Indian Journal of Surgery (April 2024) 86(2):423–427
https://doi.org/10.1007/s12262-023-03875-0

SURGICAL TECHNIQUES AND INNOVATIONS

Laparo-Enteroscopic Approach for Hepatico-jejunostomy Stricture: A One Stop Solution

Ganesh Shenoy[1] · **Makam Ramesh**[2] · **B. S. Ravindra**[3]

Received: 25 January 2023 / Accepted: 15 July 2023 / Published online: 29 July 2023

Abstract

Anastomotic stricture formation at the biliary-enteric anastomotic site is the most common complication of Roux-en-Y hepaticojejunostomy performed for post-cholecystectomy bile duct injuries. Percutaneous trans-hepatic biliary drainage followed by balloon dilatation is an available minimally invasive option to manage this complication. This will require multiple sittings along with the requirement of extracorporeal shockwave lithotripsy to break the calculi before extracting them through the matured percutaneous tract. This leads to multiple hospital visits with prolonged treatment course. To provide a one stop solution, we adopted a simplified minimally invasive technique of combining laparoscopic and endoscopic approach to dilate the hepaticojejunostomy stricture as well as to extract the stones in the same sitting. A young female presented with cholangitis and hepatolithiasis following a hepaticojejunostomy done for bile duct injury 3 years back. In view of hepatolithiasis proximal to anastomotic stricture, a new technique of Laparo-endoscopy was performed to dilate the hepaticojejunostomy stricture and extract the calculi in the same sitting. This was preferred over percutaneous trans-hepatic biliary drainage which would have required multiple sessions. The patient has been followed up over a period of 4 years. All her parameters have remained within normal limits during the follow-up period. The Laparo-endoscopic approach is safe, feasible, and can provide a one stop solution in selected cases of biliary-enteric anastomotic stricture.

Keywords PTBD · Hepaticojejunostomy · Bile duct injury · Laparoendoscopic approach · Hepaticojejunostomy stricture

Introduction

Laparoscopic cholecystectomy (LC) is one of the most commonly performed elective surgical procedures in the world for symptomatic and asymptomatic cholelithiasis [1]. The reported incidence of bile duct injuries (BDI) with open cholecystectomy is 0.1 to 0.2% which further increases to 0.4 to 0.6% with the laparoscopic approach [2–4]. When BDI is recognised at the time of initial surgery, the decision of whether or not to attempt repair, be it primary repair or bilio-enteric depends primarily on the experience of the surgeon. Roux-en-Y hepaticojejunostomy (RYHJ) is a technically challenging procedure in a non-dilated biliary system. RYHJ is the standard treatment for most post cholecystectomy BDI with long-term clinical success rates.

Stricture formation at the biliary-enteric anastomosis (BEA) site is the most common complication following RYHJ. This is due to fibrotic healing which can occur in 7–23% cases [5, 6]. Though the proportion of patients who suffer from anastomotic stricture is small, the morbidity remains substantial because of repeated episodes of cholangitis. The available therapeutic options for the management of BEA stricture include redo surgical reconstruction, percutaneous trans-hepatic biliary drainage (PTBD) followed by balloon dilatation, per oral short double-balloon enteroscopy, percutaneous trans jejunal biliary intervention, laparoscopic-assisted trans jejunal endoscopic management (LATEM) [7–10]. Redo surgical reconstruction, however, is invasive and technically challenging and causes significant morbidity for these patients. There are very few cases reported worldwide with direct access to the hepaticojejunostomy (HJ) site in managing anastomotic stricture and stones [7].

✉ Ganesh Shenoy
drshenoyganesh@gmail.com

[1] Department of Minimal Access, GI and Bariatric Surgery, Fortis Hospital, Cunningham Road, Bangalore, India

[2] Department of Minimal Access and Bariatric Surgery, Fortis Hospital, Bannerghatta Road, Bangalore, India

[3] Gastroenterology and Hepatology, Fortis Hospitals, Bangalore, India

In this case report, we present the technique of combining laparoscopic and endoscopic approaches to provide a one stop solution for a biliary cripple.

