Normal Endoscopic Retrograde Cholangiopancreatography

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Abstract

Endoscopic retrograde cholangiopancreatography (ERCP) is probably the most challenging procedure in endoscopy. Here the author demonstrates the technique of positioning the side-viewing endoscope in the duodenum, and cannulating the common bile duct and the pancreatic duct in a patient referred for ERCP for abdominal colic. This article is part of an expert video encyclopedia.

Keywords

Anatomy; Biliary tract; Cannulation technique; Endoscopic retrograde cholangiopancreatography; Video.

Video Related to this Article

Video available to view or download at doi:10.1016/S2212-0971(13)70222-X

Technique

Endoscopic retrograde cholangiopancreatography (ERCP).

Materials

1. Endoscope
   - Silver Line duodenoscope, Karl Storz, Tuttlingen, Germany.
2. Accessories
   - Balloon catheter 5F: Cook Medical, Winston-Salem, NC, USA.
   - Guide wire: Cook Medical, Winston-Salem, NC, USA.
   - PreCurved Triple-Lumen Sphincterotome, Cook Medical, Winston-Salem, NC, USA.
   - ERCP Cannula: Cook Medical, Winston-Salem, NC, USA.

Background and Endoscopic Procedure

This video shows the technique of positioning the side-viewing endoscope in the duodenum, and cannulating the common bile duct (CBD) and the pancreatic duct in a patient referred for ERCP for abdominal colic.

After careful passage of the side-viewing endoscope through the oropharynx and the esophagus, the stomach is inflated with some air. At this stage, rotating the handle of the duodenoscope to the right aligns the lesser curve of the gastric cavity and the pylorus comes into view. Because the duodenoscope is a side-viewing device, the endoscope will not pass through if the pylorus is in full view on the video monitor. Therefore, turning the tip up to resume a neutral position will align the tip next to the pyloric channel. This position is called the 'setting sun' position.[1] Gentle pressure then results in the endoscope tip advancing into the duodenal bulb. It is helpful to bring the anatomy to mind for passage of the bulb, as the overview with the side-viewing device is sometimes suboptimal and there is a potential risk of perforation with the rigid tip of the endoscope. Gentle withdrawal often allows for better orientation within the duodenal bulb, and by rotating the control handle to the right and turning the small wheel to the right, the endoscope advances beyond the bulb into the descending duodenum. At this point, the small wheel should be completely turned right and then locked, followed by withdrawal of the endoscope with slight torque to the right. This 'shortening' maneuver hooks the tip of the duodenoscope in the descending duodenum and straightens the endoscope. During this straightening maneuver, the tip of the endoscope further advances distally and the papilla usually is brought into full view on the video screen. It is typically recognizable as a protuberance with a central opening, and is limited by a horizontal fold. The key to successful cannulation is optimal positioning[1]: The endoscope should be in the short and straight position and the axis of the catheter needs to be aligned with the axis of the bile duct or pancreatic duct.

In a first step, cannulation of the pancreatic duct is attempted. The pancreatic duct typically takes off from the floor of the common channel, and follows a more horizontal course than the CBD. Therefore, a straight cannula preferably is used with its direction aiming for the 1 o'clock position of the papilla. Pancreatography shows a regular pancreatic system with tapered termination of the branch ducts. It is of utmost importance to limit injection of contrast medium to small amounts in order to minimize the filling pressure and to decrease the risk of post-ERCP pancreatitis.

In a next step, cannulation of the CBD is attempted. The CBD is found in the upper corner at the 11 o'clock position and

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is always positioned higher up into this corner than you first think. After correct alignment is achieved, a triple-lumen sphincterotome is advanced toward the papilla. This device accepts a 0.035 in (0.89 mm guide wire) in one lumen and allows simultaneous injection in another lumen. The tip of the sphincterotome is gently introduced into the common channel. Bowing of the tip eases the tip into the mouth of the common duct. The sphincterotome allows movement of the tip in the desired direction for wire-guided cannulation with a hydrophilic-tipped wire that moves very smoothly in the channel of the sphincterotome and allows the assistant to sense when the wire enters the duct. Once this is confirmed, contrast is gradually injected to fill the entire biliary tree. To avoid overdistension of the gallbladder with contrast, it is useful to advance the catheter above the level of the cystic duct takeoff before injecting. Careful observation during early filling is important in outlining small stones. It is very important to avoid overfilling, because it may cause patient discomfort and may lead to bacteremia in patients with cholangitis. In the present case, a normal CBD and normal intrahepatic ducts are visualized. To rule out small stones, it is useful to obtain an occlusion cholangiography with small amounts of contrast injected through an inflated balloon catheter. Passing the balloon slowly through the CBD downward shows adequate filling without pathological findings. At the end of the procedure, accessories are removed from the CBD and spontaneous drainage of contrast media from the papilla is observed.

