Advances in Clinical Medicine 临床医学进展, 2024, 14(11), 881-887
Published Online November 2024 in Hans. https://www.hanspub.org/journal/acm
https://doi.org/10.12677/acm.2024.14112958

Hans汉斯

结直肠癌术后吻合口瘘的诊治进展

陈　鑫[1]，蒋正华[1]，许帮荣[2*]，梁道明[2*]

[1]昆明医科大学研究生院，云南　昆明
[2]昆明医科大学第二附属医院胃肠外科一病区，云南　昆明

收稿日期：2024年10月14日；录用日期：2024年11月7日；发布日期：2024年11月14日

摘　要

结直肠癌是消化道常见恶性肿瘤之一，其发病率正逐渐升高，目前，外科手术依然是结直肠癌能够治愈的基石，然而，术后并发症的预防及处理是能否治愈的关键。术后吻合口瘘是结直肠癌手术常见且严重的并发症，吻合口瘘的发生，将导致的严重后果包括：增加肿瘤复发率、患者死亡率、再次手术增加及住院时间延长等。本文将从吻合口瘘的危险因素、诊断、治疗及预后几个维度全面梳理结直肠癌术后吻合口瘘的最新诊治进展，旨在为临床医生提供实用的指导，以降低吻合口瘘的发生率，改善患者预后。

关键词

结直肠癌，术后并发症，吻合口瘘，诊治进展，预防及管理

Advances in Diagnosis and Treatment of Anastomotic Fistula after Colorectal Cancer

Xin Chen[1], Zhenghua Jiang[1], Bangrong Xu[2*], Daoming Liang[2*]

[1]Graduate School of Kunming Medical University, Kunming Yunnan
[2]The First Ward of Gastrointestinal Surgery Department, The Second Affiliated Hospital of Kunming Medical University, Kunming Yunnan

Received: Oct. 14th, 2024; accepted: Nov. 7th, 2024; published: Nov. 14th, 2024

Abstract

Colorectal cancer is one of the common malignancies of the digestive tract, and its incidence is gradually increasing. At present, surgery is still the cornerstone of a cure for colorectal cancer, however, the prevention and treatment of postoperative complications is the key to cure. Postoperative

*通讯作者。

文章引用: 陈鑫, 蒋正华, 许帮荣, 梁道明. 结直肠癌术后吻合口瘘的诊治进展[J]. 临床医学进展, 2024, 14(11): 881-887. DOI: 10.12677/acm.2024.14112958

anastomotic fistula is a common and serious complication of colorectal cancer surgery. The occurrence of anastomotic fistula will lead to many serious consequences, including increased recurrence rate of tumor, mortality of patients, increased reoperation and prolonged hospital stay. This article will comprehensively review the latest progress in the diagnosis and treatment of anastomotic fistula after colorectal cancer surgery from the risk factors, diagnosis, treatment and prognosis, aiming to provide practical guidance for clinicians to reduce the incidence of anastomotic fistula and improve the prognosis of patients.

Keywords

Colorectal Cancer, Postoperative Complications, Anastomotic Fistula, Diagnostic and Treatment Advancements, Prevention and Management

1. 概述

结直肠癌是全球第三大最常见的恶性肿瘤，仅次于乳腺癌和肺癌，其死亡率高居恶性肿瘤第四位，据全球癌症统计数据显示，结直肠癌每年新发病例约 120 万，死亡病例约 60 万，其死亡率和发病率正逐年上升[1] [2]。在中国，这一趋势同样严峻，我国结直肠癌发病率居所有肿瘤第 2 位，死亡率居第 4 位，据国家癌症中心数据显示，我国每年结直肠癌新发病例近 52 万，死亡病例近 24 万。目前结直肠癌的治疗主要以外科手术为主，同时辅以放化疗、靶向治疗及内分泌治疗等[3]。

吻合口瘘是结直肠癌手术最严重且常见的并发症之一，相关报道显示，目前术后吻合口瘘的发生率在结肠和直肠分别为 3%~7%和 13%~18%。吻合口瘘的发生，不仅增加了二次手术风险，还可能导致肿瘤复发率增加、住院时间延长，对患者的生存质量及预后产生严重影响[4]。因此，降低吻合口瘘的发生率，提高早期诊断率和优化治疗策略对于改善患者预后至关重要。

