Percutaneous transhepatic assistance for duodenoscopic sphincterotomy

P J SHORVON, P B COTTON, R R MASON, J H SIEGEL, AND
A R W HATFIELD

From the Departments of Gastroenterology and Radiology, Middlesex Hospital, London, Mount Sinai School of Medicine, City University of New York, USA, and Department of Gastroenterology, The London Hospital, London

SUMMARY Duodenoscopic sphincterotomy is an established method for dealing with common bile duct stones and papillary stenosis. Occasionally even an experienced operator is unable to carry out a sphincterotomy, for instance in the presence of large peri-papillary diverticula or Billroth II gastrectomy. Most of these patients will be offered surgery – a few will refuse or be unfit for operation. One further therapeutic option is a combined approach involving a radiologist and endoscopist, in which percutaneous transhepatic insertion of a guide wire through the papilla, with or without balloon dilatation, is used to facilitate insertion of the sphincterotome by the endoscopist. This has been done successfully in 10 of 11 patients attempted, without significant complication.

The last decade has seen substantial developments in non-operative techniques for management of benign and malignant biliary tract obstruction. Both percutaneous¹ and duodenoscopic² approaches have proved popular. Endoscopic sphincterotomy has become the treatment of choice for common duct stones, particularly in elderly and frail patients.³ There is, however, a failure rate of 5–10% even for experienced teams. Large stones may be difficult to extract after sphincterotomy, and new techniques – for example, dissolution, crushing – are being evolved to reduce this problem. Failure may also arise from difficulties in placing the sphincterotome correctly, particularly when access to the papilla is restricted – for example, by large peripapillary diverticula or Billroth II partial gastrectomy. Many of these difficulties can be overcome with experience, but we have developed an alternative method of percutaneous transhepatic assistance which has proved useful in such cases.

Methods (Figure)

PATIENTS

The combined technique is only used after failure of standard endoscopic sphincterotomy by an experi-

enced operator. Therapeutic options are reviewed with the patient and an appropriate specialist surgeon before proceeding. Coagulation status is checked and corrected where necessary. Patients are normally given prophylactic antibiotics. The procedure is usually done under general anaesthetic, as it may take up to one and a half hours to complete, particularly when difficulty is experienced in puncturing undilated intrahepatic ducts, and as transhepatic manipulation or balloon dilatation may be painful. The patient is placed in the supine position, and percutaneous transhepatic cholangiography (PTC) is carried out in the standard manner with a sheathed needle. The needle is then replaced with a guide wire, and a catheter and the guide wire are passed down the biliary tree and through the papilla under fluoroscopic control. The catheter is then removed. In a few patients in whom failure to cannulate the papilla was considered to be the result only of an awkwardly orientated papilla, the presence of the guide wire alone may permit immediate duodenoscopic cannulation with the sphincterotome. If this fails, or in patients believed to have a degree of stenosis of the papilla, we have also used percutaneous balloon dilatation of the papilla. A five or seven French gauge angioplasty-type balloon catheter is passed over the indwelling guide wire through the papilla and into the duodenum. The patient is then turned via the left lateral to the

Address for correspondence: Dr P J Shorvon, Department of Radiology, Middlesex Hospital, Mortimer Street, London W1N 8AA.

Received for publication 1 March 1985

Figure Illustration of combined technique using balloon dilatation, (in patient with papillary orifice within diverticulum). (1) stone in bile duct, (2) guide wire inserted percutaneously and transhepatically, past the stone and through the papilla into the duodenum, (3) angioplasty balloon catheter passed over wire and balloon dilatation of papilla performed, (4) duodenoscope inserted and endoscopic sphincterotomy performed, (5) stone extracted with wire basket passed down duodenoscope.

S=stone, D=diverticulum, W=guidewire, B=balloon catheter, K=sphincterotome, WB=wire basket, E=endoscope.

semiprone position; the duodenoscope is inserted and the papilla, with the protruding catheter or guide wire, is identified. The sphincterotome is then advanced into the common bile duct, either alongside the protruding guide wire during its slow removal, or after dilatation of the papilla to 6 mm with the balloon. A standard sphincterotomy is then undertaken (followed by stone extraction where appropriate). A percutaneous drainage catheter is left in place, to be removed one or two days later after check cholangiography.

