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THE PLACE OF JEJUNOSTOMY IN PALLIATIVE CARE. LITERATURE REVIEW

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Abstract. The most common type of palliative care for dysphagia is the imposition of artificial nutritional fistulas. In this case, the operation of choice is considered to be gastrostomy, to which a large number of publications are devoted. Jejunostomy is performed much less frequently and is less covered in the literature. The article presents a review of the literature reflecting the evolution of jejunostomy as a palliative operation to provide enteral nutrition for dysphagia.

Key words: *jejunostomy; gastrostomy; dysphagia; palliative care.*

МЕСТО ЕЮНОСТОМИИ В ПАЛЛИАТИВНОЙ ПОМОЩИ. ОБЗОР ЛИТЕРАТУРЫ

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Резюме. Наиболее распространенным видом паллиативной помощи при дисфагии является наложение искусственных питательных свищей. При этом операцией выбора считается гастростомия, которой посвящено большое количество публикаций. Еюностомия выполняется значительно реже и меньше освещена в литературе. В статье представлен обзор литературы, отражающий эволюцию еюностомии как паллиативной операции для обеспечения энтеральным питанием при дисфагии.

Ключевые слова: *еюностомия; гастростомия; дисфагия; паллиативная помощь.*

A common type of palliative intervention for prolonged dysphagia is a nutritional fistula for enteral feeding [1–3]. Gastrostomy is considered the operation of choice, where the gastric stage of digestion is preserved. This is more physiological and reduces the risk of dumping syndrome and metabolic disorders that may develop when nutrition is introduced into the jejunum [4, 5]. For this reason, a jejunostomy is used when gastrostomy is technically impossible due to gastric lesions or in cases of gastric motility disorders and marked gastroesophageal reflux [4, 6–9].

The first feeding jejunostomy was applied by W. Busch to a patient with inoperable gastric cancer in 1858 [5] 9 years after the first gastrostomy [10]. Emerging new gastrostomy techniques have traditionally been adapted for eunostomy.

At present, the feeding jejunostomy with a U-shaped interintestinal anastomosis performed by K. Maydl in 1883 year remains relevant [11]. After laparotomy, the small intestine is crossed 30 cm from the ligament of Treitz. The proximal end of the intestine is anastomosed end-to-end with the small intestine 20 cm below the cross-

ing point. The distal end is passed obliquely, removed through a separate incision in the anterior abdominal wall, and fixed to the skin [12].

Another used operation is the O. Witzel jejunostomy with interintestinal anastomosis, which was proposed by A.F. Eiselberg in 1895 [7, 13]. Eiselberg in 1895 [7, 13]. After upper laparotomy the first loop of jejunum 40–50 cm long from the ligament of Treitz is taken out. An interintestinal anastomosis is applied between the driving and the withdrawing part of the intestine. A feeding tube is placed on the diverting loop proximal to the anastomosis, which is immersed in the intestinal wall with knotted sutures. The inner end of the tube is immersed through the opening in the intestinal lumen and is inserted proximal to the anastomosis area. The hole in the intestine is sutured with knotted or cicatellar sutures. Thus, the canal is formed according to O. Witzel. The tube is fixed with additional sutures to the intestinal wall and withdrawn through a separate incision of the anterior abdominal wall. The intestinal wall in the area of exit from the canal is sutured to the parietal peritoneum, and the tube is sutured to the skin with knotted sutures [14].

In addition to an independent palliative operation, the jejunostomy can be applied as a temporary step before or after another operation [7, 15, 16]. For example, nutritional eunostomy in reconstructive oesophageal surgery as a stage of small intestinal plasty according to Roux-Hertzen-Yudin, needle catheterisation of the small intestine according to H.M. Delany after abdominal operations [5, 13, 17].

Shortly after the advent of percutaneous endoscopic gastrostomy (PEG) in the 1980s, reports on the performance of direct percutaneous endoscopic eunostomy (PEE) appeared [5, 18, 19]. PEE is rarely used due to technical difficulty. As experience is gained, the success rate of the operation increases from 68 to 95% [20–22]. Possible complications are similar to those after PEG, with a lower risk of aspiration pneumonia. The mortality rate reaches 35%, but it is explained by the severity of the pathology [22].

