Precut (access) papillotomy

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INTRODUCTION

Precut papillotomy (or sphincterotomy) refers to a variety of endoscopic techniques used to gain access to the bile (or occasionally the pancreatic) duct. In most patients, precut papillotomy is followed by conventional sphincterotomy, which permits completion of therapies such as stone extraction and biliary drainage. However, precut papillotomy is sometimes used to gain access to the bile (or the pancreatic) duct for diagnostic cholangiography (or pancreatography) alone, a practice of increasingly uncertain justification given the availability of magnetic resonance cholangiopancreatography (MRCP) endoscoping ultrasound (EUS) and intraoperative laparoscopic cholangiography to diagnose biliary disease. Thus, the alternative term access papillotomy is probably more accurate [1].

Precut techniques are most often used after conventional methods of biliary cannulation have failed or, in a few centers, as a preferential technique for performing biliary and pancreatic sphincterotomy over a pancreatic stent in patients with sphincter of Oddi dysfunction [2]. Use of precut varied from none to as many as 38 percent of all biliary cannulation attempts in different reports [3-24].

Use of access papillotomy is highly controversial, with widely variable opinions as to its appropriateness, safety, and preferred technique. Access papillotomy is seldom necessary because of advances in techniques (eg, use of endoscopic ultrasound [EUS]) and equipment for biliary cannulation. In addition, the failure rate of conventional cannulation technique is low at advanced centers where most endoscopists have had advanced endoscopy training. When

precut papillotomy is performed, it should generally be limited to patients with a definitive indication for biliary therapy. There are emerging data that in patients with difficult biliary cannulation, early adoption of precut biliary sphincterotomy is advantageous, although these studies are from centers with expert endoscopists and cannot be applied universally [25].

TECHNIQUES

There are several techniques to perform precut papillotomy. Success and complication rates of precut techniques are highly variable and depend heavily upon the experience and skill of the endoscopist, the indication for the procedure, the risk profile of the patient, anatomic variations among patients, and technique-related factors such as use of pancreatic stents [26,27].

Common techniques

Free-hand needle-knife — The most widely practiced technique is the free-hand needle-knife, in which an incision is made starting at the orifice and extending cephalad for a variable distance. The original description of the technique involved using an upward sweeping motion with the elevator. However, improved control and safety can be achieved by loading the needle-knife by upward traction on the endoscope. Performing practice movements with the needle out (in the direction of anticipated cut) but not in contact with the mucosa can help in making sure of the direction of the cutting needle (figure 1). Having the duodenoscope in a shorter position can also assist in controlled transfer of movements.

A variation of the needle-knife technique involves making a puncture into the papilla above the orifice (often referred to as fistulotomy) and then cutting either upward in a cephalad direction or downward toward the orifice. A theoretical advantage of fistulotomy is that it spares the pancreatic orifice (figure 2).

Any of the above techniques can be performed after placement of a pancreatic stent (figure 3). Pancreatic stents are increasingly used to reduce the risk of post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis in a number of settings, particularly for difficult cannulations and prior to needle-knife precut papillotomy. Pancreatic stents serve not only to protect the pancreatic sphincter from injury, and maintain pancreatic drainage during and after the procedure, but may also provide anatomic guidance to the location of the bile duct. (See 'Pancreatic stenting' below.)

Various factors influence the use of precut technique at endoscopic sphincterotomy. One group reported that the need for precut papillotomy was increased in malignancies and less common

in patients with bile duct stones. Use of a precut technique was also more common in patients with an anatomical abnormality of the papilla and in duodenal stenosis [28].

Traction sphincterotome — The second major approach involves use of a traction sphincterotome. As originally described, a specialized short-nosed papillotome is wedged into the common channel in the direction of the bile duct allowing the endoscopist to perform what has been referred to as a "papillary roof incision" [4]. A report that described use of this technique in 123 patients achieved successful cannulation in all the patients in whom conventional cannulation techniques had failed [4].

A more commonly used variation of this technique involves intentional seating of the tip of a standard traction papillotome into the pancreatic duct and cutting through the septum in the direction of the bile duct, an approach often referred to as "transpancreatic precut sphincterotomy" (picture 1) [12]. Some series have shown efficacy and safety of transpancreatic papillotomy to access the bile duct [29-33].