Methods

A young female presented with cholangitis and hepatolithiasis following RYHJ done for BDI 3 years back. She had history of Strasberg Type E2 biliary injury [11] along with colonic injury at primary admission following LC done elsewhere. The colonic injury was due to bedside drain insertion which was performed with an attempt to drain sub hepatic collection detected on ultrasound scan. This was confirmed by computerised tomography (CT) scan which showed drain in the transverse colon. She had undergone transverse colostomy and no attempt was made to repair the BDI. Colostomy closure was performed after three months. Definitive repair of biliary stricture was planned at a later date in view of undilated biliary system. After 6 months, she underwent RYHJ by Hepp-Couinad technique for Type 2 benign biliary stricture [11]. During the 3rd year after RYHJ she presented with pain abdomen, jaundice and fever. Magnetic resonance cholangio-pancreaticography (MRCP) showed cluster of calculi filling the dilated common hepatic duct extending into right, left and right posterior sectoral duct with stricture at the BEA site (Fig. 1b, c).

In view of hepatolithiasis proximal to anastomotic stricture, the challenge was to dilate the BEA stricture and to extract the stones which were in both the ductal systems including the sectoral ducts. PTBD would have required multiple sessions along with the requirement of extra corporeal shockwave lithotripsy (ESWL) to break the calculi before extracting them through the matured percutaneous tract. It would also necessitize the need for a separate PTBD to enter the two ductal systems. PTBD would not have been successful in complete dilatation of the BEA stricture in a single sitting. This would have led to multiple hospital visits with prolonged treatment course. In view of overcoming these difficulties and to offer one stop solution for this patient, we thought of new technique of combining laparoscopy and endoscopy.

A 5-mm camera port was introduced in palmer's point after achieving pneumoperitoneum by closed technique. Two 5 mm ports were placed in the epigastrium and left lumbar region. Adhesiolysis was performed with cold scissors. Transmesocolic roux limb of jejunum was identified. A 12-mm port was placed in the right lumbar region. Two stay sutures were taken on the roux limb (Fig. 2a) and enterotomy was performed between the stay sutures using harmonic shears. The 12-mm port was passed through the enterotomy (Fig. 2b). Side viewing endoscope was introduced through the 12-mm port into the roux limb and the stay sutures were hitched to the abdominal wall around the 12-mm port. The endoscope was manoeuvered into the roux limb under fluoroscopic guidance (Fig. 2c, d). The HJ stricture was identified (Fig. 3a).

A guide wire was passed and the stricture was dilated using controlled radial expansion balloon (Fig. 3b, c). Under fluoroscopic guidance, right and left ductal systems including the sectoral ducts were entered and the stones with sludge were extracted by balloon sweep. Graded dilatation up to 10 mm was achieved at the same sitting (Fig. 3d). The clearance was confirmed by fluoroscopy. The schematic illustration of the procedure performed is shown in Fig. 4.

A good bile flow across the BEA site was observed at the end of the procedure. The enterotomy was closed intracorporeally in single layer. No intra-abdominal drain was placed.

