ORIGINAL ARTICLE

Endoscopic repair of surgically transected bile duct using overlapping covered metal stents

Thomas Tielleman, MD, Markus Goldschmiedt, MD

INTRODUCTION

Injury of the bile duct during surgery is a feared adverse event that is typically managed by hepatobiliary surgeons. Roux-en-Y hepaticojejunostomy is the preferred management for most significant bile duct injuries.[1] However, even injuries that are successfully treated surgically with a biliary-enteric repair are often associated with long-term adverse events, such as strictures.[2] Here we report a case in which we performed ERCP via rendezvous with interventional radiology to endoscopically repair a complete bile duct transection.

CASE

The patient was a 48-year-old man who underwent cholecystectomy. Following surgery, the patient developed hemoperitoneum requiring multiple take-backs to the operating room. ERCP was performed in the setting of elevated liver function tests and a rising white blood cell count. ERCP revealed large extravasation of contrast from the distal common bile duct (Fig. 1).

Cholangioscopy of the distal common bile duct as well as percutaneous transhepatic cholangiography confirmed a complete bile duct transection (Figs. 2 and 3). A biliary drain was placed during percutaneous transhepatic cholangiography. Following discussion with representatives from the hepatobiliary surgery department, the decision was made to attempt endoscopic reconnection of the transected bile duct (Video 1, available online at www.videogie.org).

A guidewire was advanced through the biliary drain into the peritoneal cavity and then retrieved with a cholangioscope via ERCP (Fig. 4). We attempted to bridge the duct with a Conmed Viabil (Elkton, Md, USA) 10-mm × 10-cm fully covered self-expandable metal stent (FCSEMS) equipped with antimigration flaps with 1 flap distal to the papilla for stability. Unfortunately, the stent was not long enough to bridge the entire transection. A second FCSEMS (10-mm × 8-cm WallFlex; Boston Scientific, Galway, Ireland) with 12-mm flanges was placed suprapapillary within the first stent with the thought that the 12-mm flange opened within a 10-mm stent would maintain stability and reduce migration risk (Fig. 5). The patient's drain was ultimately converted to an internal-external drain through the 2 FCSEMSs.

Four months later, the stents were removed with raptor forceps under fluoroscopic guidance, with the suprapapillary stent being removed first. The common bile duct was noted to have reconstituted (Fig. 6). There was a small

Abbreviation: FCSEMS, fully covered self-expandable metal stent.

2468-4481
https://doi.org/10.1016/j.vgie.2023.09.018

University of Texas Southwestern Medical Center, Dallas, Texas.

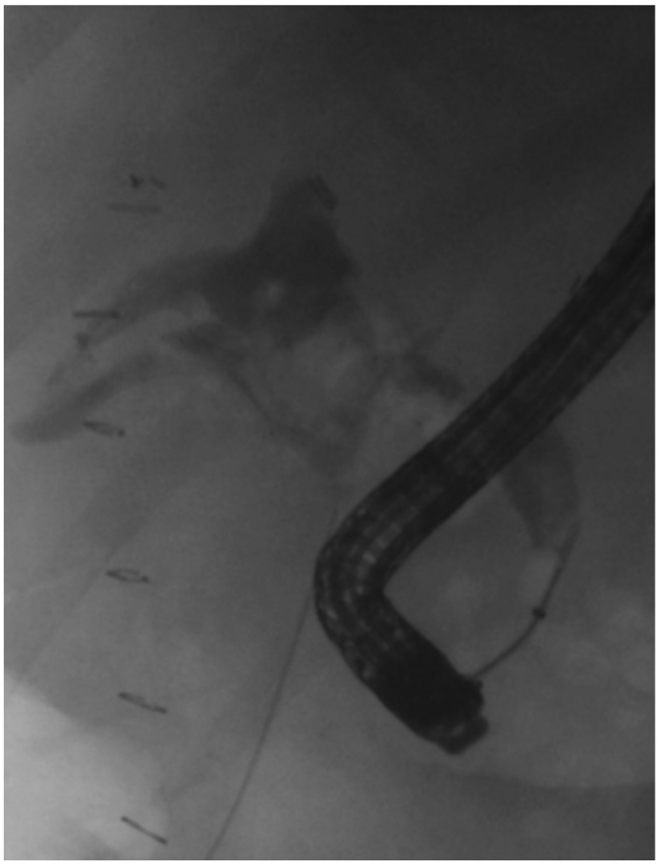

Figure 1. Initial cholangiogram with large extravasation of contrast into the peritoneum.

