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The role of transanal drainage tube in low anterior resection for rectal cancer

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Abstract

Total mesorectal excision with low anterior resection has significantly improved the long-term outcomes of surgical treatment for rectal cancer, decreasing the local recurrence rate and increasing survival. However, total mesorectal excision is becoming one of the main factors for the development of colorectal anastomosis leakage, the rate of which reaches 20% in these operations. To minimize the complications associated with the inconsistency of the colorectal anastomotic suture, preventive intestinal stoma is formed when performing low anterior resections. That significantly worsen the quality of life of patients, their elimination requires rehospitalization, and surgical interventions are accompanied by a high incidence of postoperative complications, reaching a rate of 20%, which has a significant impact on the cost of treatment for this category of patients. Transanal drainage is an alternative to the formation of preventive intestinal stoma and is devoid of its shortcomings. This literature review is devoted to an analysis of the effectiveness of transanal drainage in low anterior rectal resection. Until recently, transanal drainage has not yet gained popularity among surgeons due to the lack of evidence of its safety and effectiveness, and many studies are retrospective, including small samples. The review considered single-center, multicenter, randomized trials and a meta-analysis of the use of transanal drainage. Transanal drainage is an effective method for preventing the inconsistency of colorectal anastomotic suture, it is safe, and it surpasses the preventive intestinal stoma in a number of indicators.

Keywords: transanal tube, total mesorectal excision, colorectal anastomosis, anastomosis leak, low anterior resection, rectal cancer.

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Introduction. Total mesorectal excision has improved significantly the long-term results of surgical treatment of middle and lower ampullar rectal cancer by decreasing the local recurrence rate and by increasing survival rate [1–3]. However, total mesorectal excision is one of the main factors that influence the development of colorectal anastomosis suture leakage (CASL) which incidence during these interventions reaches up to 20% [4–7]. Other factors also influence the development of CASL, including body mass index, concomitant diseases, tumor size and height, preoperative chemoradiation therapy, anastomotic height, surgery time, and intraoperative blood loss [8–10].

The development of CASL cannot be accurately predicted and prevented using precise and effective methods; however, tests for intraoperative diagnostics and predicting leakage from anastomosis enables reduction, to some extent, of the incidence of this complication [11–14]. CASL is a fatal surgical complication that often requires repeated surgery and anastomosis disconnection [15–17].

To minimize the complications associated with CASL during total mesorectal excision, preventive intestinal stomas are formed [18–20]. They deteriorate the quality of life of patients significantly and require repeated surgery, and in some patients, temporary stomas become permanent [21–24]. To eliminate preventive stomas, the patient requires repeated admission to the hospital, and surgical interventions are accompanied by a high incidence of postoperative complications, reaching 20%, which has a significant effect on treatment cost for these patients [25–27].

As an alternative to preventive stomas, the authors have proposed various surgical options to treat and reduce the incidence of CASL [28]. One of such proposals is the use of transanal drainage (TAD) [5, 29–35].

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Table 1. Literature data on the characteristics of transanal tubes and their location

Authors	Year	Tube type	Duration of drainage, days	Tube location
Xiao et al. [29]	2011	Soft silicone tube	5–7	In the anal canal
Zhao et al. [30]	2013	Rubber drainage tube (26 Fr)	5–6	3–5 cm above the anastomosis
Adamova et al. [37]	2014	Silicone tube "no coil"	5–6	In the anal canal
Hidaka et al. [38]	2015	Marecot catheter (28 Fr) or rubber drain (10 mm)	7	3 cm above the anal canal
Lee et al. [32]	2015	Rubber drain (10 Fr)	3	5–10 cm above the anal canal
Kim et al. [39]	2015	Rubber tube (30 Fr)	4–6	Above the anastomosis
Nishigori et al. [40]	2016	Ficon (24 Fr)	5	3–5 cm above the anastomosis
Yang et al. [7]	2016	Rubber tube (24–28 Fr)	4–6	4–6 cm above the anastomosis
Goto et al. [35]	2017	Rubber or silicone tube (10 mm)	4–6	3–5 cm above the anastomosis
Kawada et al. [5]	2018	Malecot (28 Fr)	4–7	5 cm above the anastomosis

Gurjar et al. reported that only 16% of surgeons used TAD for low anterior resection because of insufficient evidence about the safety and efficacy of TAD [36].

Types of transanal tubes, their installation, safety, and mechanism of action. The qualitative and quantitative characteristics of transanal tubes are very diverse. They can be individualized, developed for TAD, or can be represented by ordinary rubber drains (Table 1) [5, 29–35, 37–39]. The tube must meet two main criteria of safety and efficacy during long-term use [29]. TAD has nearly no complications; however, isolated cases of intestinal wall perforation have been reported [29–35]. The tube is placed under palpation control 3–10 cm proximal to the anastomosis, fixed with a suture to the skin of the perineum with the connection of a drainage container.

