

Original article

NOVEL HEPATICOJEJUNOSTOMY TECHNIQUE USING THE CYSTIC DUCT CONFLUENCE IN A NARROW COMMON HEPATIC DUCT

НОВА ТЕХНИКА ЗА ХЕПАТИКОЕЈУНОСТОМИЈА СО КОРИСТЕЊЕ НА СПОЈОТ НА ЦИСТИЧНИОТ КАНАЛ КАЈ ТЕСЕН ЗАЕДНИЧКИ ХЕПАТАЛЕН КАНАЛ

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Abstract

Introduction. Hepaticojejunostomy (HJA) is a standard reconstructive procedure in hepatopancreatobiliary surgery. However, reconstruction of narrow, thin-walled bile ducts remains technically demanding and is associated with an increased risk of biliary leakage and late anastomotic stricture.

Methods. We present a novel “breech-trousers” technique for HJA in two male patients aged 71 and 66 years who underwent pancreaticoduodenectomy for pancreatic ductal adenocarcinoma of the uncinate process. Both patients had narrow common hepatic ducts measuring approximately 3-4 mm in diameter with extremely thin and fragile walls. The technique utilized a high confluence of the cystic duct into the common hepatic duct to enlarge the biliary stump by combining the cystic duct and common hepatic duct into a single wider opening. This enabled the creation of a significantly wider hepaticojejunostomy, approximately 7-8 mm in diameter.

Results. No postoperative biliary leakage, pancreatic fistula, cholangitis, or anastomotic stenosis occurred. Follow-up over 18 months demonstrated normal laboratory findings, absence of biliary dilation on ultrasonography, and satisfactory clinical recovery in both patients.

Conclusion. This novel reconstructive technique is safe, feasible, and may represent a valuable option for biliary reconstruction in patients with narrow, thin-walled bile ducts when favorable biliary anatomy is present.

Keywords: hepaticojejunostomy, biliodigestive anastomosis, pancreaticoduodenectomy, bile duct reconstruction, biliary surgery, thin-walled bile duct

Абстракт

Вовед. Хепатикојејуанастомозата (ХЈА) претставува стандардна реконструктивна процедура во хепатопанкреатобилијарната хирургија. Сепак, реконструкцијата на тесни и со тенок сид жолчни канали останува технички предизвик и е поврзана со зголемен ризик од билијарно протекување и доцна анастомотска стриктура.

Методи. Претставуваме нова „breech-trousers“ техника за хепатикојејуанастомоза кај двајца машки пациенти на возраст од 71 и 66 години, кои беа подложени на панкреатикодуоденектомија поради дуктален аденокарцином на панкреасот локализиран во унцинатниот процес. Кај двата пациенти, заедничкиот хепатичен канал беше тесен, со дијаметар од приближно 3-4 mm, со исклучително тенки и фрагилни сидови. Во оваа процедура го искористиме високиот влив на цистичниот канал во заедничкиот хепатичен канал, со што билијарната чкунка беше проширена преку спојување на цистичниот канал и заедничкиот хепатален канал во единствен поширок отвор. Ова овозможи создавање значително поширока хепатикојејуанастомоза со дијаметар од приближно 7-8 mm.

Резултати. Не беа забележани постоперативно билијарно протекување, панкреасна фистула, холангитис или анастомотска стеноза. Следењето во период од 18 месеци покажа нормални лабораториски параметри, отсуство на дилатација на билијарното стебло при ултрасонографија, отсуство на знаци за воспаление на жолчните патишта и задоволително клиничко закрепнување кај двата пациенти.

Заклучок. Оваа нова реконструктивна техника е безбедна, изводлива и може да претставува значајна опција за билијарна реконструкција кај пациенти со тесни жолчни канали со тенок сид, кога постои поволна билијарна анатомија.

