Mönkemüller K, Wilcox CM, Muñoz-Navas M (eds): Interventional and Therapeutic Gastrointestinal Endoscopy.
Front Gastrointest Res. Basel, Karger, 2010, vol 27, pp 356–362

Management of Benign Biliary Strictures

Todd H. Baron

Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, Minn., USA

Abstract

There are a variety of causes of benign biliary strictures including chronic pancreatitis, surgery, and primary sclerosing cholangitis, amongst others. The general treatment of these strictures is dilation followed by stent placement. For postoperative strictures the data shows that placement of multiple, large bore (10-Fr) stents over the course of several procedures is better than placement of fewer stents. Care must be taken to exclude malignancy in cases where benignity is not certain. The use of temporary placement of covered, removable expandable metal stents for the treatment of benign biliary strictures appears promising.

Benign strictures of the biliary tree are encountered commonly in a busy therapeutic ERCP practice. The etiologies of these strictures and their underlying histopathology are highly variable and thus each has a different natural history and response to therapy. This chapter will review the types of benign biliary strictures and the approach to therapy. Benign extrinsic processes that cause biliary obstruction (e.g., pancreatic pseudocyst) will not be considered.

Etiologies of Benign Biliary Strictures

Table 1 shows the etiologies of benign biliary strictures. When approaching the patient with a presumed benign biliary stricture, one must take a careful history of underlying diseases (underlying autoimmune pancreatitis, chronic pancreatitis, and inflammatory bowel disease) and prior pancreaticobiliary surgery. Before assuming a stricture is benign, especially when the clinical history does not suggest an obvious benign process, imaging studies should be obtained to evaluate underlying malignancy. Such imaging studies include CT and MRI, although even after extensive evaluation the strictures may remain indeterminate (discussed later). The other entities will be discussed as if the diagnosis is certain.

Overview of Endoscopic Treatment of Benign Biliary Strictures

Endoscopic therapy consists of rigid or, more commonly, balloon dilation followed by placement of plastic biliary stents (fig. 1a–d). The most recent data suggests that for most causes of benign

Table 1. Causes of benign biliary strictures

Postoperative
Laparoscopic cholecystectomy
Biliary resection
Liver transplantation
Chronic pancreatitis
Primary sclerosing cholangitis
Autoimmune cholangiopathy
Ischemia
Post-endoscopic biliary sphincterotomy