An experimental study evaluated the efficacy and safety of the six types of tubes for TAD and revealed that the development of a special "wing drain" tube surpassed the compared types in terms of the efficiency of evacuation of loose stools and gases as well as decrease in intraintestinal pressure and fixation method [40].

For safety reasons, Nishigori et al. suggested placing the transanal tube so that its caudal end is not at the anterior surface of the sacrum to prevent its perforation after restoration of intestinal motility [40]. Adverse effects can be discomfort and pain syndrome, which are arrested effectively through the use of various topical drugs [29]. The tube duration ranged from 3 to 7 days in the absence of CASL phenomena (Table 1).

The prolongation of TAD, depending on the amount of intestinal discharge, was investigated by Kawada et al., who noted a gradual increase in the volume of discharge for up to 3–4 days (25 and 23 ml per day, respectively) and its decrease on day 5 after surgery until the level of 10 ml per day ($p < 0.05$). Depending on this, the tube was removed from the rectum, and prolongation, as a rule, was performed individually [5]. According to most authors, the criterion for tube removal was the appearance of serous diarrhea [35]. In some cases, washing with isotonic sodium chloride solution was performed [29].

The mechanism of CASL remains controversial; however, some authors consider high intraintestinal pressure to be one of the factors. Hallbook and Sjodahl reported that the neorectum is rigid and sufficiently resistant to stretching. In the early postoperative period, the anal sphincter is hypertonic and spasmodic due to factors such as pain, fear, inflammation, and trauma [41]. The mechanism of action of the transanal tube may result from a reduction in the intraluminal pressure, which reduces the risk of leaks through the anastomotic suture. This theory was confirmed by Xiao et al. who measured the intraluminal pressure and established reliably its decrease in the TAD group compared with the non-TAD group (40.2 ± 22.3 and 50.6 ± 22.6 mm Hg), respectively, $p < 0.05$) [29].

Table 1 presents the general characteristics of transanal tubes, methods of their installation, and usage.

Results of using TAD. In a large randomized trial of 398 patients, Xiao et al. registered a significant decrease in the incidence of CASL in the TAD group to 4.0% (8 out of 200 patients) compared with the non-TAD group (9.6%; 19 of 198 patients; $p = 0.026$). The incidence of grade C CASL was also significantly lower in the TAD group (28.6%; 2 of 7 patients) than in the non-TAD group (82.4%; 14 of 17 patients; $p = 0.021$).

The authors used electrogastroenteromyography and revealed that restoration of gastrointestinal motility is significantly faster in the first 3 days in the TAD group than in the non-TAD group ($p = 0.001$). According to the authors, the use of TAD has a stimulating effect on the rectal mucous membrane and anal sphincter, which can enhance the defecation reflex, which leads to a more rapid renewal of gastrointestinal motility. In the TAD group, the need for repeated surgeries was significantly lower than that in the non-TAD group [25% (2 of 8) and 84.2% (16 of 19), respectively]. In the postoperative period, the transanal tube was washed with 20.0 ml of isotonic sodium chloride solution 2 times a day [29].

Kawada et al. registered significant decrease in the incidence of clinically significant CASL in the TAD group (10.7%, 19/178) compared with the non-TAD group (26.1%, 6/23; $p = 0.046$). CASL requiring repeated surgery (grade C) developed in 5.6% of the cases (10/178) in the TAD group, while it was noted in 13.0% of cases (3/23; $p = 0.17$) in the non-TAD group. Moreover, the incidence of CASL was significantly higher in the group with >100 ml/day of intestinal discharge for more than 2 days than in the group with discharge noted for only up to 1 day after surgery, namely, in 26.9% (7/26) and 7.9% of cases (12/152), respectively ($p < 0.01$). These results should be taken into account when deciding on the removal or prolongation of TAD; and further study of the relationship between the CASL development and amount of intestinal discharge in the postoperative period is required. The authors do not provide data on washing of the transanal tube [5].

Zhao et al. conducted one of the largest meta-analyses of the efficiency of TAD after anterior rectal resections [30]. Having a moderate level of evidence, the authors concluded that the use of TAD reduces the risk of CASL [on average by 38%, hazard ratio 0.38; 95% confidence interval (CI) 0.25–0.58; $p = 0.0001$], frequency of repeated surgery (on average by 32%, hazard ratio 0.31; 95% CI 0.19–0.53; $p = 0.0001$), and duration of hospital stay (on average by 2.6 days, $p = 0.0001$). Moreover, the mechanism of action of TAD in the prevention of CASL is based on a decrease in the endoluminal pressure of the rectum. The transanal tube was washed with isotonic sodium chloride solution after surgery [30].

In a multicenter study, Goto et al. revealed a significant decrease in clinically significant CASL (grades B and C) in the TAD group (8.3%, 17/205) compared with the non-TAD group (15%, 19/123; odds ratio 2.02, 95% CI 1.01–4.06). CASL requiring repeated surgery (grade C) developed in 3.4% of cases (7/205) in the TAD group and in 6.5% cases (8/123) in the non-TAD group ($p = 0.195$), and the mean time period to repeated surgery was 13 (4–35) and 3.5 (2–26) days, respectively ($p = 0.244$). The authors attributed the differences in the timing of repeated surgery to a decrease in CASL severity as a result of the use of TAD, a decrease in the number of patients requiring urgent repeated surgery, as well as to the fact that repeated surgery can be postponed due to the presence of TAD.

