Percutaneous Transhepatic Cholangiography

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Chemical and histological studies are often unable to differentiate chronic extrahepatic obstructive jaundice (due to calculi, neoplasia, or stricture) from chronic intrahepatic obstructive jaundice (caused by primary biliary cirrhosis or by drugs, notably anabolic steroids and phenothiazine derivatives). Oral and intravenous cholangiography are also ineffective when the serum bilirubin is greater than 2-3 mg./100 ml. In such circumstances percutaneous transhepatic cholangiography may be useful, since this method can demonstrate the dilated intrahepatic biliary system which develops in chronic extrahepatic obstruction; while a negative result may remove the need for laparotomy in a patient with hepatocellular disease. Since Atkinson *et al.* (1960) remarked on the revival of interest in this investigation numerous authors (Santos *et al.*, 1960; Kaplan, *et al.*, 1961; Shaldon *et al.*, 1962; Arner *et al.*, 1962; Flemma *et al.*, 1963) have agreed on its value. Only one of these reports has come from this country, and the *British Medical Journal* (1964) suggests that percutaneous transhepatic cholangiography has still to gain general acceptance in Great Britain. This report of a small series with a case history and a brief survey of recent studies may be of interest.

Material and Method

Eight patients were examined, two of them twice, using the technique described by Kaplan *et al.* (1961). In this method a needle 15 cm. in length and 1 mm. in bore is inserted under local analgesia through a point immediately below the right costal margin and 3-4 cm. from the midline. The needle is advanced for 12 cm. into the liver at an angle of 45 degrees to the horizontal and inclined to the patient's right. The patient

is instructed to hold his breath as the needle is moved to avoid injury to the liver capsule. The needle is then attached to a 100-ml. syringe by means of a 25-cm. length of translucent Portex tubing fitted with adaptors. Suction is applied and the needle is slowly withdrawn. Entry into a distended duct is shown by the aspiration of bile which may vary in colour from golden to "white" (mucus). The tubing is disconnected and washed out with saline if blood enters it. When bile is obtained, as large a volume as possible is drawn off in order to decompress the biliary system and so reduce the risk of biliary peritonitis. When no more bile can be aspirated 20-30 ml. of 75% Diaginol (sodium acetate) is injected into the biliary system as contrast medium. The needle may then be withdrawn; or be retained in position until satisfactory radiographs have been obtained, and used to aspirate the contents of the intrahepatic bile-ducts once more. If a duct is not found the needle is inserted again in a slightly different direction. Not more than four attempts should be made.

Some variants of this method have been described. The lateral approach to the liver in the mid-axillary line is useful in patients with much scar tissue in the anterior abdominal wall and was used on two occasions in this series. To avoid the disadvantages of keeping a needle in the liver for several minutes, some workers (Shaldon *et al.*, 1962; Arner *et al.*, 1962) introduce a fine polyethylene catheter over the needle, which is then withdrawn, leaving the catheter *in situ*. This technique was not employed in the present series.

To reduce the risk of haemorrhage the platelet count should exceed 100,000/c.mm. and the prothrombin time should be normal. If haemorrhage or biliary peritonitis occurs early surgical intervention is essential: all patients were therefore investigated in the morning and fasted for the rest of the day. Unless facilities for laparotomy are readily available the investigation should not be performed.

The results are presented in Table I.

TABLE I

Case No.	Age	Sex	Duration of Jaundice (months)	Cholangiographic Findings	Cholangiographic Diagnosis	Operative Findings	Remarks
1	37	F	23	Dilatation of biliary system above stricture of CBD (Fig. 2)	Stricture of CBD	Stricture of CBD	Successful operative repair
2	55	M	4	Negative	None	Multiple minute calculi. Dilated GB and CBD	No operative cholangiogram performed: size of intrahepatic ducts not known
3	38	F	Pre-operative 27	Dilatation of intrahepatic ducts. CBD normal	Carcinoma at porta hepatis	Carcinoma at porta hepatis	Pain for 20 minutes after withdrawal of needle. Operative relief of obstruction attempted
4	72	M	Post-operative 28	Dilatation unaltered	" " "	—	Death from hepatic failure 3 months after operation
5	53	M	7	Bile aspirated but Diaginol entered peritoneal cavity	Intrahepatic ducts dilated but not visualized	No operation performed	Ankylosing spondylitis and gross kyphoscoliosis. Injection caused slight transient pain. Died 6 months later. PM showed carcinoma of pancreas
6	70	F	4	Negative	None	Biliary peritonitis. Carcinoma of pancreas	Failure to aspirate bile due to use of smaller needle. Successful cholecystenterostomy with decompression of biliary system. Died 6 months later from extension of neoplasm
7	44	M	Pre-operative 2	Dilatation of ducts in right lobe: filling defect in CHD	Carcinoma at porta hepatis	Carcinoma at porta hepatis	Presumptive diagnosis: intermittent calculous obstruction of CBD
8	50	F	Post-operative 4	Negative	Right intrahepatic ducts not dilated	—	T-tube inserted to drain right lobe
			1	Multiple filling defects in GB	Calculi in GB	Calculi in GB. Cirrhosis	Returned to work with T-tube <i>in situ</i>