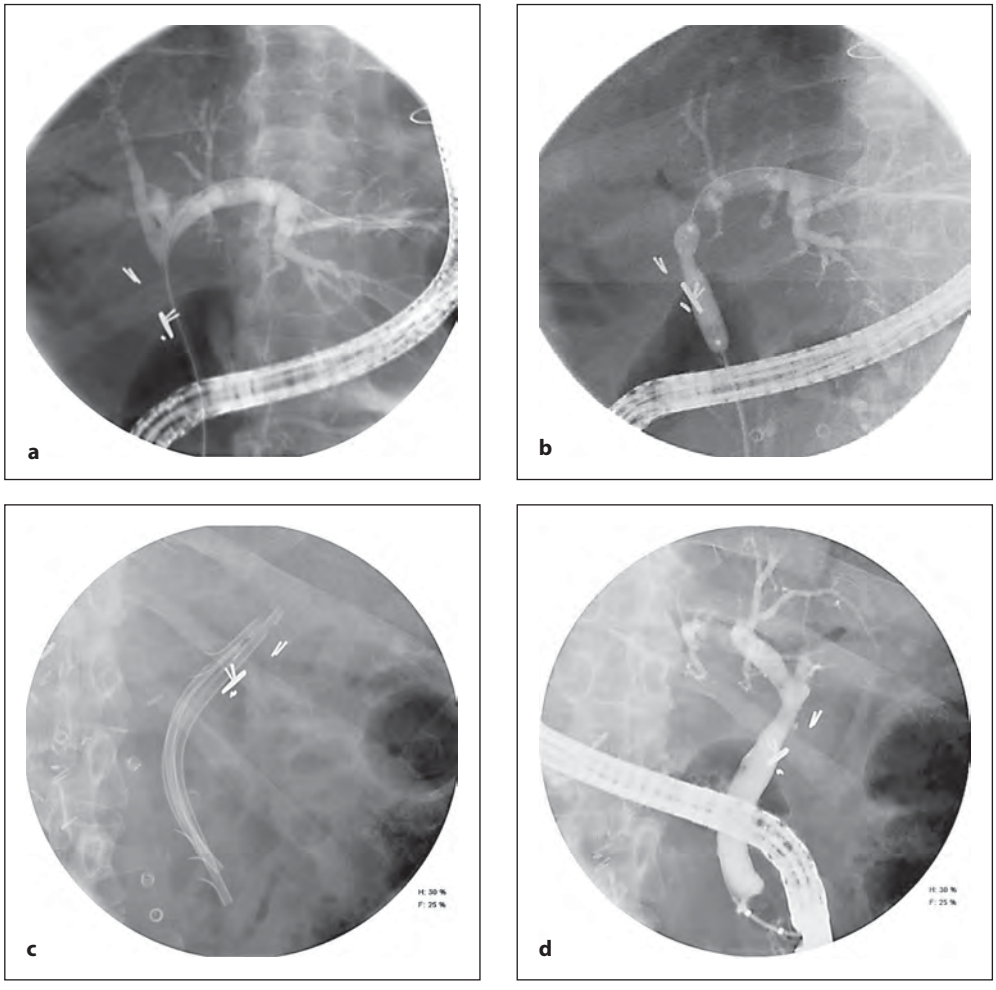

Fig. 1. Endoscopic treatment of post-cholecystectomy biliary stricture using plastic biliary stents. **a** Initial cholangiogram reveals stricture in the common hepatic duct near the previous surgical clips. **b** Balloon dilation of stricture. **c** Placement of multiple stents over two procedures. **d** Cholangiogram after stent removal showing stricture resolution.

