Percutaneous cholangiography with the Okuda needle

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SUMMARY  Percutaneous cholangiography with the Okuda needle was performed in 42 consecutive patients with a clinical diagnosis of obstructive jaundice. Six had intrahepatic cholestasis. The technique demonstrated the biliary anatomy in 41 patients and the radiological diagnosis was confirmed by laparotomy, necropsy, or liver biopsy. There were no significant complications. Laparotomy, when indicated, was performed earlier in the course of the jaundice and it was avoided in seven patients. Precise knowledge of the site of the obstruction was of great help to the surgeon. We believe that this technique represents an important advance in the management of the jaundiced patient.

Accurate diagnosis in the jaundiced patient presents several difficulties. Liver biopsy may not distinguish between intrahepatic cholestasis and extrahepatic biliary obstruction, and, although the rose bengal liver scan (Verow and Wisbey, 1975) and grey scale ultrasonography (Taylor et al., 1974) have proved welcome advances, neither of them provides details of the site or the cause of the biliary obstruction. Endoscopic retrograde cholangiopancreatography (ERCP) may allow the demonstration of both normal and dilated bile ducts, but it is a technique with considerable limitations. It is difficult, time consuming, and few workers have been able to reproduce the high success rate reported by Blumgart et al. (1974). The technique is not without risk and the retrograde injection of contrast medium sometimes fails to define the cause of the obstruction. Laparoscopy has not gained general acceptance in Britain, although high diagnostic rates have been reported (Cuschieri, 1975), for the technique usually requires general anaesthesia, is occasionally hazardous, and cannot be used in patients who have had a previous laparotomy.

Percutaneous cholangiography, first described in 1937 by Huard and Do-Xuan-Hop, has yielded diagnostic rates of up to 78% when extrahepatic obstruction is present (Hines et al., 1972) but normal calibre bile ducts are not usually demonstrated. There is a risk of biliary peritonitis if a dilated duct is punctured, and laparotomy therefore must follow within a few hours. Gram negative septicaemia and haemobilia may also occur (Redman and Joseph, 1975). Nonetheless, the technique can provide an anatomically precise demonstration of the site and type of obstruction, an advantage that is of great value to the surgeon. Okuda et al. (1974) described an improved technique in which a much slimmer needle was used, claiming that it allowed the demonstration of both dilated and undilated ducts. Biliary leakage was not a problem and other complications were uncommon.

We have used this technique with modifications for the past year and report our results.

Methods

Patients

Forty-two consecutive patients aged 23 to 88 years, in whom clinical and biochemical data suggested obstructive jaundice, were investigated. Nineteen were male and 23 were female. Tests for Australia antigen were negative in all patients. A preliminary barium meal excluded gastric and duodenal abnormalities while also providing valuable anatomical orientation. Vitamin K injections were given where necessary to reduce the prothrombin time to the normal range. Gentamicin 80 mg, twice daily, was

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prescribed for 24 hours before the investigation and the patient was premedicated with diazepam 10 mg and chlorpheniramine 4 mg/orally. The ultra-fine steel needle used was 0·5 mm in diameter (25 gauge) and 15 cm long with a bevel angle of 30 degrees (the needle developed by Okuda was 0·7 mm diameter (23 gauge)). The patients were examined in the supine position on a fluoroscopy couch and an aimed anatomical approach was made from the right flank to the area above the junction of the right and left hepatic ducts. This was achieved with the help of two lead markers. One was placed on the skin of the right flank below the costophrenic angle 10 to 13 cm above the table top, over the interspaces of the seventh, eighth, or ninth ribs, and 5 to 10 cm above the lower margin of the liver. The exact height was determined by the build of the patient. The medial marker was placed anteriorly over the sternum on a line 3 to 8 cm above and parallel to the liver edge, its position depending on the size and shape of the liver as revealed by a radiograph of this area and the barium studies of the duodenal cap and loop. With the breath held in mid-inspiration, the needle was inserted into the liver under local anaesthesia at the lateral marker, parallel both to the table top and to the lower margin of the liver, and directed towards the medial marker to a point some 3 cm lateral to the spine. Normal respiration was then permitted and 25% to 45% Hypaque was gently injected while simultaneously withdrawing the needle under fluoroscopic monitoring until a bile duct was outlined. Successful entry into a bile duct resulted in the slow flow of contrast towards the porta hepatitis. A parenchymal injection was easily recognised by the amorphous pool of contrast around the needle tip from which intrahepatic lymphatics were sometimes filled. Entry into a hepatic venous or portal radicle was recognised by the rapid disappearance of contrast. If the first attempt was unsuccessful, the needle was reinserted along the same line 0·5 cm above or below the initial site. Up to five attempts were required.

Insipissated bile can cause difficulty in defining the ducts, particularly the distal portion of the common bile duct, and may lead to the erroneous interpretation of a high duct obstruction. Multiple films were therefore taken during injection, and after removal of the needle, and always included erect and prone films to ensure complete filling down to the level of a true organic obstruction.