2. 吻合口瘘的危险因素

2.1. 术前因素

据相关研究报道，目前关于吻合口瘘术前危险因素主要包括：年龄、性别、肥胖、体重、营养状况、吸烟饮酒史、非甾体类抗炎药服用史、糖尿病病史、肠道机械准备、肿瘤大小、肿瘤分期、肿瘤远处转移、肿瘤距肛缘的距离、实验室检查结果、类固醇治疗、放化疗、术前口服抗生素等。Krarup、Jen-Kou 等人[5] [6]报道了年龄是吻合口瘘的风险因素，吻合口瘘发生率随年龄增长有所增加，但目前对年龄作为吻合口瘘危险因素没有确切证据。Jannasch、Arron 等人[7] [8]报道称性别是吻合口瘘的独立危险因素，男性的发生率是女性的 1.7 倍，这是由于男性骨盆较窄的原因，手术切除及吻合过程难度较大。Pommergaard、Richards 等人[4] [9]报道吸烟、饮酒史、肥胖、营养不良、糖尿病、术前实验室检查血清白蛋白降低、非甾体类抗炎药服用史、术前机械肠道准备、术前放化疗与吻合口瘘相关，这可能是由于吸烟引起的微血管病变导致的局部缺血所致，大量饮酒可能导致营养不良，糖尿病患者、术前体重减轻、营养不良和非甾体类抗炎药的使用是影响吻合口愈合的重要因素，术前机械肠道准备存在自身并发症，如脱水和电解质代谢紊乱和肠道菌群紊乱，术前放化疗通常用于晚期低位直肠癌的治疗，目前就术前放化疗与吻合口瘘的相关性研究证据尚不足。Samuel A、Antonio Sciuto [10]报道了肿瘤大小、肿瘤分期、肿瘤远处转移、

肿瘤距肛缘的距离与术后吻合口瘘存在相关性，其中肿瘤分期、肿瘤远处转移、肿瘤距肛缘的距离是吻合口瘘的独立危险因素。Yamamoto 报道了 BMI ≥ 35 是吻合口瘘的独立危险因素。Ziegler、Konish、Slieker 等人[11]-[13]发现类固醇治疗是吻合口瘘的风险因素，然而，Ziegler 认为这种条件只使用于糖尿病患者。Garfinkle、Yost 等人[14] [15]报道在术前肠道准备中使用口服抗生素可以降低结直肠手术后感染并发症和吻合口瘘的发生率。

2.2. 术中因素

大量研究报道了关于吻合口瘘相关的术中危险因素，其中包括手术及吻合方式、吻合口位置、手术时间、术中引流、术中肠系膜下动脉结扎方式、手术医师经验、预防性造口、大网膜成形术等。吻合口距肛门的位置是吻合口瘘的主要危险因素之一，大多数研究将低位直肠吻合定义为距肛缘 < 5 cm 或更短的吻合，Wei Zhang、Vahagn [16] [17]等人研究发现吻合口距离肛缘小于 7cm 吻合口瘘的独立危险因素，盆腔内吻合较腹腔内吻合的吻合口瘘发生率高。关于器械吻合和手动缝合对吻合口愈合的影响目前没有达成共识，Peeters 等人[18]发现吻合器和手工缝合与吻合口瘘的发生率没有关系。Zhang X、Chen H、Al-Mazrou 等人[19]-[21]研究表明腹腔镜手术、开放手术机器人结直肠手术术后吻合口瘘的发生率没有显著差异。Mrak 等人[22]研究发现术中无预防性造口的吻合口瘘发生几率和再次手术几率均显著升高。预防性盆腔引流预防性引流减少了腹膜外积液，限制了腹腔污染的风险，另一方面，在吻合失败的情况下，引流也可能有助于早期发现，从而促进术后管理，但预防性盆腔引流在降低结直肠手术后并发症发生率方面的作用仍存在争议，Menahem [23]发现腹膜外结直肠吻合术后预防性使用盆腔引流对吻合口瘘的发生率没有影响。[24] [25]多项研究报道因结直肠癌导致的肠梗阻或者腹膜炎而进行急诊手术切除被证明是吻合失败的独立风险因素，也是吻合口瘘后死亡的独立风险因素。Dana、Vahagn 等人[17] [26]发现手术时间超过 3 小时增加了吻合口瘘的发生率。关于手术医生经验对术后吻合口瘘发生率的影响，目前尚无确切证据。Tang X 等人[27]发现结扎肠系膜下动脉远端，保留左结肠动脉能够改善吻合口处血流灌注，有效降低吻合口瘘的发生率，然而，Boström P 等人[28]认为不同水平的肠系膜下动脉结扎对任何肿瘤结局都没有影响。关于术中行大网膜成形术，目前尚未达成共识，Hayari 等人[29]认为通过网膜包裹吻合口来预防吻合口瘘，为加强吻合口和改善新生血管形成提供额外支持。Nasiri 等人[30]研究表明网膜成形术后患者的吻合口瘘、术后感染和腹膜炎发生率显著降低。Ozben [31]认为该技术在降低吻合口瘘发生率方面无效。

