectal wound is 7–8 minutes longer; 95% CI –2.21–17.6. Mean postoperative hospital stay for patients in the rectal wound suturing group was increased by 12 hours.
CONCLUSION: wound suturing after TEM does not lead to significant reduction of postoperative bleeding and infection.

KEYWORDS: *rectal wound, transanal microsurgery, TEM, openly management rectal wound, suture rectal wound*

CONFLICT OF INTERESTS: *The authors declare no conflicts of interest*

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INTRODUCTION

The technique of transanal endomicrosurgery (TEM) developed in 1984 by Buess, G. made it possible to perform precision removal of tumors in all parts of the rectum [1,2]. According to the literature, the technique of complete removal of rectal neoplasms below the peritoneal fold is a safe surgery associated with a low level of complications [20]. Thus, according to Chernyshov, S.V. [19], summarizing the experience of performing 600 transanal endoscopic operations with closure of a postoperative wound, the rate of clinically significant complications after TEM was 3.6%. Of those, bleeding was the most common — 1.2%, and the incidence of infectious complications was 1%. Despite the low morbidity rate in TEM, the issue of introducing this technique into widespread practice remains open [18]. Last but not least, this is due to the endoscopic suturing in a limited space, which is a technically challenging. At the same time, there is no consensus on the need for closure of postoperative wound after TEM. One of the advantages of open wound management is the reduction of operation time [5]. On the other hand, it is believed that suturing a rectal defect provides better hemostasis and healing by primary tension, as well as reduces the risk of stenosis [6].

Table 1. *PICO model for selecting articles for analysis*

Population	Patients who underwent transanal endoscopic microsurgery
Intervention	Suturing the wound
Comparison	Open wound management
Outcomes	The rate of postoperative complications (bleeding, infection), operation time and postoperative hospital stay

This systematic review of the literature is devoted to comparing the results of treatment of patients after transanal endomicrosurgery with suturing of a postoperative rectal wound or its management in an open manner.

MATERIALS AND METHODS

The systematic review was carried out in accordance with the recommendations of Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) using the E-library, Cochrane, PUBMED search engines in the Medline electronic database without limiting the publication date. The search and selection of articles was carried out on the basis of the PICO model (Table 1) by the following keywords: transanal endoscopic microsurgery, TEMS, TAMIS, rectal defect (sutured or open). The study includes full-text articles. The following publications were excluded from the search: abstracts, literature reviews, animal surgery, pilot studies without comparison groups, description of clinical cases.

After the search, 134 publications were found. During the initial analysis, 33 articles and duplicates were deleted. After the selection and removal of duplicates, the total number of articles corresponded to 101. Further, a detailed analysis was carried out, in which 95 studies that did not meet the aim of the meta-analysis were deleted. Thus, 6 comparative studies were selected for this meta–analysis — 3 retrospective [6,7,16], one prospective [8] and two randomized studies [5,9] (Fig. 1).

All the authors in the studies included in the meta-analysis used a standard technique for performing transanal endomicrosurgical surgery on the rectum, consisting in full-wall excision of the rectal wall within healthy tissues. Depending on