Novel techniques

Intramural incision — An intramural incision technique has been described in a small number of patients. A false tract is created with a guidewire, permitting placement of a papillotome though the intramural portion of the papilla and unroofing of the biliary orifice [34,35]. This technique is applicable mostly to patients with prominent papillae in whom partial biliary cannulation has been achieved. The safety and usefulness of intramural incision has been demonstrated in patients where a false tract has been created after attempt at biliary cannulation [35].

Ultra-small sphincterotome — An ultra-small-caliber sphincterotome (1 mm diameter) introduced through a 6F or a 7F catheter has been evaluated for achieving conventional or precut papillotomy [36]. In one report, it allowed for successful cannulation in 98 percent (53 out of 54) of patients, with selective cannulation in 24 percent and precut in the remainder [36].

Suprapapillary blunt dissection — Suprapapillary blunt dissection involves creation of an initial linear cut over the mucosa of the infundibulum of the papilla with a needle-knife papillotome. A small ball of cotton held with a forceps is used for blunt dissection down to the bile duct, with subsequent needle-knife access. In one of the largest reports, this technique was used in 48 of 1057 attempted cannulations with success in all patients [37]. Pancreatitis developed in 8 percent.

Endoscopic scissors — Endoscopic scissors have been used to cut through the papillary roof or septum without cautery to gain biliary access. In an initial report, this technique was

successful in 8 of 12 attempts without any complications [38]. Although the idea is innovative, data are limited, and the instrument used is a prototype that is not widely available.

Endoscopic ampullectomy — Endoscopic ampullectomy has been performed for gaining biliary access when other methods have failed. In a series of 10 patients with malignant lesions involving the ampulla and protuberant ampullae at ectopic locations, cannulation was achieved in 100 percent, although 10 percent had significant bleeding [39] (see "Ampullary adenomas: Management"). This technique is somewhat radical and seems appropriate only in extremely unusual circumstances.

EFFICACY

Multiple reports have described the efficacy of the various precutting techniques. In several reports, precut techniques were performed in 4 to 38 percent of all cannulation or sphincterotomy attempts, with immediate success rates from 35 to 96 percent [40-42].

These results must be interpreted cautiously. Only immediate success at cannulation represents true success, because repeat endoscopic retrograde cholangiopancreatography (ERCP) without precut may also have been effective. Using a variety of techniques with or without precutting, expert endoscopists are now able to achieve biliary cannulation in >99 percent of cases during first attempt, as long as the major papilla can be reached with a duodenoscope.

For selected patients (eg, those at high risk for post-ERCP pancreatitis), limited data have suggested that precut needle-knife technique was associated with higher cannulation rates than conventional methods that do not use precut technique [33,40]. As an example, in a study of 207 patients with at least one risk factor for post-ERCP pancreatitis, needle-knife fistulotomy was associated with higher rates of biliary cannulation compared with conventional technique (98 versus 90 percent) [40]. In addition, needle-knife technique was associated with lower rates of post-ERCP pancreatitis compared with conventional methods (9 versus 0 percent). (See 'Free-hand needle-knife' above.)

COMPLICATIONS

Complications have been reported in 2 to 34 percent of precuts, a rate that is generally higher than reported in patients undergoing standard sphincterotomy. A meta-analysis and a number of multivariate analyses have suggested that precutting is an independent risk factor for overall complications, and particularly for post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis [11,19,43,44]. Severe post-ERCP pancreatitis occurs disproportionately more

often after precuts performed in the conventional fashion without a pancreatic stent [11,43,44]. In addition, rates of perforation were significantly higher in another multicenter study [20]. (See "Post-ERCP perforation".)

Bleeding is not consistently more common after precut papillotomy [3,45,46].

Differences in complication rates in part reflect variability in the rigor of data collection, definitions and patient characteristics. Complications associated with ERCP, especially pancreatitis, depend heavily upon patient-related factors, as well as technique and operator characteristics. Thus comparison of outcomes of precut with standard ERCP is not straightforward since the indications for the procedure, anatomy, and patient characteristics often are very different in patients undergoing precut compared with standard sphincterotomy. (See "Post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis".)