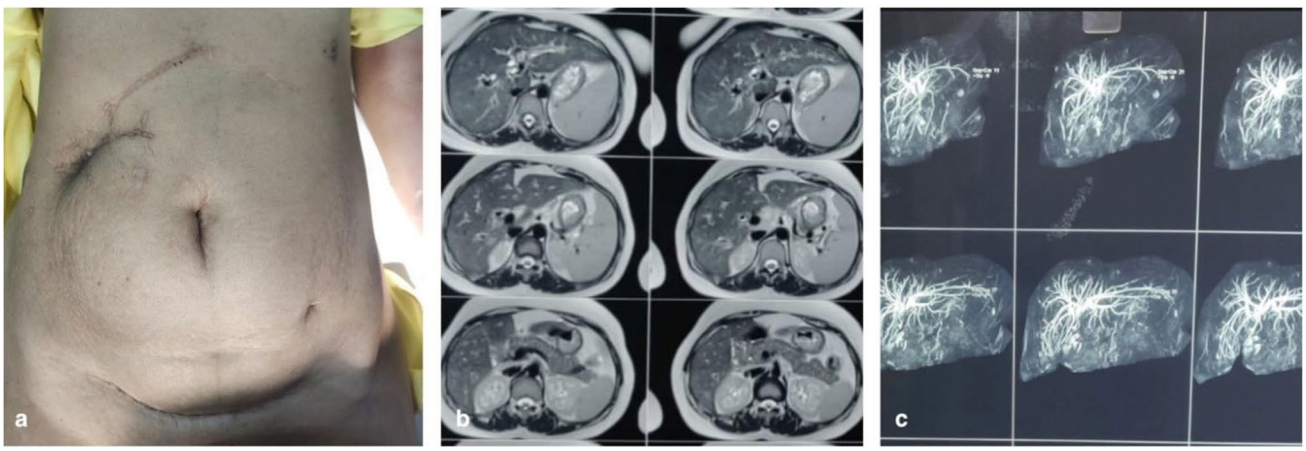

Fig. 1 **a** Scars of previous surgeries. **b** MRCP showing stones in dilated CHD. **c** MRCP showing dilated IHBR

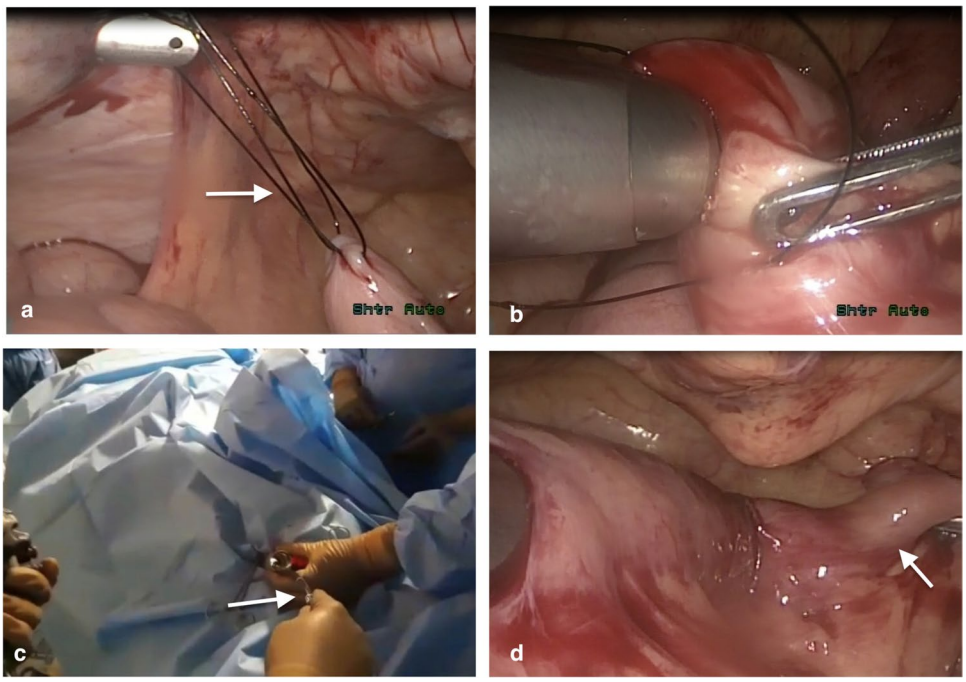

Fig. 2 **a** Stay sutures over Roux limb (white arrow). **b** 12 mm trocar passed through the enterotomy. **c** Endoscope passed into the 12-mm port (white arrow). **d** Endoscope passed into the Roux limb