The emergence of experience in puncture gastrostomy under X-ray, ultrasound and CT guidance has led to the adaptation of these techniques for eunostomy, but the number of observations is still small [9, 23, 24].

Naturally, the development of laparoscopic techniques has allowed traditional uninostomies to be applied laparoscopically [5, 16, 25]. In 1990, O'Regan et al. reported the first laparoscopically-assisted percutaneous eunostomy [19, 26].

There is no proven difference in the incidence of complications after different methods of eunostomy [5]. This is due to the small number of operations and difficulties in comparing data from heterogeneous groups of observations published by different institutions. The complication rate after traditional laparotomy jejunostomies can be as high as 56.7% [27], after needle catheterisation of the jejunum performed during another laparotomy, a complication rate of up to 3% is described [28], and complications in laparoscopic jejunostomies have been described in 9.8–17.0% of cases [29, 30]. As the PEE technique is being developed, there are reports about its advantage due to its low invasiveness, comparability in success rate (96%) and number of complications (5%) with laparoscopic eunostomy [31].

Different classifications of complications after eunostomy are used. By analogy with gastrostomy, major and minor complications are distinguished [32, 33]. There is a division of complications into the mechanical, infectious, gastrointestinal, and metabolic complications [5].

Mechanical complications are caused by the technique of the operation. Obstruction of the intestinal lumen is possible when using balloon-type tubes. In the case of O. Witzel tube jejunostomy — reflux of intestinal contents due to ischaemia and mucosal erosions from the tube pressure. In the puncture eunostomy, catheter prolapse or obstruction, intestinal pneumatisation, formation of intestinal fistulas and abscesses near the catheter are common. Laparoscopic eunostomy is additionally at risk of complications due to increased intra-abdominal pressure and deeper anaesthesia [5].

Infectious complications in the form of aspiration pneumonia may result from improper placement of the jejunostomy which leads to reflux [5].

Gastrointestinal complications are manifested as nausea, vomiting, diarrhoea, abdominal bloating, attacks of spastic abdominal pain. Their severity is strongly influenced by the diet used [5].

Metabolic disorders are manifested as hypokalaemia, hyperglycaemia and acid-base balance disorders. This may be due to improper positioning of the tube in the jejunum, administration of inappropriate nutrition. Due to the disconnection of the stomach and duodenum from digestion, there is a possibility of vitamin B12 and iron deficiency. Initiation of tube feeding after a period of fasting may lead to the development of hypokalaemia, hypophosphatemia and hypomagnesaemia. The pathophysiology is thought to be related to the release of insulin from the pancreas when feeding is

initiated. This often manifests in patients in the intensive care unit as haemodynamic instability, respiratory failure and other non-specific features [5].

Thus, at present, for palliative care of dysphagia, eunostomy is rarely used, mainly when gastrostomy is not possible or its complications. In addition, an intermediate option between gastrostomy and eunostomy has emerged. This is the insertion of a feeding tube into the jejunum through a gastrostomy. In the case of PEG, this method is called "PEG with a jejunal extension tube (PEG-J)", i.e. PEG with a jejunal tube. The advantage of this technique is the simpler technique of gastric fistula formation, and the delivery of nutrition through the probe into the jejunum allows solving the problem of gastrostasis and gastroesophageal reflux [6, 7, 34, 35].