CBD = Common bile-duct. CHD = Common hepatic duct. GB = Gall-bladder. PM = Post-mortem.

Illustrative Case

A housewife (Case 1) was first seen at St. Thomas's Hospital in September 1959 when aged 34. She complained of epigastric pain of five years' duration and recent loss of 40 lb. (18 kg.) in weight. A diagnosis of peptic ulcer was made, but a barium-meal examination revealed nothing abnormal. She was treated with alkalis, while to allay anxiety chlorpromazine 25 mg. was also given twice daily for two weeks. One month after withdrawal of this drug she developed a febrile illness with anorexia, vomiting, pruritus, and pale stools. Examination revealed a thin jaundiced woman with a tender liver of normal size. Liver-function tests showed the pattern of obstruction (serum bilirubin 7.8 mg./100 ml., thymol turbidity 3 units, serum alkaline phosphatase 35 King-Armstrong units). From the mode of onset infective hepatitis was suspected, but when no improvement had occurred within four weeks she was admitted for further examination. No fresh physical signs were present, and biochemical investigation still indicated biliary obstruction rather than hepatocellular disease. Histology of a needle-biopsy specimen also suggested extrahepatic obstruction. Accordingly laparotomy was performed on 8 December 1959: a thick-walled gall-bladder containing mixed stones was found. The common bile-duct was normal and an operative cholangiogram showed that there was no obstruction in the biliary system. Cholecystectomy was carried out. Her post-operative recovery was satisfactory and a T-tube cholangiogram (Fig. 1) was normal. Despite this the jaundice was slow to clear and when she was discharged in January 1960 the diagnosis remained uncertain.

During the next five months she slowly gained weight but did not enjoy good health. The liver-function tests improved but were still abnormal in April 1960 (serum bilirubin 1 mg./100 ml., thymol turbidity 2 units, serum alkaline phosphatase 36 King-Armstrong units). In June 1960 she relapsed, with recurrence of malaise and jaundice. In October prednisone 5 mg. twice daily was given for four weeks, resulting in a fall in the serum bilirubin. After deterioration in December there was some improvement in the early months of 1961. However, out-patient study consistently suggested biliary obstruction and she was readmitted in June 1961 for further investigation.

As before, she was thin and faintly jaundiced. There was a spider naevus on the forehead and the liver was hard, enlarged, and irregular. The spleen tip was just palpable. A needle-biopsy specimen of the liver now showed early cirrhotic change consequent on chronic biliary obstruction.

FIG. 1.—Case 1. December 1959; cholangiogram normal.

Other investigations resulted as follows: haemoglobin 61% (9 g./100 ml.); mean corpuscular haemoglobin concentration 27%; total white-cell count 7,000/c.mm.; E.S.R. 40 mm. in one hour (Westergren); no L.E. cells seen. Prothrombin time normal. Serum proteins: albumin 4.6 mg., globulin 1.9 mg./100 ml. Serum cholesterol 230 mg./100 ml.; serum bilirubin 1.4 mg./100 ml.; serum alkaline phosphatase 64 King-Armstrong units; thymol turbidity 1 unit; zinc sulphate turbidity 4 units; serum glutamic oxalacetic transaminase 68 units.

FIG. 2.—Case 1. August 1961; cholangiogram showing evidence of chronic biliary obstruction and stricture of the common bile-duct.

FIG. 3.—Case 1. June 1963; intrahepatic bile-ducts almost normal in size, but the common bile-duct slightly dilated.

