

# Novel treatment by Roux-en-Y duodenojejuno-stomy for perforated duodenum diverticulum

## Naujas perforavusio dvylikapirštės žarnos divertikulo gydymas atliekant *Roux-en-Y* duodenojejunostomiją

Audrius Šileikis<sup>1</sup>, Auksė Šileikytė<sup>2</sup>

<sup>1</sup> *Vilniaus universiteto Gastroenterologijos, nefrourologijos ir chirurgijos klinika, Abdominalinės chirurgijos centras, Santariškių g. 2, LT-08661 Vilnius, Lietuva*

<sup>2</sup> *Vilniaus universiteto Medicinos fakultetas, M. K. Čiurlionio g. 21, LT-03101 Vilnius, Lietuva*  
*El. paštas: audrius.sileikis@santa.lt*

<sup>1</sup> *Vilnius University, Clinic of Gastroenterology, Nephrourology and Surgery, Center of Abdominal Surgery, Santariškių Str. 2, LT-08661 Vilnius, Lithuania*

<sup>2</sup> *Vilnius University, Faculty of Medicine, M. K. Čiurlionio Str. 21, LT-03101 Vilnius, Lithuania*  
*E-mail: audrius.sileikis@santa.lt*

---

Duodenum diverticulum is the most common site for diverticular disease of small intestine. Symptomatic duodenal diverticulum are 1% to 5%, which present with pain, bleeding, inflammation, cholestasis, cholangitis, obstruction, perforation, pancreatitis, or malignant transformation. The most difficult complication is perforation – 0.03%. Once duodenal diverticulitis perforation has been diagnosed, traditional management has been simple diverticulectomy and two layer closure of the duodenum with drainage of the retroperitoneum. However, nowadays there is increase in case reports of successful conservative and different surgical treatment. We present our experience by treating duodenal diverticulitis with simple diversion by Roux-en-Y duodenojejunostomy according to Shigeru Fujisaki after unsuccessful conservative treatment.

**Key words:** duodenum diverticulitis, perforation, treatment

---

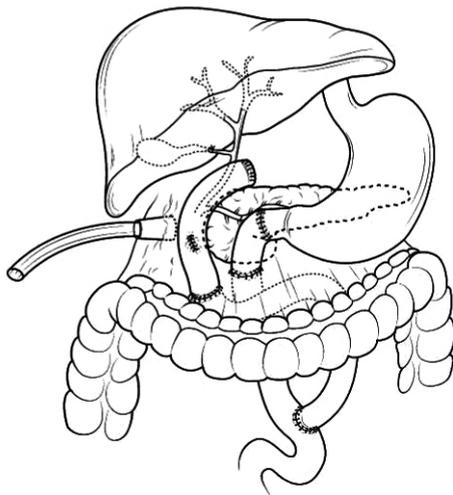
Dvylikapirštės žarnos divertikulai yra dažniausia divertikuliozės vieta plonojoje žarnoje. Nuo 1 % iki 5 % tokių divertikulų yra simptominiai ir pasireiškia skausmu, kraujavimu, uždegimu, cholestaze, cholangitu, obstrukcija, perforacija, pankreatitu ar piktybine transformacija. Pati sudėtingiausia komplikacija yra perforacija, kuri sudaro 0,03 %. Diagnozavus dvylikapirštės žarnos divertikulo perforaciją, tradicinis gydymas buvo paprasta divertikulektomija ir dvylikapirštės žarnos užsiuvimas dviem sluoksniais su retroperitoninio tarpo drenavimu. Pastaruoju metu aprašoma vis daugiau sėkmingų konservatyvaus ir kitokio chirurginio gydymo atvejų. Mes aprašome savo patirtį, susijusią su dvylikapirštės žarnos divertikulito gydymu atliekant *Roux-en-Y* duodenojejunostomiją Shigeru Fujisaki metodu po nesėkmingo konservatyvaus gydymo.