2.3. 术后因素

关于吻合口瘘的术后危险因素包括辅助治疗、术后贫血、输血及抗生素使用。Dana M [32]认为贫血是吻合口瘘的风险因素，这是由于血红蛋白导致吻合口边缘的灌注和氧合有关。Renchun [33]认为输血可能诱导免疫抑制，从而增加吻合口周围感染的风险。因此通过术中精细操作，减少失血来避免不必要的输血显得格外重要。

3. 吻合口瘘的诊断

3.1. 临床表现与体征

一般来说，临床结直肠癌术后吻合口瘘的首发症状多为发热，部分患者术后体温正常，术后 5~7 天才出现发热，或者术后持续高温不退，继而出现局限性腹膜炎体征或直肠刺激征，表现出腹痛、腹胀、压痛、反跳痛等症状，严重时可导致脓毒血症等全身症状。另外，引流液性状也是吻合口瘘的重要预测指标，当引流液变现为脓性或者粪性时有一定的提示作用[34]。

3.2. 影像学检查

临床高度怀疑吻合口瘘的前提下，在治疗前并不总是需要正式诊断吻合口瘘。然而，在吻合口瘘更隐蔽的情况下，或者有诊断不确定性，影像学检查显得格外重要，以防止不必要的剖腹手术，最常用的成像技术是 CT 扫描和水溶性造影剂灌肠[35]。目前，放射成像技术已得到诸多大型临床研究的证实，现在已有近 30 年历史，研究表明水溶性造影剂灌肠技术在诊断吻合口瘘方面灵敏度高于 CT，并被证实是安全可靠的[36]。CT 和水溶性造影剂灌肠都有各自的优势和局限性，临床上将二者结合可能会有额外的收获。

3.3. 实验室检查

实验室检查是诊断结直肠癌术后吻合口瘘的重要辅助手段，目前相关研究表明：引流液培养、缺血生物标记物(如乳酸盐、丙酮酸盐和葡萄糖等)、血清 C 反应蛋白(CRP)、引流液检测白细胞介素-1b (IL-1b)、IL-6、表皮生长因子和血小板衍生生长因子、机制金属蛋白酶等对结直肠癌术后吻合口瘘诊断有一定价值，但未得到充分证实，在结合患者临床表现及体征的情况下有参考意义[37]。

4. 吻合口瘘的治疗

4.1. 非手术治疗

吻口瘘的治疗应根据其临床表现，包括患者一般情况和腹部体征等制定个体化治疗方案，一般情况下，对于明确诊断吻合口瘘的患者，在临床症状较轻，一般情况尚可的情况下，应该首先采取非手术治疗。非手术治疗主要包括：(1) 禁食与胃肠减压、肠外营养支持、积极抗感染等对症处理，改善患者全身状况[38]。(2) 引流与冲洗，充分有效的引流是控制腹腔感染的关键，保守治疗期间若出现盆腔脓肿，可行脓肿穿刺引流。对于全身状态好、吻合口瘘小(小于 1 cm)的早期瘘，经非手术治疗后吻合口瘘的情况可能会逐渐改善[39]。

4.2. 手术治疗

如果经保守治疗后患者出现持续发热，腹膜炎扩散，局部引流不畅，病情进一步加重，则采取二次手术治疗。手术过程中切除坏死吻合口处肠袢，行造瘘术转流肠内容物，生理盐水充分清洗腹盆腔脓液，放置引流管充分引流，具体造口术式目前尚未达成共识，应根据患者状态及术中情况决定。如患者为肿瘤复发伴吻合口瘘，应当早期结肠造口，以便及早行后续的化疗[40]。