In other words, endoscopists often elect to perform precut techniques in patients who are actually at lower initial risk of complications (eg, those with true obstructive jaundice and prominent papillary landmarks). By contrast, standard sphincterotomy is more often performed for more marginal, high-risk indications such as suspected sphincter of Oddi dysfunction. Thus the complication rates of precut papillotomy may appear deceptively low when compared with standard sphincterotomy.

Complications rates with different techniques — There are only limited data comparing specific precut techniques [3,12,13,20,45-48].

- A randomized study compared fistulotomy starting above the orifice with conventional needle-knife starting at the orifice in 153 patients with suspected choledocholithiasis [20]. Rates of pancreatitis were significantly lower in the fistulotomy group (0 versus 8 percent), although overall complication rates and success at initial cannulation were similar [20]. Despite the theoretical advantages of fistulotomy in sparing the pancreatic orifice, the technique may not be feasible in patients with a very small or flat papilla, or in patients at high risk for post-ERCP pancreatitis.

- Another study looked at the two techniques of precut [45]. There was no difference in success rates or complication rates between the standard technique starting at the orifice and modified technique, in which the cut was made at top and extended downwards towards the orifice.

- Two initial reports of the transpancreatic precut technique from a single endoscopist described complication rates comparable to standard precut techniques [12,13]. However, a subsequent large series from Japan in average-risk patients suggested that, while

usually successful, transpancreatic precut was associated with a significantly higher risk of pancreatitis than standard sphincterotomy [3].

- A prospective series (n = 116) of pancreatic sphincterotomy using a precut technique reported relatively high success (85 percent at initial ERCP) and low complication rates (12 percent, mostly mild to moderate severity, although two were retroperitoneal perforations) [46].

- A randomized trial compared transpancreatic precut with needle-knife papillotomy (sometimes with, and sometimes without a 5 to 7 French pancreatic stent) [47]. The rate of successful biliary cannulation was significantly higher (100 versus 77 percent) and complication rates somewhat lower (4 percent versus 18 percent) with the transpancreatic precut approach.

  - The success and complication rates of needle-knife precut as used in this study are difficult to interpret because of inconsistent use of pancreatic stents. When they were used, relatively large caliber pancreatic stents (up to 7F) were used. This may have interfered with biliary cannulation and increased pancreatitis rates compared with small caliber stents (3 or 4F), which are currently favored [43].

  - While the transpancreatic precut method may be fairly safe in patients at low risk for complications (such as those with obstructive jaundice), caution must be advised regarding this technique in patients at high risk for post-ERCP pancreatitis since performance of a partial pancreatic sphincterotomy without a pancreatic stent can be hazardous. Placement of a pancreatic stent may be advisable in higher-risk patients undergoing this technique; unfortunately, it is not always possible to identify high- and low-risk patients. Studies have shown higher success and lower complication rates when performing precut after placement of a pancreatic duct stent [49,50]. (See "Post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis".)

- A retrospective study suggested significantly fewer complications and greater success at bile duct access using needle-knife over a pancreatic stent compared with a freehand needle knife technique [49].

- A randomized trial suggested that endoscopic ultrasound (EUS) rendezvous may be safer and more effective for bile duct access than precut papillotomy using a traction-type papillotome [51]. This study needs to be interpreted cautiously as the pancreatic stent-protected needle knife technique was not used for precut papillotomy, and this center was dealing primarily with patients with a dilated bile duct and had significant experience with EUS rendezvous.

Are complications due to the precut? — It has often been debated whether complications of precut are due to the precut itself or the antecedent cannulation attempts. A meta-analysis of six randomized trials with 966 subjects examined this issue [52]. The meta-analysis included trials in which patients were assigned to early precut implementation or persistent attempts at standard cannulation. Post-ERCP pancreatitis was significantly less common in the precut group compared with the persistent attempts at cannulation group (3 versus 5 percent). However, the overall rate of complications including pancreatitis, bleeding, cholangitis, and perforation did not significantly differ (5 versus 6 percent).

