

Surgical management of Stapfer Type 2 ERCP perforations

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ABSTRACT

BACKGROUND: While numerous studies have proposed algorithms for the management of Stapfer Type 2 ERCP perforations, there is limited research on surgical treatment options specifically for this patient group. Our aim is not to propose a new algorithm for these patients but to describe our surgical approach and contribute to the literature with our surgical procedure applied in Stapfer Type 2 ERCP perforation cases.

METHODS: Between 2016 and 2023, a total of 12 patients with Stapfer Type 2 ERCP perforations underwent surgery at our hospital. Duodenal diverticulization is a commonly used method in complex duodenal perforation cases. We performed a procedure that involves the removal of the external biliary pathway, hepaticojejunostomy, and a wide Braun anastomosis in addition to the duodenal diverticulization procedure, which we have termed "modified duodenal diverticulization."

RESULTS: Eleven out of the 12 patients were discharged successfully without any complications. One patient, who had a late diagnosis, underwent surgery 5 days after ERCP. This patient had ongoing sepsis before the operation, which continued postoperatively and eventually led to multiple organ failure and death.

CONCLUSION: There are limited alternatives for the surgical treatment of Type 2 ERCP perforations, and the widely preferred triple ostomy method may not address the underlying pathology necessitating ERCP. The modified duodenal diverticulization method, offering a definitive treatment, can be considered a surgical option for Type 2 ERCP perforations.

Keywords: ERCP; management; Stapfer Type 2; surgical.

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) plays a significant role in the treatment of jaundice associated with gallstones and other types of obstructions. While generally considered a safe procedure, it still carries a significant risk of complications.^[1,2] Perforation, although not the most common, is one of the serious complications of ERCP. The Stapfer classification system is commonly preferred to classify ERCP perforations (Fig. 1). Periampullary injury resulting in retro-

peritoneal duodenal perforation is classified as Stapfer Type 2. Type 2 perforations are the most frequently encountered among ERCP perforations. While there are numerous studies focusing on the treatment options for Stapfer Type 2 ERCP perforations, the number of studies specifically addressing surgical treatment options is limited. There are many studies providing algorithms for the choice between conservative and surgical treatment options in these patients.^[3,4] However, our aim is not to propose a new algorithm for this patient group but rather to present our surgical approach and contribute

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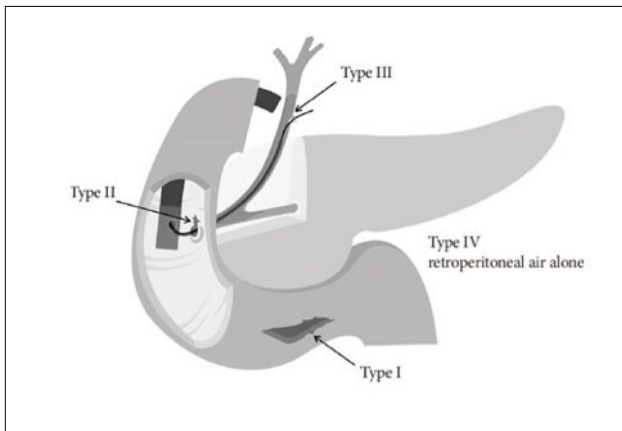


Figure 1. Type I, lateral or medial small bowel wall perforations located away from the ampulla; Type II, peri-Vaterian; Type III, bile duct; Type IV, retroperitoneal air only (3).

to the literature by describing the surgical procedure we have applied in Stapfer Type 2 ERCP perforation cases.

MATERIALS AND METHODS

Between 2016 and 2023, a total of 12 patients with Stapfer Type 2 ERCP perforations underwent surgery at our hospital. Patients who were treated conservatively and discharged were not included in the study. Surgical records were retrospectively reviewed. Ethical approval was obtained from the Aydın Adnan Menderes University Clinical Research and Ethical Committee with the number 2023/184.

Surgical Technique

In these patients, we pursued three primary objectives with our surgical methods. The first goal was to prevent the passage of bile into the duodenum, the second was to remove gastric contents, and the third was to create a controlled fistula by placing a T-tube inside the duodenum to divert pancreatic secretions away from the perforation site and change the direction of the leak. Postoperative administration of somatostatin analogs was intended to minimize the amount of leakage through the T-tube by reducing pancreatic secretion, facilitating the formation of a controlled fistula. To achieve these objectives, we performed pyloric exclusion and a wide Braun anastomosis to decrease duodenal pressure, removed the external biliary pathway, and performed a hepaticojejunostomy. A T-tube was placed through the posterior wall of the duodenum (Fig. 2).

