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When should endovascular gastrointestinal anastomosis transection Glissonean pedicle not was used in hepatectomy: A case report

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Endo-GIA; Glissonean pedicle; Hepatectomy; Bile duct injury; Case report

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Jian Zhao, Yan-Li Dang

Abstract

BACKGROUND

The literature on post-hepatectomy bile duct injury (PHBDI) is limited, lacking large sample retrospective studies and high quality experience summary. Therefore, we reported a special case of iatrogenic bile duct injury caused by Glissonean pedicle transection with endovascular gastrointestinal anastomosis (Endo-GIA) during right hepatectomy, analyzed the causes and summarized the experience.

CASE SUMMARY

We present the case of a 66-year-old woman with recurrent abdominal pain and cholangitis due to intrahepatic cholangiectasis (Caroli's disease). Preoperative evaluation revealed that the lesion and dilated bile ducts were confined to the right liver, with right hepatic atrophy, left hepatic hypertrophy and hilar translocation. This problem can be resolved by performing a standard right hepatectomy. Although the operation went well, jaundice soon followed after the operation. Iatrogenic bile duct injury was considered after, magnetic resonance cholangiopancreatography review, and the second operation were performed 10 d later. During the second operation, it was found that Endo-GIA had damaged the lateral wall of the hepatic duct and multiple titanium nails remained in the bile duct wall, leading to severe stenosis of the duct wall that could not be repaired. Therefore, the injured bile duct is transected and a hepatic-jejunal-lateral side-by-side anastomosis (Roux-Y anastomosis) is performed at the healthy part of the left hepatic duct. Finally, the patient had smooth postoperative recovery, with gradually decreased total bilirubin to normal, and was discharged 41 d after operation. No anastomotic stenosis was found at the 6 mo of follow-up.

CONCLUSION

Not all cases are suitable for Endo-GIA transection of Glissonean pedicle, especially in cases of intrahepatic bile duct lesions. PHBDI caused by Endo-GIA is very difficult to repair due to extensive ischemia, which requires special attention.

Key Words: Endovascular gastrointestinal anastomosis; Glissonean pedicle; Hepatectomy; Bile duct injury; Safety; Case report

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Core Tip: There have been few reports on post-hepatectomy bile duct injury (PHBDI). And this report is about PHBDI caused by wrong choice of transection tool, such as endovascular gastrointestinal anastomosis (Endo-GIA), which was successfully saved by reoperation. Not all cases are suitable for Endo-GIA transection of Glissonean pedicle, which should be paid enough attention.

INTRODUCTION

There have been more reports on iatrogenic bile duct injuries (BDIs) after laparoscopic cholecystectomy (LC), *i.e.*, LCBDIs, although its incidence has been reduced to 0.3%-0.7%^[1]. But the incidence of post-hepatectomy bile duct injury (PHBDI) is as high as 3.6%-17%^[2], accounting for one-third of the post-hepatectomy mortality^[3], and the attention is far from enough^[4]. With the increasing popularity of laparoscopic and robotic hepatectomy worldwide^[5,6] and the increasing reliance on the use of energy devices and Tric-staple™, as well as the difficulty in determining the spatial relationship between catheters due to the lack of complete stereoscopic vision and tactile feedback in the laparoscopic field of vision, the true incidence of PHBDI may be higher^[7]. But there is still a lack of large sample clinical studies and high quality experience summary specifically for its cause analysis and prevention strategies. Thus, we reported a specific case of PHBDI caused by Glissonean pedicle transection with endovascular gastrointestinal anastomosis (Endo-GIA) during right hemi-hepatectomy, analyzed its causes and summarized the experience.

CASE PRESENTATION

Chief complaints

A 66-year-old Chinese female presented with recurrent abdominal pain for 20 years and fever for 1 wk.

History of present illness

The patient began to experience intermittent dull pain in the upper abdomen more than 20 years ago, with no obvious inducement, and spontaneously relieved by rest. Initially, no other concomitant symptoms were found, but the pain occurred 1-2 times per month. In the past two years, the frequency of abdominal pain increased, about 1-2 times a week. And fever began to occur one week ago, with the highest body temperature of 38.3 °C and chills, which was relieved after oral administration of antipyretic and analgesic drugs, without jaundice.

History of past illness

The patient was diagnosed as type 2 diabetes and hypertension two years ago, which has been controlled well with oral medication now.

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Personal and family history

The patient had no special personal and family history.