PANCREATIC STENTING

As mentioned above, accumulating evidence has suggested that prior placement of a pancreatic stent can reduce the incidence of post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis in a number of settings including, precut papillotomy for any indication, after biliary sphincterotomy in patients with sphincter of Oddi dysfunction, or after difficult cannulation [2,43,53,54].

In addition to protecting pancreatic drainage during the incision and subsequent manipulations, a pancreatic stent provides invaluable anatomical orientation while the papilla is dissected. With a stent in place, the area can be probed with confidence with a guidewire or catheter until the bile duct is successfully cannulated with a substantially lessened risk of inadvertent partial laceration or thermal injury to the pancreatic sphincter. (See "Prophylactic pancreatic stents to prevent ERCP-induced pancreatitis: When do you use them?".)

However, a limitation of this approach is that it may sometimes be difficult to place a pancreatic stent, especially for endoscopists with limited experience at pancreatic endoscopic therapeutic techniques. If the pancreatic duct has not been cannulated and papillary anatomy is clear, it may be best to omit attempting a pancreatic stent and to avoid pancreatic duct manipulation altogether.

If pancreatic stents are placed, evidence now supports using small caliber (3 or 4 French) stents rather than 5 or 7 French stents, because the risk of causing duct injury and post-ERCP pancreatitis [43]. Pancreatic stents must be documented to pass by radiograph or removed endoscopically, preferably within two weeks, to reduce risk of duct injury. (See "Prophylactic pancreatic stents to prevent ERCP-induced pancreatitis: When do you use them?".)

ENDOSCOPIST'S EXPERIENCE

There are substantial data to support that high volume endoscopists have lower overall and severe complication rates for therapeutic endoscopic retrograde cholangiopancreatography (ERCP) in general [1,2,55], but there are fewer data regarding precut papillotomy [56]. There is probably no procedure in interventional endoscopy that requires more precise technique than precut papillotomy. It is important to remember that the published literature is primarily derived from specialized centers, and that the practicing endoscopist may not be able to achieve similar results.

The few data on outcome of precut papillotomy in the hands of practicing clinicians outside specialized centers suggest that it may not be as safe or effective as in published reports. In one study, for example, practicing endoscopists performing not more than one sphincterotomy per week were found to have a first time bile duct access rate of only 52 percent using precut techniques, with a 24 percent complication rate, a risk/benefit ratio that is hard to justify [1]. Although their complication rates may or may not be substantially lower, expert endoscopists are much more likely to succeed at initial bile duct accessing after precut (90 percent successful bile duct access during initial precut attempt for high volume endoscopists) [1].

SUMMARY AND RECOMMENDATIONS

- Success and complication rates of precut papillotomy techniques are highly variable and depend heavily upon the experience and skill of the endoscopist, the indication for the procedure, the risk profile of the patient, anatomic variations among patients, and technique-related factors such as use of pancreatic stents. The decision to perform precut papillotomy and the controversy surrounding the technique are related to a number of factors including the strength of the indication for biliary access. There should be a clear indication for endoscopic therapy, such as clinical evidence of cholangitis, demonstration of a bile duct stone at magnetic resonance cholangiopancreatography or endoscopic ultrasound, or abnormal sphincter of Oddi manometry. Endoscopists should be familiar with techniques of precut papillotomy, and weigh their own likelihood of safety and success against the option of terminating the case and referring the patient to another more experienced center, or performing an alternative imaging or drainage technique. (See 'Techniques' above.)

- Once the decision has been made to use a precut technique, it may be advisable to tailor the technique to the individual patient's anatomy and risk profile. For example, a bulging papilla with an impacted stone generally does not require a pancreatic stent, and the decision to proceed to needle-knife might be made quickly. By contrast, a young patient with a normal pancreas and small papilla who has undergone pancreatic instrumentation

might be more suitable for pancreatic stent-protected needle-knife or transpancreatic precut followed by a pancreatic stent. (See 'Common techniques' above and 'Pancreatic stenting' above.)