**Reikšminiai žodžiai:** dvylikapirštės žarnos divertikulas, perforacija, gydymas

---

## Introduction

Duodenum diverticulum is the most common site for diverticular disease of small intestine. The entity was first reported by Chomel in 1710 and the first well documented report was by Morgagni in 1762 [1]. Duodenal diverticulum is usually an acquired lesion. Sixty percent of patients are older than 40 years old and predominantly occurs in women [2, 3]. The most frequent location is the second (62%) and third (30%) portions of the duodenum [4,5]. Symptomatic duodenal diverticulum are from 1% to 5%, which present with pain, bleeding, inflammation, cholestasis, cholangitis, obstruction, perforation, pancreatitis, or malignant transformation [2,



**Figure 1.** The image shows the findings after reconstruction and drainage. The second portion of the duodenum is mobilized from its retroperitoneal attachments, and a perforated site is identified. Reconstruction is achieved by applying Critclow's method to the pancreaticobiliary complications of the duodenal diverticulum. The Roux limb is brought through the mesocolon, the duodenojejunostomy completed, and the mesentery closed. The gallbladder is removed. A drainage tube is placed near the perforated site [11].

4, 5]. The most difficult complication is perforation – 0.03%. The supposed causes of perforation are multiple and include enterolithiasis, ulceration, trauma, foreign body and most frequently ischemia due to distention related to food retention inside the diverticulum [4–9]. In two-thirds of cases, the duodenal diverticulum per-

forates into the retroperitoneum adjacent to the second portion of the duodenum [4].

Forsell and Cey performed the first open surgical treatment for complicated duodenal diverticulum in 1915. Usually perforation of duodenal diverticulitis is treated by simple diverticulectomy and two layer closure of the duodenum with drainage of the retroperitoneum [3, 4]. Unfortunately this operation has high postoperative morbidity and mortality. The main postoperative complication of diverticulectomy is duodenal leak or fistula, which carries up to a 13% to 30% mortality rate [3, 4].

Nowadays surgical treatment is reserved for failure of endoscopic or conservative therapy [3, 4].

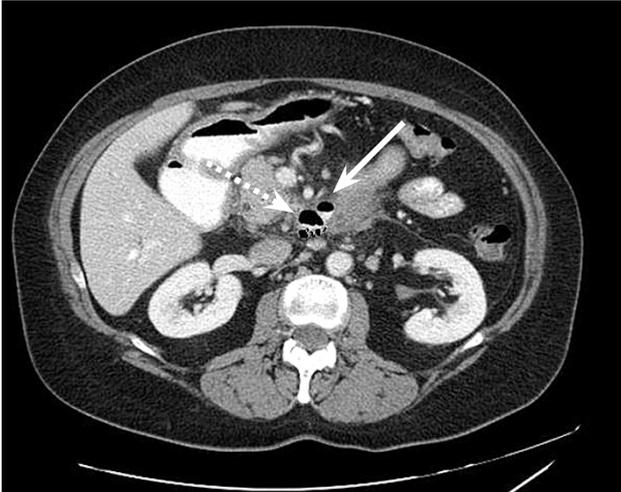
Conservative treatment of perforated duodenal diverticulum based on fasting with bowel rest with or without nasogastric suction, intravenous fluid hydration or total parenteral nutrition, and broad-spectrum antibiotics [4, 7, 10].

We present our experience by treating duodenal diverticulitis which was perforated in a second portion of duodenum. At this case conservative treatment was not effective and the patient was successful treated with simple diversion by Roux-en-Y duodenojejunostomy according to Shigeru Fujisaki [11] (Figure 1).

## Case report

One year ago, a 55 years old woman was admitted to regional hospital due to nausea, vomiting, fever and acute abdomen pain. Peritonitis was suspected and a diagnostic laparoscopy was performed. Some serous fluid in abdomen was found. On arrival the patients amylase in blood was increased more than 300 U/L and acute pancreatitis after exploration was diagnosed. Therefore the woman was treated with intravenous infusions and antibiotics by one week and was recovered.