RESULTS

A total of 12 patients participated in this study, consisting of 8 males and 4 females, with a mean age of 62.5 years (range: 41-77). All patients were referred to our facility from the gastroenterology clinic for surgical intervention. The referrals were primarily made due to the presence of retroperitoneal air and significant subcutaneous emphysema in the early post-ERCP period or retroperitoneal abscess, general deterioration, and

a substantial increase in acute-phase reactants during late follow-ups after ERCP complications.

During intraoperative examinations, it was determined that none of the patients with Stapfer type 2 perforations were suitable candidates for primary repair due to the location of the injury. Out of the 12 patients who underwent surgery, 11 were successfully discharged without any complications. Unfortunately, one patient had a fatal outcome. Notably, there were no signs of massive subcutaneous emphysema or acute abdomen in the early post-ERCP period for this patient. However, increased acute-phase reactants, a decline in the general condition, and inadequate drainage of the retroperitoneal abscess during follow-up necessitated consultation with our team. This patient was in a septic condition before the surgery and underwent the operation on the 5th day after ERCP.

DISCUSSION

The mortality rate after ERCP-related perforation is high. Scarlett and Falk conducted a study on a large series of 11,228 ERCP cases and found a cumulative incidence of duodenal perforation to be 1.1%.^[4] Surgical intervention was required in 40.8% of perforations, and the overall mortality rate was 18.3% (highest: 35%). In this study series, the surgical mortality rate was found to be 16.7%. Advanced age and concurrent chronic medical conditions, along with a low tolerance for emergency surgery, are indicators of poor surgical outcomes.^[5]

There are two approaches to Stapfer type 2 perforations. The first approach involves stent placement, drainage of the abscess through interventional methods, and antibiotic therapy if possible, if the perforation is detected during ERCP. Those who support this approach argue that it is preferable in elderly patients and those with additional comorbidities, considering the low tolerance for emergency surgery and the possibility of achieving successful outcomes with conservative treatment in these patients. However, this approach carries a significant risk of mortality and morbidity. Therefore, many doctors oppose conservative approaches in upper gastrointestinal system perforations, addressing their ineffectiveness in controlling intra-abdominal sepsis.^[6] In a study reviewing 80 perforations, increased mortality was observed in patients diagnosed with perforation more than 24 hours after ERCP and experiencing delayed surgical intervention.^[7] In the delayed surgery group, all deaths were attributed to sepsis or multiorgan failure.

The second approach is to perform surgery on these patients without allowing the development of factors that would decrease the chance of success, such as sepsis settling in, the development of multi-organ failure, and the progression of local inflammation. Our purpose in writing this article is not to debate whether conservative or surgical methods are better, but rather to present the surgical technique we applied in patients for whom a surgical decision was made.

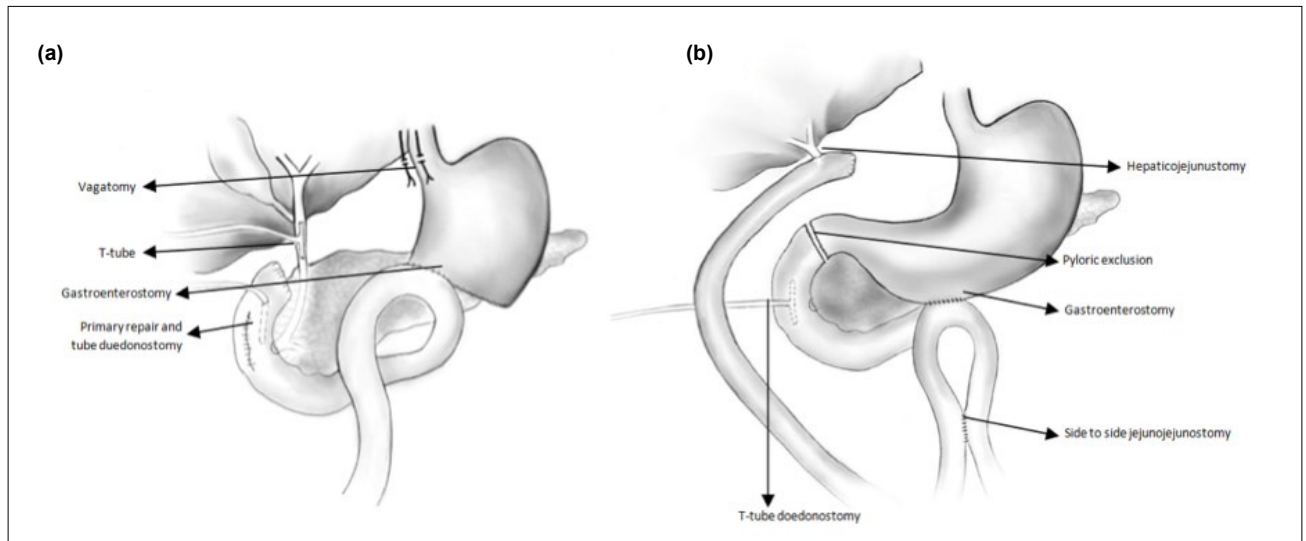


Figure 2. Duodenal diverticulization (a), Modified duodenal diverticulization (b).

