ORIGINAL RESEARCH

Advantages And Disadvantages of Cervical Tube-Type Anastomat in Endoscopic Surgery for Esophageal Carcinoma

Longmin Xiao, MMed; Anqi Wang, MMed; Wenjian Han, MMed

ABSTRACT

Objective • This study aims to investigate the use of cervical tube-type anastomat in endoscopic surgery for esophageal carcinoma (EC) by exploring its advantages and disadvantages. The findings contribute to the existing knowledge and provide valuable insights for future EC treatment.

Methods • A retrospective analysis was conducted on data collected from 82 patients who underwent endoscopic surgery for EC at The Central Hospital of Enshi Tujia and Miao Autonomous Prefecture between May 2019 and October 2022. Among the patients, 42 underwent anastomosis with a cervical tube-type anastomat (Group A), while the remaining 40 cases received layered anastomosis (Group B). Various parameters were recorded, including operation time (OT), neck bleeding volume, time to first postoperative ambulation, postoperative oral food intake, and hospitalization time. Pain assessment was performed using the Visual Analogue Score (VAS) before (T0) and at 12h (T1), 24h (T2), and 48h (T3) after surgery. Postoperative complications, changes in weight, hemoglobin (Hb), albumin (ALB) levels, and the patient's quality of life assessed by the SF-36 scale were also evaluated.

Results • Group A demonstrated significantly lower OT, neck bleeding volume, VAS scores at T1 and T2, and incidence of postoperative complications compared to Group B, leading to faster postoperative rehabilitation ($P < .05$). However, the two groups had no statistically significant differences regarding postoperative weight, Hb and ALB levels, and SF-36 scores ($P > .05$).

Conclusions • The use of cervical tube-type anastomat in endoscopic surgery for EC can accelerate postoperative rehabilitation without adversely affecting the postoperative nutritional status and quality of life. (*Altern Ther Health Med.* 2023;29(7):166-171).

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INTRODUCTION

Esophageal carcinoma (EC) is a malignant tumor originating from the esophageal epithelium, characterized by symptoms such as choking sensation during swallowing, foreign body sensation, and dysphagia accompanied by retrosternal pain.[1] Metastasis or invasion of adjacent organs may cause pain and discomfort in the affected organs.[2] EC has a high incidence and mortality rate worldwide, with over 2 million new cases reported in 2020, ranking sixth among all malignancies.[3] The incidence of EC has significantly increased by 5-7 times compared to a decade ago, and it is predicted to become the most common gastrointestinal malignancy by 2040.[4] The mortality rate for advanced EC patients within 5 years exceeds 40%, while the survival rate for stage IV EC is below 10%.[5]

Surgical intervention remains the primary treatment for EC in clinical practice. However, anastomotic stenosis, anastomotic fistula, and gastroesophageal reflux after esophagogastrostomy are important factors affecting the postoperative quality of life (QOL) and may contribute to perioperative mortality.[6,7] Cervical apparatus anastomosis techniques have been explored in clinical trials to address these concerns, showing effectiveness in reducing postoperative complications and improving surgical outcomes in EC patients.[8] Moreover, studies comparing different clinical instrument anastomosis methods have identified variations in their therapeutic effects. For instance, Li et al.[9] reported that layered anastomosis promotes the generation of new skin tissue after EC surgery, while Yoshida et al.[10] argued that cervical tube-type anastomats are more effective in minimizing the risk of postoperative infections.

The lack of a standardized guideline for selecting EC anastomosis methods has led to ongoing debates regarding the optimal approach. Since 2019, our hospital has implemented various clinical staplers in EC treatment and accumulated substantial case data. Thus, this paper examines the advantages and disadvantages of cervical tube-type anastomats in EC treatment, providing comprehensive evidence and guidance for future clinical management of EC.

MATERIALS AND METHODS

Study Design

A retrospective analysis was conducted on patient data from The Central Hospital of Enshi Tujia and Miao Autonomous Prefecture. The study included 82 patients who underwent endoscopic surgery for EC between May 2019 and October 2022.

