



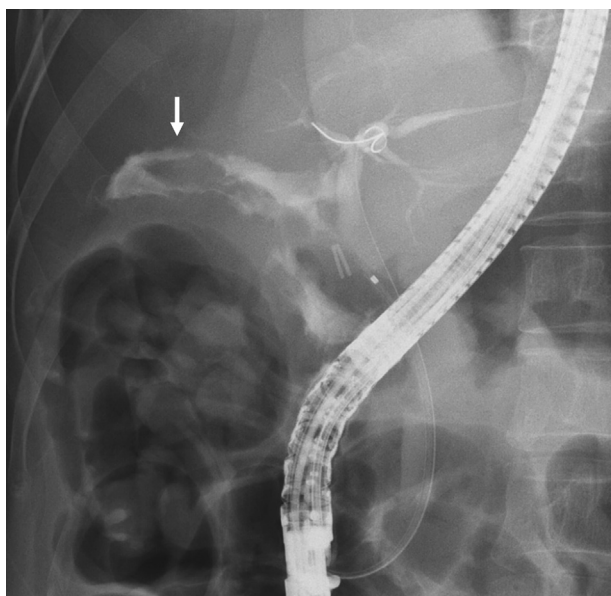
## Magnetic compression anastomosis for treatment of biliary stricture after cholecystectomy

Min Young Do, MD, Sung Ill Jang, MD, PhD, Jae Hee Cho, MD, PhD, Seung-Moon Joo, MD, Dong Ki Lee, MD, PhD

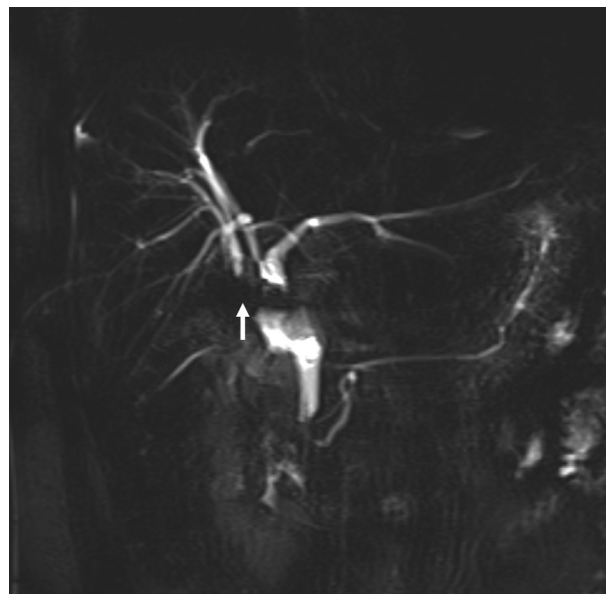
### CASE DESCRIPTION

Postcholecystectomy biliary stricture can be treated with endoscopic or percutaneous treatments. However, these conventional methods are not feasible if a guidewire cannot be passed through the stricture.<sup>1-6</sup> We report magnetic compression anastomosis for the treatment of a biliary stricture after cholecystectomy that could not be treated with conventional methods (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)).

A 60-year-old woman who had undergone laparoscopic cholecystectomy 1 week ago because of a gallbladder stone, presented with upper abdominal pain. An abdominal CT showed a moderate amount of right perihepatic biloma collection. During ERCP, cholangiogram showed that there was bile leakage on the surgical clip and right hepatic duct stricture (Fig. 1). A fully covered self-expandable metallic stent (FCSEMS) was inserted to resolve bile leakage. An abdominal CT 1 week later showed an increase in the amount of biloma in the perihepatic space and the surgical site. Percutaneous catheter drainage was performed to resolve the biloma, and follow-up abdominal CT confirmed resolution. After percutaneous catheter



