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Percutaneous video choledochoscopic treatment of retained biliary stones via dilated T-tube tract

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Abstract

Background: Retained biliary stones is a common clinical problem in patients after surgery for complicated gallstone disease. When postoperative endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic sphincterotomy are unsuccessful, several percutaneous procedures for stone removal can be applied as alternatives to relaparotomy. These procedures are performed either under fluoroscopic control or with the use of choledochoscopy, but it is also possible to combine these methods.

Methods: Since 1994, we have used the percutaneous video choledochoscopic technique for the removal of difficult retained biliary stones via dilated T-tube tract in 17 patients, applying the technique of percutaneous stone extraction used in urology. While waiting for the T-tube tract to mature and after the removal of the T-tube, the dilatation of its tract was 26–30 Fr. Stone removal was carried out using a flexible video choledochoscope and a rigid renoscope under fluoroscopic control, with the aid of Dormia baskets, rigid forceps, and high-pressure irrigation.

Results: We performed 23 operative procedures, and the clearance of the biliary ducts was successful in all cases. There were no major complications or deaths.

Conclusion: Percutaneous video choledochoscopic–assisted removal of large retained biliary stones via the T-tube tract is a highly effective and safe procedure. Its advantages over other procedures include the ability to visualize the stones and noncalculous filling defects; it also guarantees that the stones can be removed under visual video endoscopic control. It has no problems related to tract or stone size.

Key words: Stone removal — Choledochoscopy — Percutaneous extraction — Dilated T-tube tract — Gallbladder

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The conventional methods for the surgical exploration of the common bile duct (CBD) for gallstone disease employ blind techniques; this may help to explain why the incidence of retained CBD stones is higher than it should be [1, 2]. A technique for the percutaneous extraction of retained bile duct stones was first described by Mondet and later used by Burhenne [6] and Mazzariello [8]. With the introduction of postoperative choledochoscopy [3, 4, 11, 12, 13, 15], a new weapon was added to the armamentarium of biliary tract surgery, and it was widely assumed that the incidence of missed stones would decrease significantly [6]. In this report, we describe our initial experience with percutaneous video choledochoscopy (PVC), fluoroscopy, and the dilatation of the T-tube tract and high-pressure irrigation in the management of large and multiple retained biliary stones independent of the size of the T-tube tract or the stone.

Materials and methods

Seventeen consecutive patients who underwent cholecystectomy and conventional exploration of the common bile duct (CBD) without intraoperative choledochoscopy were referred to our surgical department with large, multiple retained biliary stones of the CBD on T-tube cholangiograms. There were 12 women (mean age, 53 years; range, 32–84) and five men (mean age, 59 years; range, 53–65). All of the patients had an existing T-tube. They were all deemed unsuitable for endoscopic papillotomy. Some had already undergone an unsuccessful attempt at endoscopic retrograde pancreatocholangioscopy (ERCP), others had had a Billroth II gastric resection. The indications for the procedure are shown in Table 1.

Before undergoing PVC, all of the patients waited 5–6 weeks for the T-tube tract to mature [12]. T-tube cholangiograms (Fig. 1) were repeated before the procedure to confirm the stones, their approximate number, and the position, caliber, and shape of the T-tube tract to judge whether it was suitable for dilatation.

All of the operations were performed in the Department of Urology by surgeons and urologists under general anesthesia and antibiotic prophylaxis, with aseptic precautions of skin preparation, sterile drapes, and instruments.