Participants

The eligible patients were diagnosed with EC through biopsy at the pathology department of our hospital and met the indications for endoscopic surgery.[11] They actively participated in the research, provided informed consent, and had complete medical records. Exclusion criteria included: (1) severe heart, liver, and renal insufficiency; (2) distant organ metastasis; (3) tumor invasion of adjacent organs causing complications; (4) dropouts or referrals unable to complete follow-up; and (5) age less than 18 years old. Among the patients, 42 received anastomosis with a cervical tube-type anastomat and were assigned to Group A, while the remaining 40 patients underwent layered anastomosis and comprised Group B.

Surgical Procedure

All patients underwent endoscopic radical surgery for EC performed by the same surgical team at our hospital. The procedure involved endoscopic resection of the lesion following endotracheal intubation under general anesthesia. Subsequently, the gastric and neck anastomoses were dissociated and mobilized to the neck via the retrosternal tunnel, while the chest anastomosis was raised to the chest through the diaphragmatic hiatus.

Group A. For patients in Group A, cervical tube-type anastomosis was performed. An incision was made at the inner edge of the left cervical sternocleidomastoid muscle, which was then dissociated to access the esophagus. The separated esophagus was pulled out through the cranial incision, and a purse-string suture was applied at a location more than 5 cm away from the upper margin of the tumor. Subsequently, four channels were cut off approximately 1 cm below the purse-string closure line, and a clinical stapler of appropriate size was inserted.

Group B. Patients in Group B underwent layered anastomosis. The esophagus and gastric body were routinely dissociated, and the seromuscular layer of the posterior wall was sutured. This was followed by a full-thickness interrupted suture and an anterior seromuscular layer interrupted suture.

Outcome Measures

Endpoints. The following endpoints were assessed in this study: (1) Operation Time (OT): The duration of the surgical procedure was recorded; (2) Neck Bleeding Volume: The volume of bleeding in the neck area was measured and documented; (3) Time to First Postoperative Ambulation: The time taken for patients to initiate postoperative ambulation was noted; (4) Postoperative Oral Food Intake: The ability of patients to consume oral food after surgery was evaluated; (5) Hospitalization Time: The duration of hospital stay following surgery was recorded.

Pain Assessment. Patients' pain severity was assessed using the Visual Analogue Score (VAS). The VAS was administered before surgery (T0) and at 12 hours (T1), 24 hours (T2), and 48 hours (T3) post-surgery. The VAS is a scale ranging from 0 to 10, with higher scores indicating more severe pain.

Complications. The incidence of postoperative complications, including anastomotic stenosis, bleeding, and others, was recorded within one month after surgery.

Weight and Laboratory Measurements. Patients' weight was measured and recorded before the operation and again at 6 months post-operation. Fasting blood samples were collected using an automatic biochemical analyzer to assess hemoglobin (Hb) and albumin (ALB) levels.

Quality of Life (QOL) Evaluation. Six months after surgery, patients' QOL was evaluated using the Short-Form 36 Item Health Survey (SF-36) scale.[12] The SF-36 includes items related to physical functioning, bodily pain, mental health, social functioning, role-emotional, and general health. Higher scores on the SF-36 indicate a better quality of life.

Statistical Analysis

The results were analyzed using SPSS software version 2.0 (IBM, Armonk, NY, USA). Categorical variables were presented as percentages (%) and compared between groups using the Chi-square test. Continuous variables were reported as mean ± standard deviation ($\bar{x} \pm s$). Inter-group comparisons were performed using independent samples *t* tests, while paired *t* tests, variance analysis, and Least-Significant Difference (LSD) tests were used for intra-group comparisons. A significance level of $P < .05$ was considered statistically significant in this study.

RESULTS

Clinical Baseline Data and Group Comparisons

The clinical baseline data, including age, sex, pathological stage, and tumor location, were analyzed for both groups (A and B) before the start of the study. Statistical analysis was performed to compare the baseline characteristics between the groups. The results in Table 1 indicated no significant difference between groups A and B ($P > .05$). These findings suggest clinical comparability between the two groups.

Comparison of Surgical Parameters

The statistical analysis of patients' surgical conditions revealed notable differences between Group A and Group B.