REFERENCES

1. Zav'yalova A.N., Gostimskiy A.V., Lisovskiy O.V. i dr. Enteral'noye pitaniye v palliativnoy meditsine u detey [Enteral nutrition in palliative medicine in children]. Pediatr. 2017; 8(6): 105–13. DOI: 10.17816/PED86105-113. (in Russian).
2. Gavshchuk M.V., Lisovskiy O.V., Gostimskiy A.V. i dr. Khirurgicheskiye metody korrektsii disfagii u vzroslykh palliativnykh bol'nykh po dannym sistemy OMS [Surgical methods for the correction of dysphagia in adult palliative patients according to the CHI system]. Meditsina i organizatsiya zdravookhraneniya. 2021; 6(2): 21–6. (in Russian).
3. Zav'yalova A.N., Gavshchuk M.V., Novikova V.P. i dr. Analiz sluchayev gastrostomii u detey po dannym sistemy obyazatel'nogo meditsinskogo strakhovaniya v Sankt-Peterburge [Analysis of cases of gastrostomy in children according to the obligatory medical insurance system in St. Petersburg]. Voprosy diyetologii. 2021; 11(4): 15–22. DOI: 10.20953/2224-5448-2021-4-15-22. (in Russian).
4. Yoon E.W.T., Morishita H. Management of Postprandial Hypoglycemia due to Late Dumping Syndrome after Direct Percutaneous Endoscopic Jejunostomy (D-PEJ) with Miglitol and an Isomaltulose-containing enteral formula. General Internal Medicine and Clinical Innovations. 2016; 1(5): 86–9.
5. D'Cruz J.R., Cascella M. Feeding Jejunostomy Tube. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. 2021. Available at: https://www.ncbi.nlm.nih.gov/books/NBK562278/. (accessed 11.11.21).
6. Arvanitakis M., Gkolfakis P., Despott E.J. et al. Endoscopic management of enteral tubes in adult patients. Part 1: Definitions and indications. European Society of Gastrointestinal Endoscopy (ESGE) Guideline. Endoscopy. 2021; 53(1): 81–92.
7. Pearce C.B., Duncan H.D. Enteral feeding. Nasogastric, nasojejunal, percutaneous endoscopic gastrostomy, or jejunostomy: its indications and limitations. Postgrad Med J. 2002; 78(918): 198–204.
8. Littmann I. Bryushnaya khirurgiya [Abdominal surgery]. 4-ye izd. Budapesht: Izd-vo Akademii nauk Vengrii; 1970. (in Russian).
9. Ao P., Sebastianski M., Selvarajah V., Gramlich L. Comparison of Complication Rates, Types, and Average Tube Patency Between Jejunostomy Tubes and Percutaneous Gastrostomy Tubes in a Regional Home Enteral Nutrition Support Program. Nutrition in Clinical Practice. 2015; 30: 393–7.
10. Yudin S.S. Etyudy zheludochnoy khirurgii [Sketches of gastric surgery]. Moskva: Medgiz Publ.; 1955. (in Russian).
11. Averin V.I., Aksel'rov M.A., Degtyarev Yu.G. i dr. Kishechnyye stomy u detey [Intestinal stoma in children]. Moskva: GEOTAR-Media Publ.; 2020. (in Russian)
12. Littmann I. Operativnaya khirurgiya [Operative surgery]. Tret'ye (stereotipnoye) izdaniye na russkom yazyke. Budapesht: Izd-vo Akademii nauk Vengrii; 1985. (in Russian).
13. Beloborodov V.A., Kozhevnikov M.A., Frolov A.P. Pitatel'nyye stomy [Nutritional stoma]. Uchebnoye posobiye. Irkutsk: IGMU; 2019. (in Russian).
14. Kovanov V.V. Operativnaya khirurgiya i topograficheskaya anatomiya [Operative surgery and topographic anatomy]. 3-ye izd., s ispravl. Moskva: Meditsina Publ.; 1995. (in Russian).
15. Martynov V.L., Kolchin D.G., Ryabkov M.G. i dr. "Zaglushka" na tonkuyu kishku v sozdanii pitatel'noy yeyunostomy [«Stub» on the small intestine in the creation of a nutritional jejunostomy]. Zhurnal MediAl'. 2014; 1(11): 44–8. (in Russian).
16. Prudkov I.D., Khodakov V.V., Prudkov M.I. Ocherki laparoskopicheskoy khirurgii [Essays on laparoscopic surgery]. Sverdlovsk: Izd-vo Ural. un-ta; 1989. (in Russian).
17. Delany H.M., Carnevale N., Garvey J.W. et al. Postoperative nutritional support using needle catheter feeding jejunostomy. Ann Surg. 1977; 186(2): 165–70.
18. Shike M., Schroy P., Ritchie M.A. et al. Percutanous endoscopic jejunostomy in cancer patients with previous gastric resection. Gastrointest. Endosc. 1987; 33(5): 372–4.
19. O'Regan P.J., Scarrow G.D. Laparoscopic jejunostomy. Endoscopy. 1990; 22(1): 39–40.
20. Nishiwaki S., Kurobe T., Baba A. et al. Prognostic outcomes after direct percutaneous endoscopic jejunostomy in elderly patients: comparison with percutaneous endoscopic gastrostomy. Gastrointest. Endosc. 2021; 94(1): 48–56.