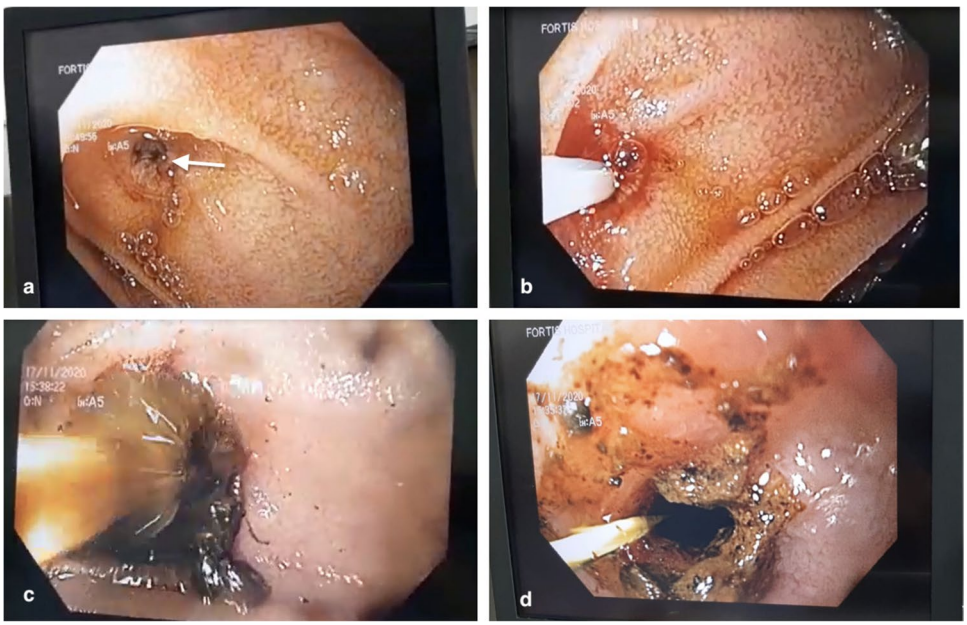

Fig. 3 **a** Hepaticojejunostomy stricture visualised through endoscope. **b** Cannulation of HJ stricture. **c** Graded dilatation of stricture with Controlled radial expansion balloon. **d** Extraction of stones and sludge along with dilatation of stricture up to 10 mm

Results

Patient was started with oral feeds on 2nd post-operative day (POD) and was discharged on POD3. She has been followed up till date over a period 4 years from the date of procedure. She is being assessed clinically, biochemically, and radiologically at an interval of 6 months. All her parameters have remained within normal limits during the follow-up period.

Discussion

RYHJ is the standard treatment for most post cholecystectomy BDI with long-term clinical success rates reaching 90% [12]. Some patients who undergo RYHJ for BDI will experience incapacitating biliary symptoms such as jaundice or recurrent cholangitis. Between 80 and 90% of patients with failure of the biliary repair develop symptoms within 5–7 years [5]. In certain cases, the situation can be further

