Top tips for pancreatic duct strictures

Jennifer Maranki, MD, MSc, FASGE

Although management of biliary strictures is part of the repertoire of endoscopists who perform ERCP, the management of pancreatic strictures is typically restricted to experts in pancreatic endotherapy. It is critical to have a fully stocked toolbox and the knowledge of how to use it. No 2 pancreatic duct strictures are exactly alike, and achieving a successful procedure often requires the ability to go from plan A to plan B, and often further down the alphabet. In this article, Dr Jennifer Maranki shares her expertise in pancreatic endotherapy to help ERCP specialists maximize success in the management of pancreatic duct strictures.

David L. Diehl, MD, FASGE, FACP
GIE Senior Associate Editor
Director of Interventional Endoscopy, Geisinger Medical Center
Danville, Pennsylvania, USA

1. **Assess the patient and review available imaging.** Obtaining an understanding of the cause of the pancreatic duct (PD) stricture is critical to planning for a successful procedure. It is important to recognize that not all PD strictures need endoscopic intervention, and a detailed history to determine the symptomatology is crucial. Beyond a history and physical examination, cross-sectional imaging will aid in understanding the anatomy and evaluating the pancreatic parenchyma and ductal anatomy. CT with pancreatic protocol is useful for evaluating the pancreatic parenchyma and evaluating for the presence and location of PD stones and chronic pancreatitis. It is also vital in assessing for either a malignancy as the cause of the stricture, signs of autoimmune pancreatitis or IgG4-related disease, or areas of trauma or ductal disruption. Magnetic resonance imaging (MRI) and MRCP are more useful in determining ductal anatomy and the precise location of the stricture(s). EUS may show findings suggestive of chronic pancreatitis, locate subtle strictures or irregularities in the duct, and identify pancreatic masses.
2. **Determine the location of the stricture(s) and plan the approach accordingly.** Strictures in the tail of the pancreas are more difficult to treat endoscopically by a transpapillary approach. Strictures in the head may be difficult to bridge, especially if large stones are causing the obstruction. Assessing the ventral and dorsal ducts in relation to the stricture will help determine the best approach (via either the major or the minor papilla). For example, if the entire ventral duct is stenosed or if a large stone is obstructing the ventral duct, and the dorsal duct is fairly intact, then a minor papilla approach may be preferred. If the cause of the stricture is not apparent, sampling the stricture with a cytology brush to exclude occult malignancy should be pursued.
3. **Assemble an experienced endoscopy technician and nurse team.** PD cases may be very challenging and require a variety of devices and expertise. It is critical to work with a team that is knowledgeable about both the procedure at hand and the various devices that may be used to achieve success. Expertise in long-wire ERCP may be beneficial because tight fibrotic areas may be more readily traversed by use of a long-wire technique with active tension while catheters, dilators, and stents are being advanced.[1] Additionally, some wires used may be challenging for nonexperienced users. It is important for the guidewire to remain wet at all times, and thinner wires (.021in or .018in) may sometimes have less pushability.
4. **Use these initial steps to gain access to the PD, perform a pancreatic sphincterotomy, and advance the guidewire across the stricture.** A tapered-tip sphincterotome may be helpful in obtaining access to a fibrotic, stenotic duct, but note that a tapered tome may require a wire slimmer than .035inches. A high-performance wire is also critical to accessing the upstream duct. A stiff wire with a

Abbreviations: ESWL, extracorporeal shock wave lithotripsy; FCSEMS, fully-covered self-expandable metal stent; MRI, magnetic resonance imaging; PD, pancreatic duct.

DISCLOSURE: *Dr Maranki is a consultant for Boston Scientific.*

Use your mobile device to scan this QR code and watch the author interview. Download a free QR code scanner by searching "QR Scanner" in your mobile device's app store.

0016-5107/$36.00
https://doi.org/10.1016/j.gie.2023.01.003

Received July 23, 2022. Accepted January 1, 2023.

Current affiliation: Division of Gastroenterology and Hepatology, Penn State Hershey Medical Center, Hershey, Pennsylvania, USA.