21. Gkolfakis P., Arvanitakis M. Percutaneous endoscopic gastrostomy and direct percutaneous endoscopic jejunostomy: 2 sides of the same coin. Gastrointest. Endosc. 2021; 94(1): 57–9.
22. Moran G.W., Fisher N.C. Direct Percutaneous Endoscopic Jejunostomy: High Completion Rates with Selective Use of a Long Drainage Access Needle. Diagn. Ther. Endosc. 2009; Art. ID 520879. Available at: https://downloads.hindawi.com/archive/2009/520879.pdf (accessed 30.06.2022). DOI: 10.1155/2009/520879.
23. Gebel M., Lange P., Mu¨ller M.J. et al. Percutaneous sonographically guided gastro- and enterostomy — New approach for enteral feeding. Gastroenterology. 1991; 100: 365.
24. Albrecht H., Hagel A.F., Schlechtweg P. et al. Computed Tomography — Guided Percutaneous Gastrostomy/Jejunostomy for Feeding and Decompression. Nutrition in Clinical Practice. 2017; 32: 212–8. DOI: 10.1177/0884533616653806.
25. Lotti M., Capponi M.G., Ferrari D. Laparoscopic Witzel jejunostomy. J. Minim. Access. Surg. 2021; 17(1): 127–30.
26. Siow S.L., Mahendran H.A., Wong C.M. Laparoscopic T-tube feeding jejunostomy as an adjunct to staging laparoscopy for upper gastrointestinal malignancies: the technique and review of outcomes. BMC Surg. 2017; 17(1): 25.
27. Mumladze R.B., Rozikov Yu.Sh., Deyev A.I., Korzheva I.Yu. Chreskozhnaya endoskopicheskaya gastrostomiya kak sovremennyy metod obespecheniya enteral'nym pitaniyem [Percutaneous endoscopic gastrostomy as a modern method of providing enteral nutrition]. Med. vestn. Bashkortostana. 2011; 6(1): 67–73. (in Russian).
28. Myers J.G., Page C.P., Stewart R.M. et al. Complications of needle catheter jejunostomy in 2,022 consecutive applications. Am J Surg. 1995; 170(6): 547–50. DOI: 10.1016/s0002-9610(99)80013-0. PMID: 7491998.
29. Siow S.L., Mahendran H.A., Wong C.M. et al. Laparoscopic T-tube feeding jejunostomy as an adjunct to staging laparoscopy for upper gastrointestinal malignancies: the technique and review of outcomes. BMC Surg. 2017; 17(1): 25. DOI: 10.1186/s12893-017-0221-2.
30. Han-Geurts I.J., Lim A., Stijnen T., Bonjer H.J. Laparoscopic feeding jejunostomy: a systematic review. Surg Endosc. 2005; 19(7): 951–7. DOI: 10.1007/s00464-003-2187-7.
31. Kim C.Y., Dai R., Wang Q. et al. Jejunostomy Tube Insertion for Enteral Nutrition: Comparison of Outcomes after Laparoscopic versus Radiologic Insertion. J. Vasc. Interv. Radiol. 2020; 31(7): 1132–8. DOI: 10.1016/j.jvir.2019.12.010.
32. Mastoridis S., Bracalente G., Hanganu C.B. et al. Laparoscopic vs. open feeding jejunostomy insertion in oesophagogastric cancer. BMC Surg. 2021; 21(1): 367. DOI: 10.1186/s12893-021-01318-9.
33. Gavshchuk M.V., Gostimskiy A.V., Zav'yalova A.N. i dr. Evolyutsiya gastrostomy v palliativnoy meditsine [Evolution of gastrostomy in palliative medicine]. Vestnik Rossiyskoy voyenno-meditsinskoy akademii. 2018; 4(64): 232–6. (in Russian).
34. Nunes G., Fonseca J., Barata A.T. et al. Nutritional Support of Cancer Patients without Oral Feeding: How to Select the Most Effective Technique? GE — Port. J. Gastroenterol. 2020; 27(3): 172–84.
35. Westaby D., Young A., O'Toole P. The provision of a percutaneously placed enteral tube feeding service. Gut. 2010; 59(12): 1592–1605.