Key Learning Points/Tips and Tricks

- The key to successful cannulation is optimal positioning. The endoscope should be in the short and straight position, and the axis of the catheter aligned with the axis of the bile duct or pancreatic duct.
- The pancreatic duct follows a more horizontal course than the bile duct. Therefore, a straight cannula is preferably used with its direction aiming for the 1 o'clock position of the papilla.
- At pancreatography, limit injection of contrast medium to small amounts in order to minimize the filling pressure and decrease the risk of post-ERCP pancreatitis.
- At the end of the procedure, fluoroscopy of the spontaneous drainage ('milking') of contrast medium from the papilla gives important information regarding proper drainage of the bile duct and pancreatic duct.

Complications/Risk Factors

ERCP has a considerable potential for procedure-related complications, including post-ERCP pancreatitis (1–7%) and cholangitis.[2]

Alternatives

ERCP is indicated when therapeutic interventions in the biliary or pancreatic duct are likely. For most other settings, endosonography might be considered in the first place.

Scripted Voiceover

This video demonstrates standard ERCP in a patient with abdominal colics. While the duodenoscope is advanced the pylorus comes into view. By virtue of it being a side-viewer, the device will not pass through if the pylorus is in full view on the video monitor. Turning the tip up facilitates passage through the pylorus into the duodenal bulb.

By rotating the control handle to the right, and turning the small wheel right-ward, the endoscope advances beyond the bulb into the descending duodenum. At this point the small wheel should be completely turned right and then locked, followed by withdrawal of the endoscope with slight torque to the right.

This 'shortening' maneuvers hooks the tip of the duodenoscope in the descending duodenum, straightens the endoscope and the papilla is brought into full view on the video screen.

It is typically recognizable as a protuberance with a central opening, and is limited by a horizontal fold. The key to successful canulation is optimal positioning: The endoscope should be in the short and straight position and the axis of the catheter needs to be aligned with the axis of the bile duct or pancreatic duct.

In a first step cannulation of the pancreatic duct with a straight cannula is attempted. The pancreatic duct typically takes off from the floor of the common channel, and follows a more horizontal course than the bile duct. In the present case it is pretty challenging to achieve an optimal position to approach the papilla from a distance and aim for the 1 o'clock position of the papilla.

Therefore fluoroscopy is used to optimize the angle and the endoscope is gently advanced to achieve the proper position. This time cannulation with the straight cannula at the 1 o'clock position is successful.

Pancreatography shows the pancreatic duct with a discrete dilation but regular branch ducts within the pancreatic head. It is of utmost importance to limit injection of contrast medium to small amounts in order to minimize the filling pressure and decrease the risk of post-ERP pancreatitis.

In a next step cannulation of the common bile duct with a triple lumen sphincterotome is attempted. The device accommodates a hydrophilic tipped wire in one lumen and allows simultaneously injecting in another lumen. The duct is located in the upper corner at the 11 o'clock position and is always positioned higher up into this corner than you first think.

The tip is gently introduced into the common channel. Bowing of the tip eases the tip into the mouth of the common duct. The sphincterotome allows movement of the tip in the desired direction for wire-guided cannulation. The hydrophilic tipped wire moves very smoothly in the channel of the sphincterotome and allows the assistant to sense when the wire enters the duct.

At fluoroscopic control we affirm that the sphincterotome is already within the bile duct and the guide wire is used as a pathfinder to allow passage through a siphon at the prepapillary duct.

Now we achieved a stable position inside the duct and contrast is gradually injected to fill the entire biliary tree. To

avoid overdistension of the gallbladder with contrast, it is useful to advance the catheter above the level of the cystic duct takeoff before injecting. Careful observation during early filling is important in outlining small stones. It is very important to avoid overfilling because it may cause patient discomfort and may lead to bacteremia in patients with cholangitis. Guided by the wire the sphincterotome is advanced within the duct. The triple lumen allows for concomitant application of contrast medium. In the present case a regular common bile duct and a normal intrahepatic ducts are visualized.

To rule out discrete pathologies and small stones it is useful to obtain an occlusion cholangiography through an inflated balloon catheter. To this end, the sphincterotome is withdrawn and the guide wire is back-loaded with a balloon catheter.

Exchanging accessories over the wire takes some time and it is crucial to synchronize with the speed of the assistent and keep the wire at a constant position with the tip of the wire just reaching beyond the right or left hepatic duct. Therefore intermittent fluoroscopic control is performed simultaneously.

The occlusion cholangiography reveals adequate filling without pathological findings. The inflated balloon catheter is moved back and forth to straighten the common bile duct and to detect mobile biliary stones. No pathology is found in this case.

At the end of the procedure accessories are removed from the CBD and spontaneous drainage of contrast media from the papilla is observed. This can be stimulated by suction through the endoscope. Regular spontaneous drainage strongly argues against a stricture or hidden stone in the prepapillary position.

References

1. Haber, G.B; Sandha, G. S. Endoscopic Retrograde Cholangiopancreatography. In *Gastroenterological Endoscopy*; Classen, M., Tytgat, G. N. J., Lightdale, C. J., Eds.; Thieme: New York, **2002**; pp 152–161.
2. Loperfido, S.; Angelini, G.; Benedetti, G.; *et al.* Major Early Complications from Diagnostic and Therapeutic ERCP: A Prospective Multicenter Study. *Gastrointest. Endosc.* **1998**, *48*, 1–10.