Techniques in Gastrointestinal Endoscopy 18 (2016) 62–66

Contents lists available at ScienceDirect

Techniques in Gastrointestinal Endoscopy

journal homepage: www.techgiendoscopy.com/locate/tgie

Benign biliary strictures: Endoscopic management

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ARTICLE INFO

Article history:
Received 25 May 2016
Accepted 18 July 2016

Keywords:
Plastic stents
Self-expandable metal stents
Chronic pancreatitis
Laparoscopic cholecystectomy
Liver transplantation
primary sclerosing cholangitis
Autoimmune cholangiopathy

ABSTRACT

Over the past 2 decades, endoscopic retrograde cholangiopancreatography with stricture dilation and stent placement has gradually become the first-line treatment modality for the vast majority of benign biliary strictures (BBSs). Stricture remediation with progressive placement of multiple plastic stents with 3 months interval stent exchange during a period of one year has excellent long-term results in patients with postoperative BBSs. Covered self-expandable metal stents (SEMS) are a reasonable alternative to multiple plastic stenting, especially in patients with chronic pancreatitis. The use of covered SEMS should be limited to carefully selected cases of postoperative BBSs. Uncovered SEMS are contraindicated for any type of BBSs. Understanding of the etiology and exclusion of malignancy is essential for optimal treatment in some types of biliary strictures, especially in the case of autoimmune cholangiopathy and primary sclerosing cholangitis.

1. Introduction

Benign biliary strictures (BBSs) are often the consequence of iatrogenic injury during laparoscopic cholecystectomy or may arise after liver transplantation or a hepatic resection with duct-to-duct biliary anastomosis. There are also other etiologies of BBSs, including primary sclerosing cholangitis (PSC), chronic pancreatitis (CP), and autoimmune cholangitis. The etiologies of BBSs are in the Table. Up to 80% of postoperative BBSs present within 6-12 months after surgery with symptoms as pruritus, jaundice, abdominal pain, alterations of liver function tests, and recurrent cholangitis [1].

In the past, surgical repair was the treatment of choice for BBSs. Today, endoscopic retrograde cholangiopancreatography (ERCP) has a pivotal role in the treatment of the vast majority of these lesions. Prompt recognition of these lesions is important because long-standing cholestasis can lead to secondary biliary cirrhosis [2]. Moreover, in patients with BBSs occurring in the course of CP and PSC, it is important to exclude underlying malignancy.

MRCP with cholangiographic sequences is the preferred non-invasive modality for diagnostic cholangiography [3]. In particular, this imaging method can be useful in hilar strictures (as a roadmap for endoscopic drainage) and in patients with suspected anastomotic (ABS) biliary stricture after LT (to exclude the ischemic nature of the stricture) [4].

Endoscopic ultrasound with fine-needle aspiration (EUS/FNA) can be useful in ruling out malignancy in patients with mass-forming chronic pancreatitis, or for rendezvous EUS/ERCP procedures in case of failed transpapillary access to the bile ducts.

Currently, ERCP is considered to be primarily a therapeutic procedure; however, it maintains a diagnostic role when used to perform biliary brushing or intraductal biopsies or both.

Cholangioscopy with targeted biopsy can be useful in autoimmune cholangiopathy or PSC [5] and in selected cases of indeterminate strictures where other diagnostic methods have failed in ruling out malignancy.

The morphologic classification of Bismuth [6] was developed in the prelaparoscopic era, and its intent was to guide surgical repair of postoperative benign biliary strictures [7]. It is still widely used to classify patients according to the cholangiographic appearance. This classification divides BBSs into following 5 types: *type 1:* located at the lower common hepatic duct or bile duct (>2 cm from the hilum); *type 2:* mid common hepatic duct (<2 cm from the hilum); *type* 3: stricture located at the hilum; *type 4:* destruction of the hilar confluence (separation of the right and the left hepatic ducts); and *type 5:* involvement of one right hepatic branch.

2. Principles of endoscopic management

The endoscopic management of BBSs consists of 2 important steps: the first step is negotiation of the stricture and the second one is dilation of the stricture.

The author reports no direct financial interests that might pose a conflict of interest in connection with the submitted article.

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http://dx.doi.org/10.1016/j.tgie.2016.07.002
0049-0172/

Table
Etiologies of benign biliary strictures.

Postsurgical
Cholecystectomy (open or laparoscopic)
Liver transplantation (anastomotic and nonanastomotic)
Bilioenteric anastomosis
Postbiliary sphincterotomy or biliary precut
Inflammatory
Chronic pancreatitis
Primary sclerosing cholangitis
Immunoglobulin G4-related cholangiopathy
Cholangiopathy in acquired immune deficiency syndrome
Vasculitis
Other
Abdominal trauma
Portal biliopathy
Postradiofrequency ablation
Tuberculosis or other infections (ie, Clonorchiasis)
Radiation injury
Endoscopic injection sclerotherapy of duodenal ulcer bleeding
Stone disease
Idiopathic

Negotiation of a biliary stricture is possible only if there is a continuity of the bile ducts. For instance, patients with complete transection or tight ligation of the common bile duct are not, in principle, good candidates for endoscopic treatment. There are reports of combined percutaneous or endoscopic techniques aiming at bringing together the 2 stumps of a transected bile duct, which, however, are still to be considered as exceptions to this rule [8].