After one year the same symptoms recurred – acute abdominal pain, fever, vomiting and increased amylase more than 500 U/L. Following a diagnostic computed tomography (CT), a cancer of duodenum was suspected. When the acute abdomen pain passed and after the same conservative treatment the patient was transferred to a third level hospital for a more accurate diagnosis and treatment. After the reevaluation of CT scans duodenum cancer was denied and patient was diagnosed with diverticulitis – one diverticulum with perforation in



**Figure 2.** Dotted line marked perforation of diverticulum in second portion of duodenum and with arrow marked diverticulum without perforation in third portion of duodenum.

second portion of duodenum and another one without perforation in third portion of duodenum (Figure 2).

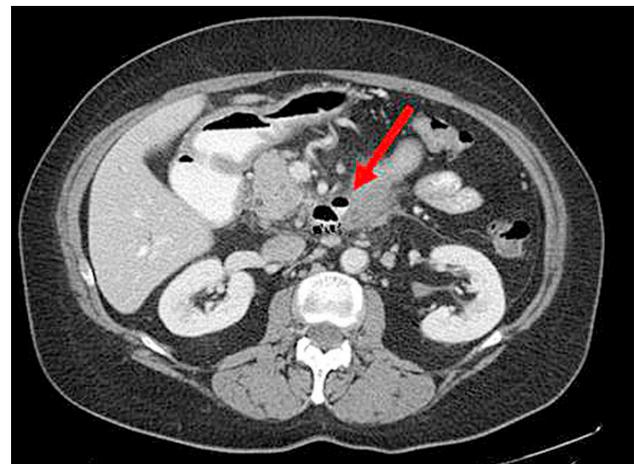
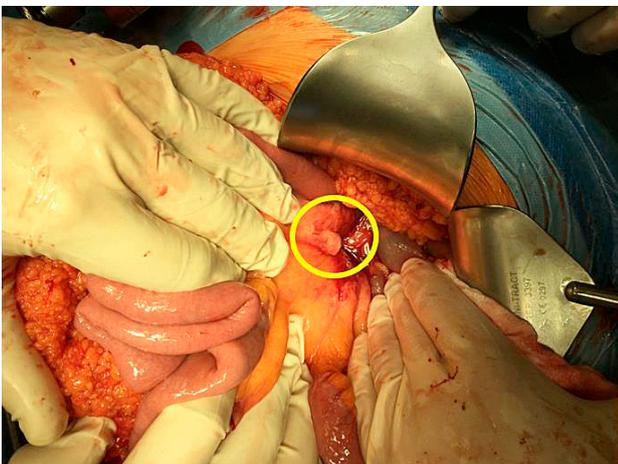
Conservative treatment was started: radio guided feeding tube was inserted behind diverticulum also intravenous infusions and antibiotics was applied.

Unfortunately the patients health condition has not recovered – within two weeks patient had two abdomen pain attacks with fever, amilazemia and still could not

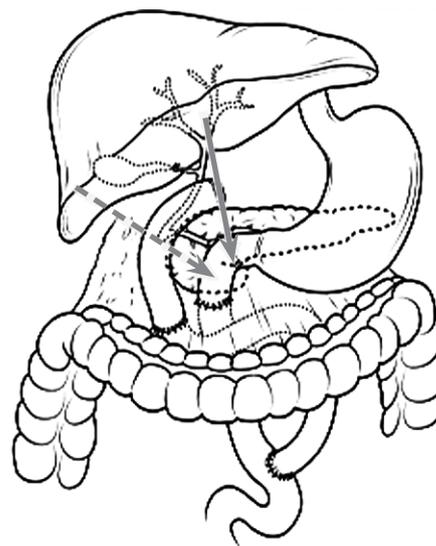
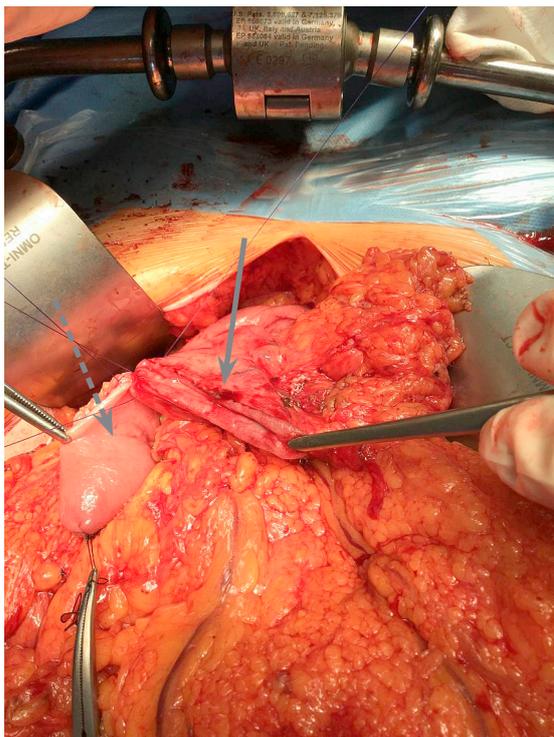
eat.

