How I cannulate the bile duct

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Next year will mark the 50th anniversary of the first report of ERCP. Despite 5 decades of improved duodenoscopes and accessories, deep cannulation of the desired duct in a native papilla remains the most challenging step to successful completion of the procedure. Although many reports attempt to distill cannulation down to a science, it remains primarily an art. No single technique is uniformly successful. We hope that providing our thoughts on basic principles of cannulation will improve your cannulation success rate.

The most important components to successful cannulation include (1) Take time to study the conformation of the papilla, (2) spend the necessary time to achieve proper positioning of the duodenoscope before touching the papilla, (3) initiate cannulation, with the leading edge of the accessory perpendicular to the ampullary orifice, (4) first obtain a free "insinuation," (5) use either the guidewire or a limited injection of contrast material (or both) as the first approach for deep cannulation, and (6) never fight with the papilla.

A wide variety of accessories is available for cannulation, but, in most circumstances, start with a soft-tipped guidewire and a papillotome. There is no universal best or perfect accessory. Be inquisitive, and expose yourself to a broad spectrum of available accessories in order to select the ones that are optimal for you.

Begin all ERCPs with a careful inspection of the papilla. What is the intraduodenal length and conformation of the papilla? Can deep cannulation be achieved with a single trajectory ("straight shot," no intra-papillary angles, single axis) or will you need to manipulate the endoscope to allow redirection of the catheter tip within the ampullary segment to maneuver around angles?

The next step in cannulation is to position the scope tip in optimal orientation to the papilla. This is an underappreciated aspect of ERCP. We are taught to shorten the scope in the second portion of the duodenum and then begin cannulation. Although the short scope position provides the greatest maneuverability and keeps you close to the papilla, it is not a primary goal unto itself. Use whatever conformation of the scope is necessary to (1) allow the tip of the catheter to enter the papillary orifice at a perpendicular angle, (2) orient the papilla en face, (3) be acceptably close to the papilla, and (4) have the papilla in the center of the visual field (or slightly above). The radiographic scope position has no relevance to cannulation, but the fluoroscopic and scope positions must be coordinated to allow radiographic observation of the shape of the distal, intrapapillary part of the duct. When this is suboptimal, consider repositioning the patient.

The initial axis for biliary cannulation is always cephalad (uphill). Whether the tip of the wire or the catheter is used at the initiation of cannulation, the tip should be perpendicular to the face of the papillary orifice with an uphill trajectory. Scope position and accessory orientation should be optimized before cannulation is initiated. Avoid engaging the papilla and then trying reorientation because this distorts the papilla and makes deep cannulation more difficult. Make an effort to stay reasonably close to the papilla. If the tip of the scope is too far away, the curvature of the papillotome will inevitably go into the roof of the papilla as it is advanced, and you will lose precision in fine movements.

There are 2 basic steps to cannulation: insinuation and deep cannulation. Insinuation describes the deep seeding of the catheter into the ampullary orifice. It is a "feel" thing. We work very hard to achieve a comfortable seeding of the accessory before progressing to maneuvers to achieve deep cannulation. You will know when you are "seeded" when the guidewire or catheter tip is deeply engaged without causing distortion of the papilla. Do not force the catheter tip into the ampullary segment. This causes distortion and compression of the papilla. When the catheter tip is forced into the papillary orifice, attempts to advance the wire will cause progressive edema, rendering further attempts more difficult, or cause disruption of the mucosa, creating a false track. If you try injecting contrast material, it will either reflux into the duodenal lumen, or you will cause a submucosal injection, further

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(footnotes continued on last page of article)

distorting the ampullary anatomy. Nothing good comes from what we call the "cram and squirt" maneuver, and it all begins with trying to deeply cannulate without first achieving a free insinuation. During the process of cannulation, if you want to inject or advance a guidewire, always release the pressure on the catheter slightly before proceeding; it will be less traumatic and more effective.

Much has been written about wire-guided cannulation; the concept of advancing the guidewire and using its trajectory to determine which duct you are in. The purpose of the maneuver is to avoid pancreatic injection. In our opinion, there is too much emphasis placed on this approach. A gentle and limited injection of contrast material can provide a "road map" of the intra-ampullary segment, making it much easier to adjust the trajectory of the guidewire or catheter tip under fluoroscopic guidance to successfully negotiate tricky angles. We advocate the careful use of either or both techniques depending on the circumstances. When there is advanced pancreatic disease, there is no harm to limited pancreatic injections to achieve a radiographic roadmap. In these cases, ampullary distortion can be such that this guidance is indispensable in achieving a selective deep biliary cannulation. In the case of a normal pancreas, you may persist longer with the wire-guided method in order to avoid pancreatic injections. If an ampullary road map is desired, the injection should be slow, careful, under fluoroscopic guidance, and limited; the purpose is to understand the ampullary angles, not to fill the biliopancreatic ducts.