Results

A successful cholangiogram was obtained in all but one patient, who was later shown at surgery to have stones in the gall bladder and cystic duct without

<table>
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<tr>
<th>Diagnosis</th>
<th>Clinical</th>
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<th>Dilated intrahepatic ducts</th>
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<tr>
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<td>3 Malignant obstruction common hepatic duct</td>
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<td>Common bile duct stone</td>
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dilatation of the biliary tree. No serious complications were encountered; septicaemia was not seen. Although laparotomy was performed from one to seven days later, only one patient developed a biliary leak, which may have resulted from a fistulous communication between a carcinoma of the gall bladder and the colon. Pain, severe enough to warrant pethidine injection, was encountered in eight patients, due to subcapsular injection of dye in three. When the line of insertion of the needle was changed to become parallel to the lower edge of the liver this minor complication was avoided. The other five cases of pain occurred during parenchymal injection—in three patients with intrahepatic cholestasis, in one with hepatic metastases, and in one with a bile duct carcinoma. In two patients there was some sub-hepatic leakage of contrast from injection near the porta hepatis but without untoward consequences.

In every case the examination separated intra- from extrahepatic obstruction and accurately defined the level of the block (Table). In three patients with carcinoma of the pancreas gall stones were an incidental finding.

Discussion

Although extrahepatic biliary obstruction may be distinguished on clinical and biochemical data from other causes of jaundice in the majority of cases (Knill-Jones et al., 1973), problems may arise in a minority with intrahepatic cholestasis. It has been suggested that no patient should be operated upon for jaundice within three to four weeks of its onset, as liver failure can be precipitated by laparotomy in patients with hepatitis (Harville and Summerskill, 1963). It is also helpful to demonstrate the level and nature of an obstruction before surgical treatment. Slim needle cholangiography was able to do this in every patient, including eight with non-dilated hepatic ducts. Six of these had intrahepatic cholestasis and laparotomy was therefore avoided (Fig. 1); the other two had stones in the common bile duct.

The accuracy of radiological diagnosis was very high: of 16 patients with pancreatic carcinoma, 15 had a correct radiological diagnosis of malignant low common bile duct obstruction and the remaining one was shown to have a malignant obstruction of the common hepatic duct. An additional advantage of this prograde visualisation of the biliary ducts is that it demonstrates a low medial insertion of the cystic duct (Fig. 2). This is frequently difficult to establish at laparotomy and may render the gall

Fig. 1  Intrahepatic cholestasis: normal biliary tree.

Fig. 2  Low obstruction of common bile duct caused by carcinoma of pancreas with low medial insertion of cystic duct and two incidental duct calculi.
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bladder unsuitable for use in a palliative drainage procedure for carcinoma of the pancreas (Howard and Jordan, 1960). Gall stone obstruction was correctly diagnosed in all successful cases and the complete filling of the proximal biliary tree enabled us to estimate the number of intraduct gall stones present (Fig. 3). Accurate diagnosis of common bile duct stones by ERCP is often impeded by a stone in the ampulla (Blumgart et al., 1974), and operative cholangiography may also fail to demonstrate calculi (Hicken and McAllister, 1964).

We were surprised to find five carcinomas of the bile ducts and in no case was the clinical diagnosis correctly made. In all five cases slim needle cholangiography provided a diagnosis, additionally demonstrated the site of the obstruction, which in two was hidden within the porta hepatis (Fig. 4), and allowed in three palliative surgery to be performed. All three patients with benign strictures of the common bile duct had had previous cholecystectomies and the clinical diagnosis was easily made. Slim needle cholangiography confirmed the diagnosis and provided valuable anatomical detail for surgical correction.

Three patients with miscellaneous conditions each showed points of interest. One patient, in haematological remission from acute myeloid leukaemia, was wrongly diagnosed clinically as having obstructive jaundice secondary to gall stones. The correct radiological diagnosis of a malignant common hepatic duct obstruction was of considerable help in locating a tiny malignant leukaemic plaque in the porta hepatis, allowing a palliative hepaticochoJejunostomy to be performed. In a very ill patient with a multifocal cholangiocarcinoma, laparotomy was avoided when radiology showed a high obstruction of the biliary tree suggestive of intrahepatic malignancy. Radiology of the third case suggested the presence of a common bile duct stone and inspissated bile. At laparotomy no gall stone was found, but there was a localised benign stricture at the ampulla, and it is possible that the stone had been passed into the duodenum; inspissated bile was removed from the common bile duct relieving the jaundice.

Good results with this technique have been reported in extrahepatic obstruction but in those patients with intrahepatic jaundice the ducts were outlined in only 25 to 67% (Okuda et al., 1974; Elias et al., 1976; Redeker et al., 1975). We believe that our success in eight out of nine patients is attributable to careful radiological technique wherein the entry point and track of the needle are determined by liver size and shape, and by directing the needle towards the area above the junction of the right and left hepatic ducts. This area contains
widely diverging intrahepatic ducts of reasonable calibre and offers a high probability of successful duct puncture, even when the ducts are not dilated. We have also used a finer needle than Okuda and his colleagues, and this may be an important factor in our success in patients with non-dilated ducts.

The rarity of serious complications in our series is attributed to prophylactic antibiotics, the slimmness and flexibility of the needle, and the lateral entry point, which provides protection against bile leakage through the thickness of the liver. The technique is not applicable in all patients. Untreated cholangitis may be followed by septicaemia. Ascites will increase the risk of liver trauma, as will a persistent cough. A bleeding tendency and allergy to the contrast medium are contraindications, and difficulties arise in the confused patient who is unable to co-operate.

We consider that fine needle cholangiography is the procedure of choice in the investigation of the patient with suspected obstructive jaundice. When the necessary precautions are taken it has very little risk and can provide the correct diagnosis in almost every case.

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