Conservative treatment was not effective. Therefore was decided to do less risky operation – a simple diversion by duodenojejunostomy for a retroperitoneal perforation of the second portion of the duodenal diverticulum, because diverticulectomy with drainage of the retroperitoneum have a lot of complications.

The duodenum was mobilized by Kocher maneuver. Due to huge infiltration of peripancreatic region visualization of the second portion of duodenum diverticulum was impossible. Only diverticulum in the third portion of duodenum was visualized (Figure 3). A Roux-en-Y loop of the jejunum was brought through a rent in the transverse mesocolon. Two cm below pylorus duodenum was transected and the distal stump oversewn. The Roux-en-Y of the jejunum was then anastomosed end-to-site to the duodenum (Figure 4) and a jejunojunctionostomy was created 40 cm distal to the duodenojejunostomy. An enteral feeding tube was inserted. The mesentery was then carefully closed about the jejunum. An abdominal drainage tube was placed near the diverticulum site in Kocher mobilization place. The patient tolerated operation well and was discharged from the hospital in good condition after two weeks. Patient condition was followed one year – relapse was unidentified.



**Figure 3.** During exploration in a third portion of duodenum was found not perforated diverticulum that marked with arrow in computed tomography.



**Figure 4.** The Roux-en-Y of the jejunum was then anastomosed end-to-site to the duodenum. Dotted line marked jejunum and arrow marked anastomosis of jejunum and pylorus.

## Discussion

Once duodenal diverticulitis perforation has been diagnosed, traditional management has been surgical.

Nowadays there is increase in case reports of successful conservative treatment. Shackleton was the first to describe the conservative management of perforated duodenal diverticulitis. Increasingly widespread, for selected patients, treatment is based on gut rest, nasogastric tube, parenteral nutrition, broad spectrum intravenous antibiotics and monitoring [12]. Non-operative treatment should be considered for patients who present with mild symptoms and whose leak is shown by CT to be contained. But if these patients deteriorate clinically, they must undergo surgical intervention [12].

Surgical procedures depend on the clinical situation and intraoperative findings. If inflammation permits, usually the treatment of choice is diverticulectomy with single or double-layer of retroperitoneal space [7, 9]. On the other hand, when it is difficult to achieve closure of duodenum diverticulum site easily and difficult to resect, primary closure of diverticulum is not always

safe or feasible, and the optimal surgical procedure has been not established.

Other choice to remove the duodenal diverticulum can be Whipple procedures. However, sometimes the patient's condition deteriorates due to progressive sepsis, so we should avoid excessive invasive operations such as Whipple procedures. By the way for most of patients with a local inflammation and infiltration, as in our case, this procedure technically is impossible.

Miller *et al* recommended diversion of gastric and biliary flow away from the duodenum [13]. This can be accomplished by stapling or suturing, closing the distal pyloric channel, decompression of the biliary tree with an externally draining common bile duct T-tube, and the creation of an externalized tube duodenostomy. Gastrointestinal continuity can be restored with a gastrojejunostomy. However, this procedure is rather complicated.