Клучни зборови: хепатикојејуностомија, билиодигестивна анастомоза, панкреатикодуоденектомија, реконструкција на

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жолчните канали, билијарна хирургија, жолчен канал со тенки сидови

Introduction

Biliodigestive anastomosis provides an alternative pathway for bile drainage into the digestive tract and represents a fundamental reconstructive procedure in hepatopancreatobiliary surgery. It is primarily indicated in malignant extrahepatic biliary obstruction and less commonly in benign biliary diseases such as chronic fibrosing cholangitis, sclerosing papillitis, choledochal cysts, choledochoceles, and chronic pancreatitis [1].

Since the first bilioenteric anastomoses were performed in the late nineteenth century, numerous reconstructive techniques have been developed [2].

Hepaticojejunostomy (HJA) is commonly performed either during primary surgery for malignant disease or as a secondary reconstructive procedure after bile duct injury or postoperative complications [3].

Several technical variations have been described, including Roux-en-Y reconstruction with interrupted or continuous sutures. The principal types include:

- Standard end-to-side HJA with transverse duct incision;
- Hepp-Couinaud technique with longitudinal extension of the duct, particularly the left hepatic duct [4,5];
- Oblique-slantwise bile duct incision creating a larger oval lumen;
- “Pantaloons” hilar hepaticojejunostomy;
- Sutureless hepaticojejunostomy techniques in selected complex hilar lesions [6];

- Mechanical stapled HJA in selected dilated ducts [7,8].

Despite these advances, reconstruction of narrow bile ducts measuring only 3-4 mm with thin and fragile walls remains a major technical challenge.

We present a novel “breech-trousers” technique for HJA that increases the caliber of the biliary stump by utilizing the confluence of the cystic duct and common hepatic duct. This method may be particularly useful in patients with narrow, thin-walled bile ducts.

Material and methods

This novel reconstructive technique was applied in two patients after their informed consent was obtained.

Both patients had pancreatic ductal adenocarcinoma of the uncinate process without obstructive jaundice. Consequently, both were presented with narrow common hepatic ducts measuring approximately 3-4 mm in diameter and extremely thin ductal walls.

The curative surgical procedure performed was cephalic duodenopancreatectomy, Whipple procedure. Due to the narrow and thin wall hepatic duct, we performed HJA applying our novel “breech-trousers” technique.

Surgical technique of the novel HJA

The procedure was feasible because both patients exhibited a high insertion of the cystic duct into the common hepatic duct.

The common bile duct was transected caudal to the cystic duct insertion. Subsequently, the cystic duct was divided while preserving the proximal 5-6 mm of its confluence with the common hepatic duct (Figure 1).

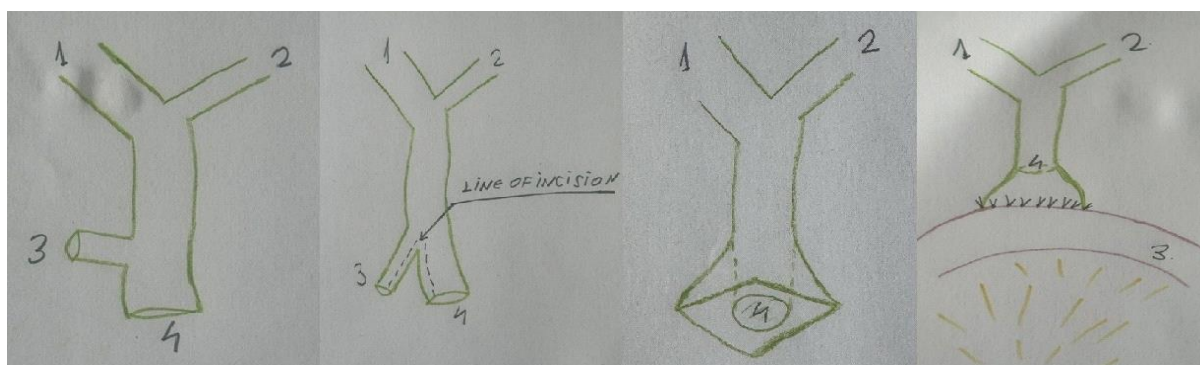


Fig. 1. Schematic illustration of the novel “breech-trousers” HJA technique, demonstrating the anatomical relationship between the cystic duct and common hepatic duct and the planned incision line. 1-right hepatic duct, 2-left hepatic duct, 3-cystic duct, 4-common hepatic duct.