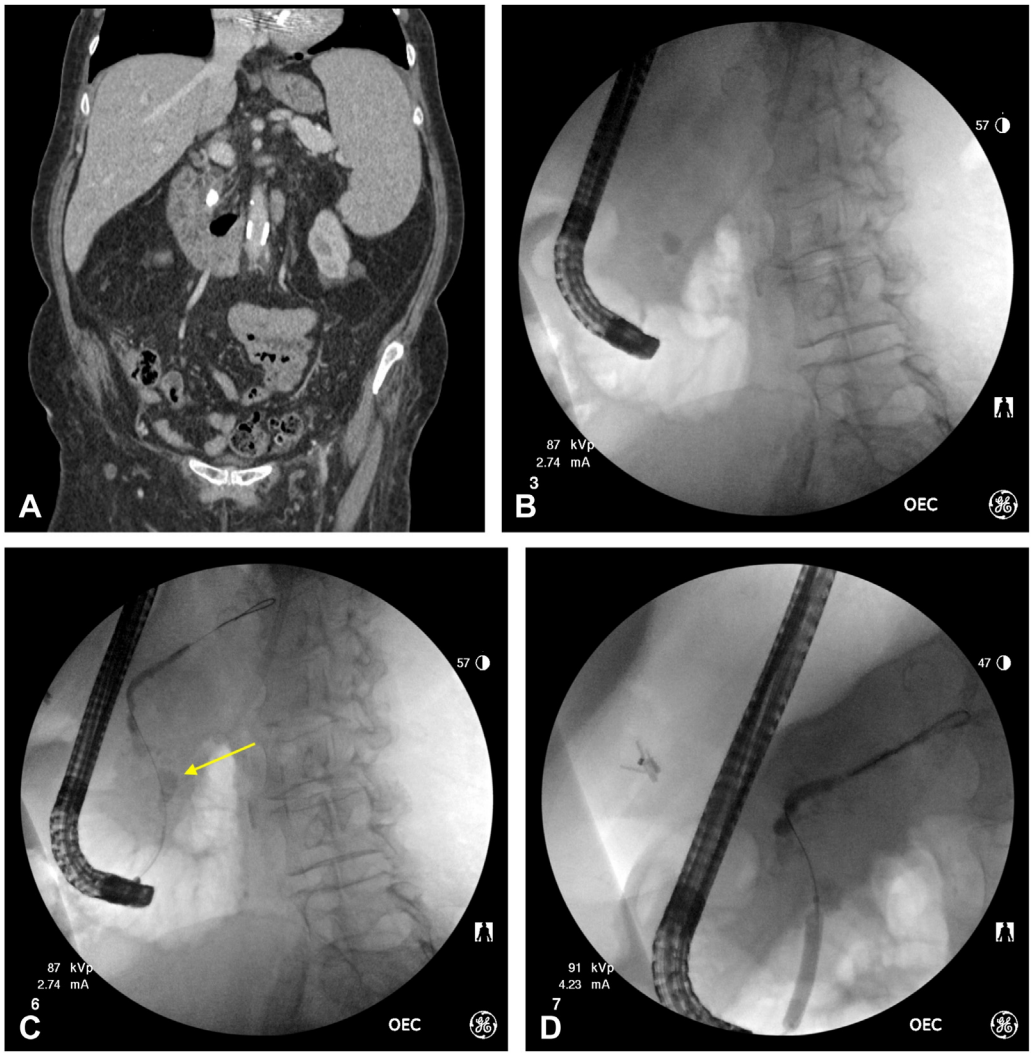

Figure 1. A, CT scan showing a large, obstructing, calcified stone in the head of the pancreas. **B,** Scout film demonstrating a radiopaque stone (*yellow arrow*) in the head of the pancreas. **C,** Wire advanced beyond stone (*yellow arrow*) and stricture with pancreatogram showing upstream ductal dilation. **D,** Balloon dilation of the duct in the head of the pancreas. This patient ultimately underwent extracorporeal shock wave lithotripsy and is stent free.

floppy tip with substantial pushability is ideal, and we favor the use of a .025inches hydrophilic tip wire (VisiGlide, Olympus, Tokyo, Japan). A straight-tip wire is often used initially, but an angled-tip wire may be effective in navigating an ectatic duct. The angled wire may more readily assume a shepherd's hook configuration, which is desirable as a safety measure, especially when pushing the wire through the duct in a supple pancreas. A .032-inch wire with a hydrophilic coating along its entire length (Glidewire, Terumo, Somerset, NJ, USA) is also helpful in traversing tight strictures and is very responsive to torque. Often, a straight catheter like the 5-4-3 catheter (Boston Scientific Corp, Marlborough, Mass, USA) is helpful for minor duct cannulations. This catheter requires a .018-inch wire, however, which may be somewhat more challenging to use.