Table 1. Indications for PVC

No. of patients	Indication
9	Unsuccessful ERCP
5	Unsuccessful papillotomy
3	Billroth II gastric resection

ERCP, endoscopic retrograde cholangiopancreatography; PVC, percutaneous video choledochoscopy

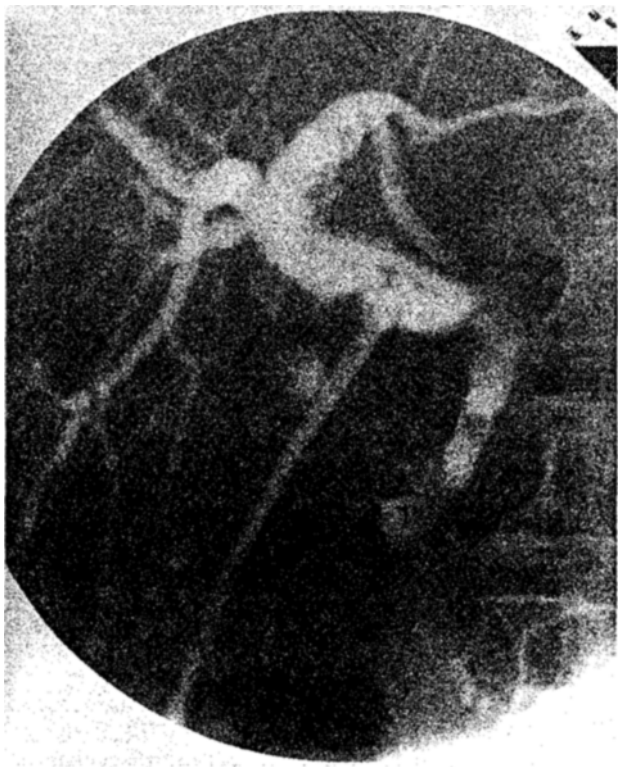

Fig. 1. Retained stones seen at the lower part of the common bile duct with a straight T-tube.

Surgical technique

The CBD was filled with contrast media and visualized under fluoroscopic control; then the stones were detected. An angiographic guidewire was advanced through the T-tube until it reached the distal part of the CBD or it passed to the duodenum. It was maintained in position, then the T-tube was withdrawn above the wire. The smallest metal catheter of the telescopic dilatation set (Karl Storz, Tuttlingen, Germany) was introduced into the tract over the guidewire and advanced with caution until its tip lay in the CBD. The dilatation was then performed over the first catheter. Successively larger catheters were used until the T-tube tract was wide enough to accept the 7-mm wide flexible renoscope (Karl Storz), the 8.5-mm rigid renoscope (Karl Storz), or the large fragments of stones; the dilatation was carried out up to 20–30 Fr. The tract was then supported by a metal sheath that reached the opening of the track as it communicated with the CBD. This sheath worked as an operative channel and reduced the likelihood of the tract being lost during the introduction of the equipment and subsequent manipulations.

The flexible renoscope was introduced with continuous saline irrigation with a pressure of <80 mmHg through the operative sheath [7]. When it reached the CBD, contrast media was injected through its operative channel to fill the CBD in order to localize and visualize its position under fluoroscopic control. The renoscope was then attached to the video camera and light cable to display the intraluminal image of the CBD in a large format via the TV monitor. Once the renoscope had passed alongside the guidewire, explorative choledochoscopy was performed up to the second and third branches of the intrahepatic bile ducts. By deflecting the scope distally, the papilla of Vater could be visualized.

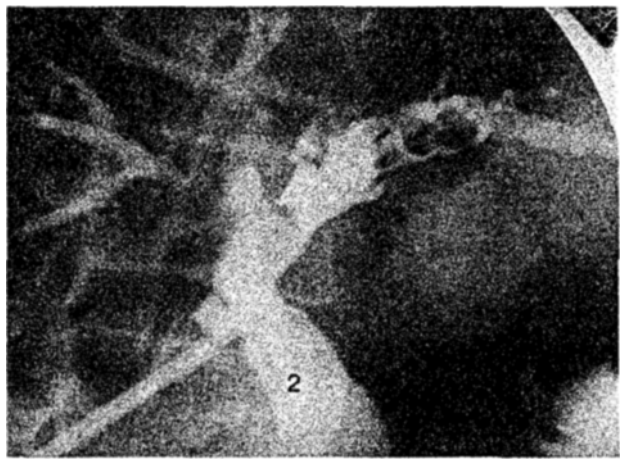

Fig. 2. Three large stones can be seen in the left hepatic duct.