The combined technique has been attempted in 11 patients (Table). Standard sphincterotomy had failed because of complex diverticula in six patients. One patient had undergone previous Billroth II gastrectomy, and no reason for failure was evident in the remaining four patients who were suspected of suffering from papillary stenosis. The reasons for not proceeding to operation (after surgical consultation) were as follows: three were elderly and frail, one was extremely obese, and three other elderly

patients had severe ischaemic heart disease. One of the latter patients had previously undergone unsuccessful operative attempt to clear the bile duct of stones. Two other elderly patients were also referred for endoscopic management of their cholelithiasis after failure of surgery. One patient with a history of mental illness had refused surgery. The last patient was a 50 year old woman with postcholecystectomy pain and a raised alkaline phosphatase. Retrograde cholangiography had failed on three occasions and a diagnostic percutaneous transhepatic cholangiogram was planned. As it was agreed that a sphincterotomy would be the treatment of choice whether or not a bile duct stone was demonstrated, it was decided in advance to continue with the combined approach at the time of percutaneous transhepatic cholangiography.

Results

The combined technique succeeded in all seven

Table Clinical details of patients

Case	Age/sex	Problem	Past cholecystectomy	Risk	Problem for sphincterotomy	Procedure	Complications
1	74 F	Stones	+	General debility	Diverticulum	Balloon	Haematemesis-1 unit transfusion
2	55 M	Stones	+	Obesity	Diverticulum	Balloon	Bleed into duodenum – no transfusion
3	72 F	Stones	+	IHD/ Previous surgery	Diverticulum	Balloon	Fever-responded to antibiotics
4	80 M	Stones	+	IHD	Diverticulum	Guide wire	None
5	68 F	Stones	+	Previous surgery	Diverticulum	Guide wire	None
6	80 M	Stones	–	IHD	Diverticulum	Guide wire	None
7	70 F	Stones	–	Previous surgery	Billroth II gastrectomy	Balloon	None
8	79 M	Papillary stenosis	+	General debility	Nil obvious	Balloon	None
9	46 F	Papillary stenosis	+	Mental state	Nil obvious	Balloon	Bleed into duodenum – no transfusion
10	70 F	Papillary stenosis	+	General debility	Nil obvious	Balloon	None
11	50 F	Papillary stenosis	+	General debility	Nil obvious	Failed PTC	Procedure abandoned

IHD=Ischaemic heart disease, PTC=Percutaneous transhepatic cholangiogram.

patients with choledocholithiasis, and in three of the four patients with benign papillary stenosis, although two attempts were necessary in one patient when it proved impossible initially to pass a balloon catheter. Some bleeding was seen at endoscopy immediately after sphincterotomy in three patients but only one subsequently required a blood transfusion. One patient became febrile but this responded to antibiotics. The combined approach failed on a 50 year old woman with symptoms attributable to benign papillary stenosis in whom three previous attempts at standard sphincterotomy had failed despite good visualisation and access to the papilla. The patient's biliary tree was of normal calibre and it proved impossible to carry out an adequate percutaneous cholangiogram. Fortunately a further attempt at endoscopic sphincterotomy without percutaneous assistance was successful.

Discussion

The success rate of sphincterotomy varies with the experience of the operators and selection of patients. Over the last two years at the Middlesex Hospital the overall success rate was 97% in 392 patients, despite the fact that many of the procedures are done by trainees. Of the patients with stones, these were finally extracted in 93% with an overall duct clearance rate of 89%.

There are several reasons for the rare failures. Occasionally, the papilla cannot be identified, especially after complex surgery. Often the problem is

difficulty in inserting the sphincterotome. This may be because of an impacted stone, or a stenosis (benign or malignant), or a diverticulum which conceals the papillary orifice or distorts its orientation. Cannulation of the papilla in the afferent loop of a Billroth II gastrectomy can be particularly difficult. We recently reported a cannulation success rate of only 60% in this context, but sphincterotomy was achieved in six of the eight patients attempted.⁶

There are several options when standard sphincterotomy fails. The patient may be best served by an operation if in reasonable health, or by referral to an endoscopist with greater experience. In high risk patients it is reasonable to use other endoscopic methods. 'Precut' sphincterotomy involves incision with a short diathermy wire in the common channel; this usually permits subsequent deep cannulation, either immediately or a few days later.⁷ This technique cannot be used if it is not possible to cannulate the papilla at all. Endoscopic diathermy puncture of a dilated bile duct through the wall of the duodenum above the papilla has been used in several centres but is not without risk. The combined percutaneous and endoscopic approach which we originally described in 1981⁹⁻¹¹ appears to provide an effective and safe alternative to surgery.

A similar method has recently been reported by Long and colleagues;¹² they inserted a Dormia basket percutaneously, to dilate the papilla or actually clasp the sphincterotome and pull it back into the bile duct. We have not used a basket, believing that a balloon catheter is simpler and

inherently safer – although the only significant complication which we experienced with this combined technique (bleeding) occurred exclusively in those patients in whom a balloon was used.

Several pioneer radiologists have advocated dealing with some of these problems by a purely percutaneous approach,¹³ using descending balloon dilatation¹⁴ or sphincterotomy (Weichel KL – personal communication) lithotripsy,^{15 16} diathermy of stenosed biliodigestive anastomoses,¹⁷ and even extracting stones through the liver. An approach through the duodenum seems preferable, and is likely to be more applicable.

