

# ADVANCES IN ENDOSCOPY

Current Developments in Diagnostic and Therapeutic Endoscopy

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## Update on Cholangioscopy



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### **G&H** What are the primary indications for cholangioscopy?

**PT** Cholangioscopy has both diagnostic and therapeutic indications. More broadly, ductoscopy encompasses both cholangioscopy (biliary) and pancreatoscopy (pancreatic). Cholangioscopy is used most commonly to differentiate benign from malignant conditions, particularly in regard to indeterminate biliary strictures, but also in the settings of primary sclerosing cholangitis, immunoglobulin G4-related disease, and Mirizzi syndrome. Ductoscopy has also been shown to be helpful in examining ductal mass lesions and strictures, investigating mucinous tumors, and identifying bile duct stones that were missed on routine cholangiography. Additionally, cholangioscopy can be used for targeting tissue acquisition either directly using forceps passed via a working channel or under fluoroscopic guidance with transpapillary-passed biopsy forceps. In rare cases, cholangioscopy is useful to facilitate guidewire access to difficult intraductal locations, such as the cystic duct, intrahepatic ducts, and/or across tight strictures (eg, hilar or anastomotic strictures).

Therapeutically, cholangioscopy is commonly used for targeting therapies such as laser or electrohydraulic lithotripsy for tumor ablation or palliation. Ductoscopy can also be used to remove foreign bodies (eg, stents or clips) and to delineate the need for surgical resection.

For example, pancreatoscopy may be helpful to surgeons to map the extent of disease, such as in the setting of intraductal papillary mucinous tumors. Cholangioscopy has also been used to facilitate nonradiation endoscopic retrograde cholangiopancreatography (ERCP) when fluoroscopy is contraindicated, such as in the case of pregnancy, to achieve visual confirmation of ductal clearance.

### **G&H** How has the field of cholangioscopy evolved?

**PT** Cholangioscopy has been around for more than 50 years, and the practice of cholangioscopy has almost paralleled the history of ERCP. There are several different situational aspects and modalities of cholangioscopy. Endoscopists are mainly concerned with peroral cholangioscopy, which includes mother-baby and direct peroral devices. Cholangioscopy can also be performed percutaneously, with some of the same instruments, by endoscopists, surgeons, or, more commonly, interventional radiologists. Lastly, cholangioscopy can be performed surgically, usually with a transcystic approach. In general, most of the developments and clinical applications have been in the peroral realm.

### **G&H** What limitations were associated with early iterations of mother-baby cholangioscope systems?

**PT** Most of the limitations of the mother-baby cholangioscope systems were related to optics and operational aspects. Early on, the optical output was via fiberoptic methods, and the image result was suboptimal. Even after the optics progressed to video miniscopes, there was still the limitation of needing 2 instruments and 2 operators. This was a challenge for some centers that could not justify the purchase of extra cholangioscopes and equipment and may not have had the additional operators available to help facilitate the procedure. Another major disadvantage of the mother-baby cholangioscope systems was the fragility and the tendency for breakage and associated repair costs.

### G&H How have current systems overcome these limitations?

**PT** Most of the improvements pertain to the methods for delivery of the cholangioscope and with the optics themselves. As mentioned, early imaging evolved from fiberoptic to video. In 2015, optical output progressed to digital technology. However, the biggest advance has been the ability to perform single-operator cholangioscopy. A fiberoptic catheter passed through a baby cholangioscope was first available from Boston Scientific in 2007. Since then, the single-operator cholangioscope has become the most commonly used technique. This device also has the advantages of being a disposable instrument and easy to use. The setup is simple; the instrument can be advanced into the bile duct over an indwelling guidewire placed via ERCP or even over a guidewire that is advanced transpapillary under direct vision via the cholangioscope channel. It is also quite easy to pass a SpyScope (Boston Scientific) directly into the bile duct without guidewire assistance because of the 4-way tip directional control. Successful primary ductal access without the need of a guidewire leaves the working channel immediately available for accessories, such as forceps. It is worth noting that all of this technology can be applied to pancreatoscopy as well.

