Recanalization of completely obstructed bilioenteric anastomoses using a needle knife puncture

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Abstract

The development of an anastomosis stricture postoperatively is associated with significant morbidity. A bilioenteric anastomosis stricture can cause bile duct obstruction, which can lead to jaundice, cholangitis, hepatic failure, and sepsis. Most strictures can be resolved using radiological or endoscopic approaches. However, some strictures can cause complete obstructions that are intractable to nonoperative methods, and clinicians are obliged to use surgical means to alleviate the symptoms. To avoid a surgery, some minimal invasive measures have been suggested, including the needle knife puncture technique. Although this new procedure has some risks, future trials with protective measures may minimize the complication rate and maximize the benefits. We report three cases of complete obstructions of the bile duct due to bilioenteric strictures, which were treated using the needle knife puncture technique.

Introduction

The severity of an anastomosis site stricture after a choledochojejunostomy or Roux-en-Y hepaticojejunostomy can range from a mild flow disturbance to complete obstruction, blocking even the contrast medium. Conventional treatment options for patients with complete obstructions are either reoperation or lifelong external biliary drainage. However, reoperation entails risks and difficulties due to the postoperative adhesions, whereas maintaining the external drainage catheter is a burden for the patients and can reduce the patient’s quality of life. To overcome these limitations, endoscopists have suggested other means to resolve the complete obstruction, such as gentle tapping of the anastomotic lumen and fistula formation via magnet compression of the anastomosis. The tapping method may be minimally invasive, but requires further investigation. Magnet compression of anastomosis has proven to be a good substitute for the surgery. The key to recanalization using the magnet compression of an anastomosis begins by successfully securing the routes of magnet delivery to both sides of the stricture. After a choledochojejunostomy, the magnet for the bile duct side can be delivered via a percutaneous approach, and the magnet for the enteric side via an endoscopic approach. This can prove difficult when the magnet delivery is hindered by a fixed stricture or long afferent loop. We have developed a method for those patients who are not candidates for a surgery or magnet compression of the anastomosis. The following series of three cases describe the use of a needle knife, which was originally used for papillotomy, in patients with a complete obstruction at the bilioenteric anastomosis.

Case report

Case 1

A 55-year-old male with an 18F percutaneous transhepatic biliary drainage catheter was referred to us with epigastric pain and concomitant fever, 3 years after undergoing a conventional Whipple operation for ampulla of Vater cancer. He underwent percutaneous transhepatic cholangioscopy (PTCS; CYF-240A; Olympus Optical, Tokyo, Japan), which showed a complete obstruction at the hilum, where the hepaticojejunostomy had been performed (Fig. 1A). Under PTCS, the center of the stricture membrane was detected by the texture of the tissue (Fig. 1B). A cross-shaped incision was made with a needle knife (KD-441Q; Olympus Optical; Fig. 1C). Then, a guide wire was passed through the lesion (Fig. 1D). Diatrizoate sodium (Gastrografin; Bayer Schering Pharma, Berlin, Germany) was injected to ensure successful canalization, and an 18F percutaneous transhepatic biliary drainage catheter (Ji in CTN, Seoul, Korea) was passed through the anastomosis over the guide wire (Fig. 1E). Nine months later, the catheter was removed. The patient is under close observation as an outpatient (Fig. 2).
Case 2

The second case was a 40-year-old male with a history of a Whipple operation, performed to treat pancreas transection following a traffic accident 7 years earlier. A bilioenteric anastomosis site stricture was confirmed at PTCS (CYF-240A; Fig. 3A). A cross-shaped incision was made at the end of the bile duct, the center of which was vague (Fig. 3B). We found that the entry of the needle knife was not at a perpendicular angle during the procedure (Fig. 3C,D). When diatrizoate sodium was injected to check the recanalization of the anastomosis site, peritoneal leakage was observed (Fig. 3E). The patient was taken to the operating room for a revision surgery.