ЛИТЕРАТУРА

1. Завьялова А.Н., Гостимский А.В., Лисовский О.В. и др. Энтеральное питание в паллиативной медицине у детей. Педиатр. 2017; 8(6): 105–13. DOI: 10.17816/PED86105-113.
2. Гавщук М.В., Лисовский О.В., Гостимский А.В. и др. Хирургические методы коррекции дисфагии у взрослых паллиативных больных по данным системы ОМС. Медицина и организация здравоохранения. 2021; 6(2): 21–6.
3. Завьялова А.Н., Гавщук М.В., Новикова В.П. и др. Анализ случаев гастростомии у детей по данным системы обязательного медицинского страхования в Санкт-Петербурге. Вопросы диетологии. 2021; 11(4): 15–22. DOI: 10.20953/2224-5448-2021-4-15-22.
4. Yoon E.W.T., Morishita H. Management of Postprandial Hypoglycemia due to Late Dumping Syndrome after Direct Percutaneous Endoscopic Jejunostomy (D-PEJ) with Miglitol and an Isomaltulose-containing enteral formula. General Internal Medicine and Clinical Innovations. 2016; 1(5): 86–9.
5. D'Cruz J.R., Cascella M. Feeding Jejunostomy Tube. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. 2021. Available at: https://www.ncbi.nlm.nih.gov/books/NBK562278/. (accessed 11.11.21).
6. Arvanitakis M., Gkolfakis P., Despott E.J. et al. Endoscopic management of enteral tubes in adult patients. Part 1: Definitions and indications. European Society of Gastrointestinal Endoscopy (ESGE) Guideline. Endoscopy. 2021; 53(1): 81–92.
7. Pearce C.B., Duncan H.D. Enteral feeding. Nasogastric, nasojejunal, percutaneous endoscopic gastrostomy, or jejunostomy: its indications and limitations. Postgrad Med J. 2002; 78(918): 198–204.
8. Литтманн И. Брюшная хирургия. 4-е изд. Будапешт: Изд-во Академии наук Венгрии; 1970.
9. Ao P., Sebastianski M., Selvarajah V., Gramlich L. Comparison of Complication Rates, Types, and Ave-