5. **Optimize fluoroscopy use.** Another key aspect with delicate PD work is to use high-resolution fluoroscopy and to appropriately collimate the view to minimize radiation exposure and achieve best results. It is very important to position the fluoroscopy screen in an area that can be clearly seen by the endoscopist and nurse. When optimal images are obtained, it is helpful to capture a high-resolution image and save it as a reference. This helps maintain a roadmap without having to add contrast material to the duct and helps minimize radiation exposure. Working with an experienced technician also helps decrease the amount of fluoroscopy used, because the location of the wire and devices will be more predictable.
6. **Perform stricture dilation with either passage dilators or balloon dilators.** Although passage (bougienage) dilators are available in a short-wire form, the long-wire passage dilators are preferred because of the active tension applied on the wire, which aids in advancing the dilator across tight, fibrotic stenoses. The smallest dilator, typically ranging from 4F to 7F, is fairly flexible and prone to bending. One size up, starting at

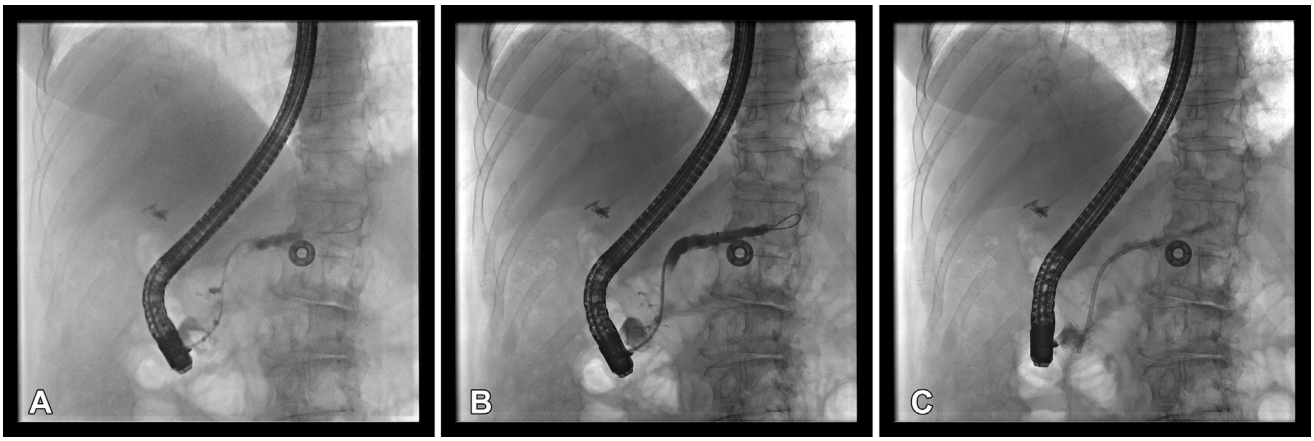

Figure 2. A, Initial pancreatogram showing a long stricture due to chronic pancreatitis in the head of the pancreas. **B,** Retrieval balloon is positioned in the body, and balloon sweeps are performed to remove stone debris. A stricture in the tail is also identified. **C,** A 7F stent is placed into the pancreatic duct with the proximal end in the body of the pancreas.

5.5F and expanding to 8F, is substantially more rigid and effective for dilation. Whereas we recommend a long wire for passage dilators, a short-wire system is adequate for balloon dilation (Fig. 1). The tips of the balloon dilator are fairly rigid and usually able to follow the wire without requiring the active back tension of a long-wire system. For calcific strictures, the Soehendra stent retriever (Cook Medical, Bloomington, Ind, USA) may be advanced over the wire and then used to screw into the stricture, effectively boring an orifice for passage. It helps to use snug-fitting gloves for these techniques.