Case 3

The third case was a 74-year-old female who underwent a pylorus-preserving pancreaticoduodenostomy due to ampulla of Vater cancer. An ischemic stricture at the anastomosis site of the common hepatic duct was discovered 1 year postoperatively, resulting from iatrogenic damage to the common hepatic artery, causing permanent occlusion. A cholangiogram via PTCS (CYF-240A; Olympus Optical) confirmed a complete occlusion of the bile duct (Fig. 4A), and the center of fibrosis was detected (Fig. 4B). This time, to minimize the risks of complications, a tiny hole was made in the obstructing membrane with a needle knife (KD-441Q; Olympus Optical), sufficient only to enable passage of a guide wire.

Fig. 1. Process of recanalization by a needle knife puncture and 18F catheter insertion. (A) Cholangiogram reveals a complete obstruction of the anastomosis site. (B) Center of anastomosis site stricture is observed at the percutaneous transhepatic cholangioscopy. (C) Cross-shaped incision is made at the center of the stricture. (D) Guide wire was passed through the incision site to confirm recanalization. (E) The flow of contrast medium into jejunal lumen confirms a successful recanalization, and an 18F percutaneous transhepatic drainage catheter is placed to prevent restenosis.

Fig. 2. Successful recanalization is observed under (A) percutaneous transhepatic cholangioscopy and (B) cholangiogram.
No additional incision was made (Fig. 4C,D). The guide wire was inserted until it was coiled along the jejunal wall to ensure that it was in place (Fig. 4E). Then, diatrizoate sodium was injected to confirm that there was no peritoneal leakage (Fig. 4F). After visualizing proper contrast drainage into the jejunum, a 6-mm balloon (Hurricane RX Biliary Dilatation Catheter; Boston Scientific, Natick, MA, USA) was introduced through the hole and inflated to 6 atmospheres twice for 30 seconds each. After retrieving the balloon, a 14F catheter (Jin CNT) was placed to prevent restenosis. After 4 days, the anastomosis site was further dilated with a 6-mm balloon (Hurricane RX Biliary Dilatation Catheter; Boston Scientific) at 8 atmospheres twice (Fig. 4G), and a 16F catheter (Jin CNT) was inserted (Fig. 4H). The patient is under close observation, and we plan to remove the catheter after 6 months. Information regarding the patients is summarized in Table 1.

Fig. 3. Needle knife puncture resulting in bile duct injury. (A) Cholangiogram shows a complete obstruction of the anastomosis site. (B) Center of stricture membrane is vague. (C) Needle knife puncture is performed. (D) Cross-shaped incision is made. (E) Inappropriate puncture is confirmed from the peritoneal dye leakage.

Fig. 4. Successful recanalization of the anastomosis site stricture by a needle knife puncture and gradual ballooning. (A) Cholangiogram shows a complete obstruction in the anastomosis site. (B) Center of stricture is well demonstrated by the texture of stricture under percutaneous transhepatic cholangioscopy. (CD) Needle knife puncture is performed; perpendicular entry is confirmed both by fluoroscopy and percutaneous transhepatic cholangioscopy. (E) Guide wire is passed through the puncture site. (F) Contrast medium is injected to confirm the absence of peritoneal leakage. (G) Balloon dilatation is performed. (H) A 16F percutaneous transhepatic bile drainage catheter is inserted.
Table 1  Patient Overview, Treatment, and Follow-up Status in Three Patients with Bilio-enteric Anastomosis Site Stricture