Physical examination

At admission, the patient's consciousness was clear, with the body temperature of 37.3 °C, and the blood pressure on 145/85 mmHg, without skin and sclera jaundice. The abdomen was soft and flat, with percussive pain in the right upper quadrant and liver area, without tenderness or rebound pain, and Murphy (-).

Laboratory examinations

Laboratory tests indicated that only alkaline phosphatase and gamma-glutamyltransferase (γ -GTP) were slightly elevated at admission, with normal infection indicators, tumor markers, and total bilirubin (TBIL) (Table 1).

Imaging examinations

Contrast-enhanced abdominal magnetic resonance imaging demonstrates a dilated bile duct in right liver with a large cyst occupying the beginning of the right anterior and posterior hepatic ducts, and the peripheral bile ducts were full of stones (Figure 1F), accompanied by right liver atrophy, left liver hyperplasia and counterclockwise hilar translocation (Figure 1A). The opening of left hepatic duct was very close to the cyst (Figure 1C), the right portal vein branch was not clearly seen (Figure 1E), with no variation of extrahepatic bile duct and other blood vessels (Figure 1D and E). According to the preoperative imaging evaluation, standard right hepatectomy can resolve this lesion.

FINAL DIAGNOSIS

According to clinical and imaging features, intrahepatic cholangiectasia (Caroli's disease, Todani type-V) with recurrent cholangitis, atrophy-hypertrophy complex, and hilar translocation was considered.

TREATMENT

After preoperative evaluation, it was considered that the lesion was confined to the right liver and could be resolved by standard right hepatectomy, so the first operation was performed. During the operation, obvious fibrosis and atrophy were found in the right liver (Figure 2A). The diseased bile duct was close to the bifurcation of the left and right hepatic ducts, and the extrahepatic bile duct was slender. The initial part of the right hepatic duct was separated from extrasheathical dissection method in advance, the right hepatic duct was transected with Endo-GIA (Figure 2C), and then a standard

right hepatectomy was performed along the demarcation line of the liver surface. No abnormality was found during the operation. Postoperative pathology showed chronic inflammation of the bile duct wall, and no malignant cells were found (Figure 2H). Postoperative reexamination showed a gradual increase in TBIL, but no significant change in white blood cells (Table 1), and no special uncomfortable feeling. Magnetic resonance cholangiopancreatography (MRCP) was reexamined on the 5th postoperative day and no extrahepatic bile duct was found, and the left hepatic duct was dilated compared with the operation before (Figure 2D). At this point, we realized that the biliary tract injury had occurred, so the second operation was performed on the 10th day. During the second operation, the lateral wall of the hepatic duct damaged by Endo-GIA was found, which led to severe stenosis and occlusion. Residual titanium nail could be seen in the damaged bile duct wall, leading to locally significant inflammatory edema and ischemia (Figure 2E and F).⁴ The damage was about 4 cm long, which could not be repaired to here. No damage to the portal vein and the hepatic artery was found during the operation. Therefore, the injured hepatic duct was directly transected, the main trunk of the left hepatic duct was dissected and exposed, and the left hepatic duct and jejunum side-by-side anastomosis (Roux-Y anastomosis) was completed (Figure 2G). The patient recovered smoothly from no other complications after re-operation, with gradually decreased TBIL and γ -GTP and gradually improved liver function damage (Table 1). The patient was discharged on the 41st day after operation.

OUTCOME AND FOLLOW-UP

After half a year of follow-up, the patient had no abdominal pain or fever, no anastomotic stenosis, and normal liver functions. It was later lost due to Corona Virus Infectious Disease-2019 (COVID-19) pandemic.

DISCUSSION

Iatrogenic bile duct injury is a permanent pain for hepatobiliary surgeons^[8]. However, the understanding of BDI is often limited to LCBDI, rather than PHBDI that few

scholars pay attention to. Both of the two have significant differences in injury causes, risk factors, injury characteristics, clinical classification, preventive principle and treatment methods^[4]. The reviews of the literature on the clinical characteristics of PHBDI show that PHBDI occurs mostly to the high bile duct (the **confluence of the left and right hepatic ducts** and above) and **is prone to** vascular injury^[9-10]. Injuries to laparoscopic hepatectomy are often related to the use of Endo-GIA/**Endo-Cutter** and energy equipment, with difficult repair and poor prognosis^[9]. Clinical manifestations are hyperbiliary stenosis, obstruction, bile duct leakage and bile duct bleeding, most patients complicated with basic liver diseases (cirrhosis, cholangitis, liver cancer, *etc.*) can develop severe abdominal infection, liver failure and even death^[11].