**Figure 1.** Cholangiogram showed bile leakage on the surgical clip and right hepatic duct stricture.

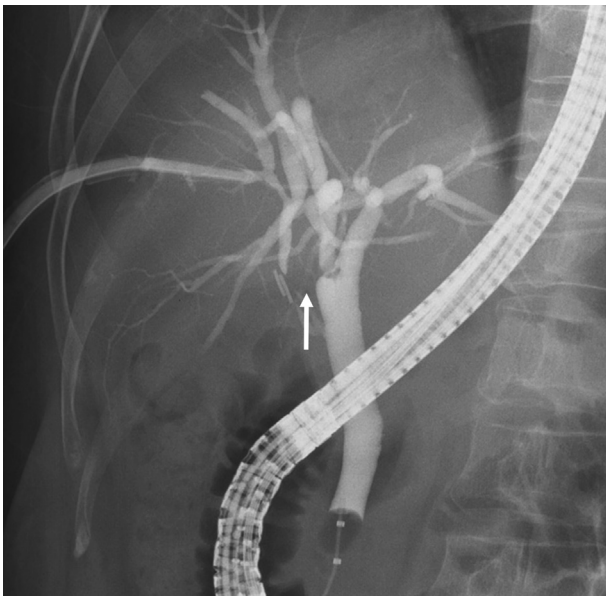


**Figure 2.** In MCRP, there was an iatrogenic obstruction of the right intrahepatic duct on the surgical clip.

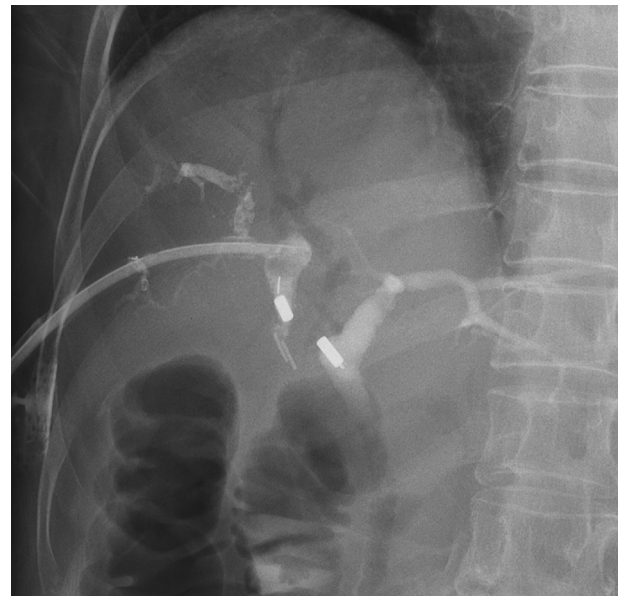
removal, MRCP was performed. In the MRCP, there was an iatrogenic obstruction of the right intrahepatic duct (IHD) on the surgical clip (Fig. 2). The right IHD appeared to be separated from the common bile duct (CBD); this was related to an underlying congenital variation in the insertion of the right IHD into the extrahepatic duct. During subsequent ERCP, the guidewire could not be passed through the right IHD. Cholangiogram showed that the right IHD was separated from the CBD (Fig. 3).

To resolve complete biliary obstruction, we decided to use the magnetic compression anastomosis technique. We developed a rare-earth magnet (Taewoong Medical, Seoul, Korea) (Fig. 4). The magnet is 4 mm in diameter and 8 mm in width with a hole drilled in the side opposite to the alignment side. A silk string was connected by forming a hook through the hole. The silk string attached to the magnet was grasped with an endoscopic snare.

A retrieval FCSEMS (Kaffes; Taewoong Medical) was inserted into the distal CBD to facilitate magnet insertion across the papilla. Percutaneous transhepatic biliary