Schematic illustration of the novel “breech-trousers” HJA technique, demonstrating the anatomical relationship between the cystic duct and common hepatic duct and the planned incision line. 1-right hepatic duct, 2-left hepatic duct, 3-cystic duct, 4-common hepatic duct. The Figure illustrates the enhance of the HJA comparing to the caliber of the common hepatic duct.

A dissector was introduced through the common hepatic duct and exteriorized through the cystic duct. The tissue bridge between the two ducts was then incised longitudinally, thereby creating a wider biliary opening, resembling a “breech-trousers” configuration (Figures 2 and 3).

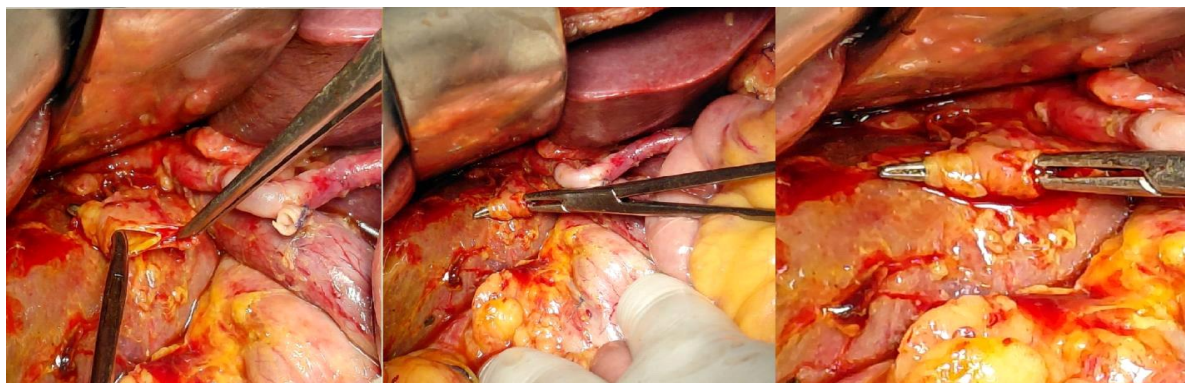


Fig. 2. Preparation of the biliary stump. A dissector is introduced through the common hepatic duct and exteriorized through the cystic duct.

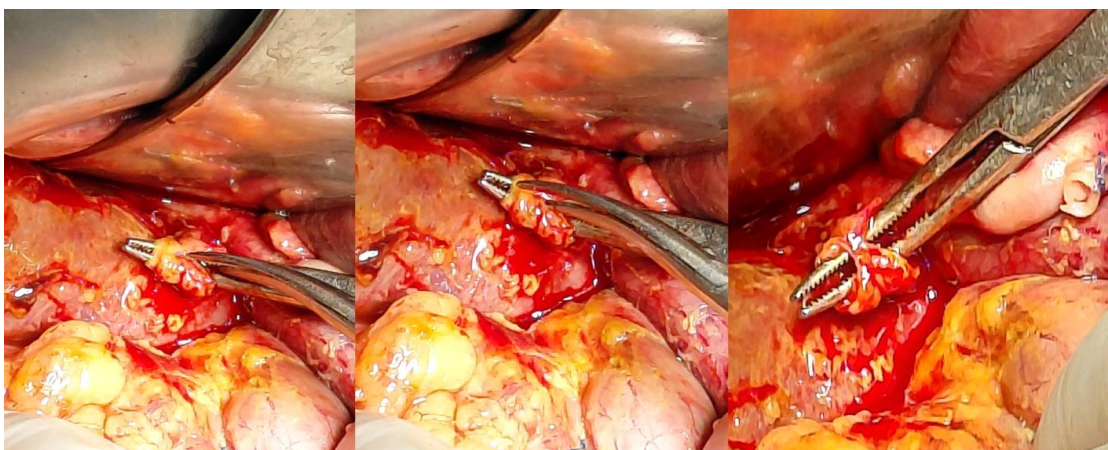


Fig. 3. Incision of the tissue bridge between the common hepatic duct and cystic duct creating a widened biliary opening.