ERCP-related peri-Vaterian duodenal or type II perforations can be difficult to diagnose. Patients with type 2 perforation who do not develop major subcutaneous emphysema or acute abdomen are typically a group of patients with delayed diagnosis and treatment.^[8] Due to the localization of the perforation in Stapfer type 2 perforation patients, primary repair is generally not feasible. The classical method preferred in patients requiring surgery is the triple ostomy method, which was described by Stone and Fabian.^[9] This technique includes primary repair of the duodenal injury, opening of a gastrostomy for decompression, retrograde duodenostomy for drainage of the duodenum, and antegrade jejunostomy for nutrition. This technique aims to quickly control the leakage in ERCP perforations, but there is no definitive surgical approach to address other causes that may cause ERCP-related injury in the first place, in this technique.

Duodenal diverticulization was described by Berne et al. in 1968 as a surgical technique for complicated duodenal and pancreatic injuries.^[10] This technique involves primary repair of the duodenal injury, tube duodenostomy, gastric antrectomy, gastrojejunostomy, vagotomy, and placement of a T-tube in the common bile duct (Fig. 2a). Due to its long duration and complexity, it has lost popularity. However, in patients with type 2 ERCP perforation, we perform a modified duodenal diverticulization procedure, which involves removing the extrahepatic bile duct, pyloric exclusion instead of antrectomy, creating a wide Braun anastomosis, and performing hepaticojejunostomy. Vagotomy, which is included in classical duodenal diverticulization, is not performed in our technique (Fig. 2b). The purpose of creating a wide Braun anastomosis in our technique is to prevent complications such as alkaline reflux gastritis in these patients, as the underlying causes of ERCP perforation in most cases are benign, and to contribute to duodenal decompression in patients with a long-term life expectancy.

The presence of difficult-to-extract stones in the extrahepatic bile duct is a risk factor in Stapfer type 2 injuries. In general, additional procedures are required for stones in the extrahepatic bile duct. Therefore, if the triple ostomy method is preferred in type 2 perforation patients, a second procedure specifically for stone extraction will be required in the future because the stones in the extrahepatic bile duct have not been removed. With the modified duodenal diverticulization method, the extrahepatic bile duct is removed, and hepaticojejunostomy is performed, eliminating the need for additional surgical procedures in these patients. Additionally, out of our 12 patients, 6 had stones that could not be removed with ERCP and were obstructing the common bile duct. Therefore, even if perforation had not occurred in these cases, considering that these patients would have required a hepaticojejunostomy or repeated ERCP, the fact that the patients underwent definitive surgery in the method we described can also be argued as an advantage over triple ostomy.

Preventing ERCP perforation is an ideal but unrealistic goal. Identifying predictors of procedural complications and carefully selecting cases that are consistent with endoscopist experience will further reduce the risk.^[11,12] Among the 12 patients we operated on due to perforation, one resulted in mortality. This patient, who had comorbidities and presented with sepsis at the time of surgery, was decided to have a surgery after a significant increase in acute-phase reactants and persistent abdominal pain during follow-up after the ERCP procedure and was operated on approximately 5 days after ERCP. Despite the surgery, the sepsis condition did not improve and led to the patient's death. This demonstrates how the situation can turn catastrophic when things do not go well after ERCP perforations.

CONCLUSION

Considering the promising outcomes associated with modi-

fied duodenal diverticulization and the potential for a catastrophic course with conservative treatment, we believe that a more proactive approach should be taken in making surgical decisions for patients with Stapfer Type 2 perforations. Early diagnosis and prompt perforation evaluation, as well as effective coordination between the endoscopist and surgeon, can be life-saving.

Ethics Committee Approval: This study was approved by the Aydin Adnan Menderes University Medical Faculty Ethics Committee (Date: 23.10.2023, Decision No: 2023/184).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: B.C.; Design: A.D.U.; Supervision: O.A.; Resource: E.B.C.; Materials: E.B.C.; Data collection and/or processing: U.U.S.; Analysis and/or interpretation: U.U.S.; Literature search: M.C.C.; Writing: U.U.S.; Critical review: O.A., E.B.C.

Conflict of Interest: None declared.