After calculating the independent risk factors of CASL, the authors concluded that TAD is extremely effective in men, in patients with diabetes mellitus, in patients with body mass index < 25 kg/m^2, in patients on neoadjuvant treatment, and in those with surgery duration >5 hours. The criterion for the removal of the transanal tube was the first appearance of loose stools on it; and washing was not performed [35].

Nishigori et al. also revealed that the use of TAD reduces significantly the risk of CASL. In the TAD group, it developed in 2.7% (1/36), while in patients without TAD, it was registered in 15.7% of the cases (22/140; $p = 0.04$). The authors designated the use of TAD as a significant factor in the prevention of CASL (odds ratio 11.1, 95% CI 1.04–118; $p = 0.04$). However, the authors did not report about washing of the transanal tube in the postoperative period [31].

Similar results were obtained by Brandl et al., who established reliably reduction in the risk of CASL in the group with TAD. The authors recorded a decrease in the incidence of CASL leading to repeated surgery (grade C), namely, in 1 of 5 patients in the TAD group compared with 14 of 15 patients in the non-TAD group ($p = 0.006$). The authors noted less serious complications in patients with CASL in the TAD group, explaining this by the possible earlier detection of CASL and the presence of a transanal tube, which reduces the spread of the pyoinflammatory process into the pelvis and abdominal cavity [33].

Yang et al. analyzed the use of TAD in 204 patients after anterior rectal resection for cancer and revealed no significant differences in the incidence of CASL (9.8% and 11.8% with TAD and without TAD, respectively, $p = 0.652$). However, all patients in the non-TAD group required repeated surgery, while repeated surgery was required only in 3 of 12 patients in the TAD group ($p = 0.037$). The authors

Table 2. Literature data on leakage of sutures of colorectal anastomosis, depending on the use of transanal tubes

Authors, year	TAD group	Comparison group	Anastomotic suture leakage, %		p
			TAD group	Comparison group	
Xiao et al., 2011 [29]	200 (–stoma)*	198 (–stoma)	4	10	0.026
Zhao et al., 2013 [30]	81 (–stoma)	77 (–stoma)	3	8	0.05
Nishigori et al., 2014 [31]	36 (–stoma)	140 (–stoma)	2.7	15.7	0.04
Lee et al., 2015 [32]	154 (–stoma)	382 (–stoma)	5.8	10.7	0.078
Brandl et al., 2016 [33]	139 (±stoma)	103 (±stoma)	3.6	13.6	0.007
Yang et al., 2017 [34]	107 (–stoma)	267 (–stoma)	9.8	11.8	0.652
Kawada et al., 2018 [5]	178 (–stoma)	23 (–stoma)	12.4	26.1	0.046
Goto et al., 2017 [35]	205 (±stoma)	123 (±stoma)	8.3	16	0.044

Note: *–stoma, without the formation of preventive intestinal stomas; ± stoma, preventive intestinal stomas were formed in some patients; TAD, transanal drainage.

also revealed that the non-use of TAD is a significant risk factor for the development of CASL (odds ratio 0.306; $p = 0.047$) [7].

Lee et al. did not reveal significant differences in the incidence of CASL in patients with TAD and without TAD (5.8% and 10.7%, respectively; $p = 0.078$). However, in the TAD group, there was significantly less CASL of grade C (1.9% and 6.0% with symptoms of peritonitis, respectively; $p = 0.047$) [32]. Administration of drugs through a transanal tube was not performed.

The results of the above studies are presented in Table 2.

Conclusion. The data presented suggest the efficiency of the use of TAD after low anterior resections of the rectum with total mesorectal excision in the prevention of CASL. These results were obtained by most authors regardless of the types of transanal tubes and the methods of their installation. The use of TAD, subject to the technique and certain measures indicated by Nishigori et al., does not entail serious complications and is safe. An experimental study showed a higher efficiency of the "wing drain" tube, but randomized trials are required to validate this. Nearly all studies indicate a significant decrease in the incidence of CASL of grades B and C, which has a positive effect on the prevention of serious complications such as abscesses and phlegmon of the small pelvis, peritonitis, sepsis, and reduced duration of hospitalization. TAD accelerates the recovery of gastrointestinal motility.

Preventive intestinal stoma, which currently serves as the main method of decompression of the colorectal anastomosis after low anterior resections, can cause various complications such as wound infection, prolapse, retraction, stenosis, necrosis, parastomal hernia, intestinal obstruction, and stricture. TAD is devoid of these drawbacks, as they can be easily installed and removed without requiring repeated hospitalizations and surgeries to eliminate intestinal stomas, which prevents an increase in treatment costs without compromising its quality.

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