Preparation of the biliary stump. A dissector is introduced through the common hepatic duct and exteriorized through the cystic duct.

Incision of the tissue bridge between the common hepatic duct and cystic duct creating a widened biliary opening.

This maneuver significantly enlarged the biliary stump available for reconstruction compared to the original diameter of the common hepatic duct.

The jejunal loop used for reconstruction was the efferent loop located approximately 20 cm distal to the pancreatojejunostomy.

The HJA was constructed using interrupted 5-0 monofilament sutures. Posterior wall sutures were placed first, followed by anterior wall sutures. Particular attention was paid to precise mucosa-to-mucosa approximation (Figure 4).

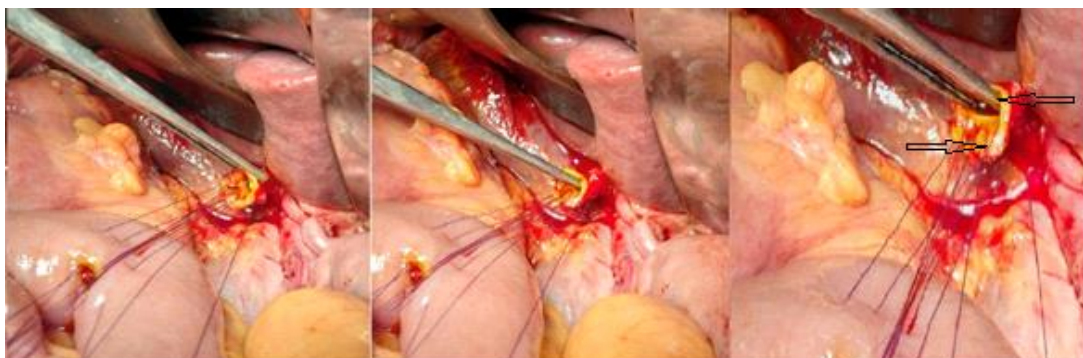


Fig. 4. Completed dorsal wall of HJA demonstrating the increased caliber of the anastomosis compared to the original diameter of the common hepatic duct. Right arrow shows the caliber of the common hepatic duct, while left arrow shows the new increased caliber of the HJA.

Completed dorsal wall of HJA demonstrating the increased caliber of the anastomosis compared to the

original diameter of the common hepatic duct. Right arrow shows the caliber of the common hepatic duct,

while left arrow shows the new increased caliber of the HJA.

Postoperative monitoring included:

- clinical examination,
- drain output analysis,
- bilirubin serum values,
- alpha-amylase serum values,
- liver function tests,

- ultrasonographic follow-up.

Results

Our novel “breech-trousers” procedure was successfully performed in both patients.

