Holmium laser vaporization and percutaneous removal of a migrated endothelialized biliary self-expanding metal stent

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Self-expanding metal stents (SEMSs) are widely used for drainage of malignant biliary obstruction.1 Tissue ingrowth or overgrowth in uncovered SEMSs is common, and endoscopic removal is challenging. Holmium laser is the clinical criterion standard for endourologic lithotripsy because of its ability to fragment stones of a wide variety of compositions.2 Few studies have reported its use in the vaporization of exogenous prosthetic material in extraurinary scenarios. We report our experience using a Holmium laser for vaporization and percutaneous extraction of a partially endothelialized biliary SEMS causing recurrent obstruction and cholangitis.

DESCRIPTION OF TECHNOLOGY

The Holmium:yttrium-aluminum-garnet (Ho:YAG) laser is a commonly used pulsed laser in endourologic and...
bile duct procedures. From both a scientific and a technical perspective, Holmium laser has several ideal characteristics for use in endoscopic procedures. Strong water absorption at 2140 μm translates into a penetration depth of 400 μm. Energy emitted from the laser fiber after activation leads to the formation of a vapor channel through which laser radiation is transmitted. Infrared laser energy absorption by water causes microexplosions during thermal expansion and vaporization of water molecules. Furthermore, Holmium laser can be delivered through durable biocompatible silica optical fibers. Silica fibers possess desirable thermal, mechanical, and chemical properties that enable transmission of high laser power for ablation, short bend radii for use inside the working channel of flexible endoscopes, and resistance to corrosion in various fluid environments.

**VIDEO DESCRIPTION AND CASE REPORT**

We report the case of a 76-year-old patient with a history of recurrent choledocholithiasis. An uncovered SEMS had been implanted 15 years earlier, possibly for a common bile duct stenosis of unknown cause. However, the exact indication for insertion in a patient with a benign condition remained unclear because the original records were not available.

The patient had a history of partial gastrectomy with Billroth II reconstruction because of a perforated gastroduodenal ulcer. The patient was referred to our department because of recurrent biliary obstruction with cholangitis. ERCP followed by direct per-oral cholangioscopy showed migration of the SEMS into the proximal common bile duct and the left intrahepatic duct. The stent was also occluded with sludge and stones (Fig. 1A). Endoscopic transpapillary removal failed because the SEMS was partially endothelialized and ingrown into the tissue (Fig. 1B).

A percutaneous drain was inserted through the left intrahepatic bile duct (Fig. 1C). A single dose of 400 mg ciprofloxacin was preoperatively administered as a prophylactic antibiotic. The percutaneous tract was then consecutively dilated to a maximum diameter of 6.7 mm using percutaneous bougienage and drainages (up to 20F) in several procedures. After establishment of a percutaneous tract, flexible cholangioscopy with a 5-mm gastroscope showed the partially occluded and ingrown SEMS in the left hepatic duct and common bile duct. A 12F rigid nephroscope was inserted through an external 18F sheath and equipped with a 500-μm Holmium laser fiber. This fiber caliber allows energy settings over 25 watts to accelerate target disintegration. The procedure was carried out with the following Holmium laser settings: 1.5 J pulse energy, 25 Hz pulse frequency, and 750 μs pulse length, generating a cumulative laser energy power of 39 watts.

Under continuous irrigation, the SEMS was fragmented, and endothelialized parts were exposed with the laser (Figs. 1D and E). The remaining fragments were percutaneously extracted through the access sheath with endoscopic forceps. The duration of the entire procedure, from anesthesia induction to final percutaneous drainage placement, was 80 minutes (Video 1, available online at www.VideoGIE.org).

Postprocedural cholangioscopy confirmed complete clearance of the intrahepatic duct and common bile duct. Fluoroscopy showed a residual proximal stent fragment that was deeply ingrown into the choledochal wall but did not compromise the patency of the bile duct. Cholangioscopic follow-up after 2 weeks showed no evidence of residual intraductal stent fragments; also, there was no bile duct injury or stenosis (Fig. 1F). The percutaneous drainage was removed 6 weeks later, and the patient remained free of symptoms with normal laboratory test results.

Holmium laser vaporization is a highly effective method to facilitate removal of biliar endothelialized self-expanding metal stents in selected cases. Its minimal penetration depth allows for meticulous vaporization of prosthetic material without injuring the ductal wall.

**DISCLOSURE**

Dr Miernik is an advisor to Richard Wolf GmbH and to Lisa laser OHG. The other authors disclosed no financial relationships relevant to this publication.

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