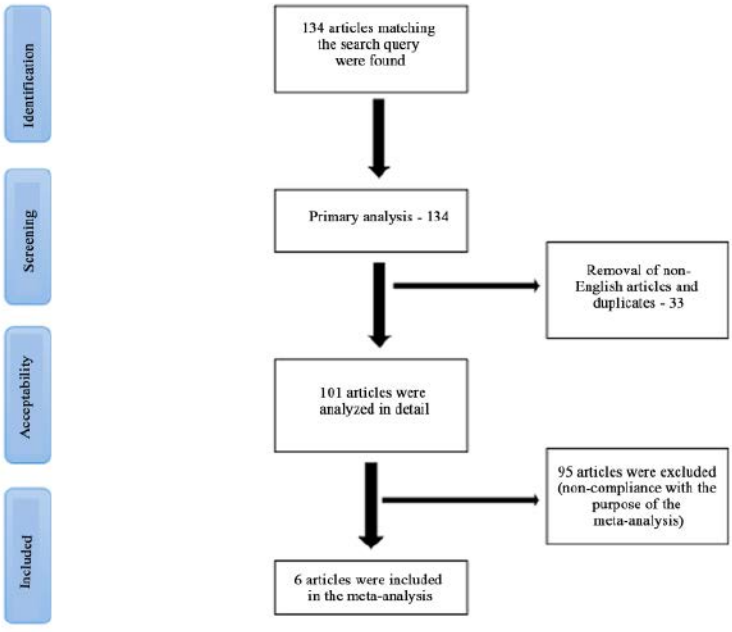

Figure 1. *Flowchart of the research selection process for meta-analysis*

Table 2. *Characteristics of the studies included in the meta-analysis*

Author	Year	Study design	Wound size (suturing/ open wound)	suturing/open wound	N bleeding (sutured wound/ open wound)	N infectious complications (sutured wound/ open wound)	Operation time (min) (sutured wound/ open wound)	Postoperative hospital stay (sutured wound/ open wound)
Ramirez 2002 [5]	2002	RCT[1]	4.0 (3–6) cm/ 4.3 (2.5–10) cm	21/19	1/1	0/0	93.8 (40–180)/ 77.8 (20–180)	3.8 (2–6)/ 3.9 (2–7)
Hahnloser 2009–2012 [8]	2015	RCT[1]	The area of the wound 1218 ± 914 mm^2/ 1404 ± 1078 mm^2 $p = 0.4$	40/35	1/4	1/0	90 (± 51)/ 62 (± 16)	3.4 (± 1.9)/ 3.4 (± 3.5)
Noura 2004–2015 [6]	2016	Retrospective	2.2 ± 0.8 (1.0–3.0) cm/ 2.6 ± 1.2 (1.5–3.0) cm $p = 0.37$	21/22	5/0	4/2	72.5 (± 51.9)/ 72.6 (± 34.0)	12.6 (± 11.5)/ 9.9 (± 4.9)
Lee 1997–2016 [16]	2018	Retrospective	3.4 (1.6) cm/ 2.8 (2,0) cm $p = 0.04$	215/215	3/10	5/3	88 (± 50)/ 87 (± 46)	1.4 (± 1.9)/ 2 (± 3.15)
Brown 2012–2013 [9]	2019	RCT[1]	3.9 ± 0.78 cm/ 3.3 ± 0.56 cm $p = 0.19$	28/22	2/5	1/0	54 (± 11)/ 49 (± 12)	0.39 (± 0.21)/ 0.32 (0.24)
Altaf 2012–2019 [7]	2021	Retrospective	3.5 (1–10) cm/ 3.0 (2–6.5) cm $p > 0.05$	100/70	2/3	3/2	No data	3 (± Weeks)/ 4 (± Weeks)

Note: RCT randomized clinical trial

the groups formed, the rectal wound was sutured or remained open.

STATISTICS

The meta-analysis was carried out using The Review Manager Software (RevMan, version 5.4, Cochrane Collaboration). The total value of the dichotomous data was presented as a ratio of odds (OR) with a 95% coincidence interval (CI) and standardization of means. Statistical heterogeneity among the studies was assessed using the χ^2 test.

Statistically significant heterogeneity was considered to be $I^2 > 50\%$ and $p < 0.05$.

RESULTS

The characteristics of the selected studies are shown in Table 2. A total of 808 patients were included in the systematic review of the literature, 383 (47%) had an open rectal wound. The analysis assessed the primary data on the mean size of the lesion and postoperative complications: the incidence of bleeding, infectious complications, the operation time and the hospital stay after surgery (Table 2).

At the first stage, the differences in the lesion size in the groups of open and closed rectal wound management were analyzed. There was no statistically significant difference; 95% CI -0.60–0.22; ($p = 0.36$) at $I^2 = 73\%$ (Fig. 2).

The incidence of postoperative bleeding in the group where the wound was treated by an open method was 6% (23/383) versus 3.3% (14/425) in the group with wound suturing (OR 0.47; 95% CI 0.18–1.26) (Fig. 3). At the same time, low heterogeneity of studies was obtained ($I^2 = 31\%$), which indicates their homogeneity. Thus, the meta-analysis of the data showed that wound suturing after TEM leads to a two-fold decrease in the incidence of postoperative bleeding. However, these differences are not statistically significant ($p = 0.13$).