Table 1. Clinical Baseline Data

Group	Male/Female	Age	Phase I/II/III	Upper/Middle/Lower section
Group A (n = 42)	29 (69.05)/13(30.95)	66.31 ± 6.51	19 (45.24)/16 (38.10)/ 7 (16.67)	12 (28.57)/22 (52.38)/8 (19.05)
Group B (n = 40)	25 (62.50)/15 (37.50)	67.00 ± 9.42	19 (47.50)/16 (40.00)/5 (12.50)	10 (25.00)/24 (60.00)/6 (15.00)
χ^2 and t	0.391	0.388	0.285	0.506
P value	.532	.699	.867	.777

Note: Values are presented as mean ± standard deviation ($\bar{x}$ ± s) or frequency (percentage). χ^2 represents the chi-square test, and *t* represents the independent samples *t* test.

Table 2. Postoperative Complications

Group	Anastomotic stenosis	Bleeding	Abdominal infection	Impaired gastric emptying	Total incidence
Group A (n = 42)	2 (4.76)	2 (4.76)	1 (2.38)	0 (0.0)	11.90
Group B (n = 40)	4 (10.00)	3 (7.50)	2 (5.00)	3 (7.50)	30.00
χ^2					4.082
P value					.043

Note: Values in parentheses represent percentages. The chi-square test was used for comparison (χ^2).

In Group A, the mean operation time was recorded as 20.64 ± 3.03 minutes, and the neck bleeding volume was measured as 16.95 ± 2.99 mL. In contrast, Group B had a longer OT of 30.85 ± 4.20 minutes and a higher neck bleeding volume of 19.48 ± 3.94 mL. These results indicate that Group A had a shorter OT and lower neck bleeding volume compared to Group B ($P<.05$, as shown in Figure 1).

Comparison of Postoperative Rehabilitation

Group A demonstrated a significantly faster postoperative rehabilitation compared to Group B. The time to first postoperative ambulation, oral food intake, and hospitalization duration in Group A were recorded as 4.40 ± 1.19 days, 7.21 ± 0.90 days, and 9.05 ± 1.34 days, respectively. These values were significantly shorter than those observed in Group B ($P<.05$, as shown in Figure 2), indicating a faster recovery process in Group A.

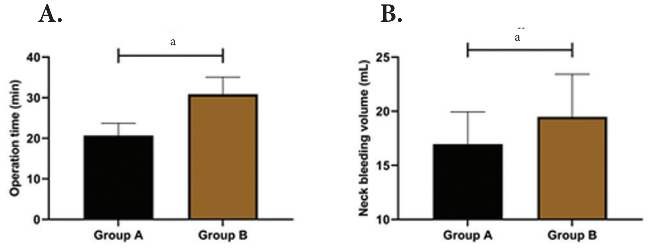
Comparison of Postoperative Pain

Group A exhibited milder postoperative pain compared to Group B. There was no significant difference between groups A and B in the Visual Analogue Score (VAS) at T0 ($P>.05$). However, both groups experienced a significant increase in VAS scores at T1 compared to T0. Subsequently, the scores gradually decreased at T2 and reached their lowest value at T3 ($P<.05$). Notably, the VAS score at both T1 and T2 was significantly lower in Group A compared to Group B ($P<.05$, as depicted in Figure 3).

Comparison of Postoperative Complications

Group A exhibited a lower incidence of postoperative complications compared to Group B. Both groups experienced postoperative complications, including anastomotic stenosis, bleeding, and abdominal infection. The incidence of postoperative complications in Group A was 11.90%, significantly lower than the incidence of 30.00% observed in Group B ($P<.05$, as presented in Table 2).

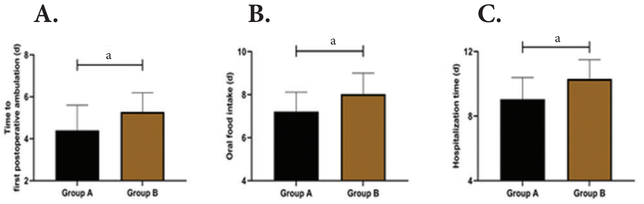
Figure 1. Surgical condition: **A.** Operation time; **B.** Neck bleeding volume



$^{a}P<.05$.