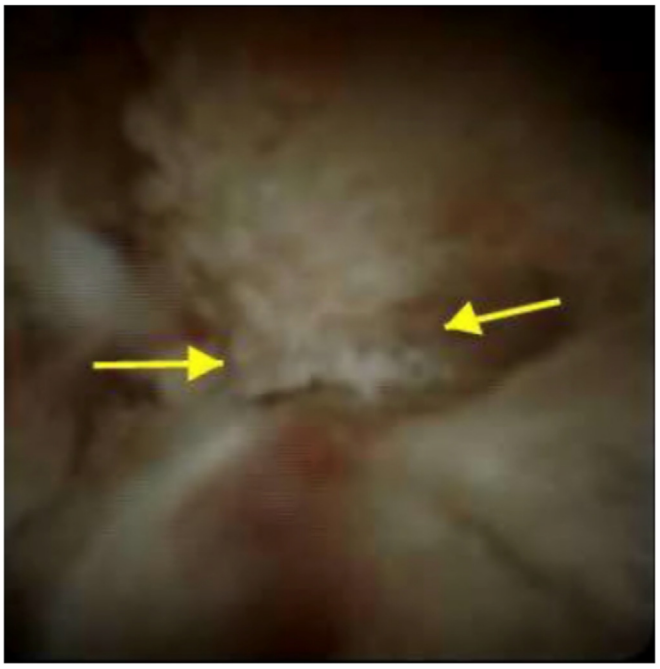

Figure 2. Cholangioscopy revealed narrowing at the level of contrast extravasation (*arrows*), raising concern for bile duct transection.

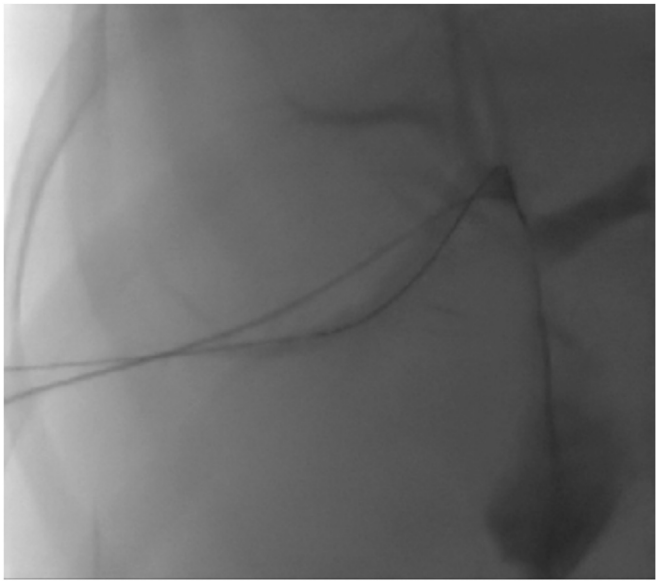

Figure 3. Percutaneous transhepatic cholangiography was performed without any contrast noted to drain to the duodenum, further confirming bile duct transection.

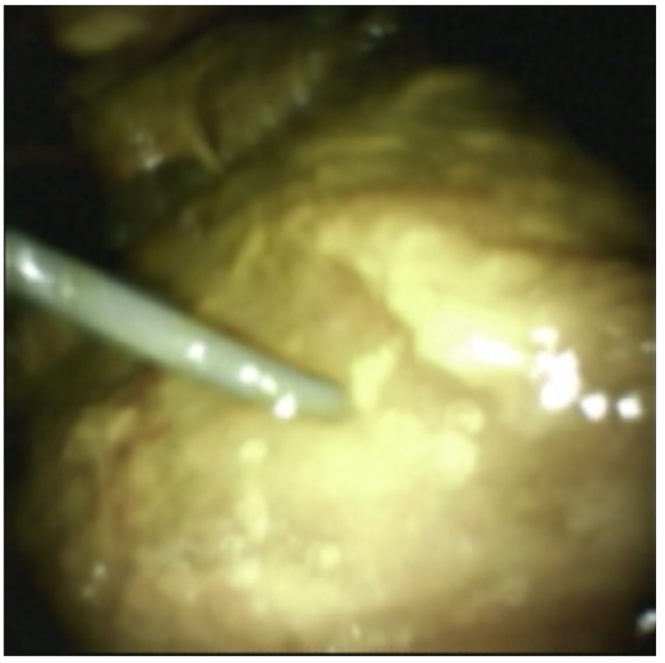

Figure 4. Wire originating from percutaneous biliary drain seen endoscopically within the peritoneal cavity.