The overall incidence of infectious complications after transanal endomicrosurgery was 3.3% (14/425) in the sutured wound group versus 1.8% (7/383) with open wound management (OR 1.66; 95% CI 0.69–4.00 (Fig. 4). The collected data also had low heterogeneity ($I^2 = 0$). Suturing of the postoperative wound did not lead to a statistically

significant decrease in the incidence of infectious complications ($p = 0.26$).

The analysis of the mean duration of surgery in 2 groups showed that when suturing a postoperative wound, the operation time increases, on mean, by 7–8 minutes; 95% CI –2.21–17.6; ($p = 0.13$) at $I^2 = 63\%$ (Fig. 5).

When assessing the mean duration of postoperative hospital stay, patients in the wound suturing group stayed on mean for 12 hours longer. However, the differences obtained were not statistically

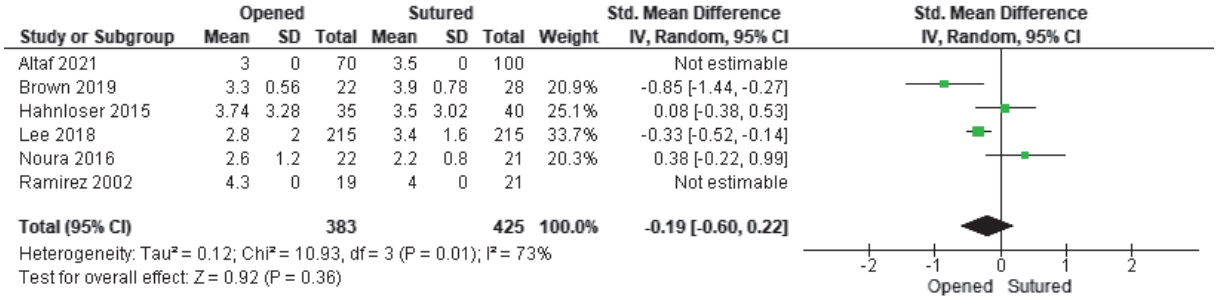

Figure 2. *Forest plot showing the mean lesion size in the group with wound suturing and open wound management*

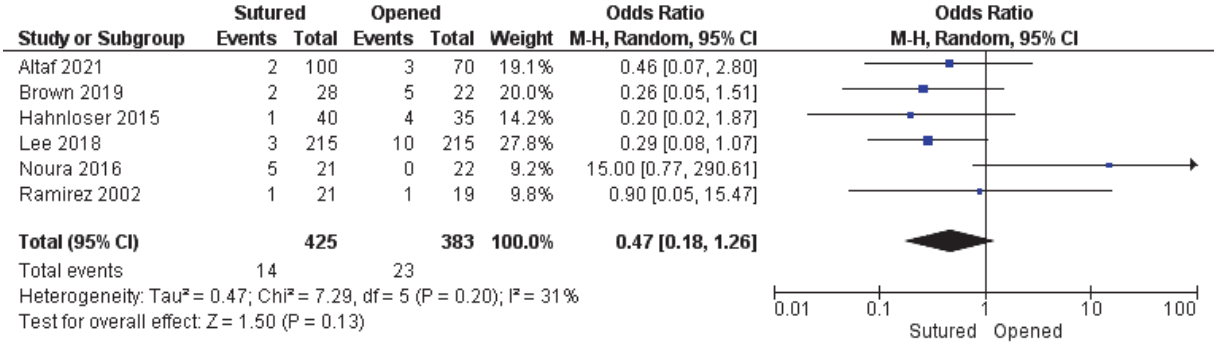

Figure 3. *Forest plot showing the rate of bleeding in the group with wound suturing and open wound management*