Note: The bars represent the mean values, and the error bars indicate the standard deviation. Statistical analysis was performed using independent samples *t* tests. It indicates a statistically significant difference between Group A and Group B ($P<.05$).

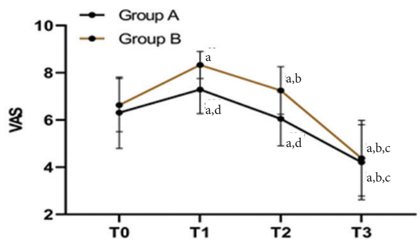
Figure 2. Postoperative rehabilitation; **A.** Time to first postoperative ambulation; **B.** Oral food intake; **C.** Hospitalization time.



$^{a}P<.05$.

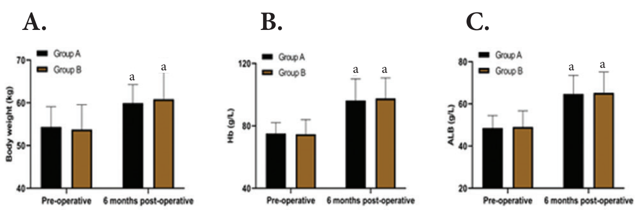
Note: The bars represent the mean values, and the error bars indicate the standard deviation. Statistical analysis was performed using independent samples *t* tests. It indicates a statistically significant difference between Group A and Group B ($P<.05$).

Figure 3. Comparison of Visual Analogue Score (VAS) at Different Time Points between Group A and Group B



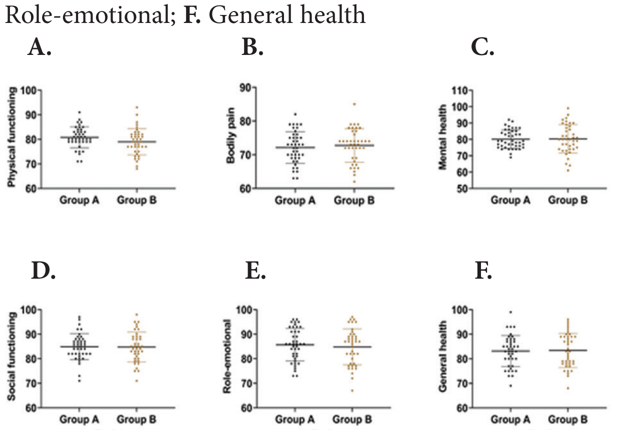
[a]indicates a statistically significant difference compared to the same group at T0
[b]indicates a statistically significant difference compared to the same group at T1
[c]indicates a statistically significant difference compared to the same group at T3
[d]indicates a statistically significant difference compared to Group B at the same time.

Figure 4. Postoperative nutritional status; **A.** Body weight. **B.** Hb. **C.** ALB.



[a]means that the difference with the same group before treatment is statistically significant

Figure 5. Postoperative QOL: **A.** physical functioning; **B.** Bodily pain; **C.** Mental health; **D.** Social functioning; **E.** Role-emotional; **F.** General health



Note: Each bar represents the mean value in the respective dimension. The error bars indicate the standard deviation. No statistically significant difference was observed between Group A and Group B in any dimensions ($P > .05$).

Comparison of Postoperative Nutritional Status

There was no significant difference in postoperative nutritional status between groups A and B. The preoperative body weight, as well as hemoglobin (Hb) and albumin (ALB) levels, were similar in both patient cohorts ($P > .05$). After six months of the operation, both groups exhibited a significant increase in body weight, Hb, and ALB levels ($P < .05$). However, the two groups had no significant difference in postoperative nutritional status ($P > .05$, as shown in Figure 4).

Comparison of Postoperative Quality of Life (QOL)

There was no significant difference in postoperative QOL between groups A and B. The scores obtained from the SF-36 scale, representing various dimensions of QOL, were comparable between the two groups 6 months after surgery ($P > .05$, as depicted in Figure 5). These results indicate that the two different anastomosis methods did not have a significant impact on the postoperative QOL of the patients.