5. 结直肠癌术后吻合口瘘的预防

鉴于术后吻合口瘘是多因素作用的结果，其预防策略主要从术前、术中及术后整个围手术期三个维度出发。

5.1. 术前预防

吻合口瘘的术前预防主要应该在于手术前准备及患者本身两方面。(1) 积极治疗患者基础疾病，纠正患者贫血、低蛋白血症、善患者营养状况、控制高血压和糖尿病等；(2) 积极术前准备，做好肠道清洁，减少术中不必要的感染，Rikke Bech Hansen 等人[41]研究表明术前机械性肠道准备和口服抗生素联合使用对降低术后吻合口瘘的发生有积极作用。Salem 等人[42]报道了结直肠癌手术患者使用肠道益生菌治疗对降低术后吻合口瘘有一定作用。

5.2. 术中及术后预防

手术过程是降低患者术后吻合口瘘发生率的关键环节，根据患者吻合口瘘发生的术中高危因素手术

医生应该操作精细，严密加固缝合，避免出现吻合口处狭窄，预防性使用腹盆腔引流管，若患者一般情况较差，吻合张力大，肠袢情况差时，可预防性造口，待患者一般情况恢复后行二期造口还纳。相关研究表明，大网膜成形术可有效预防术后吻合口瘘，可根据术中情况选择使用。M. Song 等人[43]研究发现术中使用吲哚菁绿色荧光成像对吻合口的严密缝合有一定优越性，可有效预防术后吻合口瘘的发生。Zhouqiao Wu 等研究表明，术中使用组织粘合剂对吻合口的愈合具有有利影响。引起吻合口瘘的重要原因是腹腔感染，术后应定期复查感染指标，及时发现尽早控制腹腔炎症。

6. 总结与展望

结直肠癌术后吻合口瘘是严重且常见的并发症，对患者的预后有很大影响。导致吻合口瘘的原因错综复杂，与患者本身、手术因素及术后管理密切相关，早期诊断及治疗是降低患者死亡率的关键因素。目前，吻合口瘘的诊断及治疗方法还有待提升，未来的研究应继续探索早期诊断的新型生物标志物，创新治疗手段，并深化对预防和术后管理的理解，以期最大程度降低患者死亡率，提高生活质量及远期预后。

基金项目

昆明医科大学研究生创新基金(2024S278)。

参考文献

[1] Dekker, E., Tanis, P.J., Vleugels, J.L.A., Kasi, P.M. and Wallace, M.B. (2019) Colorectal Cancer. *The Lancet*, **394**, 1467-1480. https://doi.org/10.1016/s0140-6736(19)32319-0

[2] Brenner, H., Kloor, M. and Pox, C.P. (2014) Colorectal Cancer. *The Lancet*, **383**, 1490-1502. https://doi.org/10.1016/s0140-6736(13)61649-9

[3] 郑荣寿, 陈茹, 韩冰峰, 等. 2022 年中国恶性肿瘤流行情况分析[J]. 中华肿瘤杂志, 2024, 46(3): 221-231.

[4] Pommergaard, H.-., Gessler, B., Burcharth, J., Angenete, E., Haglind, E. and Rosenberg, J. (2014) Preoperative Risk Factors for Anastomotic Leakage after Resection for Colorectal Cancer: A Systematic Review and Meta-Analysis. *Colorectal Disease*, **16**, 662-671. https://doi.org/10.1111/codi.12618

[5] Krarup, P.-., Jorgensen, L.N., Andreasen, A.H. and Harling, H. (2012) A Nationwide Study on Anastomotic Leakage after Colonic Cancer Surgery. *Colorectal Disease*, **14**, e661-e667. https://doi.org/10.1111/j.1463-1318.2012.03079.x

[6] Lin, J., Yueh, T., Chang, S., Lin, C., Lan, Y., Wang, H., *et al*. (2011) The Influence of Fecal Diversion and Anastomotic Leakage on Survival after Resection of Rectal Cancer. *Journal of Gastrointestinal Surgery*, **15**, 2251-2261. https://doi.org/10.1007/s11605-011-1721-5

[7] Jannasch, O., Klinge, T., Otto, R., Chiapponi, C., Udelnow, A., Lippert, H., *et al*. (2015) Risk Factors, Short and Long Term Outcome of Anastomotic Leaks in Rectal Cancer. *Oncotarget*, **6**, 36884-36893. https://doi.org/10.18632/oncotarget.5170