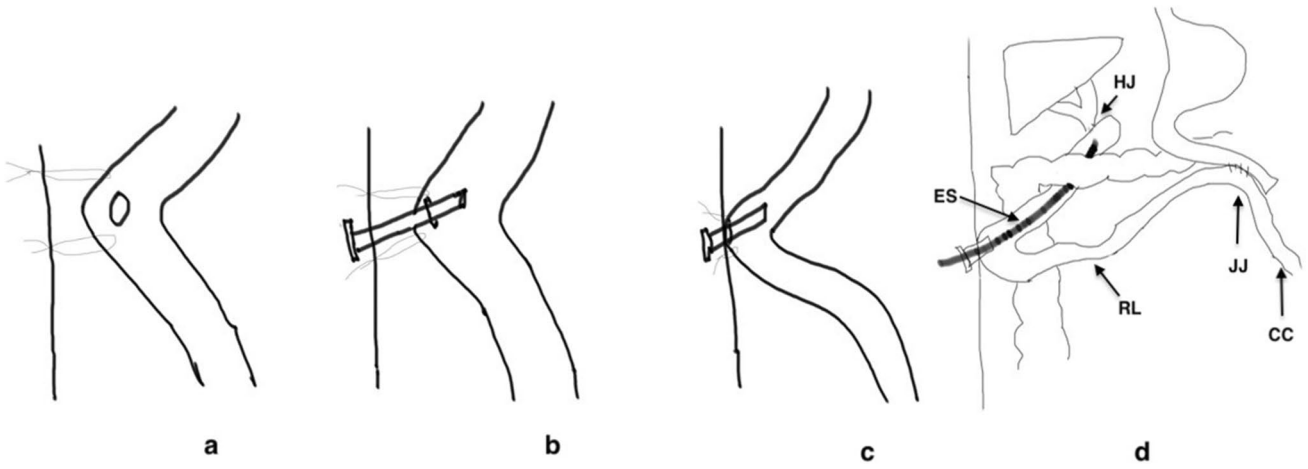

Fig. 4 Schematic illustration. **a** Enterotomy with stay sutures on either side. **b** 12-mm port through the enterotomy. **c** Stay sutures hitched to abdominal wall. **d** Endoscope passed through the 12-mm port towards the roux limb (JJ: Jejuno-jejunostomy, CC: Common channel, RL: Roux limb, ES: Side viewing endoscope, HJ: Hepatico-jejunostomy site)

complicated by intra-hepatic calculi, intra-hepatic strictures, and progression to biliary cirrhosis. Management of such complicated cases requires a multidisciplinary approach with a combination of surgical, radiological and endoscopic techniques. The options that are available for the management of BEA stricture include a redo surgical reconstruction, PTBD followed by balloon dilatation, per oral short double-balloon enteroscopy, percutaneous trans jejunal biliary intervention, laparoscopic-assisted trans jejunal endoscopic management (LATEM).

In 2020, Elbert et al. [10] published a case report of LATEM performed for a HJ stricture and stone. The RYHJ was performed following choledochal cyst excision. In this case, the enterotomy of the roux limb of jejunum was performed extra corporeally and side viewing endoscope was introduced through the enterotomy to manage the stricture and stone under fluoroscopic guidance. In our case, two stay sutures were taken on the roux limb of jejunum and the enterotomy was performed intracorporeally. The 12-mm port was itself introduced through the enterotomy and the stay sutures were hitched to the abdominal wall. This prevented the peritoneal contamination with the intestinal contents. The side-viewing endoscope was then introduced through the 12-mm port into the roux limb (Fig. 4). In this case, the entire procedure was accomplished by total laparoscopic and endoscopic approach.

The altered anatomy of RYHJ may make the traditional endoscopic manoeuvre extremely difficult with standard equipment. The main challenges encountered are the intubation of the Jejuno-jejunal (JJ) anastomosis, the length of the afferent limb to the JJ anastomosis, the cannulation of the HJ anastomotic site and the lack of customised endoscopes and accessories [13]. The newer endoscopic approaches such as single or double-balloon enteroscopy are considered as alternative approaches in patients with modified gastrointestinal anatomy [7]. PTBD is another well-described alternative in such cases. Although PTBD is effective in precisely localising the affected bile duct and allows repeated interventions through the percutaneous tract, preparation for a safe and effective PTBD may require days or even weeks. In addition, access to multiple bile ducts cannot be achieved in a single puncture. Percutaneous trans jejunal biliary intervention has also shown promising results, but is a relatively unfamiliar technique and has yet to be integrated into daily practise [9].

With our technique of combining laparoscopy and enteroscopy, there were all the advantages of minimally invasive approach such as lower rates of wound complications, less post-operative pain and early return to normal activity. After extensive literature search, which to the best of our knowledge, of the eleven published cases so far, eight performed the intervention through the native papilla, whereas three [7, 10, 14] and the present case performed direct cannulation of the HJ site, as in these patients the hepatic duct could not be reached through the native papilla due to the nature of previous surgery.