Both patients were male, aged 71 and 66 years, with

Table 1. Demographic, operative, and biliary anatomical characteristics

Category	Parameter	Patient 1	Patient 2
Demographics	Sex	Male	Male
Demographics	Age	71 years	66 years
Diagnosis	Primary diagnosis	Carcinoma of the uncinated process	Carcinoma of the uncinated process and neck of the pancreas
Operative details	Operative procedure	Duodenopancreatectomy (Whipple procedure)	Duodenopancreatectomy (Whipple procedure)
Operative details	Operative time	8 h	9 h
Biliary anatomy	Common hepatic duct caliber at incision (proximal)	3 mm	4 mm
Biliary anatomy	Cystic duct caliber (proximal)	2 mm	2 mm
Biliary anatomy	Newly created HJA caliber	7 mm	8 mm
Intraoperative outcomes	Blood loss	300 ml	150 ml
Intraoperative outcomes	Blood transfusion	1 pack erythrocytes	No transfusion
Intraoperative outcomes	Suture technique	5-0 monofilament, interrupted sutures	5-0 monofilament, interrupted sutures
Postoperative course	Early postoperative course	Uneventful, no complications, no biliary fistula	Uneventful, no complications, no biliary fistula
Follow-up (18 months)	Long-term outcome	No biliary stasis, no cholangitis, no HJA stricture/stenosis	No biliary stasis, no cholangitis, no HJA stricture/stenosis
Pathology	Proximal biliary resection margin	Free of malignancy, R0 resection	Free of malignancy, R0 resection

pancreatic ductal adenocarcinoma of the uncinate process. One patient had borderline resectable disease, while the other had clearly resectable carcinoma.

Both underwent Whipple procedure-pancreaticoduodenectomy with curative intent. Histopathological examination confirmed R0 resection margins in both cases. The native common hepatic duct diameter was approximately 3–4 mm. Following reconstruction using the novel technique, the resulting HJA diameter measured approximately 7–8 mm.

The postoperative course was uneventful in both patients. No biliary fistula, pancreatic fistula, cholangitis, or intra-abdominal collections occurred.

Drain fluid bilirubin and alpha-amylase levels remained within normal ranges on postoperative days 3 and 6. The patients were discharged on postoperative days 10 and 12.

Transient mild elevation of alkaline phosphatase and gamma-glutamyl transferase levels was observed but

resolved spontaneously. No jaundice or cholestasis developed.

Follow-up over 18 months demonstrated:

- normal laboratory findings,
- absence of biliary dilation on ultrasonography,
- no evidence of anastomotic stricture,
- no episodes of cholangitis,
- satisfying nutritional and functional status.

Discussion

The reconstruction of narrow, thin-walled bile ducts remains one of the most technically demanding aspects of hepatopancreatobiliary surgery.

Several principles are essential for successful HJA:

- creation of the widest possible anastomosis;
- preservation of duct vascularization;

- tension-free reconstruction;
- meticulous mucosa-to-mucosa approximation.

Currently, the Roux-en-Y HJA remains the most widely accepted reconstructive technique for biliary-enteric continuity in both benign and malignant diseases [9,10]. Radical oncologic resection and extensive lymphadenectomy may compromise the vascularization of the bile duct and increase the risk of biliary complications [11].

The risk of leakage is particularly increased in patients with narrow ducts and thin duct walls, especially in tumor of the uncinate process that may not produce jaundice and therefore do not dilate the biliary tree [12].

Some authors advocate additional protective measures, including transanastomotic drainage or nasogastric tube decompression of the HJA, especially in high-risk patients [12,13].

Reported rates of biliary leakage after HJA range between 2% and 8% [14,15]. Recent studies have identified hypoalbuminemia, malignancy, and poor nutritional status as independent risk factors for postoperative bile leakage and mortality [16].

Late biliary-enteric anastomotic strictures remain another important complication, occurring in approximately 3%-17% of patients [17,18].

Our proposed technique attempts to reduce both early leakage and late stenosis by enlarging the biliary stump through incorporation of the cystic duct into the reconstruction.

The limitations of this report include the small number of patients and limited follow-up duration. Larger clinical studies are necessary to evaluate long-term outcomes and reproducibility.

Conclusion

The presented “breech-trousers” HJA is a novel reconstructive technique that may be useful in selected patients with narrow, thin-walled bile ducts and favorable cystic duct anatomy.

The method allows creation of a wider biliary-enteric anastomosis while preserving tissue integrity and vascularization. Our initial experience suggests that the technique is safe, feasible, and associated with satisfactory short- and mid-term outcomes.