- The need for a precut papillotomy should be guided by the following considerations:
  - The strength of the indication for biliary therapy
  - The urgency of obtaining biliary drainage
  - The anatomic feasibility of obtaining bile duct access
  - The experience of the endoscopist with precut papillotomy
  - The ability to place a pancreatic stent in higher risk circumstances
  - The possibility of referral to an expert endoscopic retrograde cholangiopancreatography center
  - The availability and safety of alternative approaches

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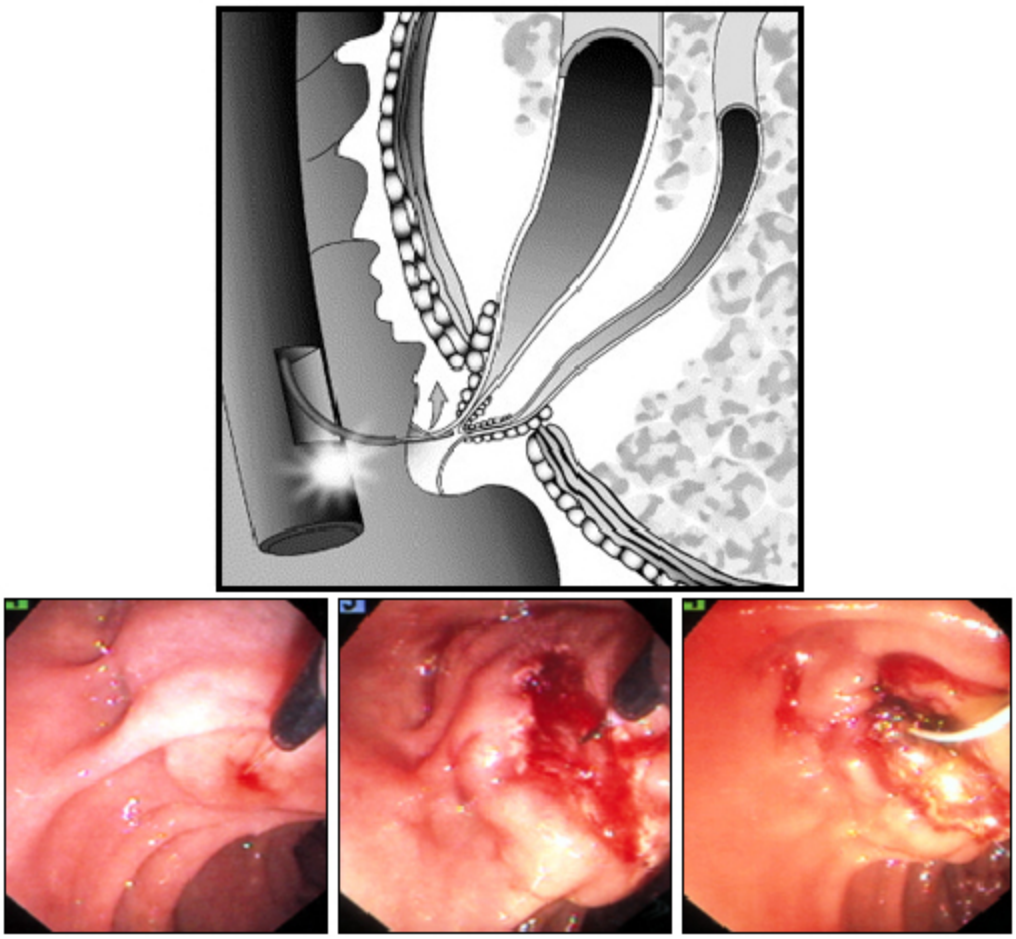
GRAPHICS