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REFERENCES

1. Talukdar R. Complications of ERCP. *Best Pract Res Clin Gastroenterol* 2016;30:793–805. [CrossRef]
2. Galeazzi M, Mazzola P, Valcarcel B, Bellelli G, Dinelli M, Pasinetti GM, et al. Endoscopic retrograde cholangiopancreatography in the elderly: results of a retrospective study and a geriatricians' point of view. *BMC Gastroenterol* 2018;18:38. [CrossRef]
3. Park SM. Recent advanced endoscopic management of endoscopic retrograde cholangiopancreatography related duodenal perforations. *Clin Endosc* 2016;49:376–82. [CrossRef]
4. Scarlett PY, Falk GL. The management of perforation of the duodenum following endoscopic sphincterotomy: a proposal for selective therapy. *Aust N Z J Surg* 1994;64:843–6. [CrossRef]
5. Pedersen T. Complications and death following anaesthesia. A prospective study with special reference to the influence of patient-, anaesthesia- and surgery-related factors. *Dan. Med. Bull* 1994;41:319–31.
6. Crofts TJ, Park KG, Steele RJ, Chung SS, Li AK. A randomized trial of non operative treatment for perforated peptic ulcer. *N Engl J Med* 1989;320:970–3. [CrossRef]
7. Bell RCW, Steigmann GV, Goff J, Reveille M, Norton L, Pearlman NW. Decision for surgical management of perforation following endoscopic sphincterotomy. *Am Surg* 1991;57:237–40.
8. Sarr MG, Fishman EK, Milligan FD, Siegelman SS, Cameron JL. Pancreatitis or duodenal perforation after peri-Vaterian therapeutic endoscopic procedures: diagnosis, differentiation, and management. *Surgery* 1986;100:461–6.
9. Stone HH, Fabian TC. Management of duodenal wounds. *J Trauma* 1979;19:334–9. [CrossRef]
10. Berne CJ, Donovan AJ, White EJ, Yellin AE. Duodenal "diverticulization" for duodenal and pancreatic injury. *Am J Surg* 1974;127:503–7. [CrossRef]
11. Enns R, Eloubeidi MA, Mergener K, Jowell PS, Branch MS, Pappas TM, et al. ERCP-related perforations: risk factors and management. *Endoscopy* 2002;34:293–8. [CrossRef]
12. Huijbregtse K. Complications of endoscopic sphincterotomy and their prevention. *N Engl J Med* 1996;335:961–3. [CrossRef]

ORJİNAL ÇALIŞMA - ÖZ

Stapfer Tip 2 ERCP perforasyonlarda cerrahi yönetim

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AMAÇ: Stapfer tip 2 ERCP perforasyonlarının yönetimi için birçok çalışma algoritma önermişken, bu hasta grubu için özellikle cerrahi tedavi seçenekleri konusunda sınırlı araştırma bulunmaktadır. Amacımız, bu hastalar için yeni bir algoritma önermek değil, Stapfer tip 2 ERCP perforasyon vakalarında uyguladığımız cerrahi yaklaşımımızı tanımlamak ve literatüre katkıda bulunmaktır.

GEREÇ VE YÖNTEM: 2016 ile 2023 yılları arasında, hastanemizde toplam 12 Stapfer tip 2 ERCP perforasyonlu hasta cerrahi tedavi gördü. Kompleks duodenal perforasyon vakalarında sıkça kullanılan bir yöntem duodenal divertikülasyon prosedürüdür. Biz, duodenal divertikülasyon prosedürünün yanı sıra dış safra yolunun çıkarılmasını, hepatojejunostomi ve geniş bir Braun anastomozunu içeren bir işlem gerçekleştirdik ve bu yöntemi "modifiye duodenal divertikülasyon" olarak adlandırdık.

BULGULAR: 12 hastanın 11'i komplikasyon olmaksızın başarılı bir şekilde taburcu edildi. Bir hasta ise geç tanı alması sebebi ile ERCP'den 5 gün sonra ameliyat edildi. Bu hasta, ameliyat öncesinde mevcut olan ve ameliyat sonrası da devam eden sepsis sonucu çoklu organ yetmezliğine bağlı yaşamını yitirdi.

SONUÇ: Tip 2 ERCP perforasyonlarının cerrahi tedavisi için sınırlı alternatifler bulunmaktadır ve genellikle tercih edilen üçlü ostomi yöntemi, ERCP gerektiren temel patolojiyi ortadan kaldırmayabilir. Modifiye duodenal divertikülasyon yöntemi, definitif bir tedavi sunmaktadır ve tip 2 ERCP perforasyonlarında cerrahi bir seçenek olarak düşünülebilir.

Anahtar sözcükler: ERCP, stapfer tip 2, cerrahi, yönetim

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