The risk factors of PHBDI that should be a major **concern** for liver surgeons include^[7,12]: (1) Variations in hilar bile duct anatomy, such as **right anterior hepatic duct** opening in **left hepatic duct** or **right posterior hepatic duct** low or ectone confluence in hepatic duct or gallbladder duct^[3]. (2) The combination of hepatic atrophy and hyperplasia, as well as hilar translocation, which usually occurs to benign biliary lesions (such as hepatolithiasis and Caroli's disease), past hepatectomy, and mass effect of large hilar tumors. (3) Intraoperative overstretching causing the displacement of the reserved lateral bile duct. (4) Improper position of transverse hepatic pedicle. (5) Complex and difficult operations or combined hilar lymph node dissection that are easy to cause injury. (6) Blind clipping or disconnection performed in case of intraoperative misjudgment or deviation from the resection plane. (7) Incorrect use of energy devices (such as ultrasound scalpel, electrocoagulating blood stopper, *etc.*) and Endo-GIA.

The causes of this case is various, including objective unfavorable factors, such as the lesion duct close to the reserved side bile duct and right liver atrophy leading to hilar translocation. But the root cause of this case is the wrong choice of transection tools, such as Endo-GIA, rather than the wrong process when using it. First of all, during the operation, the author and assistants repeatedly remind each other not to accidentally hurt the healthy side bile duct, which is not caused by carelessness. Second, because the lesion bile duct of cystic dilation is too close to the common hepatic duct,

there is no "safe boundary" when it is transected. This is because Endo-GIA's fuselage itself has a certain width, and the tissue inside this objectively present width is invisible when transected. Predictably, in this particular type of case, if Endo-GIA is used to transect the Glissonean pedicle, it is expected that there is a higher chance that BDI will occur. This is the contradiction between "removal of lesions thoroughness" and "surgical safety".

Therefore, we considered from this particular case include: (1) It is necessary to transect Glissonean pedicle in or as close as possible to the liver, whether Glissonean pedicle extrahepatic or intrahepatic dissection technology is adopted^[13-15]. (2) Endo-GIA should not be selected for transection Glissonean pedicle in hepatectomy cases involving intrahepatic bile duct diseases, as we need to treat the intrahepatic bile duct separately and prevent the bile duct injury. It should not be recommended for cases such as intrahepatic cholangiectasia, intrahepatocholic stones, and Hilar cholangiocarcinoma, especially the special types of lesion bile ducts very close to the reserved side bile duct^[3]. (3) In particular, it should be not that the reason why use Endo-GIA transection Glissonean pedicle is less accurate than ligation and suture is that the fuselage of gastrointestinal anastomosis has a certain width, and it is necessary to reserve a certain safety boundary during operation to prevent the damage of bile duct on the reserved side. (4) Based on the above discussion, we believe that a better way to avoid this situation is to replace the Endo-GIA with a manual suture method.

Another important topic we would like to discussion about this case is that the damage to the sidewall of the bile duct caused by Endo-GIA is very difficult to reconstruct. The experience and methods we have accumulated in the past for the repair and reconstruction of the bile duct after LCBDI are totally inapplicable. The root cause is dense peptide nails that cause damage to the bile ducts lead to a unimaginable range of ischemia, as shown in Figure 2E. If it is repaired by local plastic surgery or gastrointestinal muscle flaps, the consequences must be stenosis. Therefore, only a higher position of the hepatic duct and jejunum anastomosis can solve the problem. This opinion has not been mentioned in previous literature.

In conclusion, we would like to remind that the use of Endo-GIA should also have certain indications and contraindications (It is usually safe, but not always **s.**). We need to understand Endo-GIA's advantages and disadvantages, as well as a learning curve and operational experiences. Selecting the right patient with the right device is a key concern, and sometimes safety is more important than "radical resection". The treatment of PHBDI caused by Endo-GIA is difficult, and we may provide a reference to the successful treatment of this case.

CONCLUSION

Not all cases are suitable for Endo-GIA transection of Glissonean pedicle, especially in cases of intrahepatic bile duct lesions. PHBDI caused by Endo-GIA is very difficult to repair due to extensive ischemia, which requires special attention.

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