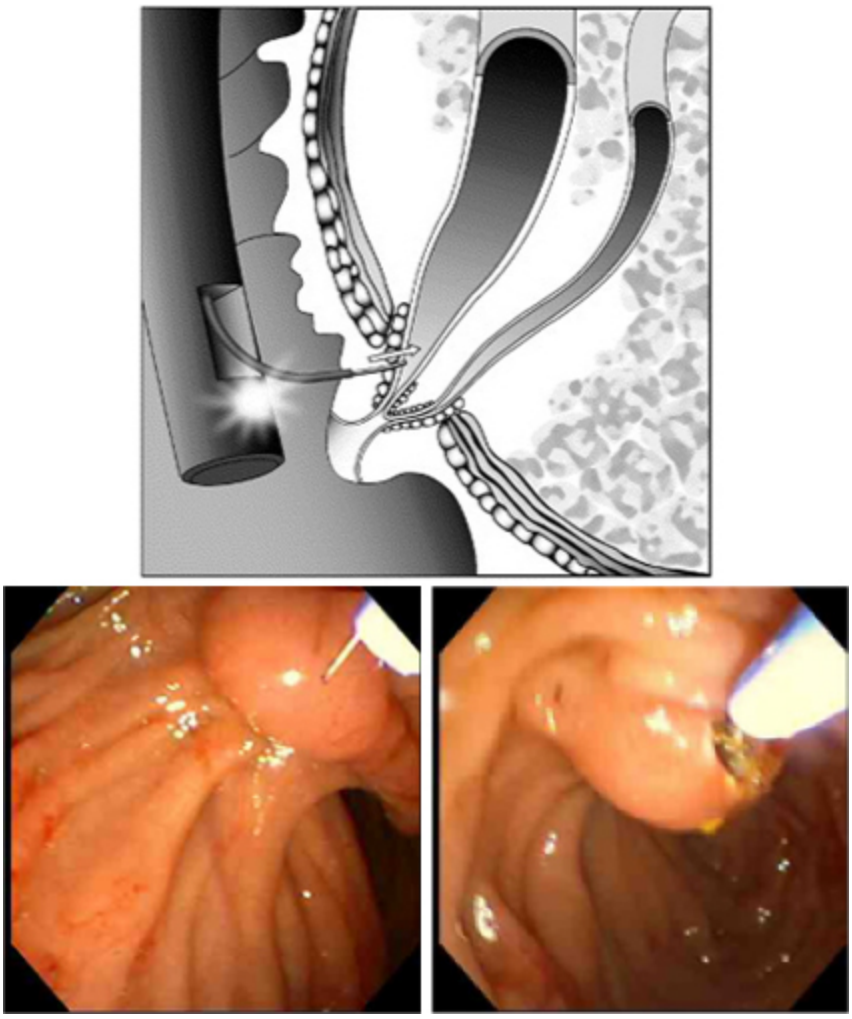
Free-hand needle-knife papillotomy



Courtesy of Martin L Freeman, MD.

Graphic 76180 Version 4.0

Precut fistulotomy



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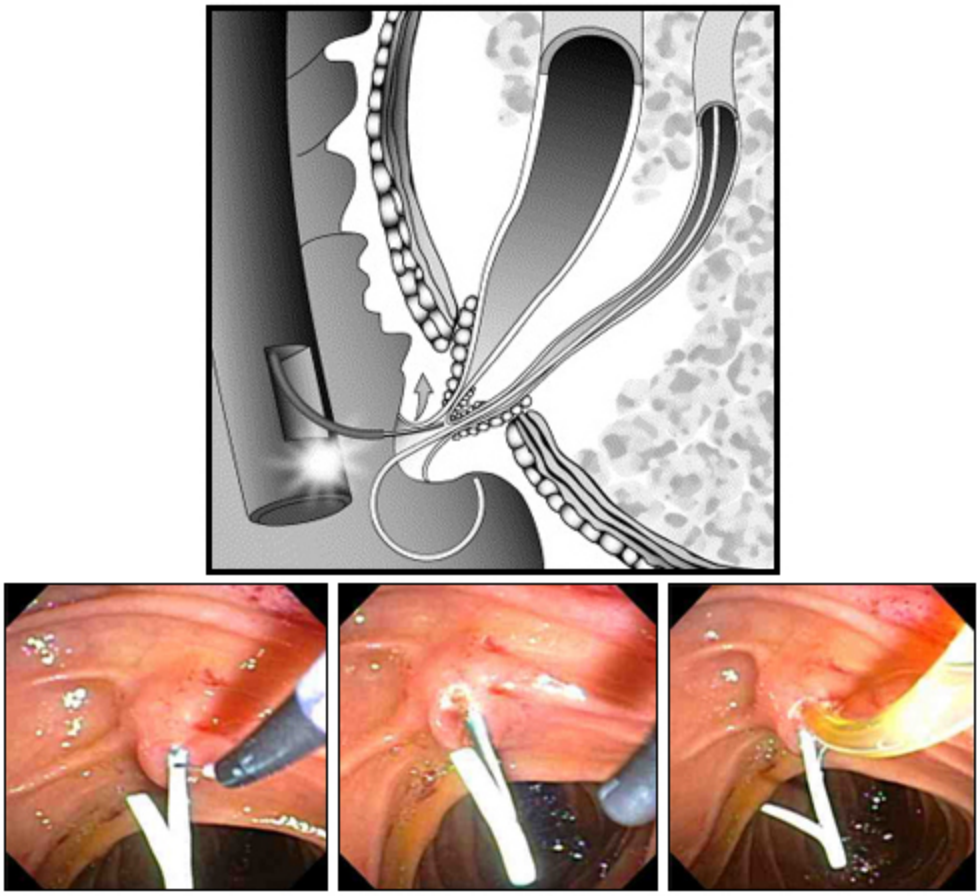
Precut papillotomy over a pancreatic stent