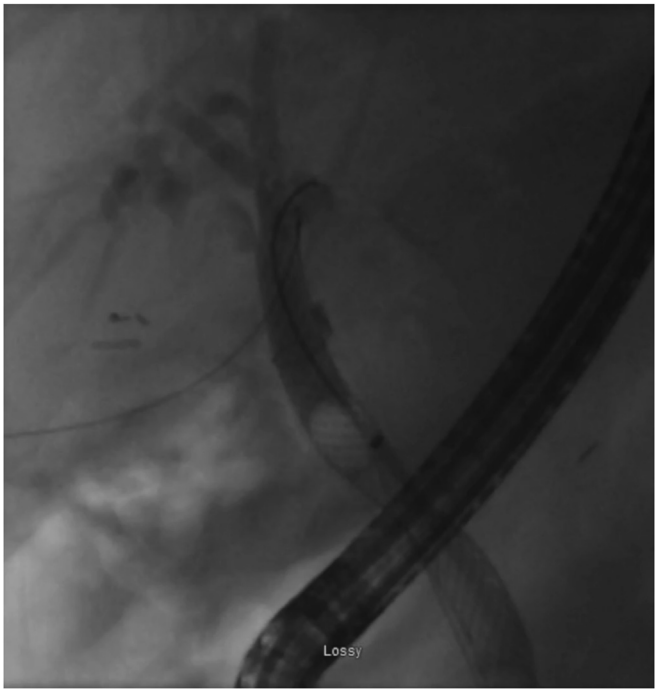

Figure 5. Resolution of leak after placement of overlapping fully covered self-expandable stents.

persistent leak, so a new Boston Scientific 10-mm × 8-cm FCSEMS was placed. Given the resolution of the bile leak after repeat stenting, the biliary drain was removed.

On follow-up ERCP, there was no further leak, but a common hepatic duct stricture developed (Fig. 7) that required serial dilations with plastic stent upsizing until eventual resolution of the stricture (Fig. 8, Table 1). The patient has not required any stenting or repeat interventions in 16 months of follow-up.

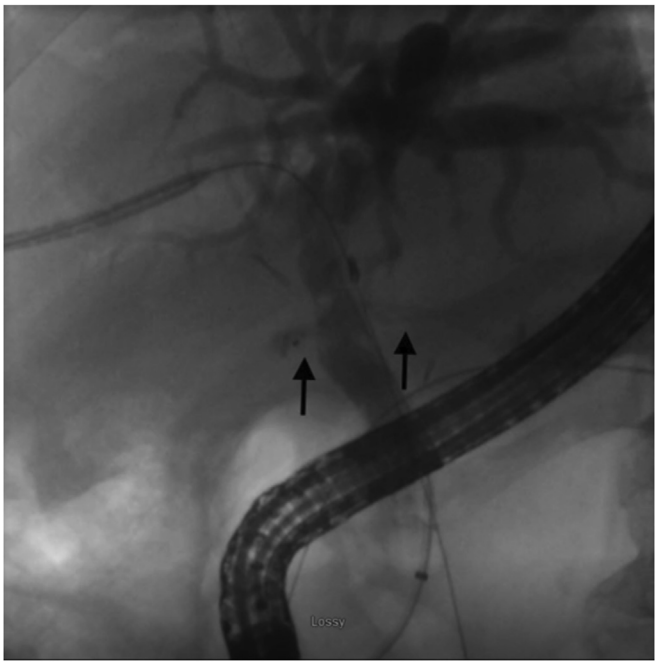

Figure 6. Bile duct transection significantly improved after removal of overlapping stents, but a small bile leak remained, requiring repeat stenting with a single fully covered self-expandable metal stent.

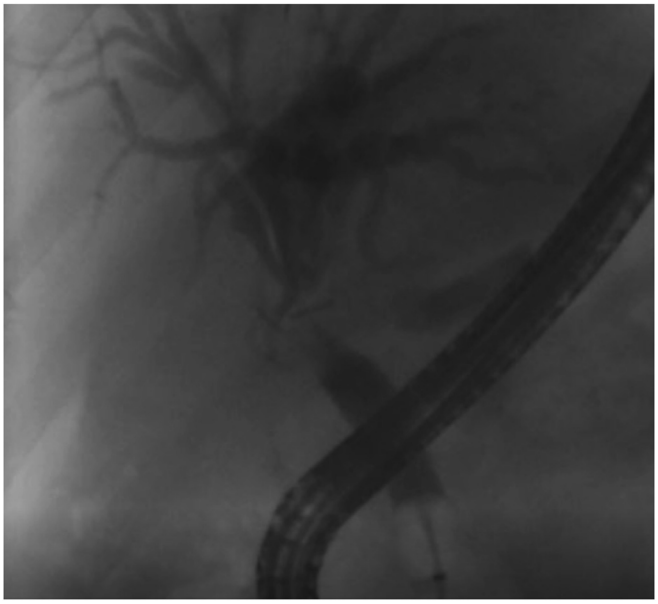

Figure 7. Common hepatic duct stricture after removal of fully covered self-expandable metal stent.