Further studies with larger patient cohorts are required to validate its clinical utility.

Conflict of interests: None declared.

References

1. Dourado GP, Melo BV, Melo RAV, *et al.* Biliodigestive anastomosis: case series. *Int J Health Sci* 2023; 3(39):2-5.
2. Ahrendt SA, Pitt HA. A history of the bilioenteric anastomosis. *Arch Surg* 1990; 125(11): 1493-1500.
3. Goessmann H, Lang S, Fichtner-Feigl S, *et al.* Biliodigestive Anastomosen. *Chirurg* 2012; 83: 1097-1108.
4. Sutherland F, Launois B, Stanescu M, *et al.* A refined approach to the repair of postcholecystectomy bile duct strictures. *Arch Surg* 1999; 134(3): 299-302.
5. Launois B, Sutherland FR, Harissis H. A new technique of Hepp-Couinaud hepaticojejunostomy using the posterior approach to the hepatic hilum. *J Am Coll Surg* 1999; 188(1): 59-62.
6. Brătucu E, Straja D, Nechita D. Double sutureless hepaticojejunostomy. *Chirurgia (Bucur)* 2011; 106(3): 375-378.
7. Tersigni R, Capaldi M, Cortese A. Biliodigestive anastomosis with circular mechanical device after pancreaticoduodenectomy: our experience. *Updates Surg* 2011; 63(3): 191-195.
8. Fabbri N, Ferro S, Bagolini F, *et al.* Mechanical hepaticojejunostomy: can we use a circular stapler as a viable and safe alternative? A retrospective study of a single center. *Gland Surg* 2020; 9(5): 1298-1304.
9. Tamang TY, Maharjan D, Thapa PB. Roux-En-Y hepaticojejunostomy: an evaluation of its indications and results in benign and malignant biliary tree disease. *J Kathmandu Med Coll* 2015; 3(3): 96-99.
10. Stefanini P, Carboni M, Patrassi N, *et al.* Roux-en-Y hepaticojejunostomy: a reappraisal of its indications and results. *Ann Surg* 1975; 181(2): 213-219.
11. Antolovic D, Koch M, Galindo L, *et al.* Hepaticojejunostomy-analysis of risk factors for postoperative bile leaks and surgical complications. *J Gastrointest Surg* 2007; 11(5): 555-561.
12. Wellner UF, Keck T. Leakage of hepaticojunal anastomosis: reoperation. *Visc Med* 2017; 33(3): 197-201.
13. Kaya B, Ozcabi Y, Tasdelen I, *et al.* Nasogastric tube placement into the hepaticojejunostomy anastomosis in pancreaticoduodenectomy: a simple surgical technique for prevention of bile leak. *Korean J Hepatobiliary Pancreat Surg* 2016; 20(2): 89-92.
14. de Castro SMM, Kuhlmann KFD, Busch ORC, *et al.* Incidence and management of biliary leakage after hepaticojejunostomy. *J Gastrointest Surg* 2005; 9(8): 1163-1171.
15. Andrianello S, Marchegiani G, Malleo G, *et al.* Biliary fistula after pancreaticoduodenectomy: data from 1618 consecutive pancreaticoduodenectomies. *HPB (Oxford)* 2017; 19(3): 264-269.
16. Tidjane A, Bengueddach A, Ikhlef N, *et al.* Risk factors for postoperative bile leakage and mortality following bilioenteric anastomosis: a prospective cohort study. *Langenbecks Arch Surg* 2025; 410: 299.
17. Chan CHY. Taming the BEAST: management of biliary-enteric anastomotic strictures. *Dig Dis Sci* 2019; 64: 3363-3365.
18. AbdelRafee A, El-Shobari M, Askar W, *et al.* Long-term follow-up of 120 patients after hepaticojejunostomy for treatment of post-cholecystectomy bile duct injuries: a retrospective cohort study. *Int J Surg* 2015; 18: 205-210.