Whenever small stones were observed (diameter <5 mm), the flexible choledochoscope was withdrawn to be replaced with the rigid renoscope. By applying saline irrigation with high pressure [7], the small stones were flushed out of the CBD through the operative channel of the renoscope. Medium-sized stones (diameter >5–10 mm) required extraction with the Dormia basket. Large stones were fragmented with rigid forceps, which were introduced through the operative channel of the rigid renoscope. The fragments were then extracted. Stones situated high in second and third generations of intrahepatic or hepatic ducts (Fig. 2) were drawn down into the larger ducts by balloon catheters or continuous irrigation. Finally, the function of the sphincter of Oddi was checked.

On completion of the procedure, a 15–20 Fr Latex catheter was left in the CBD and fixed to the skin. Control catheter cholangiography was performed instantly (Fig. 3) to detect any extravasation from the CBD. The tract Latex catheter was left in the CBD for 48–72 h for drainage and repeat cholangiograms (Fig. 4). Whenever retained stones or missed stones were still observed, the procedure was repeated in a second similar operative procedure. If no more retained stones were discovered, the tract tube catheter was removed within 48–72 h.

Results

We performed 23 operative procedures, and the clearance of the biliary tracts was successfully achieved in all cases. Three patients had intrahepatically situated stones that were difficult to extract; this group alone required seven operative procedures. In four patients, bile leakage through the tube tract lasted for >3 days after the removal of the tube. No tract perforation or significant morbidity occurred, and all patients were discharged in a mean of 3 days after the procedure (range, 1–13).

Discussion

Annual estimates of the percentage of retained biliary stones range is between 10% and 15% [14]. However, the incidence of overlooked stones proved to be significantly lower in patients who had undergone intraoperative cholangiography combined with choledochoscopy [16]. The high mortality rate of patients with retained stones underscores the importance of performing a thorough exploration of the biliary tree with cholangiography and choledochoscopy during

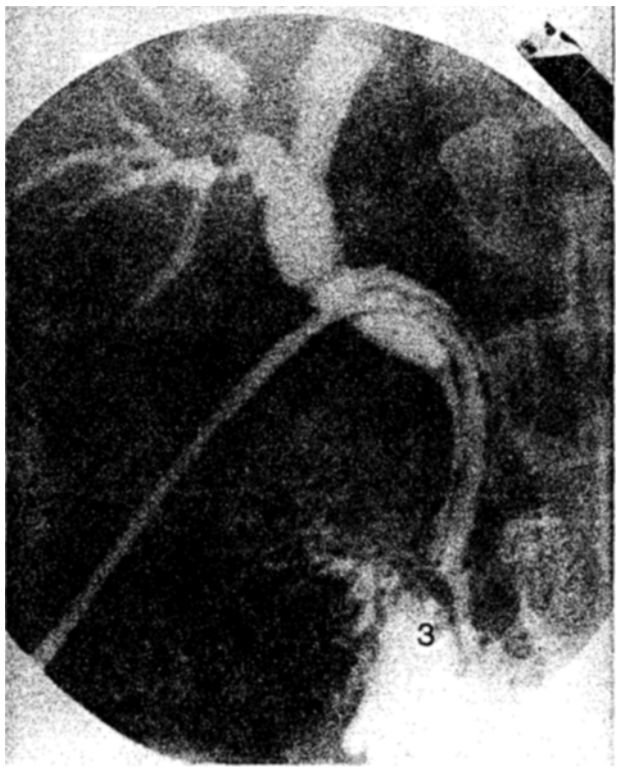

Fig. 3. Latex catheter cholangiography after the extraction of the stones seen in Fig. 1.