### G&H How have advances in endoscopic and imaging technology affected the field of cholangioscopy?

**PT** Perhaps the greatest benefit of having improved optics with second-generation instruments is that “seeing is believing.” There are now good-quality data and emerging experience showing that observational impressions at the time of cholangioscopy are often superior to tissue-proven sensitivity. Recently, several studies have reported that accuracy of visual impressions for diagnosis, for example of indeterminate strictures to suggest malignancy, can be as high as 90%. This, of course, is

far superior to conventional techniques such as brush cytology and biopsy, which originally had sensitivities in the range of 45% to 55%. Efforts have also been made to improve subjectivity. Studies are suggesting that direct vision can help clinicians identify certain mucosal, surface, and vascular patterns that are consistent with malignancies.

### G&H What are the benefits and limitations of digital single-operator cholangioscopes?

**PT** Other than ease of use, the main advantage of current technology with the ability to perform ductoscopy is that the technical success with single-operator systems is 90% to 95%.

However, there are still some challenges. Cholangioscopy generally requires a sphincterotomy, which may be contraindicated in some settings (eg, coagulopathy). Cholangioscopy is of limited utility in targeting very distal locations—for example, just inside the papilla, in certain areas of duct angulations, in the very proximal intrahepatic or peripheral ducts, or in the proximal pancreatic ducts. Another limitation is that some of the biopsy specimens that are obtained with the current single-operator systems tend to be quite small. Although an assistant can suction some debris, the operator often needs to instill lavage fluid via a foot pump into the duct to achieve adequate visualization. Due to potential for excess fluid in the stomach, it is prudent to use general anesthesia with endotracheal intubation to protect the airway. Additionally, adverse events including cholangitis may occur; thus, prophylactic antibiotics are recommended.

### G&H How does direct peroral cholangioscopy compare with digital single-operator cholangioscopy?

**PT** Direct peroral cholangioscopy is traditionally performed using a miniscope or an ultraslim endoscope that is passed directly into the bile duct without use of a mother scope. In early experience, the scope was passed over a guidewire placed during an ERCP performed immediately before attempting ductoscopy. Passing the scope over a guidewire sometimes requires an anchoring balloon to maintain traction in order to facilitate passage of the miniscope into the duct. A new prototype multi-bending endoscope from Olympus has turning adjustments that can occur in 2 different directions and at 2 separate fulcrums. This function may actually improve the ability to achieve primary duct cannulation without the requirement of having an indwelling guidewire. This scope is longer than a traditional miniscope and has 2 accessory ports.

The disadvantage of using peroral cholangioscopy is that, as with any cholangioscopy, a prior sphincterotomy or balloon dilation of papilla is still likely needed. As these procedures are performed in the setting of ERCP, it often makes more sense to proceed with mother-baby cholangioscopy than with direct peroral cholangioscopy.

### **G&H** What have studies reported regarding the use of the multibending endoscope to treat biliary tract disease?

**PT** There are some very early data on this instrument. A recent study compared the use of a traditional ultra-slim endoscope to that of the novel multibending endoscope. Results suggested that the multibending endoscope achieved faster cannulation time by a few minutes, but ultimate outcomes were otherwise similar. However, the results are likely not generalizable to most endoscopists based on experience and expertise, and data suggest that outcomes of cholangioscopy, like most other endoscopic procedures, are better in the hands of more experienced operators. Currently, however, the device is not yet available in the United States.

### **G&H** Are any devices currently being developed?

**PT** There have been some recent developments mostly in the form of added accessories, such as a mini-snare and a mini-basket that can be passed through a mother-baby cholangioscope. Those have been useful for retrieving stones and foreign bodies. Undoubtedly, endoscopy and device manufacturers other than Boston Scientific are working toward additional options related to single-operator cholangioscopy systems.

### **G&H** What are the priorities of research?

**PT** As mentioned previously, some centers maintain that visual impressions are superior to histologic accuracy. However, visual accuracy of the endoscopic impressions during cholangioscopy needs to be further validated before allowing for a more generalized acceptance of the concept that seeing is believing. Additionally, we need to improve the overall yield by refining our biopsy techniques and accessories to meet the level of visual accuracy. Tissue acquisition techniques need improved functionality, and adjunct techniques such as probe-based confocal laser endomicroscopy need to be clarified. There are still some limitations with cholangioscopy control; the 4-way tip deflection can be restricted and is not always predictable due to being constrained both in the duodenoscope and in variable patient anatomy. A joystick technology may provide a better method of the operational or directional control of the cholangioscope as opposed to the current wheel technology.

*Dr Tarnasky serves as a speaker and consultant for Boston Scientific.*

### **Suggested Reading**

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