Conclusions

This minimally invasive technique of combining laparoscopy and endoscopy can benefit a biliary cripple as a one stop solution for hepaticojejunostomy stricture and associated with hepatolithiasis involving both the ductal systems and sectoral ducts. The difficulties and drawbacks of percutaneous trans-hepatic biliary drainage can be avoided. The procedure is safe and is reproducible, although further

studies with a higher number of cases are needed to be able to assess the long-term success rate and morbidity.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12262-023-03875-0.

Declarations

Conflict of Interest The author declares no competing interests.

References

1. Flum DR, Cheadle A, Prela C et al (2003) Bile duct injury during cholecystectomy and survival inmedicare beneficiaries. JAMA 290:2168–2173. https://doi.org/10.1001/jama.290.16.2168
2. Lau WY, Lai EC, Lau SH (2010) Management of bile duct injury after laparoscopic cholecystectomy:a review. ANZ J Surg 80:75–81. https://doi.org/10.1111/j.1445-2197.2009.05205.x
3. Stewart L (2014) Iatrogenic biliary injuries: classification, identification, and management. Surg Clin North Am 94:297–310. https://doi.org/10.1016/j.suc.2014.01.008
4. Vachhani PG, Copelan A, Remer EM et al (2015) Iatrogenic hepatopancreaticobiliary injuries: a review. Semin Intervent Radiol 32:182–194. https://doi.org/10.1055/s-0035-1549377
5. Pellegrini CA, Thomas MJ, Way LW (1984) Recurrent biliary stricture: patterns of recurrence andoutcome of surgical therapy. Am J Surg 147:175–180. https://doi.org/10.1016/0002-9610(84)90054-0
6. Lillemoe KD, Melton GB, Cameron JL et al (2000) Postoperative bile duct strictures: management and outcome in the 1990s. Ann Surg 232:430–441. https://doi.org/10.1097/00000658-200009000-00015
7. Arzaga AA, Chavez HN, Galindo J, Juarez JS, Gonzalez CC, Villalba EF (2019) Transjejunal laparoscopic assisted ERCP in a patient with Roux-en-Y hepaticojejunostomy. Medicina (Kaunas) 55:483
8. Tsutsumi K, Kato H, Yabe S, Mizukawa S, Seki H, Akimoto Y et al (2017) A comparative evaluation of treatment methods for bile duct stones after hepaticojejunostomy between percutaneous transhepatic cholangioscopy and peroral, short double-balloon enteroscopy. Therap Adv Gastroenterol 10:54–67
9. Fontein DB, Gibson RN, Collier NA, Tse GT, Wang LL, Speer TG et al (2011) Two decades of percutaneous transjejunal biliary intervention for benign biliary disease: a review of the intervention nature and complications. Insights Imaging 2:557–565
10. Khiangte E, Chetri K, Khiangte IN, Deka KP, Phukan P, Agarwala M (2021) Laparoscopic-assisted transjejunal endoscopic management of intrahepatic calculi and anastomotic stricture in a patient with Roux-en-Y hepaticojejunostomy. J Minim Access Surg 17(2):253–255. https://doi.org/10.4103/jmas.JMAS_79_20
11. Chun K (2014) Recent classifications of the common bile duct injury. Korean J Hepatobiliary Pancreat Surg 18(3):69–72. https://doi.org/10.14701/kjhbps.2014.18.3.69
12. Murr MM, Gigot JF, Nagorney DM, Harmsen WS, Ilstrup DM, Farnell MB (1999) Long-term results of biliary reconstructionafter laparoscopic bile duct injuries. Arch Surg 134:604–610
13. Mita MT, Dalmonte G, Gnocchi A, Marchesi F (2019) Transjejunal laparoscopic-assisted ERCP in Roux-en-Y patient: the new right path. Ann R Coll SurgEngl 101:e45–e47
14. Mansor SM, Abdalla SI, Bendardaf RS (2015) Laparoscopy assisted transjejunal endoscopic retrograde cholangiography for treatment of intrahepatic duct stones in a post Roux-en-Y patient. Saudi Med J 36:104–107