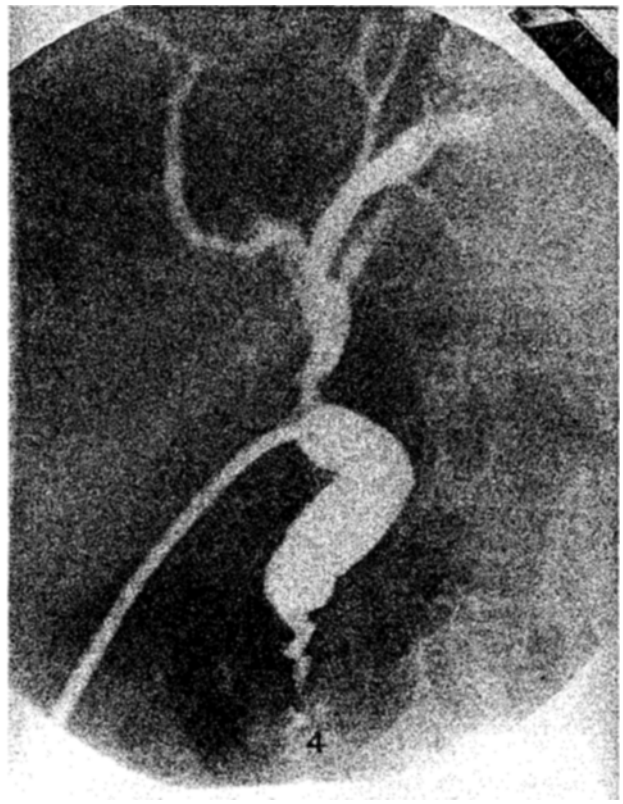

Fig. 4. Postoperative check cholangiogram through the Latex catheter. No further stones were detected.

the initial operation [10]. Despite the fact that video choledochoscopy has revolutionized the exploration of the pathology in the biliary tree and the papilla of Vater, it is still used infrequently in the course of biliary surgery. The general surgeon is not an endoscopist; therefore, he or she usually underestimates the role of intraoperative choledochoscopy when the CBD is opened, thus promoting the high incidence of the overlooked stones. The introduction of laparoscopic biliary surgery and the frequent use of video techniques changed this pattern because the learning curve of video choledochoscopy has been shortened and the procedure is by now easier and faster to perform [3, 5].

In addition to our experience in laparoscopic biliary surgery, we also made use of the wide experience and excellent facilities of our Department of Urology in performing the technique of percutaneous stone extraction. We applied this method to solve the problems of biliary stones retained under the indications listed in Table 1. After acquiring sufficient experience, we started our interventions in a way similar to that described by Motson [12], but we also used high-pressure irrigation, dilatation of the tract, and rigid operative renoscopes in addition to the flexible ones.

All interventions were video-guided; thus, radiation exposure was markedly reduced. The dilatation of the T-tube tract was carried out in all cases to make the tract as large as possible for the easy introduction of the equipment and subsequent manipulations. The flushing and washing out of small stones and fragments by the high irrigation pressure can be performed routinely. Tortuous tracts are unsuitable for dilatation. Circumstances for PVC are most favorable when the T-tube is large, and it is brought out straight to the right space between the medio-calvicular and anterior axillary line at the initial operation.

PVC has many advantages over other percutaneous procedures. One of them is the presence of a constant, fixed, and large operation channel, which prevents the obliteration of the tract and allows the easy reinsertion of any drain or equipment. It also allows easy access to the extrahepatic and intrahepatic duct stones and makes it possible to evaluate the pathology and motility disorders of the papilla of Vater. PVC reduces the exposure to radiation in comparison with radiological percutaneous extractions through the T-tube tracts. It has also the advantage of the visualization of noncalculous filling defects, such as air bubbles, mucus, and biliary tumors. High-pressure irrigation can be used to wash out and flush the stones. The same video equipment and light transmission systems used for laparoscopic interventions can also be used here. With the exception of the choledochoscope and renoscope, no new investment is required.

With this procedure, we had a success rate of 100%, with no significant morbidity and no mortality. Using PVC, the surgeon may safely manage complicated biliary stone problems, allowing the patient a last chance to avoid an unwanted reoperation.

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