rage Tube Patency Between Jejunostomy Tubes and Percutaneous Gastrostomy Tubes in a Regional Home Enteral Nutrition Support Program. Nutrition in Clinical Practice. 2015; 30: 393–7.
10. Юдин С.С. Этюды желудочной хирургии. М.: Медгиз; 1955.
11. Аверин В.И., Аксельров М.А., Дегтярев Ю.Г. и др. Кишечные стомы у детей. М.: ГЭОТАР-Медиа; 2020.
12. Литтманн И. Оперативная хирургия. Третье (стереотипное) издание на русском языке. Будапешт: Изд-во Академии наук Венгрии; 1985.
13. Белобородов В.А., Кожевников М.А., Фролов А.П. Питательные стомы. Учебное пособие. Иркутск: ИГМУ; 2019.
14. Кованов В.В. Оперативная хирургия и топографическая анатомия. 3-е изд., с исправл. М.: Медицина; 1995.
15. Мартынов В.Л., Колчин Д.Г., Рябков М.Г. и др. «Заглушка» на тонкую кишку в создании питательной еюностомы. Журнал МедиАль. 2014; 1(11): 44–8.
16. Прудков И.Д., Ходаков В.В., Прудков М.И. Очерки лапароскопической хирургии. Свердловск: Изд-во Урал. ун-та; 1989.
17. Delany H.M., Carnevale N., Garvey J.W. et al. Postoperative nutritional support using needle catheter feeding jejunostomy. Ann Surg. 1977; 186(2): 165–70.
18. Shike M., Schroy P., Ritchie M.A. et al. Percutanous endoscopic jejunostomy in cancer patients with previous gastric resection. Gastrointest. Endosc. 1987; 33(5): 372–4.
19. O'Regan P.J., Scarrow G.D. Laparoscopic jejunostomy. Endoscopy. 1990; 22(1): 39–40.
20. Nishiwaki S., Kurobe T., Baba A. et al. Prognostic outcomes after direct percutaneous endoscopic jejunostomy in elderly patients: comparison with percutaneous endoscopic gastrostomy. Gastrointest. Endosc. 2021; 94(1): 48–56.
21. Gkolfakis P., Arvanitakis M. Percutaneous endoscopic gastrostomy and direct percutaneous endoscopic jejunostomy: 2 sides of the same coin. Gastrointest. Endosc. 2021; 94(1): 57–9.
22. Moran G.W., Fisher N.C. Direct Percutaneous Endoscopic Jejunostomy: High Completion Rates with Selective Use of a Long Drainage Access Needle. Diagn. Ther. Endosc. 2009; Art. ID 520879. Available at: https://downloads.hindawi.com/archive/2009/520879.pdf (accessed 30.06.2022). DOI:10.1155/2009/520879.
23. Gebel M., Lange P., Mu¨ller M.J. et al. Percutaneous sonographically guided gastro- and enterostomy — New approach for enteral feeding. Gastroenterology. 1991; 100: 365.
24. Albrecht H., Hagel A.F., Schlechtweg P. et al. Computed Tomography–Guided Percutaneous Gastrostomy/Jejunostomy for Feeding and Decompression. Nutrition in Clinical Practice. 2017; 32: 212–8. DOI: 10.1177/0884533616653806.
25. Lotti M., Capponi M.G., Ferrari D. Laparoscopic Witzel jejunostomy. J. Minim. Access. Surg. 2021; 17(1): 127–30.
26. Siow S.L., Mahendran H.A., Wong C.M. Laparoscopic T-tube feeding jejunostomy as an adjunct to staging laparoscopy for upper gastrointestinal malignancies: the technique and review of outcomes. BMC Surg. 2017; 17(1): 25.
27. Мумладзе Р.Б., Розиков Ю.Ш., Деев А.И., Коржева И.Ю. Чрескожная эндоскопическая гастростомия как современный метод обеспечения энтеральным питанием. Мед. вестн. Башкортостана. 2011; 6(1): 67–73.
28. Myers J.G., Page C.P., Stewart R.M. et al. Complications of needle catheter jejunostomy in 2,022 consecutive applications. Am J Surg. 1995; 170(6): 547–50. DOI: 10.1016/s0002-9610(99)80013-0. PMID: 7491998.
29. Siow S.L., Mahendran H.A., Wong C.M. et al. Laparoscopic T-tube feeding jejunostomy as an adjunct to staging laparoscopy for upper gastrointestinal malignancies: the technique and review of outcomes. BMC Surg. 2017; 17(1): 25. DOI: 10.1186/s12893-017-0221-2.
30. Han-Geurts I.J., Lim A., Stijnen T., Bonjer H.J. Laparoscopic feeding jejunostomy: a systematic review. Surg Endosc. 2005; 19(7): 951–7. DOI: 10.1007/s00464-003-2187-7.
31. Kim C.Y., Dai R., Wang Q. et al. Jejunostomy Tube Insertion for Enteral Nutrition: Comparison of Outcomes after Laparoscopic versus Radiologic Insertion. J. Vasc. Interv. Radiol. 2020; 31(7): 1132–8. DOI: 10.1016/j.jvir.2019.12.010.
32. Mastoridis S., Bracalente G., Hanganu C.B. et al. Laparoscopic vs. open feeding jejunostomy insertion in oesophagogastric cancer. BMC Surg. 2021; 21(1): 367. DOI: 10.1186/s12893-021-01318-9.
33. Гавщук М. В., Гостимский А. В., Завьялова А.Н. и др. Эволюция гастростомы в паллиативной медицине. Вестник Российской военно-медицинской академии. 2018; 4(64): 232–6.
34. Nunes G., Fonseca J., Barata A.T. et al. Nutritional Support of Cancer Patients without Oral Feeding: How to Select the Most Effective Technique? GE — Port. J. Gastroenterol. 2020; 27(3): 172–84.
35. Westaby D., Young A., O'Toole P. The provision of a percutaneously placed enteral tube feeding service. Gut. 2010; 59(12): 1592–1605.