After deep bile duct access, a cholangiogram is performed to determine the type and the features of the BBSs. Biliary sphincterotomy is routinely performed to facilitate repeated stent exchanges and insertion of multiple stents, which is required in most of the cases.

Negotiation of postoperative biliary strictures may sometimes be much more difficult than malignant strictures, because the stenosis, even if short, may be asymmetric and sharply angulated. Furthermore, strictures located at the hepatic hilum can be very complex and difficult to negotiate.

The negotiation of BBSs may require the use of steerable catheters or stone extraction balloons that, inflated below the stricture, can help to straighten the common bile duct. It is advisable to use straight or angulated hydrophilic guidewires (0.035, 0.021, or 0.018-in. in diameter) with gentle torquing under optimal fluoroscopic guidance.

In rare cases, when a stricture cannot be traversed at ERCP, a combined ERCP/percutaneous or ERCP/EUS rendezvous approach can be used. This approach is discussed in detail in Chapter 8 of this issue.

The dilation of the stricture has the following 2 main aims: to achieve bile duct drainage and to keep the stenosis open over time.

Stricture dilation is usually performed with balloons. Balloon dilation as a single treatment is very effective for the short term, but the rate of restenosis can reach up to 47% of cases in the long term [9-11]. Balloon dilation induces disruption of the tissue at the site of the stricture, which activates the inflammatory response. This can lead to a consequential development of further exuberant fibrotic tissue that per se can lead to restenosis. Therefore, balloon dilatation should be performed only if strictly necessary and only during the first endoscopic treatment to allow for insertion of the stent.

The most important objective of the first endoscopic session is to provide drainage of the obstructed ducts. For this purpose, it is enough to place at least one 8.5-10-Fr plastic stent. The stent keeps the bile ducts patent allowing remodeling and consolidation of the scar.

Sometimes it can be impossible to place a stent across the stricture even after dilation. In these cases, insertion of a 5- or 6-Fr nasobiliary drain may be a good alternative, granting biliary drainage. The nasobiliary drain acts as a mechanical dilator until the next ERCP, which can be scheduled after 24-48 hours. At this time, placement of a plastic stent is almost always possible.

It has been shown that placement of a single plastic stent leads to unsatisfactory long-term outcomes [12]. Temporary, simultaneous placement of a progressive number of plastic stents, over a period of one year (with every 3-month exchanges), is currently considered to be the most effective method for remediation of postoperative BBSs. This aggressive multistenting strategy requires multiple ERCP sessions and is dependent on the patient compliance, but it is highly effective (Figure) [13-15].

To avoid multiple ERCP sessions with plastic stent exchanges, it has been suggested to place fully covered, removable self-expanding metal stents (SEMS). This treatment method requires two ERCP sessions: one for placement and one for removal of the stent. Uncovered SEMS lead to the ingrowth of reactive tissue (epithelial hyperplasia) through the meshes of the stent, which makes the stent irretrievable [16]. Therefore, placement of uncovered stents in BBSs should be strongly discouraged [14]. To avoid the impaction of the proximal end into the hilum, fully covered SEMS should be used only in Bismuth type I strictures. Placing metal stents in more proximal strictures, especially if involving the hepatic hilum, should be avoided due to the risk of impaction of the proximal end of the stent into the roof of the hilum and the risk of occlusion of intrahepatic branches potentially leading to septic complications [14]. It is important to note that the use of SEMS in BBSs is considered off-label use of the device in the United States, as SEMS are FDA-approved for use in the setting of malignancy.

The use of biodegradable biliary stents is still under investigation. The efficacy of these stents has been proved in animal models [17]. At present, there are some case reports but no clinical trials proving their efficacy in humans [18].

3. Outcomes of endoscopic management

3.1. Postcholecystectomy strictures

The advent of laparoscopic cholecystectomy has increased by 2-3 times the incidence of BBSs (between 0.2% and 1.7%) [19,20]. These strictures usually arise as a consequence of misidentification of anatomical structures (anatomical variations of the biliary tree, adhesions), inadequate placement of sutures and clips, misuse of electrocautery, and other surgical issues [19].

In the past, surgical repair was the treatment of choice of these strictures, while the role of ERCP was limited to diagnosis. This situation has gradually inverted in favor of ERCP in the past 2 decades, mainly because ERCP is repeatable, safe, with less complications, and at least similar success rates [15,21].

The best endoscopic treatment consists of the placement of a progressive number of plastic stents exchanged every 3 months over a period of 12 months. At each exchange, all previously placed stents are removed, and the maximum number of large-diameter stents is inserted until complete morphological disappearance of the stricture at cholangiography [13-15,21]. Good long-term results are achieved in 80%-100% of patients with this technique [9,13-15,21,22].

Scant data are available in the literature regarding fully and partially covered SEMS in the treatment of postcholecystectomy strictures [14]. In a large, multicenter study published by Devière et al, fully covered SEMS were placed in 187 patients with BBSs of different etiologies. Of these, only 18 patients had