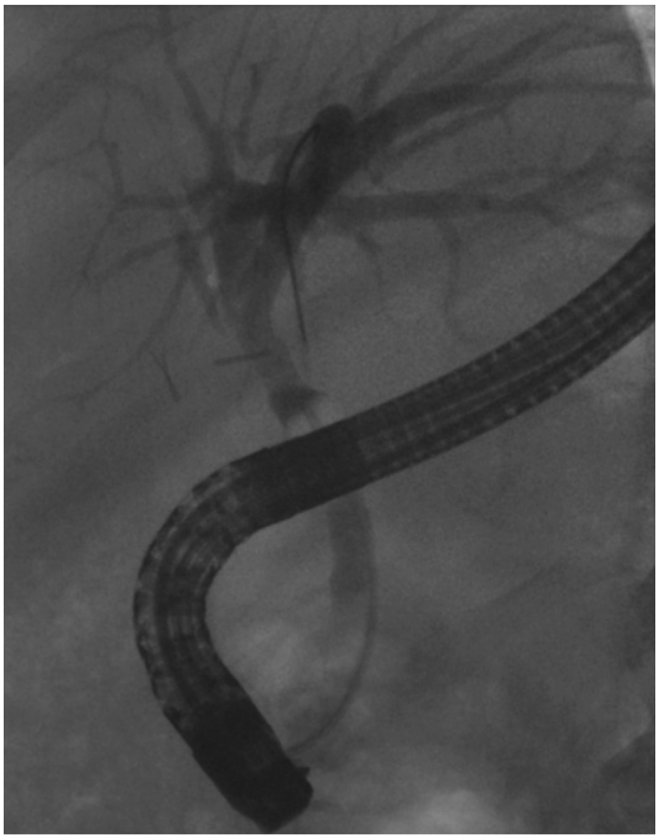

Figure 8. Complete resolution of the common hepatic duct stricture after serial dilations. No further bile leak was present.

CONCLUSIONS

To the best of our knowledge, the present study is the first to report overlapping covered metal stents to fully repair and reconstitute a large common bile duct transection. The patient was not thought to be a surgical candidate for hepaticojejunostomy. Our endoscopic approach allowed for healing and reconnection of a completely transected common bile duct with a large, disconnected segment. This allowed for the patient to avoid high-risk surgery as well as avoid an indefinite percutaneous biliary drain.

Transection of the common bile duct can be successfully managed with biliary stenting. Over time, the covered metal stent can act as a scaffolding to allow for reconstitution of the bile duct. We suspect that the prolonged stenting allowed for the formation of fibrotic scar tissue to allow

TABLE 1. ERCPs performed following confirmation of bile duct transection

ERCP	Time since prior ERCP	Cholangiogram findings	Dilation performed?	Stent(s) placed
1	N/A	Bile duct transection	N/A	1. 10 mm × 10 cm Conmed Viabil 2. 10 mm × 8 cm Boston Scientific WallFlex
2	17.5 weeks	Small persistent leak	N/A	10 mm × 8 cm Boston Scientific WallFlex
3	15.5 weeks	Common hepatic duct stricture	Yes, 4 mm	7F × 12 cm straight plastic stent
4	3 weeks	Common hepatic duct stricture	Yes, 6 mm	10F × 12 cm straight plastic stent
5	4 weeks	Common hepatic duct stricture	Yes, 6 mm	10F × 12 cm straight plastic stent (second stent attempted, but could not pass)
6	5.5 weeks	Common hepatic duct stricture	Yes, 8 mm	1. 10F × 12 cm straight plastic stent 2. 7F × 7 cm double-pigtail plastic stent
7	11 weeks	Common hepatic duct stricture	Yes, 10 mm	1. 10F × 12 cm straight plastic stent 2. 10F × 9 cm straight plastic stent
8	9 weeks	Normal cholangiogram	No	None

N/A, Not applicable.

reconnection of the transected bile duct. From our case, 4 months appears to be an appropriate amount of time after initial stenting to remove the stents and reassess the bile duct. If a small leak persists, another FCSEMS can be placed to allow for further resolution. However, a shorter amount of stent indwelling time may be advisable on subsequent FCSEMSs to try to avoid stricture formation.

This technique can be used in patients who are not thought to be surgical candidates to avoid indefinite percutaneous biliary drainage. In the case of a very large transection, we demonstrate that overlapping stents can be successfully used to allow for bridging and reconstitution of the bile duct.

DISCLOSURE

Dr Tielleman is a consultant for Conmed. Dr Goldschmiedt did not disclose any financial relationships.

REFERENCES

1. Thompson CM, Saad NE, Quazi RR, Darcy MD, Picus DD, Menias CO. Management of iatrogenic bile duct injuries: role of the interventional radiologist. Radiographics 2013;33:117-34.
2. Walsh RM, Henderson JM, Vogt DP, Brown N. Long-term outcome of biliary reconstruction for bile duct injuries from laparoscopic cholecystectomies. Surgery 2007;142:450-7.