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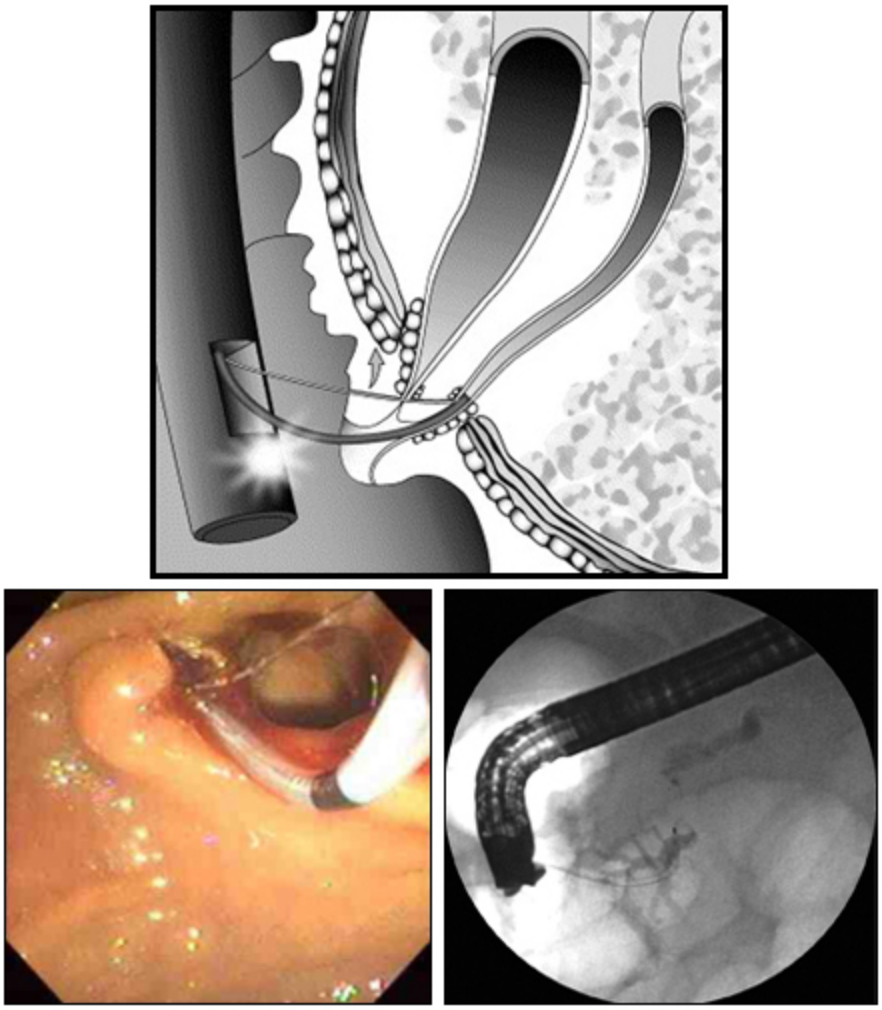
Graphic 68914 Version 3.0

Transpancreatic precut sphincterotomy



Courtesy of Martin L Freeman, MD.

Graphic 52970 Version 4.0

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