Diagnostic and Interventional Endoscopy

Case Report

Magnetic Compression Anastomosis for Post-cholecystectomy Biliary Stricture

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Abstract

Post-cholecystectomy bile duct injury treatment is always challenging for the surgeon. In order to perform endoscopic treatments, it is necessary to pass through the stricture site with a guide wire. The Rendezvous technique and single-operator cholangioscopy are used for this purpose. Magnetic compression anastomosis is a novel minimally invasive treatment for biliobiliary or bilioenteric anastomosis in a situation where the guide wire cannot be passed. However, there are only a few case reports regarding magnetic compression anastomosis usage in human, especially in biliary stricture after cholecystectomy. This case showed that the magnetic compression anastomosis is an alternative nonsurgical method for reconnecting the internal biliary pathway after a failed conventional method.

Keywords: Biliary stricture, magnamosis, endoscopy

INTRODUCTION

Laparoscopic cholecystectomy (LC) demonstrates several benefits over the open technique. However, the laparoscopic approach comes with 2-7 times higher incidence rate of bile duct injury.[1] Post-cholecystectomy bile duct injury management depends on the type, extent of injury, and recognition time. The purpose is to establish tension-free anastomosis and prevent complications such as cholangitis, bile leakage, and stricture.[2] There are many guidelines on managing post-cholecystectomy bile duct injury, which followed Strasberg's classification.[3,4] Type-E injuries (main hepatic duct injury and transection) are the most difficult to handle as they involve both intra- and extra-hepatic bile duct. Recently, a minimally invasive approach has been much more favorable because it allows a patient to recover faster and avoid early major operations. In order to perform endoscopic treatments, it is necessary to pass through the stricture site with a guide wire. The Rendezvous technique and single-operator cholangioscopy are used for this purpose.[5,6]

Magnetic compression anastomosis (MCA), also known as magnamosis, is a novel, minimally invasive method of performing biliary anastomosis in a situation where the guide wire cannot be passed. However, only a few human studies supported this technique in post-cholecystectomy bile duct stricture.[7-9] Our study aimed to show the clinical results of MCA for re-canalizing the bile duct in a bile duct injury patient after a failed conventional method.

Ethical Consideration

This retrospective case report was approved by the Khon Kaen University Ethics Committee for Human Research based on the Declaration of Helsinki and the ICH good clinical practice guidelines. The patient gives her consent to participate in this research project and for the material about the patient to appear in a publication.

CASE PRESENTATION

The patient was a woman in her 60s with a symptomatic gallstone. She was admitted to another hospital for LC. However, a complete transection of the common bile duct (CBD) occurred during the procedure. In the same operative period, she underwent open primary repair of the CBD without T-tube placement. However, the bile leakage persisted after the operation. So, she was transferred to our hospital for proper treatment. Her liver function test revealed an elevated alanine transferase (356 U/L), aspartate transaminase (612 U/L), alkaline phosphatase (687 U/L), total

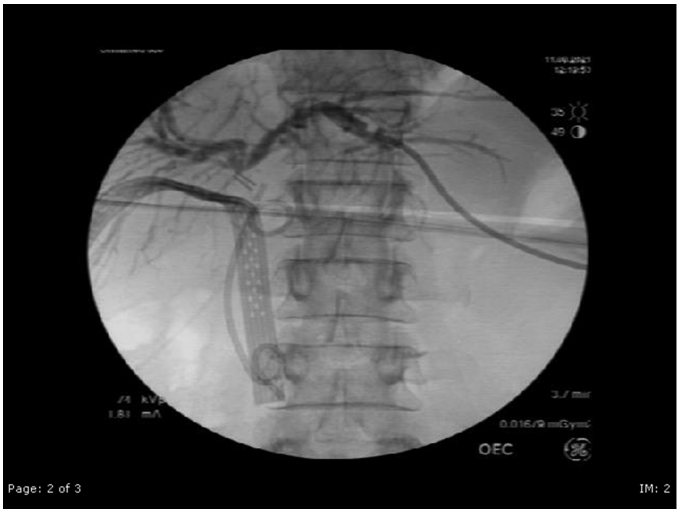

Figure 1. Percutaneous transhepatic biliary drainage demonstrated the type E3 bile duct stricture.

Figure 2. The different poles of 2 magnets were painted.

bilirubin (1.0 mg/dL), direct bilirubin (0.6 mg/dL), and white cell count 4.05×10^9/L.

The endoscopic retrograde cholangiopancreatography (ERCP) showed a benign bile duct stricture at the perihilar area with a leakage. We could pass a guide wire across the stricture site with difficulty. However, any dilator or stent could not be passed across the stricture site. Later, the patient was sent to an intervention radiologist for percutaneous transhepatic biliary drainage (PTBD) to drain the biliary anastomosis leakage. The cholangiogram showed a type E3 bile duct stricture with an approximately 4 mm gap according to Strasberg classification (Figure 1).

To recanalize the biliary tract, we decided to use MCA. The 4 × 15 mm neodymium magnets which were commercially available were used. We attached the magnet to the outer tube of a 10-French plastic stent delivery system. The opposite poles of 2 magnet pieces were painted to ascertain they would attract to each other after deployment (Figure 2). We also made a hole at the tip of the delivery system for a guide wire cannulation (Figure 3). Then, the 2 magnets were deployed, one from ERCP and another from the PTBD route under fluoroscopic guidance. We used the inner tube of the delivery system to release the magnets. We ensured the deployment ease as close to the stricture site as possible. The 2 magnets were successfully connected after the procedure (Figure 4).