[8] Arron, M.N.N., Greijdanus, N.G., ten Broek, R.P.G., Dekker, J.W.T., van Workum, F., van Goor, H., *et al*. (2021) Trends in Risk Factors of Anastomotic Leakage after Colorectal Cancer Surgery (2011-2019): A Dutch Population-Based Study. *Colorectal Disease*, **23**, 3251-3261. https://doi.org/10.1111/codi.15911

[9] Richards, C.H., Campbell, V., Ho, C., Hayes, J., Elliott, T. and Thompson-Fawcett, M. (2012) Smoking Is a Major Risk Factor for Anastomotic Leak in Patients Undergoing Low Anterior Resection. *Colorectal Disease*, **14**, 628-633. https://doi.org/10.1111/j.1463-1318.2011.02718.x

[10] Käser, S.A., Mattiello, D. and Maurer, C.A. (2015) Distant Metastasis in Colorectal Cancer Is a Risk Factor for Anastomotic Leakage. *Annals of Surgical Oncology*, **23**, 888-893. https://doi.org/10.1245/s10434-015-4941-1

[11] Ziegler, M.A., Catto, J.A., Riggs, T.W., Gates, E.R., Grodsky, M.B. and Wasvary, H.J. (2012) Risk Factors for Anastomotic Leak and Mortality in Diabetic Patients Undergoing Colectomy. *Archives of Surgery*, **147**, 600-605. https://doi.org/10.1001/archsurg.2012.77

[12] Konishi, T., Watanabe, T., Kishimoto, J. and Nagawa, H. (2006) Risk Factors for Anastomotic Leakage after Surgery for Colorectal Cancer: Results of Prospective Surveillance. *Journal of the American College of Surgeons*, **202**, 439-444. https://doi.org/10.1016/j.jamcollsurg.2005.10.019

[13] Slieker, J.C., Komen, N., Mannaerts, G.H., Karsten, T.M., Willemsen, P., Murawska, M., *et al*. (2012) Long-Term and Perioperative Corticosteroids in Anastomotic Leakage. *Archives of Surgery*, **147**, 447-452. https://doi.org/10.1001/archsurg.2011.1690

[14] Garfinkle, R., Abou-Khalil, J., Morin, N., Ghitulescu, G., Vasilevsky, C., Gordon, P., *et al*. (2017) Is There a Role for Oral Antibiotic Preparation Alone before Colorectal Surgery? ACS-NSQIP Analysis by Coarsened Exact Matching. *Diseases of the Colon & Rectum*, **60**, 729-737. https://doi.org/10.1097/dcr.0000000000000851

[15] Yost, M.T., Jolissaint, J.S., Fields, A.C. and Whang, E.E. (2018) Mechanical and Oral Antibiotic Bowel Preparation in the Era of Minimally Invasive Surgery and Enhanced Recovery. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, **28**, 491-495. https://doi.org/10.1089/lap.2018.0072

[16] Zhang, W., Lou, Z., Liu, Q., Meng, R., Gong, H., Hao, L., *et al*. (2017) Multicenter Analysis of Risk Factors for Anastomotic Leakage after Middle and Low Rectal Cancer Resection without Diverting Stoma: A Retrospective Study of 319 Consecutive Patients. *International Journal of Colorectal Disease*, **32**, 1431-1437. https://doi.org/10.1007/s00384-017-2875-8

[17] Nikolian, V.C., Kamdar, N.S., Regenbogen, S.E., Morris, A.M., Byrn, J.C., Suwanabol, P.A., *et al*. (2017) Anastomotic Leak after Colorectal Resection: A Population-Based Study of Risk Factors and Hospital Variation. *Surgery*, **161**, 1619-1627. https://doi.org/10.1016/j.surg.2016.12.033

[18] Peeters, K.C.M.J., Tollenaar, R.A.E.M., Marijnen, C.A.M., Klein Kranenbarg, E., Steup, W.H., Wiggers, T., *et al*. (2005) Risk Factors for Anastomotic Failure after Total Mesorectal Excision of Rectal Cancer. *Journal of British Surgery*, **92**, 211-216. https://doi.org/10.1002/bjs.4806