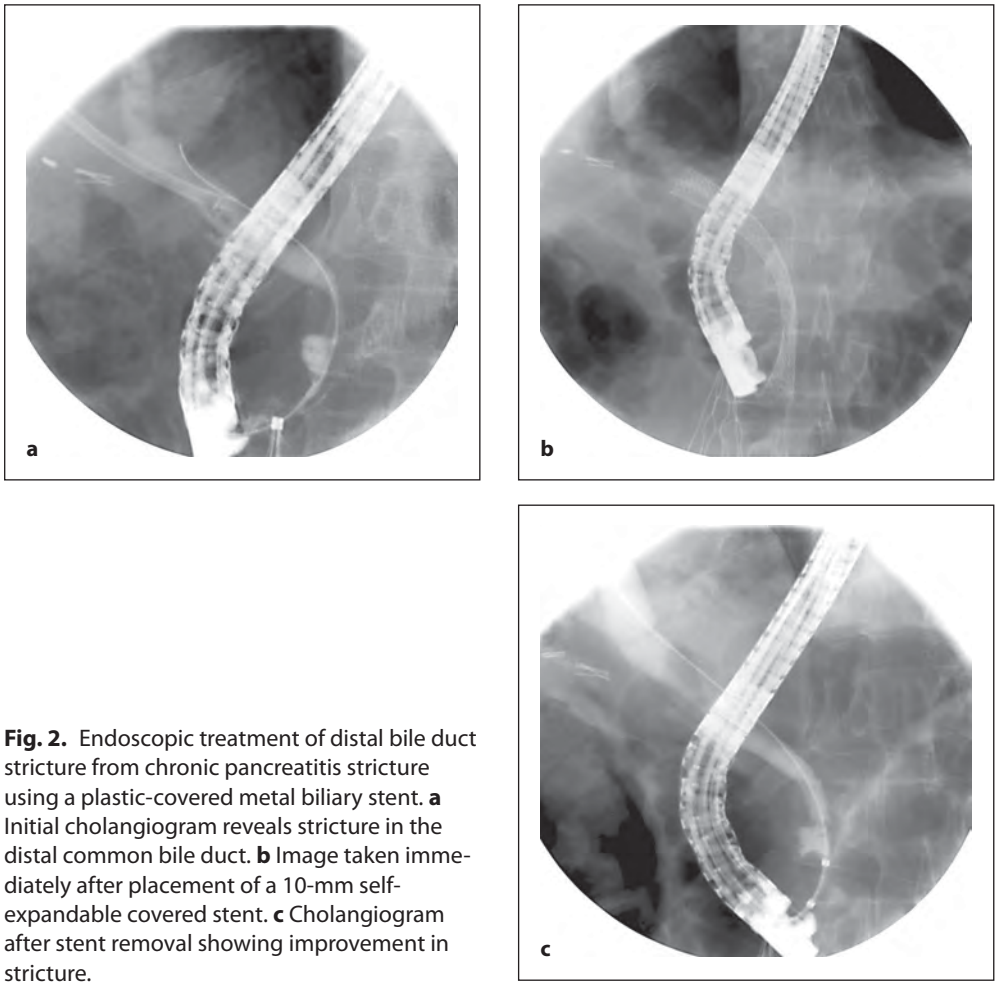

Fig. 2. Endoscopic treatment of distal bile duct stricture from chronic pancreatitis stricture using a plastic-covered metal biliary stent. **a** Initial cholangiogram reveals stricture in the distal common bile duct. **b** Image taken immediately after placement of a 10-mm self-expandable covered stent. **c** Cholangiogram after stent removal showing improvement in stricture.

strictures placement of multiple side-by-side large bore plastic stents over the course of several endoscopic sessions, exchanging periodically (every 3–4 months) for up to 1 year allows a higher rate of successful stricture resolution than when only one or two stents are placed [1, 2].

Self-expandable metal stents (SEMS) placement for management of benign strictures has evolved. Initial studies using uncovered SEMS showed that although the early clinical outcome (relief of biliary obstruction) was favorable, reobstruction occurred from tissue hyperplasia [3]. Moreover, since uncovered SEMS imbed into the bile duct wall, they are non-removable. Thus, the use of uncovered stents for benign biliary strictures has been abandoned. More recently, partially covered and fully covered SEMS have been used since little (partially covered) to no embedding (fully covered) occurs. The stents expand to a diameter of 10 mm and remain in place for a variable period of time to allow dilation and remodeling of the stricture. Then stents are subsequently removed by snare or grasping using a forceps (fig. 2a–c). It is important that these stents be left across the papilla and that enough length remains in the duodenum to allow effective grasping. There is emerging data on the use of covered metal stents for a variety of benign biliary strictures [4].