There are other variants of the combined approach. We have used it to attempt balloon dilatation of stenosed biliodigestive anastomoses. In a patient with sump syndrome, we were able to complete a sphincterotomy only after passing a guide wire endoscopically through the choledochoduodenostomy and out again through the papilla. Endoscopic techniques can also be facilitated by guide wires or instruments passed percutaneously down postoperative tracts formed by T-tubes or cholecystostomy drains.^{18 19} A combined method for placing biliary endoprostheses has also recently been described.²⁰

These techniques illustrate and emphasise the value of close cooperation between experts in endoscopy and radiology. These methods should not be attempted by the inexperienced. The relative risks and projected benefits of these and more orthodox techniques should be reviewed carefully in each case.

This paper includes one case (number 8) previously published in the *British Journal of Radiology*;¹⁰ others have been included in meeting abstracts.^{9 10}

References

- 1 Ring EJ, Kerlan RK. Interventional biliary radiology. *AJR* 1984; **142**: 31–2.
- 2 Cotton PB. Endoscopic methods for relief of malignant obstructive jaundice. *World J Surg* 1984; **8**: 854–61.
- 3 Mee AS, Vallon AG, Croker JR, Cotton PB. Non-operative removal of bile duct stones by duodenoscopic sphincterotomy in the elderly. *Br Med J* 1981; **2**: 521–3.
- 4 Jarrett LN, Balfour TW, Bell GD, Knapp DR, Rose DH. Intraductal infusion of Mono-octanoin; experience in 24 patients with retained common bile duct stones. *Lancet* 1981; **1**: 68–70.
- 5 Starlitz M, Ewe K, Meyer zum Buschenfelde KH. Mechanical gallstone lithotripsy in common bile duct-in-vitro and in-vivo experience. *Endoscopy* 1983; **15**: 316–8.
- 6 Forbes A, Cotton PB. ERCP and sphincterotomy after Billroth II gastrectomy. *Gut* 1984; **25**: 971–4.
- 7 Siegel JH. Precut papillotomy: a method to improve success of ERCP and papillotomy. *Endoscopy* 1980; **12**: 130–2.
- 8 Osnes M. Endoscopic choledochoduodenotomy for common bile duct obstruction. *Lancet* 1979; **1**: 1059.
- 9 Cotton PB, Mason RR. Two hands in the bile duct. [Abstract]. *Gastrointestinal Endoscopy* 1981; **27**: 120.
- 10 Mason RR, Cotton PB. Combined duodenoscopic and transhepatic approach to stenosis of the papilla of Vater. *Br J Radiol* 1981; **54**: 678–9.
- 11 Hatfield ARW, Murray RS, Lennard-Jones JE. Periapillary diverticula and common duct calculi: a combined transhepatic and endoscopic technique for difficult cases. [Abstract]. *Gut* 1982; **23**: A889.
- 12 Long WB, Schwartz W, Ring EJ. Endoscopic sphincterotomy assisted by catheterisation antegrade. *Gastrointestinal Endoscopy* 1984; **30**: 36–39.
- 13 Perez MR, Oleaga JA, Frieman DB, McClean GL, Ring EJ. Removal of a distal common bile duct stone through percutaneous transhepatic catheterisation. *Arch Surg* 1979; **104**: 107–9.
- 14 Centola CAP, Jander HP, Stauffer A. Balloon dilatation of the papilla of Vater to allow biliary stone passage. *AJR* 1981; **136**: 613–4.
- 15 Clouse ME. Dormia basket modification for percutaneous transhepatic common duct stone removal. *AJR* 1983; **140**: 395–7.
- 16 Lear JL, Ring EA, Macoviak JA, Baum S. Percutaneous transhepatic electrohydraulic lithotripsy. *Radiology* 1984; **150**: 589–90.
- 17 Guenther RW, Klose KJ, Schmidt HD. Work in progress: percutaneous transhepatic electrocutting of stenosis after hepaticojejunostomy. *Radiology* 1983; **146**: 355–8.
- 18 Mason RR, Cotton PB. Combined percutaneous and trans-cystic approach to a retained common duct stone. *Br J Radiol* 1980; **53**: 38–9.
- 19 Mason RR, Shorvon PJ, Cotton PB. Percutaneous descending biliary sphincterotomy with a choledochoscope through the cystic duct after cholecystostomy. *Br J Radiol* 1982; **55**: 595–7.
- 20 Kerlan RK, Pogancy AC, Ring EJ, Jeffrey RB Jr. Biliary endoprosthesis. Insertion using a combined peroraltranshepatic method. *Radiology* 1984; **150**: 828–30.