**Figure 3.** The right intrahepatic duct was separated from the common bile duct.

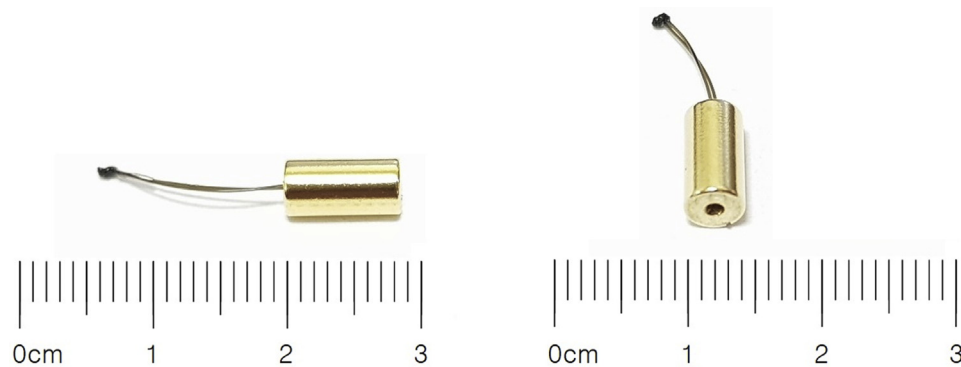


**Figure 5.** One magnet was delivered through the percutaneous transhepatic biliary drainage tract, and the other magnet was advanced through the common bile duct.

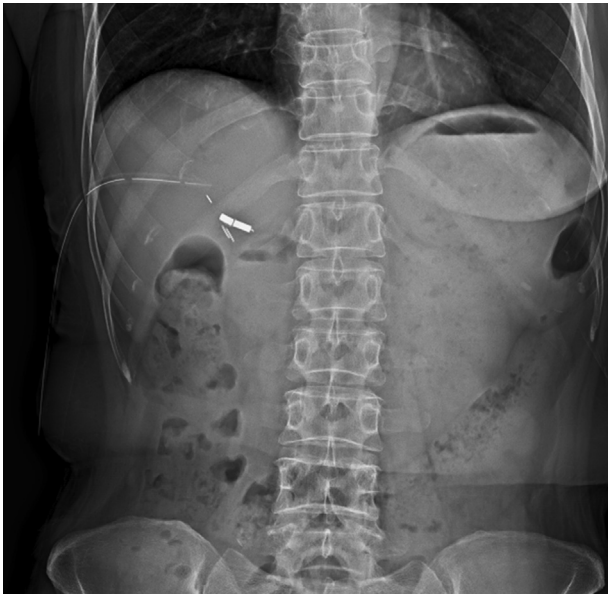
drainage (PTBD) was inserted, and the catheter was exchanged to an 18 sheath for delivery of magnets. One magnet was delivered through the PTBD tract using an endoscopic snare (Taewoong Medical). The magnet was fixed to the right IHD using a biliary balloon catheter (Extraction balloon; Cook Medical, Bloomington, Ind, USA), and the other magnet was advanced through the CBD (Fig. 5). A plain abdominal radiograph was performed at 2-week intervals for 6 weeks after approximation of the magnets. After 6 weeks, the magnets were successfully approximated (Fig. 6). The approximated magnet was removed through the PTBD tract using a grasping forceps (MTW Endoskopie Manufaktur, Wesel, Germany). Another magnet was

removed via ERCP of the CBD using a grasping forceps, and the guidewire was able to pass the stricture site. The recanalized fistula was confirmed, and an FCSEMS was inserted at the recanalized site to maintain the new fistula tract (Fig. 7). The FCSEMS was exchanged every 3 months for 6 months. After 6 months, the FCSEMS was removed. Cholangiogram showed complete resolution of the biliary stricture (Fig. 8). The patient is under outpatient follow-up without specific symptoms or recurrence.

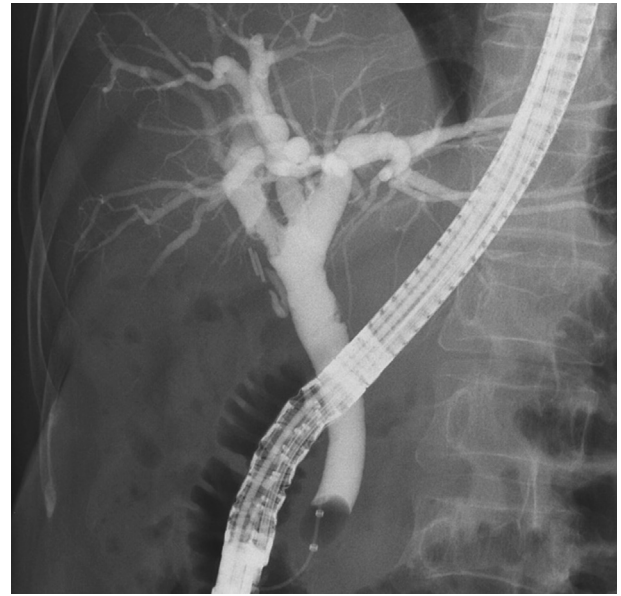
In conclusion, conventional methods have limitations in treating severe biliary stricture or complete biliary stricture. Magnetic compression anastomosis may be useful in treating complete biliary stricture after cholecystectomy.