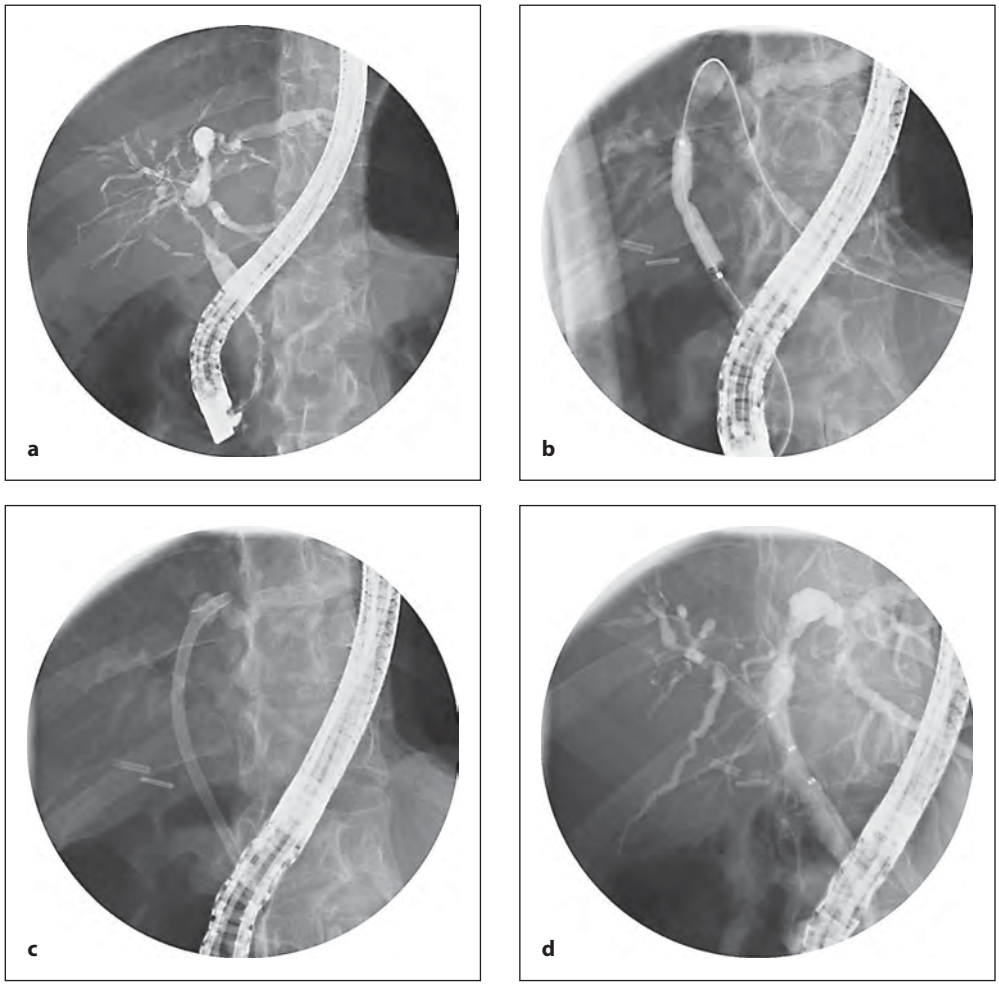

Fig. 3. Endoscopic treatment of dominant biliary stricture in PSC using single plastic biliary stents. **a** Initial cholangiogram reveals stricture in the common hepatic duct extending to the left hepatic duct. **b** Balloon dilation of stricture. **c** Placement of a single 10-Fr plastic biliary stent. **d** Cholangiogram after stent removal showing marked improvement in stricture.

Specific Etiologies

Postoperative Strictures

Cholecystectomy, open or more commonly laparoscopic, can result in injury to the bile duct. These injuries can be recognized early in the postoperative period where there is commonly an associated bile leak, or late. Later presentation may respond less favorably because of the established fibrosis. Other postoperative strictures include post-liver resection (hepatectomy). Post-liver transplant strictures can occur at the anastomosis following either a duct-to-duct (DDA or choledochocholedochal) or hepaticojejunal anastomosis. Living related donor transplantation with DDA anastomosis can be particularly challenging since the arrangement of the anastomoses are variable and can include the cystic duct remnant. There is a large body of literature to support

endoscopic therapy for all of these postoperative strictures. With aggressive dilation and placement of multiple stents, the long-term success rate for endoscopic intervention is high [5, 6].

Whether patients who relapse after stent removal respond to additional or more prolonged plastic stent therapy or to removable, metal stents, is unknown.

Chronic Pancreatitis

Chronic pancreatitis produces distal bile duct strictures that are usually refractory to endoscopic therapy with single plastic stents, particularly in those patients with calcific chronic pancreatitis. Multiple plastic stents can be used as a treatment modality for biliary strictures in the setting of chronic pancreatitis [7]. Recently, covered SEMS have been used for the treatment of chronic pancreatitis-induced bile duct strictures [4, 8–10]. The large diameter (10 mm) dilates the stricture over time. The stent is removed after an interval of 3–6 months. Results using this approach have been encouraging, though these devices are not yet approved in the USA for benign disease.

Primary Sclerosing Cholangitis (PSC)

PSC develops in patients with underlying inflammatory bowel disease. Such patients may benefit from endoscopic intervention for treatment of dominant strictures and/or biliary lithiasis [11]. Patients with dominant strictures usually present with worsening biliary obstruction. Underlying cholangiocarcinoma must be considered in these patients. Routine brush cytology has a low sensitivity for detecting cancer in this population. Recently, fluorescence in-situ hybridization has been shown to have a high sensitivity for the detection of underlying cholangiocarcinoma in the setting of PSC [12]. Cholangioscopy has recently been shown to enhance the detection of malignancy in these patients [13].