7. **Carefully select stent size, length, and indwell duration.** Most PD strictures resulting from chronic pancreatitis are refractory to dilation alone, so dilation plus stenting is recommended.[2] We ideally start with a single 7F stent but, depending on the size of the duct, may need to downsize to 5F or be able to upsize to 10F. The stent diameter should not be larger than the greatest diameter of the main PD. In terms of stent length, aim to bridge the dominant main PD stenosis that allows the proximal end (toward the tail) to be situated in the center of the duct, without pressure on the adjacent walls. In our experience, a 7-cm stent from the major papilla tends to hit at the genu, which then applies pressure to the surrounding duct, leading to duct damage, stricture formation, and potentially patient discomfort (Fig. 2). As stents are exchanged, it is helpful to vary the stent length to avoid secondary PD strictures at the proximal aspect of the stent. For symptomatic benign main PD strictures that are responsive to stenting, the European Society of Gastrointestinal Endoscopy guidelines recommend a single 10F plastic stent to be placed for the duration of 1 year.[3] Inasmuch as PD stents are prone to clogging, these may need to be exchanged on the basis of symptoms or signs of stent dysfunction. On-demand stent exchange has been associated with infectious adverse events, whereas a predetermined stent exchange protocol has not.[3]
8. **Use multiple side-by-side plastic stents or place a fully covered self-expandable metal stent (FCSEMS) as an option for refractory strictures related to chronic pancreatitis beyond 1 year.** If the stricture persists beyond a year, and after discussion at a multidisciplinary conference, the gradual placement of more stents to progressively dilate and remodel the duct is warranted. This process seems to be better tolerated than does placement of an FCSEMS, in part because the smallest FCSEMS available at our center is 8 mm in diameter. Compared with multiple plastic stents, FCSEMS placement in the PD is associated with a higher rate of stent migration, de novo strictures, and severe pain.[4]
9. **Consider additional options for dealing with large PD stones and strictures not amenable to ERCP.** Extracorporeal shock wave lithotripsy (ESWL) is a very effective method for removing stones in the head and body of the pancreas that are >5 mm and radiopaque, and it is considered first-line therapy for an obstructed main PD.[3] ESWL use is limited in the United States because despite its efficacy, few centers offer it, in part because of its off-label use of the lithotripsy device and regulatory hurdles.

Digital pancreatoscopy-assisted electrohydraulic lithotripsy is another option for large stone removal. This procedure may be technically challenging, depending on ductal anatomy and the location of the stone(s). Additionally, the pancreatoscope can be used to directly visualize strictures and perform forceps-directed biopsies. The duct must be dilated to at least 4 mm to accommodate the 10F pancreatoscope, and ideally the duct will be straight and not tortuous.

EUS-guided pancreatic drainage is another option, including EUS-guided PD rendezvous or EUS-guided transmural drainage to the stomach or duodenum. These techniques should be performed only in expert centers

with adequate surgical support and after a multidisciplinary discussion.

Finally, surgical intervention, in either the form of resection, drainage, or a combination of both, may be performed for symptomatic PD strictures not amenable or responsive to endoscopic treatment.[5]

REFERENCES

1. Reddy SC, Draganov PV. ERCP wire systems: the long and the short of it. World J Gastroenterol 2009;15:55-60.
2. Chandrasekhara V, Chathadi KV, Acosta RD, et al. The role of endoscopy in benign pancreatic disease. Gastrointest Endosc 2015;82:203-14.
3. Dumonceau JM, Delhaye M, Tringali A, et al. Endoscopic treatment of chronic pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline - Updated August 2018. Endoscopy 2019;51:179-93.
4. Li TT, Song SL, Xiao LN, et al. Efficacy of fully covered self-expandable metal stents for the management of pancreatic duct strictures in chronic pancreatitis: a systematic review and meta-analysis. J Gastroenterol Hepatol 2020;35:1099-106.
5. Ahmed Ali U, Pahlplatz JM, Nealon WH, et al. Endoscopic or surgical intervention for painful obstructive chronic pancreatitis. Cochrane Database Syst Rev 2015:D007884.