No single technique is successful in all cases, and it is important that you do not obstinately persist when a particular technique is not working. If you are trying to cannulate with the tip of the catheter, then switch to having a little guidewire protruding in order to more precisely engage in the 11 o'clock position. If you go into the pancreas, withdraw the catheter from the papilla and restart the cannulation from a slightly different angle. Do not forcefully engage the papilla and then try to redirect the catheter tip. If you are trying a wire-guided technique that is not succeeding, inject a small amount of contrast material to obtain a roadmap.

One can examine the papilla and predict what maneuvers are required to cannulate. If the papilla faces downstream, and there is a long intraduodenal segment, the scope will need to be positioned distal to the papilla so that the initial trajectory will be sufficiently uphill. Also, you will need to hook the papilla with the elevator and pull the scope back in order to straighten the ampulla to facilitate deep cannulation. Remember that the tract to enter the bile duct is almost always an "S" shape, with the acuteness of the angles dependent on the individual anatomy and the pressure applied on the papilla. The most common difficult cannulation is what we call the *up and over* papilla (an accentuated "S" shape). On inspection, this papilla looks like a camel's hump. It requires 3 distinct maneuvers to achieve deep cannulation. The first maneuver requires a cephalad trajectory, insinuation, and advancement to the top of the hump. Then, one must direct the tip downward, and this requires turning left with the small dial of the scope and pulling the shaft of the scope back. This will provide the downward trajectory needed to negotiate the angle at the top of the hump. This is also the time when your assistant can try again to gently advance a guidewire. Once this is achieved, the scope shaft is pushed in (and the small dial gently turned back to the right) to reachieve the cephalad trajectory needed to negotiate the second angle that is present at the ampullary-duodenal junction. These angles are not only in the frontal but also in the anteroposterior axis. Cannulation requires an "intellectual" 3-dimensional vision of what you are doing (Fig. 1).

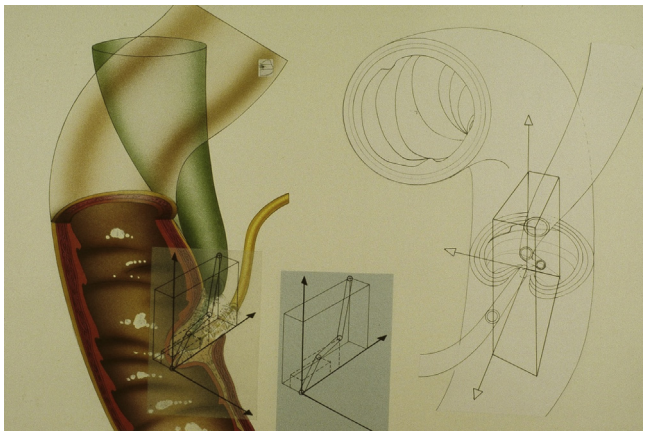

Figure 1. Three-dimensional rendition of the papilla of Vater demonstrating the angles present within the ampullary segment.

A "shar-pei" papilla refers to those that have multiple redundant folds and no turgor (stiffness). This situation requires straightening the papilla by hooking it with the elevator and then turning left on the small dial while pulling back slightly on the scope. With a shar-pei papilla, you will never achieve deep cannulation by simply pushing on the catheter or guidewire.

Advanced maneuvers have evolved to increase cannulation success when standard maneuvers fail. A popular maneuver is to pass a guidewire into the pancreatic duct and use that wire to straighten the intra-ampullary angles. With a second wire (and/or with a tapered papillotome), one probes along the pancreatic wire directing the guidewire northward into the bile duct. This maneuver should be used only if the course of the pancreatic duct is free of acute angles. Also, one must be very cognizant of the pancreatic wire during cannulation attempts to avoid the wire's being advanced into a side branch, which can cause perforation. An alternative to a wire is to place a pancreatic stent. However, the smallest stent that will fit over a 0.25 or 0.35 wire is 4F, and in many units, the smallest stent stocked is 5F. Five-French stents often "fill" the ampullary orifice, and working beside them can be

cumbersome and frustrating. In this case, the best maneuver may be to use a needle-knife over the stent to perform an "access" or "precut" sphincterotomy. A rare cause of failed cannulation is transposition of the ducts where the bile duct is at 5 o'clock, and the pancreas at 11 o'clock. In our experience, aberrant orientation is most often discovered after needle-knife sphincterotomy over a stent.

Finally, always be gentle with the papilla. If you encounter difficulties, never be angry at the patient, the scope, the papilla, or any coworker. Cannulation is, in our minds, the most prototypical procedure where kindness, tenderness, and feeling are keys for success and prevention of adverse events. Also, learn to know when to stop and refer to a center with greater expertise. If you perform ERCP for proper indications and use a precise and gentle technique, there is no shame in stopping and making an alternative plan if cannulation fails. Always keep patient care "numero uno." Good luck!

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