Endoscopic treatment of dominant strictures involves balloon dilation, often in combination with short-term (≤8 weeks) large bore (10-Fr) stent placement (fig. 3a–d). Endpoints following endoscopic therapy have included clinical, biochemical, and radiological improvement and range from 65 to 100% [14]. Generally, because the bile ducts are small throughout the biliary tree, the use of multiple stents, which has been shown to be effective for the treatment of other strictures, is not an option. There is a small amount of data on the use of removable SEMS for PSC strictures [4].

Autoimmune Cholangiopathy

Autoimmune cholangiopathy is usually seen as an extrapancreatic manifestation of autoimmune pancreatitis (AIP). Biliary obstruction can be caused by an inflammatory mass within the pancreatic head (similar to chronic pancreatitis of other etiologies) or by coexisting sclerosing cholangitis. Biliary tract involvement occurs in 17% of patients with AIP. Pancreatic and extrapancreatic manifestations of AIP respond to corticosteroid therapy. Elevated levels of serum IgG_4 are characteristic of AIP though normal IgG_4 serology does not exclude a diagnosis of AIP. IgG_4-associated cholangitis (IAC) refers to the manifestation of IgG_4-related systemic disease in the biliary tree and can occur with AIP or as an isolated biliary disease.

IAC can cause intrahepatic, proximal extrahepatic, or intrapancreatic biliary strictures. Establishing a diagnosis of IAC relies on histologic analysis or response to a corticosteroid trial. Endoscopic biopsy specimens often do not provide sufficient tissue to diagnose IAC. Intrahepatic strictures in patients with IAC can mimic those of PSC, but IAC strictures are more segmental, longer, with prestenotic dilatation and more commonly affected the distal common bile duct.

Stent placement is used to temporarily relieve biliary obstruction while patients are being diagnosed and treated with corticosteroids.

Ischemic Strictures

Ischemic strictures usually involve the bifurcation and intrahepatics. They are often seen in post-liver transplant patients and are associated with multiple factors but often seen as a result of poor hepatic arterial flow. Similar strictures have been reported after other causes of localized or systemic ischemia in non-transplant patients. Such strictures can be treated endoscopically with placement of multiple stents [15], though they respond less well to dilation and stent therapy than anastomotic strictures and require more endoscopic procedures [16].

Post-Endoscopic Biliary Sphincterotomy Strictures

Endoscopic biliary sphincterotomy can occasionally be complicated by the development of a cautery-induced stricture. Similar to other biliary strictures, dilation and multiple plastic stents can be placed to allow resolution of the stricture [17].

Indeterminate Biliary Obstruction

Some patients with biliary strictures cannot be readily classified into benign or malignant based upon imaging studies and tissue sampling. Tissue-sampling techniques at ERCP consist of wire-guided biliary brush cytology and intraductal forceps biopsy [18]. Adjuvant techniques to assess strictures include intraductal ultrasonography [19] and direct cholangioscopy with or without directed biopsy [20]. In a small percentage of patients the diagnosis remains unclear. In some patients the final diagnosis can only be established during long-term follow-up or at surgical exploration and resection.

References

1 Matlock J, Freeman ML: Endoscopic therapy of benign biliary strictures. Rev Gastroenterol Disord 2005;5:206–214.

2 Draganov P, Hoffman B, Marsh W, Cotton P, Cunningham J: Long-term outcome in patients with benign biliary strictures treated endoscopically with multiple stents Gastrointest Endosc 2002;55:680–686.

3 Dumonceau JM, Devière J, Delhaye M, Baize M, Cremer M: Plastic and metal stents for postoperative benign bile duct strictures: the best and the worst. Gastrointest Endosc 1998;47:8–17.

4 Kahaleh M, Behm B, Clarke BW, Brock A, Shami VM, De La Rue SA, Sundaram V, Tokar J, Adams RB, Yeaton P: Temporary placement of covered self-expandable metal stents in benign biliary strictures: a new paradigm? Gastrointest Endosc 2008;67:446–454.