An intravenous cholangiogram did not outline any bile-ducts. Partial obstruction of the biliary system appeared to be the most probable diagnosis, but without evidence of the nature and site of the lesion a second laparotomy was not thought justifiable. It was at this point that percutaneous transhepatic cholangiography was performed, providing convincing evidence of chronic biliary obstruction and demonstrating a stricture of the common bile-duct (Fig. 2). At operation on 5 September 1961 (Mr. Lockhart Mummery) a stricture of the common bile-duct was dilated. A polyethylene tube was passed through it and left to drain to the exterior for two weeks.

Post-operative improvement was rapid, with early loss of pruritus and jaundice. In the three years since that time she has remained in excellent health, gaining 30 lb. (13.6 kg.) in weight. The liver is no longer enlarged, but the serum alkaline phosphatase is still slightly raised (31 King-Armstrong units). Intravenous cholangiography in June 1963 showed that the intrahepatic bile-ducts were almost normal in size but that there was still slight dilatation of the common bile-duct (Fig. 3).

Discussion

This series, although small, illustrates several points concerning percutaneous transhepatic cholangiography. First, it is a simple investigation which may give most valuable information, clarifying an obscure clinical situation, permitting surgery on the biliary passages to be planned in advance, and obviating the need for surgery in those cases of hepatocellular disease most likely to be harmed by it.

Secondly, as Case 5 shows, it carries an appreciable risk of haemorrhage and of biliary peritonitis, although this should be weighed against the risk of the alternative method of diagnosis—namely, surgical exploration of the biliary system. Atkinson *et al.* (1960), in a study of 21 cases, together with a survey of the world literature (excluding, however, the results obtained by Richieri (1957), which are incompletely reported), found that among 277 patients death had occurred in two instances and biliary peritonitis in nine, a combined incidence of 4%. Numerous reports have appeared since that time: Table II, though not a complete review of the literature, summarizes the results of 11 subsequent studies.

TABLE II

Authors	No. of Investigations	Deaths	Biliary Leakage	Haemorrhage	Tension Pneumothorax
Santos <i>et al.</i> (1960)	52	—	1	—	—
Kaplan <i>et al.</i> (1961)	40	—	4	—	—
Shaldon <i>et al.</i> (1962)	30	—	2	—	—
Glenn <i>et al.</i> (1962)	46	—	1	1	—
Arner <i>et al.</i> (1962)	105	1	4	2	—
Isley and Schauble (1962) ..	43	—	1	—	1
Evans <i>et al.</i> (1962)	25	—	1	1	—
Vakil <i>et al.</i> (1962)	11	—	—	—	—
Flemma <i>et al.</i> (1963)	47	—	3	—	1
Hellens (1963)	4	—	—	—	—
Present series	10	—	1	—	—
Total	413	1	18	4	2

It will be seen that death or major complication occurred in 25 patients out of a total of 413 investigations, an incidence of 6%. It is noteworthy that in the series described by Glenn *et al.* (1962), both patients who developed a complication were investigated under general anaesthesia; and that the only death

occurred post-operatively, laparotomy having been delayed for a week as infection of the biliary system was suspected. There are several reports that when, at operation for biliary peritonitis, a free flow of bile was established to the gut, the escape from the site of puncture ceased: this agrees with our experience in Case 5.

There is thus much evidence to show that the risk of complication following this investigation is in the region of 4–6%. A comparison with figures for mortality after exploration of the biliary system, quoted by Evans *et al.* (1962) from United States sources as being 3–10% even in the absence of hepatocellular disease, suggests that percutaneous transhepatic cholangiography could profitably be performed more often.

Thirdly, a number of negative results occur, and there may be difficulty in deciding whether this indicates failure to locate dilated ducts, or their absence. Interpretation has depended upon the experience and confidence of the individual worker (Shaldon *et al.*, 1962) but the recent introduction of television fluoroscopy (Glenn *et al.*, 1962; Arner *et al.*, 1962) may prove a considerable advance, since this technique can demonstrate ducts of normal size in 50% of patients with an undilated biliary system (Arner *et al.*, 1962). If this proportion can be increased it will become possible to diagnose a normal biliary system by percutaneous transhepatic cholangiography as readily as a distended system can be diagnosed at present.

Summary

Details are given of eight patients investigated by percutaneous transhepatic cholangiography, together with an illustrative case history.

One patient developed biliary peritonitis. A brief review of 413 reported investigations shows that complication occurs in 6% while the mortality from surgical exploration of the biliary system is 3–10%.

The value of this investigation in selected cases of chronic obstructive jaundice should be more generally appreciated.

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