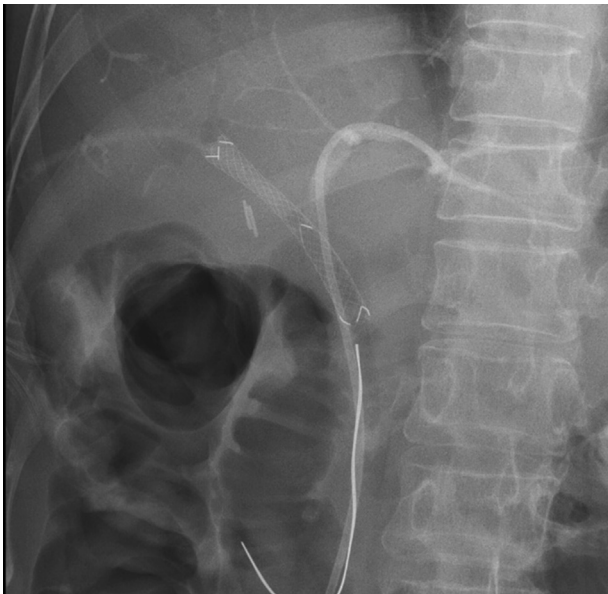
**Figure 4.** The magnet (Taewoong Medical, Seoul, Korea) is 4 mm in diameter and 8 mm in width with a hole drilled in the side opposite to the alignment side. A silk string was connected by forming a hook through the hole. The silk string attached to the magnet was grasped with an endoscopic snare.



**Figure 6.** After 6 weeks, the magnets were successfully approximated.



**Figure 8.** Cholangiogram showed complete resolution of the biliary stricture.



**Figure 7.** The recanalized fistula was confirmed, and a fully covered self-expandable metallic stent was inserted at the recanalized site to maintain the new fistula tract.

## DISCLOSURE

*All authors disclosed no financial relationships.*

*Abbreviations: CBD, common bile duct; FCSEMS, fully covered self-expandable metallic stent; IHD, intrabepatic duct; PTBD, percutaneous transbepatic biliary drainage.*

## REFERENCES

1. Yamanouchi E, Kawaguchi H, Endo I, et al. A new interventional method: magnetic compression anastomosis with rare-earth magnets. *Cardiovasc Intervent Radiol* 1998;21:S155.
2. Yamanouchi E, Kawaguchi H, Endo I, et al. A new interventional method of anastomosis with magnets: magnetic compression anastomosis in five clinical cases. *Radiology* 1998;209:567.
3. Mimuro A, Tsuchida A, Yamanouchi E, et al. A novel technique of magnetic compression anastomosis for severe biliary stenosis. *Gastrointest Endosc* 2003;58:283-7.
4. Itoi T, Kasuya K, Sofuni A, et al. Magnetic compression anastomosis for biliary obstruction: review and experience at Tokyo Medical University Hospital. *J Hepatobiliary Pancreat Sci* 2011;18:357-65.
5. Jang SI, Rhee K, Kim H, et al. Recanalization of refractory benign biliary stricture using magnetic compression anastomosis. *Endoscopy* 2014;46:70-4.
6. Jang SI, Lee K-H, Yoon HJ, et al. Treatment of completely obstructed benign biliary strictures with magnetic compression anastomosis: follow-up results after recanalization. *Gastrointest Endosc* 2017;85:1057-66.

Department of Internal Medicine, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, Korea (1), Department of Radiology, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, Korea (2), Department of Internal Medicine, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, Korea (3).

If you would like to chat with an author of this article, you may contact Dr Lee at [dklee@yuhs.ac](mailto:dklee@yuhs.ac).

Copyright © 2022 American Society for Gastrointestinal Endoscopy. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.vgje.2022.03.005>