DISCUSSION

The occurrence of EC is strongly linked to unhealthy lifestyle factors such as smoking and alcohol consumption. Currently, surgical resection remains the preferred and primary treatment option for EC. In particular, the reconstruction of the digestive tract with end-to-side anastomosis plays a crucial role in achieving radical surgery for EC.[13] With advancements in technology and the economy in recent years, clinical staples have gradually replaced traditional manual anastomosis methods and are being increasingly utilized in clinical practice.[14] By examining the advantages and disadvantages of employing cervical tube-type anastomats in EC surgery, this study holds significant reference value for informing its subsequent clinical application.

Layered anastomosis is a commonly employed method in clinical practice.[15] Despite ongoing advancements in suture techniques and materials, this method still has several limitations, including a complex surgical procedure, prolonged operation time, and an increased risk of postoperative complications. Anastomotic fistula, for example, occurs in 10-27% of cases following manual anastomosis, and its occurrence is associated with various factors such as incorrect suture positioning and excessive tension, which restricts its clinical utility.[15,16]

Through continuous technological innovations, the use of anastomats has evolved from manual anastomosis to stapler anastomosis. When employing cervical tube-type anastomats, the length of the stomach can be extended to the top of the chest and neck, meeting the requirements for anastomosis. This helps to reduce tension at the postoperative anastomotic site, ensuring the safety of the procedure. Furthermore, this method offers simplicity and convenience in operation, achieves uniform caliber anastomosis, and demonstrates a high success rate on the first attempt. It also exhibits notable hemostatic effects, reduced postoperative bleeding, and minimal patient trauma.[17-19]

This study demonstrated that Group A exhibited reduced OT, decreased neck bleeding volume, and faster postoperative rehabilitation compared to Group B, providing preliminary evidence supporting the value of cervical tube-type anastomats in EC treatment. These findings are consistent with the study conducted by Tverskov et al.,[19] where they observed significantly shorter anastomosis duration in gastric cancer patients who underwent tube-type anastomosis compared to manual anastomosis, thus corroborating our results.

Our findings suggest that the effectiveness of the cervical tube-type anastomat technique lies in its ability to meet the requirements of modern EC surgical treatment. Firstly, a clean environment can be maintained by swiftly applying a dressing to cover the wound. Secondly, the appropriate selection of cervical tube-type anastomosis techniques and dressings enables the maintenance of a clean environment, facilitating the timely removal of anastomotic effusion and necrotic tissue. It regulates the debridement and tissue reconstruction process at the anastomotic site, inhibits bacterial proliferation, promotes granulation tissue formation, and improves blood circulation at the anastomotic site.[20] The lower VAS scores observed in Group A compared to Group B at T1 and T2 may be attributed to the reasons mentioned above. When analyzing postoperative complications, we observed a lower incidence of complications and a significantly reduced occurrence of anastomotic stenosis in Group A. This finding suggests that this can be attributed to the ability of the cervical tube-type anastomat to avoid or minimize the occurrence of anastomotic stenosis to a certain extent.

The soft and elastic nature of the mucosal layer allows for the use of absorbable sutures, resulting in less scarring during mucosal layer anastomosis. Furthermore, mucosal and muscular anastomosis are not in the same plane, reducing the likelihood of stenosis formation within the same plane.[21] The layered anastomosis technique demonstrates high overall histocompatibility and does not affect the surrounding skin. This allows for the anastomosis site to be enclosed in an isolated environment, minimizing the risk of infection and ensuring a favorable level of safety.[22] In the subsequent inter-group comparisons regarding postoperative nutritional status and QOL, noticeable improvements were observed in both groups following treatment. However, there was no statistically significant difference between the two groups. It suggests that while the cervical tube-type anastomat has a positive impact on EC surgery, postoperative rehabilitation, and pain relief, it does not appear to enhance the prognostic outcomes of patients further.

Surgical treatment for EC is widely recognized as a complex and time-consuming process involving multiple procedures such as surgery, anastomosis, tumor tissue removal, and subsequent postoperative recovery.[23] Postoperative rehabilitation is influenced not only by medical interventions but also by individual factors such as autoimmunity and metabolism. Moreover, the effectiveness of clinical staplers is closely tied to the professional skills and experience of physicians.[24] Additionally, given the variability in medical expertise across different regions, the outcomes following stapler anastomosis may significantly differ among patients. Therefore, the application of the cervical tube-type anastomat warrants further in-depth and comprehensive exploration and analysis, with the aim of providing a more reliable safety guarantee for EC treatment.