[19] Zhang, X., Wu, Q., Hu, T., Gu, C., Bi, L. and Wang, Z. (2018) Laparoscopic versus Conventional Open Surgery in Intersphincteric Resection for Low Rectal Cancer: A Systematic Review and Meta-Analysis. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, **28**, 189-200. https://doi.org/10.1089/lap.2017.0495

[20] Chen, H., Ma, B., Gao, P., Wang, H., Song, Y., Tong, L., *et al*. (2017) Laparoscopic Intersphincteric Resection versus an Open Approach for Low Rectal Cancer: A Meta-Analysis. *World Journal of Surgical Oncology*, **15**, 229. https://doi.org/10.1186/s12957-017-1304-3

[21] Al-Mazrou, A.M., Chiuzan, C. and Kiran, R.P. (2017) The Robotic Approach Significantly Reduces Length of Stay after Colectomy: A Propensity Score-Matched Analysis. *International Journal of Colorectal Disease*, **32**, 1415-1421. https://doi.org/10.1007/s00384-017-2845-1

[22] Mrak, K., Uranitsch, S., Pedross, F., Heuberger, A., Klingler, A., Jagoditsch, M., *et al*. (2016) 315. Diverting Ileostomy versus No Diversion after Low Anterior Resection for Rectal Cancer: A Prospective, Randomized, Multicenter Trial. *European Journal of Surgical Oncology* (*EJSO*), **42**, S145. https://doi.org/10.1016/j.ejso.2016.06.211

[23] Menahem, B., Vallois, A., Alves, A. and Lubrano, J. (2017) Prophylactic Pelvic Drainage after Rectal Resection with Extraperitoneal Anastomosis: Is It Worthwhile? A Meta-Analysis of Randomized Controlled Trials. *International Journal of Colorectal Disease*, **32**, 1531-1538. https://doi.org/10.1007/s00384-017-2891-8

[24] Bakker, I.S., Grossmann, I., Henneman, D., Havenga, K. and Wiggers, T. (2014) Risk Factors for Anastomotic Leakage and Leak-Related Mortality after Colonic Cancer Surgery in a Nationwide Audit. *British Journal of Surgery*, **101**, 424-432. https://doi.org/10.1002/bjs.9395

[25] Choi, H., Law, W. and Ho, J.W.C. (2006) Leakage after Resection and Intraperitoneal Anastomosis for Colorectal Malignancy: Analysis of Risk Factors. *Diseases of the Colon & Rectum*, **49**, 1719-1725. https://doi.org/10.1007/s10350-006-0703-2

[26] Telem, D.A. (2010) Risk Factors for Anastomotic Leak Following Colorectal Surgery. *Archives of Surgery*, **145**, 371-376. https://doi.org/10.1001/archsurg.2010.40

[27] Tang, X., Zhang, M., Wang, C., He, Q., Sun, G. and Qu, H. (2021) Preservation of the Left Colic Artery and Superior Rectal Artery in Laparoscopic Surgery Can Reduce Anastomotic Leakage in Sigmoid Colon Cancer. *Journal of Minimal Access Surgery*, **17**, 208-212. https://doi.org/10.4103/jmas.jmas_15_20

[28] Boström, P., Hultberg, D.K., Häggström, J., Haapamäki, M.M., Matthiessen, P., Rutegård, J., *et al*. (2019) Oncological Impact of High Vascular Tie after Surgery for Rectal Cancer. *Annals of Surgery*, **274**, e236-e244. https://doi.org/10.1097/sla.0000000000003663

[29] Hayari, L., Hershko, D.D., Shoshani, H., Maor, R., Mordecovich, D. and Shoshani, G. (2004) Omentopexy Improves Vascularization and Decreases Stricture Formation of Esophageal Anastomoses in a Dog Model. *Journal of Pediatric Surgery*, **39**, 540-544. https://doi.org/10.1016/j.jpedsurg.2003.12.013

[30] Nasiri, S., Mirminachi, B., Taherimehr, R., Shadbakhsh, R. and Hojat, M. (2017) The Effect of Omentoplasty on the Rate of Anastomotic Leakage after Intestinal Resection: A Randomized Controlled Trial. *The American Surgeon™*, **83**, 157-160. https://doi.org/10.1177/000313481708300215

[31] Ozben, V., Aytac, E., Liu, X. and Ozuner, G. (2016) Does Omental Pedicle Flap Reduce Anastomotic Leak and Septic