We prefer simple Roux-en-Y diversion by duodenojejunostomy for the treatment of duodenal diverticulum retroperitoneal perforation described by Shigeru Fujisaki in 2014 [11]. Use of this simple technique prevents gastric juice flows into the duodenum. As a result, a patient may be able to start eating meals sooner

postoperatively, regardless of whether the resected site is recovered [14].

On the other hand, the disadvantage is that the diverticulum site may be less likely to be healed, and that duodenal fistula may more easily develop. However, as long as a drainage tube is set up properly near the diverticulum site in the abdominal cavity, major complications will hardly occur. In our case, the patient's general condition was stable after surgery and oral intake was started early.

## REFERENCES

1. Dan D, Bascombe N, Maharaj R, Hariharan S, Naraynsingh V. Laparoscopic diverticulectomy for massive hemorrhage in a duodenal diverticulum. *Surg Laparosc Endosc Percutan Technol.* 2012; 22: e39–e41.
2. Graur F, Bala O, Bodea R. Laparoscopic resection of duodenal diverticulum. A case report. *Rom J Gastroenterol.* 2005; 14: 405–8.
3. Ekici Y, Moray G. Large duodenal diverticula treated by laparoscopic surgical excision: a case report. *J Minim Invasive Surg Sci.* 2015; 4(2): e30196.
4. Oukachbi N, Brouzes S. Management of complicated duodenal diverticula. *J Visc Surg.* 2013; 150: 173–9.
5. Rossetti A, Buchs NC, Bucher P, Dominguez S, Morel P. Perforated duodenal diverticulum, a rare complication of a common pathology: a seven-patient case series. *World J. Gastrointest Surg.* 2013; 5(3): 47–50.
6. Simões VC, Santos B, Magalhães S, Faria G, Silva DS, Davide J. Perforated duodenal diverticulum: surgical treatment and literature review. *Int J Surg Case Rep.* 2014; 5: 547–50.
7. Thorson ChM, Paz Ruiz PS, Roeder RA, Sleeman D, Casillas VJ. The perforated duodenal diverticulum. *Arch. Surg* 2012; 147(1): 81–88.

## Conclusions

Perforated duodenal diverticulum is a rare condition and symptoms often mimic other intra-abdominal disease. Traditionally, the treatment was surgical, but due to the good results reported in the literature, the current trend is toward conservative management if the patient's clinical condition allow. If conservative treatment is not effective we suggest the Roux-en-Y duodenojejunostomy method and drainage by Shigeru Fujisaki, because it is simple and can avoid long- term fasting and serious complications.

8. Juler GL, List JW, Stemmer EA. Perforated duodenal diverticulitis. *Arch Surg.* 1969; 99: 572–8.
9. Duarte B, Nagy KK, Cintron J. Perforated duodenal diverticulum. *Br J Surg.* 1992; 79: 877–81.
10. Chen CF, Wu DC, Chen CW, Hsieh JS, Chen CY, Wang JY. Successful management of perforated duodenal diverticulitis with intra-abdominal drainage and feeding jejunostomy: a case report and literature review. *Kaohsiung J Med Sci.* 2008; 24(8): 425–9.
11. Fujisaki S, Takashina M, Sakurai K, Tomita R, Takayma T. Simple diversion by duodenojejunostomy for a Retroperitoneal Perforation of the Second Portion of the Duodenal Diverticulum. *Int Surg.* 2014; 99: 628–31.
12. Marhin W, Bradley J, Amson, MD. Management of perforated duodenal diverticula. Department of Surgery, Roylee Jubitee Hospital, Victoria, BC. *Can J Surg.* 2005; 48 (1).
13. Miller G, Mueller C, Yim D, Macari M, Liang H, Marcus S, et al. Perforated duodenal diverticulitis: a report of three cases. *Dig Surg.* 2005; 22(3): 198–202.
14. Munnell ER, Preston WJ. Complications of duodenal diverticula. *Arch Surg.* 1966; 92(1): 152–6.