Study Limitations

It is important to acknowledge several limitations of this study. Firstly, the relatively small sample size in this study raises the possibility that some of the observed results may be statistically coincidental. Therefore, caution should be exercised when interpreting these findings, and further studies with larger sample sizes are warranted to validate the outcomes. Secondly, this study focused primarily on assessing the application effect of the cervical tube-type anastomat. In future studies, it would be beneficial to include control groups utilizing linear staplers and staplers made of different materials to comprehensively explore the clinical value of the cervical tube-type anastomat and compare its efficacy with alternative methods. Lastly, a longer-term follow-up survey is needed to evaluate the impact of the cervical tube-type anastomat on the long-term outcomes of EC patients. It would provide valuable insights into the sustained benefits and potential complications associated with the use of this technique.

CONCLUSION

The application of cervical tube-type anastomat in endoscopic surgery for EC has demonstrated significant benefits in terms of enhancing surgical safety, accelerating postoperative rehabilitation, and alleviating postoperative pain. However, no significant impact on postoperative nutritional status and quality of life was observed. These findings highlight the potential of cervical tube-type anastomat as a valuable tool in improving the overall quality of medical care for EC patients. Nonetheless, further research and analysis are warranted to gain a deeper understanding of the optimal application and potential limitations of cervical tube-type anastomat in EC surgery. It will enable the medical community to enhance the overall quality of care and outcomes for EC patients.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to report relevant to this article.

AUTHORS' CONTRIBUTIONS

All authors equally contributed, read and approved the final manuscript.

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REFERENCES

1. Uhlenhopp DJ, Then EO, Sunkara T, Gaduputi V. Epidemiology of esophageal cancer: update in global trends, etiology and risk factors. *Clin J Gastroenterol*. 2020;13(6):1010-1021. doi:10.1007/s12328-020-01237-x
2. Watanabe M, Otake R, Kozuki R, et al. Recent progress in multidisciplinary treatment for patients with esophageal cancer. *Surg Today*. 2020;50(1):12-20. doi:10.1007/s00595-019-01878-7
3. Huang TX, Fu L. The immune landscape of esophageal cancer. *Cancer Commun (Lond)*. 2019;39(1):79. doi:10.1186/s40880-019-0427-z
4. Rogers JE, Sewastjanow-Silva M, Waters RE, Ajani JA. Esophageal cancer: emerging therapeutics. *Expert Opin Ther Targets*. 2022;26(2):107-117. doi:10.1080/14728222.2022.2036718
5. Liu K, Zhao T, Wang J, et al. Etiology, cancer stem cells and potential diagnostic biomarkers for esophageal cancer. *Cancer Lett*. 2019;458:21-28. doi:10.1016/j.canlet.2019.05.018
6. Zhao Q, Yu J, Meng X. A good start of immunotherapy in esophageal cancer. *Cancer Med*. 2019;8(10):4519-4526. doi:10.1002/cam4.2336