Complications after Rectal Cancer Surgery? *International Journal of Surgery*, **27**, 53-57. https://doi.org/10.1016/j.ijsu.2015.12.070

[32] Hayden, D.M., Mora Pinzon, M.C., Francescatti, A.B. and Saclarides, T.J. (2015) Patient Factors May Predict Anastomotic Complications after Rectal Cancer Surgery. *Annals of Medicine & Surgery*, **4**, 11-16. https://doi.org/10.1016/j.amsu.2014.12.002

[33] Lai, R., Lu, Y., Li, Q., Guo, J., Chen, G. and Zeng, W. (2012) Risk Factors for Anastomotic Leakage Following Anterior Resection for Colorectal Cancer: The Effect of Epidural Analgesia on Occurrence. *International Journal of Colorectal Disease*, **28**, 485-492. https://doi.org/10.1007/s00384-012-1585-5

[34] Yun, J., Cho, Y.B., Park, Y.A., Huh, J.W., Yun, S.H., Kim, H.C., *et al*. (2015) Clinical Manifestations and Risk Factors of Anastomotic Leakage after Low Anterior Resection for Rectal Cancer. *ANZ Journal of Surgery*, **87**, 908-914. https://doi.org/10.1111/ans.13143

[35] Hyman, N.H. (2009) Managing Anastomotic Leaks from Intestinal Anastomoses. *The Surgeon*, **7**, 31-35. https://doi.org/10.1016/s1479-666x(09)80064-4

[36] Shorthouse, A.J., Bartram, C.I., Eyers, A.A. and Thomson, J.P.S. (1982) The Water Soluble Contrast Enema after Rectal Anastomosis. *Journal of British Surgery*, **69**, 714-717. https://doi.org/10.1002/bjs.1800691210

[37] Hirst, N.A., Tiernan, J.P., Millner, P.A. and Jayne, D.G. (2014) Systematic Review of Methods to Predict and Detect Anastomotic Leakage in Colorectal Surgery. *Colorectal Disease*, **16**, 95-109. https://doi.org/10.1111/codi.12411

[38] Rondelli, F., Reboldi, P., Rulli, A., Barberini, F., Guerrisi, A., Izzo, L., *et al*. (2009) Loop Ileostomy versus Loop Colostomy for Fecal Diversion after Colorectal or Coloanal Anastomosis: A Meta-Analysis. *International Journal of Colorectal Disease*, **24**, 479-488. https://doi.org/10.1007/s00384-009-0662-x

[39] Klink, C.D., Lioupis, K., Binnebösel, M., Kaemmer, D., Kozubek, I., Grommes, J., *et al*. (2011) Diversion Stoma after Colorectal Surgery: Loop Colostomy or Ileostomy? *International Journal of Colorectal Disease*, **26**, 431-436. https://doi.org/10.1007/s00384-010-1123-2

[40] Doeksen, A. (2007) Factors Determining Delay in Relaparotomy for Anastomotic Leakage after Colorectal Resection. *World Journal of Gastroenterology*, **13**, 3721. https://doi.org/10.3748/wjg.v13.i27.3721

[41] Hansen, R.B., Balachandran, R., Valsamidis, T.N. and Iversen, L.H. (2023) The Role of Preoperative Mechanical Bowel Preparation and Oral Antibiotics in Prevention of Anastomotic Leakage Following Restorative Resection for Primary Rectal Cancer—A Systematic Review and Meta-Analysis. *International Journal of Colorectal Disease*, **38**, Article No. 129. https://doi.org/10.1007/s00384-023-04416-7

[42] Bajramagic, S., Hodzic, E., Mulabdic, A., Holjan, S., Smajlovic, S. and Rovcanin, A. (2019) Usage of Probiotics and Its Clinical Significance at Surgically Treated Patients Sufferig from Colorectal Carcinoma. *Medical Archives*, **73**, 316-320. https://doi.org/10.5455/medarh.2019.73.316-320

[43] Song, M., Liu, J., Xia, D., Yao, H., Tian, G., Chen, X., *et al*. (2020) Assessment of Intraoperative Use of Indocyanine Green Fluorescence Imaging on the Incidence of Anastomotic Leakage after Rectal Cancer Surgery: A Prisma-Compliant Systematic Review and Meta-Analysis. *Techniques in Coloproctology*, **25**, 49-58. https://doi.org/10.1007/s10151-020-02335-1