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Sex/Age (y)</th>
<th>Reason for operation</th>
<th>Name of operation</th>
<th>Time from operation to stricture (mo)</th>
<th>Time from stricture to puncture (mo)</th>
<th>Outcome</th>
<th>Follow-up status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M/55</td>
<td>Ampulla of vater cancer pancreas transection</td>
<td>Whipple operation with hepaticojejunostomy</td>
<td>25</td>
<td>10</td>
<td>Success</td>
<td>9 mo after PTBD catheter removal</td>
</tr>
<tr>
<td>2</td>
<td>M/40</td>
<td>Ampulla of vater cancer</td>
<td>Whipple operation with choledocojejunostomy</td>
<td>15</td>
<td>74</td>
<td>Failure</td>
<td>Operation</td>
</tr>
<tr>
<td>3</td>
<td>F/74</td>
<td>Ampulla of vater cancer</td>
<td>PPPD (hepaticojejunostomy)</td>
<td>11</td>
<td>1</td>
<td>Success</td>
<td>1 mo after 16F PTBD catheter insertion following recanalization</td>
</tr>
</tbody>
</table>

PPPD, pylorus preserving pancreaticoduodenectomy; PTBD, percutaneous transhepatic bile drainage.

Discussion

A postoperative biloenteric anastomosis stricture can be benign, but may have negative effects including choledocholithiasis, cholangitis, hepatic failure, and death.5–12 Endoscopic or radiological dilatation of the narrowed lumen requires passing a guide wire through the stricture, which is impossible in patients with complete obstruction, and necessitates a surgery. However, surgical approaches have a higher morbidity and mortality.2 Hence, less invasive measures are preferred, such as percutaneous approaches,13,14 including guide wire tapping and magnet compression of the anastomosis.2 A needle knife puncture can also be used to treat complete obstruction of the bile duct following an enteric anastomosis.

When performing a needle knife puncture, the endoscopist must ensure that the center of the stricture is targeted and use incision current. In addition, the angle of the needle knife entry to the stricture membrane should be perpendicular. In one of our cases (Case 2), the puncture was not performed in a perpendicular manner, and the center of the stricture membrane was not conspicuous. The patient required a surgical repair of the unintended perforation of the common bile duct. In a low level biloenteric anastomosis (such as choledocojejunostomy) anatomical alteration can result in a deviation of the common bile duct due to a long segment between bile duct hilum and jejunum. The deviation may lead to a nonperpendicular contact between the bile duct and bowel wall, which increases the perforation risks. However, the possibility of anatomical deviation would be lower in patients with a high level anastomosis such as hepaticojejunostomy.

Due to the small caliber of the bile duct, the safety margin is quite narrow. Therefore, a puncture followed by a gradual balloon dilatation can reduce the risks of complications, as compared with making an additional incision. A guide wire can be passed through the hole made by the needle knife into the jejunum to assess the puncture. If the hole is placed properly, the guide wire will coil along the bowel wall. Contrast injection, preferably with diatrizoate sodium solution, can provide further assurance. After confirming a successful puncture, a tapered catheter can be introduced into the puncture site to promote a gradual dilation. First, an indwelling 8–12F catheter is recommended. This can be increased incrementally to a 16F or 18F catheter at 2–4-week intervals. When the caliber reaches 16–18F, the catheter should be left in place for 6 months before removal to prevent restenosis. The endoscopist can check the patency with PTCS on the day of the catheter removal.

The main priority in the treatment of a completely obstructed biloenteric fistula lies in reducing the invasiveness of the procedure. The magnet compression anastomosis method, which is safe and efficacious,215 should be tried prior to attempting our blind puncture method. If the magnet compression anastomosis and the needle knife puncture method fail, surgery should be considered. In addition, when performing the needle knife puncture method, a surgical back-up is mandatory due to the possibility of an inappropriate puncture. A needle knife puncture can be applied in diverse situations, such as a benign esophagojejunal anastomosis stricture after a total gastrectomy. In this instance, force can be applied vertically by the needle. The stricture is relatively larger, which reduces the technical burden and makes the procedure safer than for a biloenteric stricture. The key to minimizing the risks in puncturing the biloenteric stricture is puncturing the fibrotic center perpendicular to the anastomosis. This procedure should prevent another surgery when performed properly and safely. If the necessary precautions are taken, the risks can be minimized. Further study should be conducted to minimize the risks and determine the indications and contraindications for the procedure.

Conflict of interest

Authors have no conflict of interest.

References