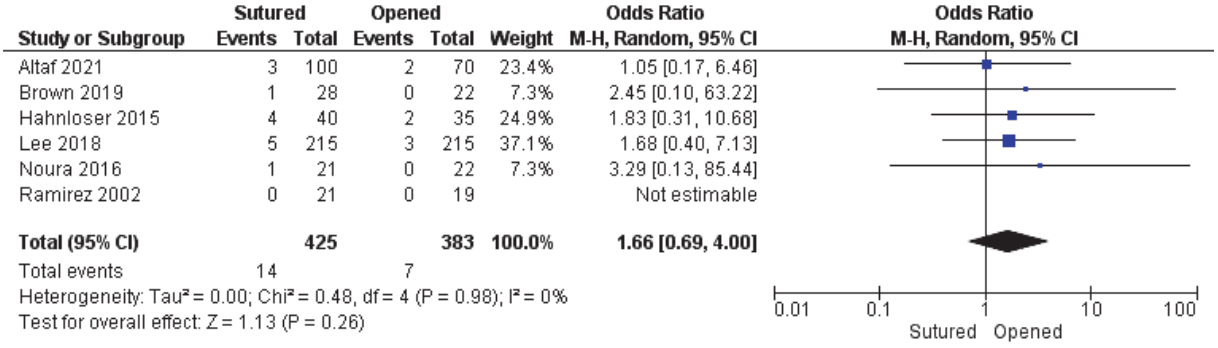

Figure 4. *Forest plot showing the rate of infectious complications in the group with wound suturing and open wound management*

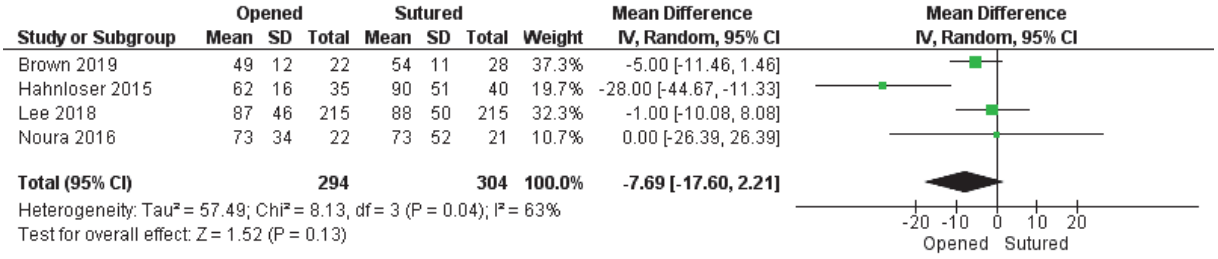

Figure 5. *Forest plot and funnel plot showing the mean duration of surgery (min) in a group with wound suturing and open wound management*

significant (–0.47; 95% CI –1.01–0.06; $p = 0.08$) at $I^2 = 5\%$ (Fig. 6).

DISCUSSION

Transanal endomicrosurgery is a minimally invasive and safe treatment method with mortality tending to 0 [13]. This meta-analysis combines the results of comparative studies of patients who underwent complete removal of rectal tumors using transanal endomicrosurgery, when the rectal wound was either sutured or left open.

The question of the need for suturing a postoperative rectal wound currently remains open and, often, depends on the preferences of the surgeon. The decision in favor of closed wound management requires the surgeon to have the skill of applying an endoscopic suture in a limited space inside the rectal lumen, which leads to an increase in the surgery duration.

Thus, according to the prospective randomized study by Hahnloser [8], suturing of a postoperative wound after transanal endomicrosurgery increases the operation time by 30 minutes (62 ± 16 vs. 90 ± 51 minutes). In other studies, the mean operation time in both groups did not differ significantly. The resulting difference can be explained by the fact that Hahnloser's data were obtained from three centers where there was no uniform technique for preparing the intestine for surgery, different devices for intestinal resection were used, and the mean size of the postoperative wound was 3.6 cm in diameter. And when analyzing the time, a high level of heterogeneity was obtained ($I^2 = 63\%$). In general, the results of meta–analyses should be treated with caution, since the sizes of the formed lesions in the studies were relatively small — on mean, 3.0–4.0 cm, which may explain the absence of statistically significant differences.