Twenty-eight days later, we performed ERCP to retrieve the magnets using a balloon catheter. After that, the stricture site was dilated with a balloon dilator; then, we inserted a 10-French plastic stent across. The patient then underwent serial bile duct dilatation sessions every 3

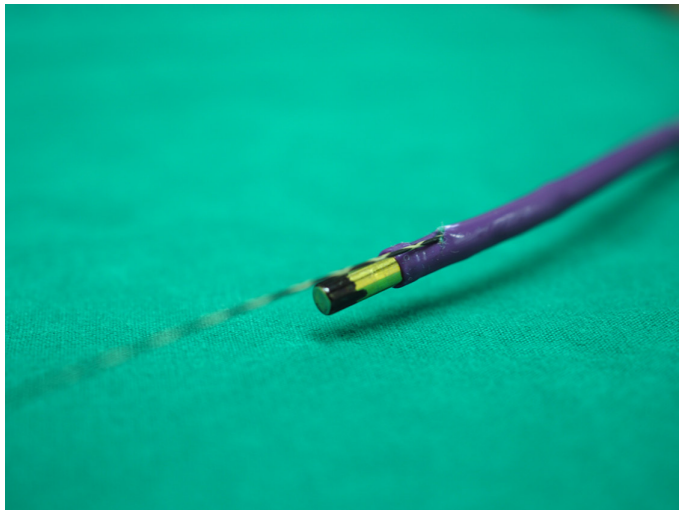

Figure 3. A hole was made at the tip of a delivery system for guide wire cannulation.

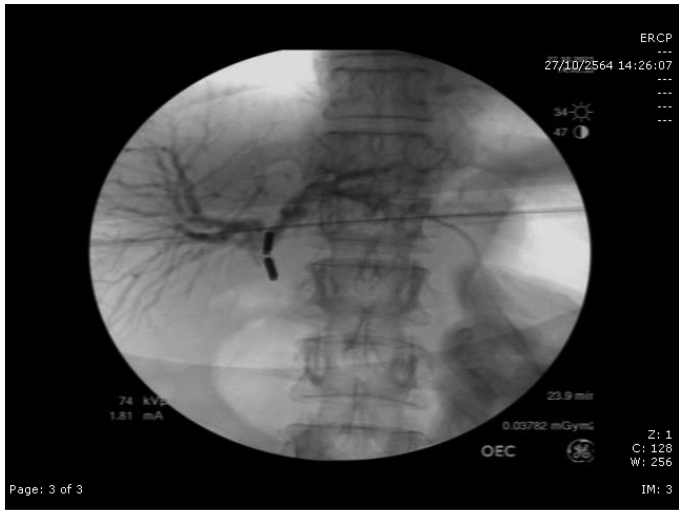

Figure 4. The 2 magnets attached to each other after the operation.

MAIN POINTS

- Biliary stricture after cholecystectomy is a challenging situation.
- Endoscopic treatment can achieve success only when the guide wire can be inserted across the stricture site.
- Magnetic compression anastomosis can safely perform biliobiliary anastomosis in a selected case.

Figure 5. Double 10-French plastic stent was used to dilate the stricture site.

months to insert double 7-French plastic stents and double 10-French plastic stents (Figure 5).

After 12 months of serial dilatations, the plastic stent was removed. At the 3-month follow-up after the stent removal, the patient experienced no jaundice or cholangitis. Her liver function test improved (alanine transferase 18 U/L, aspartate transferase 31 U/L, alkaline phosphatase 74 U/L, total bilirubin 0.2 mg/dL, and direct bilirubin 0.1 mg/dL).

DISCUSSION

Magnamosis is a new technique for performing alimentary tract anastomosis without surgery. The efficacy and safety of MCA are ongoing to be validated in both animal models and human studies. The outcomes of MCA in an animal model were promising regarding safety.[10-13] The number of reports in human studies has increased after Yamanouchi et al demonstrated this technique.[14-16] Optimistic outcomes have been reported regarding the MCA usage for benign biliary stricture treatment, specifically biliobiliary- or bilioenteric anastomosis.[17,18] However, the most common indication for MCA for benign biliary stricture was postoperative complications after living-donor liver transplantation. Only a few studies reported the success of MCA in post-cholecystectomy bile duct injury.[8,19]

There are several factors associated with the success rate of MCA, such as length of stricture, shape of the bile duct, pattern of direction of each magnet and bile duct axis.[20] The patient can safely achieve internal biliary drainage with MCA in our study because the above factors were in appropriate condition. We successfully removed the magnet faster than in the previous studies (53.3 days)[20]; the shorter gap between both ends of the bile duct in our patient might explain.

In conclusion, the MCA is a magnificent technique which can perform biliobiliary anastomosis in post-cholecystectomy bile duct injury without major surgery. However, further research is required to investigate this therapeutic effect.

Ethics Committee Approval: This retrospective case report was approved by the Khon Kaen University Ethics Committee for Human Research based on the Declaration of Helsinki and the ICH good clinical practice guidelines. Clinical data were obtained by reviewing medical records. (Date: July 10, 2022, Number: HE651311).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – C.E.; Design – C.E.; Supervision – S.R.; Data Collection and/or Processing – J.W., S.R.; Writing Manuscript – C.E.; Critical Review – K.E.

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