7. Harding E. WHO global progress report on tuberculosis elimination. *Lancet Respir Med*. 2020;8(1):19. doi:10.1016/S2213-2600(19)30418-7
8. Rasihashemi SZ, Ramouz A, Beheshtirouy S, Amini H. Comparison of end-to-side hand-sewn and side-to-side stapled cervical esophagogastric anastomosis in patients with lower thoracic esophageal cancer undergoing transhiatal esophagectomy: an Iranian retrospective cohort study. *BMC Gastroenterol*. 2020;20(1):250. doi:10.1186/s12876-020-01393-x
9. Li Z, Liu C, Liu Y, Yao S, Xu B, Dong G. Comparisons between minimally invasive and open esophagectomy for esophageal cancer with cervical anastomosis: a retrospective study. *J Cardiothorac Surg*. 2020;15(1):128. doi:10.1186/s13019-020-01182-3
10. Yoshida N, Eto K, Matsumoto T, et al. Omental Flap Wrapping Around the Esophagogastric Anastomosis and Association with Anastomotic Leak in Esophagectomy for Esophageal Cancer: A Propensity Score-Matching Analysis. *J Am Coll Surg*. 2023;236(1):189-197. doi:10.1097/XCS.0000000000000454
11. Halliday LJ, Doran SLF, Sgromo B, et al. Variation in esophageal anastomosis technique-the role of collaborative learning. *Dis Esophagus*. 2020;33(5):doz072. doi:10.1093/dote/doz072
12. Lins L, Carvalho FM. SF-36 total score as a single measure of health-related quality of life: scoping review. *SAGE Open Med*. 2016;4:2050312116671725. doi:10.1177/2050312116671725
13. Jung MK, Schmidt T, Chon SH, et al. Current surgical treatment standards for esophageal and esophagogastric junction cancer. *Ann N Y Acad Sci*. 2020;1482(1):77-84. doi:10.1111/nyas.14454
14. Abbassi O, Patel K, Jayanthi NV. Three-Dimensional vs Two-Dimensional Completely Minimally Invasive 2-Stage Esophagectomy With Intrathoracic Hand-Sewn Anastomosis for Esophageal Cancer: Comparison of Intra-and Postoperative Outcomes. *Surg Innov*. 2021;28(5):582-589. doi:10.1177/1553350620972546
15. Martínez Burgos M, Angulo McGrath I, Morales Bermudez AI, et al. Experience in the treatment of esophageal anastomosis dehiscence using self-expanding metallic prosthesis. *Rev Esp Enferm Dig*. 2022;114(7):432-433. doi:10.17235/reed.2022.8692/2022
16. Wang Z, Wei Y, Liu X, et al. Application value of hand-sewn anastomosis in totally laparoscopic total gastrectomy for gastric cancer. *World J Surg Oncol*. 2021;19(1):229. doi:10.1186/s12957-021-02249-8
17. Angehrn FV, Neuschütz KJ, Fourie L, et al. Continuously sutured versus linear-stapled anastomosis in robot-assisted hybrid Ivor Lewis esophageal surgery following neoadjuvant chemoradiotherapy: a single-center cohort study. *Surg Endosc*. 2022;36(12):9435-9443. doi:10.1007/s00464-022-09415-3
18. Plat VD, Bootsma BT, van der Wielen N, van der Peet DL, Daams F. Autologous Activated Fibrin Sealant for the Esophageal Anastomosis: A Feasibility Study. *J Surg Res*. 2019;234:49-53. doi:10.1016/j.jss.2018.08.049
19. Tverskov V, Wiesel O, Solomon D, Orgad R, Kashtan H. The impact of cervical anastomotic leak after esophagectomy on long-term survival of patients with esophageal cancer. *Surgery*. 2022;171(5):1257-1262. doi:10.1016/j.surg.2021.10.011
20. Cubas R, Andres R, Chintalapani S, et al. Initial management of esophageal anastomotic strictures after transhiatal esophagectomy for esophageal cancer with dilations up to 18-20 mm. *Surg Endosc*. 2021;35(7):3488-3491. doi:10.1007/s00464-020-07801-3
21. Wu J, Putnam LR, Silva JP, Houghton C, Bildzukewicz N, Lipham JC. Impact of Robotic Approach on Post-Anastomotic Leaks After Esophagectomy for Esophageal Cancer. *Am Surg*. 2022;88(10):2499-2507. doi:10.1177/00031348221101515
22. Lai Y, Li H, Tian L, Ye X, Hu Y. Baseball bat-like gastric tube for end-to-side oesophageal-gastric anastomosis decreased risks of anastomotic leakage after oesophagectomy for oesophageal cancer: A retrospective propensity score matched comparative study with 613 patients. *Int J Surg*. 2022;98:106227. doi:10.1016/j.ijsu.2022.106227
23. Szymański M, Marek I, Wilczyński M, et al. Evaluation of esophageal pathology in a group of patients 2 years after one-anastomosis gastric bypass (OAGB) - Cohort study. *Obes Res Clin Pract*. 2022;16(1):82-86. doi:10.1016/j.orcp.2021.12.001
24. Li J, Wang B, Liang T, Guo NN, Zhao M. Pre-embedded cervical circular stapled anastomosis in esophagectomy. *Thorac Cancer*. 2020;11(3):723-727. doi:10.1111/1759-7714.13324