17C Percutaneous Biliary Endoscopy: Technique and Clinical Applications

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17C.1 Introduction

Percutaneous cholangioscopy consists in the direct visualization of the biliary tree – for both diagnostic and therapeutic purposes – using a flexible endoscope that can be introduced percutaneously, either through a transhepatic tract created during biliary drainage or through a surgical T-tube tract. The technique was initially used in the early 1970s by some Japanese surgeons (Takada et al. 1974; Yamakawa et al. 1976) and then taken up around the world in the late 1980s and early 1990s by radiologists and surgeons (Picus et al. 1989; Nimura et al. 1989; Bonnel et al. 1991; Picus 1995; Rossi et al. 1996). More recently, many surgeons have begun to use a fine-caliber endoscope during laparoscopic operations, to visualize the intrahepatic ducts or for therapeutic maneuvers (Lezoche and Paganini 1995).

17C.2 Cholangioscopes

The characteristics of a cholangioscope for the percutaneous approach are the following:

- Small caliber (less invasive)
- Steerability
- Working channel of adequate caliber to permit the introduction of baskets, biopsy forceps, and lithotripsy probes

Their small size has many advantages – like flexibility and ease of introduction – but, compared with larger instruments (8 mm), they have poorer image resolution.

Larger cholangioscopes provide higher-resolution images because of the larger number of optical fibers; however, they require a larger transhepatic tract, and often do not permit exploration of the subsegmental biliary radicles. Smaller scopes have fewer light fibers, which has a negative effect on image quality, but they can be more easily advanced into the peripheral biliary tree, and through a smaller percutaneous entry.

Miniature cholangioscopes (<1 mm in diameter) have been recently developed for the pancreatic and biliary system (Tajiri et al. 1993; Riemann and Kohler 1993). These scopes, however, have a limited observation field and their image quality becomes suboptimal in enlarged ducts; in addition, they do not have an operating channel for biopsy and/or lithotripsy. The clinical use of these scopes is mainly limited to visual inspection of the ducts for diagnostic purposes.

Several fine-caliber cholangioscopes, ranging in size between 1.9 and 2.8 mm, are also commercially available (Guenther et al. 1990). Their primary advantage is that they can be used through smaller tracts, thus extending the range of indications for percutaneous cholangioscopy. Some of these fine-caliber scopes, however, are not steerable, and this makes manipulation within the biliary tree difficult. These scopes have no instrument channel at all, or only a small working channel, and are used for...
visual inspection and for limited therapeutic procedures.

Two types of flexible cholangioscopes are currently used at our institution. The first one introduced into our practice is 4.9 mm (15 F) in diameter with a 2.2-mm working channel (Olympus, model CHF-P20, Olympus Optical Co. GmbH, Hamburg, Germany). The working channel allows the use of a large variety of operative instruments, up to a size of 5–6 F. The total usable length of the scope is 67 cm. The lighting system has two light guides, while the optical system is characterized by forward viewing with a 120° field of view and a depth of field between 3 and 50 mm; this depth of field permits the exploration of highly dilated ducts. The distal end of the scope can be deflected by means of a control lever (the range of bending is 160° up and 120° down).

The second scope currently in use in our department is a ureteroscope (Olympus, model URF-P). It is 3.9 mm (12 F) in size, with a 1.2-mm instrument channel. This channel permits the introduction of instruments up to 3 F. The lighting system has only one light guide, and this gives an image quality inferior to the larger 4.9-mm scope. The optical system is characterized by forward viewing with a 90° field of view and a depth of field similar to the CHF-P20 scope. The distal end of the instrument can also be bent (180° up and 100° down).

The light source for both instruments is a xenon light source. The eyepiece of both cholangioscopes may be attached to a video camera, directly or by means of an adaptor. Digital charge-coupled device (CCD) video cameras provide endoscopic images with better resolution than conventional video cameras. The use of a video camera has the main advantage that the operator is not obliged to look directly into the cholangioscope; this allows a second operator and other people in the room to follow the procedure.

17C.3 Technique

Any visual exploration of the biliary tree with a cholangioscope requires a direct approach and adequate tract maturation and dilation. The area where the percutaneous cholangioscopy is to be done is considered when deciding the approach. The left ductal approach allows more direct access to the common bile duct; in addition, it causes less pain during dilation due to the absence of an intercostal tract. If the biliary drain, however, has been already placed through the right ducts and the tract is mature, percutaneous cholangioscopy of the common bile duct can be done from this approach and there is no need for a second approach from the left. When the lesion to be treated is located in the intrahepatic biliary tree, either right or left, a contralateral approach is usually preferred. This usually allows exploration of all the segmental branches of one lobe from the other side; this is particularly useful in case of intrahepatic stones and/or strictures (Fig. 17C.1).

Tract dilation should be done progressively in order to avoid severe complications as reported by Bonnel et al. (1991); this author reports severe complications in 22% of a group of 50 patients treated with percutaneous cholangioscopy for bile duct stones, and a mortality of 8% when percutaneous cholangioscopy was performed within 3 days after the initial percutaneous drainage.

The introduction of the scope can be performed either through a peel-away Teflon sheath or directly through the cutaneous biliary fistula. Larger dilation