It is believed that closing the intestinal wall lesion reduces the risks of postoperative bleeding. In a previously published systematic review by Khan et al. [11], the bleeding rate was 2.12% in the group with a sutured bowel wound versus 6.99% in the group with an open wound (OR 0.26; 95% CI 0.10–0.68; $p = 0.006$). In a systematic review by Menahem et al. [12], wound suturing did not reduce the bleeding rate — 5.6% vs. 7.7% (OR 0.83; 95% CI 0.29–1.77; $p = 0.63$). In our meta-analysis, there were also no significant differences in the rate of postoperative bleeding in the groups with and without wound suturing — 3.3% vs. 6.0% (OR 0.47; 95% CI 0.18–1.26; $p = 0.13$). However, it should be noted that the rate of postoperative bleeding in the open group is still almost 2 times higher.

On the other hand, wound suturing may lead to a lower incidence of local infectious complications. However, according to Khan et al. [11], the incidence of infectious complications is 3.53% with wound suturing and 1.84% if the wound is not sutured (OR 1.81; 95% CI 0.63–5.20; $p = 0.27$). In contrast, in a meta-analysis by Menahem et al. [12], the incidence of infectious complications during wound suturing was 3.1%, when treating rectal wounds in an open manner -4.9% (OR 0.62; 95% CI 0.23–1.62;p = 0.33). In our meta–analysis, the incidence of infectious complications was 3.29% in the sutured wound group versus 1.8% in the open wound management group (OR 1.66; 95% CI 0.69–4.00; $p = 0.26$). Thus, suturing

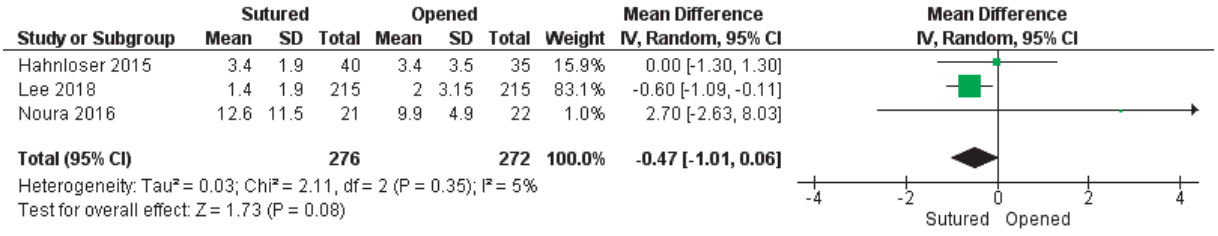

Figure 6. *Forest plot showing the mean number of days of postoperative hospital stay in the groups with wound suturing and open wound management*

a postoperative wound does not significantly reduce the rate of infectious complications. A number of studies have noted a higher incidence of infection in the wound during suturing. This aspect may indicate that the formation of an intraluminal suture leads to poor drainage of the postoperative wound, which contributes to the local inflammatory process. It should also be noted that the above studies did not study the consistency of the intraluminal suture; perhaps, the lack of differences between the groups may be due to the failure of the suture, which led to diastasis of the wound edges and similar immediate results of treatment of patients.

A comparison of the postoperative hospital stay also revealed no differences between the groups: the difference was only 12 hours. The study by Noura [6] stands out, in which patients of the open group were on mean in hospital for less than 2.5 days. However, it should be noted that the hospital stay after minimally invasive surgery in this study was more than 10 days, which, apparently, is due to the clinic's policy. In two other studies, the mean hospital stay was 2–3 days, and significant differences between the groups were noted only in the study by Lee [16], where patients were hospitalized for half a day less when they refused to suture the wound.

A systematic review in the Russian-language literature comparing the results of open or closed rectal wound management after transanal endomicrosurgery is the first of its kind. The advantage of this study is that it is the third meta-analysis in the world on this topic with the largest number of patients included. The limitations of the meta-analysis include the retrospective nature of most of the included studies, and the heterogeneity of studies in some parameters. Thus, conducting new randomized trials would make it possible to evaluate the advantages and disadvantages of open or closed rectal wound management after transanal surgery.

CONCLUSION

Suturing the wound after TEM increases the surgery duration and does not lead to a statistically significant decrease in both the incidence of postoperative bleeding and infectious complications.

AUTHORS CONTRIBUTION

Concept and design of the study: *Michael V. Alekseev, Eugeny G. Rybakov, Stanislav V. Chernyshov*

Collection and processing of the material: *Roman K. Sinitsyn*

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