5 Costamagna G, Pandolfi M, Mutignani M, Spada C, Perri V: Long-term results of endoscopic management of postoperative bile duct strictures with increasing numbers of stents. Gastrointest Endosc 2001;54:162–168.

6 Morelli G, Fazel A, Judah J, Pan JJ, Forsmark C, Draganov P: Rapid-sequence endoscopic management of post-transplant anastomotic biliary strictures. Gastrointest Endosc 2008;67:879–885.

7 Catalano MF, Linder JD, George S, Alcocer E, Geenen JE: Treatment of symptomatic distal common bile duct stenosis secondary to chronic pancreatitis: comparison of single vs. multiple simultaneous stents. Gastrointest Endosc 2004;60:945–952.

8 Cantù P, Hookey LC, Morales A, Le Moine O, Devière J: The treatment of patients with symptomatic common bile duct stenosis secondary to chronic pancreatitis using partially covered metal stents: a pilot study. Endoscopy 2005;37:735–739.

9 Cahen DL, Rauws EA, Gouma DJ, Fockens P, Bruno MJ: Removable fully covered self-expandable metal stents in the treatment of common bile duct strictures due to chronic pancreatitis: a case series. Endoscopy 2008;40: 697–700.
10 Mahajan A, Ho H, Sauer B, Phillips MS, Shami VM, Ellen K, Rehan M, Schmitt TM, Kahaleh M: Temporary placement of fully covered self-expandable metal stents in benign biliary strictures: midterm evaluation (with video). Gastrointest Endosc 2009;70:303–309.
11 Gluck M, Cantone NR, Brandabur JJ, Patterson DJ, Bredfeldt JE, Kozarek RA: A twenty-year experience with endoscopic therapy for symptomatic primary sclerosing cholangitis. J Clin Gastroenterol 2008;42: 1032–1039.
12 Charatcharoenwitthaya P, Enders FB, Halling KC, Lindor KD: Utility of serum tumor markers, imaging, and biliary cytology for detecting cholangiocarcinoma in primary sclerosing cholangitis. Hepatology 2008;48:1106–1017.
13 Tischendorf JJ, Krüger M, Trautwein C, Duckstein N, Schneider A, Manns MP, Meier PN: Cholangioscopic characterization of dominant bile duct stenoses in patients with primary sclerosing cholangitis. Endoscopy 2006;38:665–669.
14 McLoughlin M, Enns R: Endoscopy in the management of primary sclerosing cholangitis. Curr Gastroenterol Rep 2008;10:177–185.
15 Tabibian JH, Asham EH, Goldstein L, Han SH, Saab S, Tong MJ, Busuttil RW, Durazo FA: Endoscopic treatment with multiple stents for post-liver transplantation non-anastomotic biliary strictures. Gastrointest Endosc 2009;69:1236–1243.
16 Barriga J, Thompson R, Shokouh-Amiri H, Davila R, Ismail MK, Waters B, Tombazzi CR: Biliary strictures after liver transplantation. Predictive factors for response to endoscopic management and long-term outcome. Am J Med Sci 2008;335:439–443.
17 Pozsár J, Sahin P, László F, Topa L: Endoscopic treatment of sphincterotomy-associated distal common bile duct strictures by using sequential insertion of multiple plastic stents. Gastrointest Endosc 2005;62: 85–91.
18 Papachristou GI, Smyrk TC, Baron TH: Endoscopic retrograde cholangiopancreatography tissue sampling: when and how? Clin Gastroenterol Hepatol 2007;5:783–790.
19 Varadarajulu S, Eloubeidi MA, Wilcox CM: Prospective evaluation of indeterminate ERCP findings by intraductal ultrasound. J Gastroenterol Hepatol 2007;22:2086–2092.
20 Shah RJ, Langer DA, Antillon MR, Chen YK: Cholangioscopy and cholangioscopic forceps biopsy in patients with indeterminate pancreaticobiliary pathology. Clin Gastroenterol Hepatol 2006;4:219–225.

Todd H. Baron, MD
200 First Street S.W., Charlton 8A
Rochester, MN 55905 (USA)
Tel. +1 507 266 6931, Fax +1 507 266 3939, E-Mail baron.todd@mayo.edu