Liver and biliary

Experience with transjugular liver biopsy

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SUMMARY The results of 193 transjugular liver biopsies performed with a modified needle are described. An adequate specimen was obtained in 97%, and complications were rare, although puncture of the liver capsule does occur and caused bleeding in two patients. Fever after the procedure was reduced by ultrasonic cleaning of the needle. Although not easy, this technique is safe and preferable in the management of selected patients, but in most patients percutaneous biopsy is to be preferred.

Liver biopsy *via* the internal transjugular vein was first described in 1973¹ as an extension of transjugular cholangiography. It was advocated in patients with abnormal blood clotting in whom the risk of percutaneous biopsy was unacceptable. The rigidity of the initial modified Ross transeptal needle, however, made biopsy difficult, and histological specimens from patients with cirrhosis often fragmented during aspiration.¹⁻³ We overcame these disadvantages with a modified Vim-Silverman (Trucut) needle mounted on flexible coaxial cable;⁴ this resulted in less technical difficulties in obtaining a biopsy, and larger, less fragmented specimens. More recently a modified Menghini needle has been developed with bevelling of the tip to prevent damage to the catheter and reduce compression artefacts of the biopsy specimen.⁵ We now report our experience of transjugular liver biopsy using our St Thomas' modified needle in 193 patients biopsied during the last three years.

Methods

PATIENTS

The indications for the transjugular approach are shown in Table 1. Over half were performed because of abnormal blood clotting, usually due to liver disease, but sometimes because patients were receiving anticoagulant drugs.

The method has been previously described in detail.⁴ After sedation with intravenous diazepam and local anaesthesia, the right, or occasionally the

left, internal jugular vein is entered using the Seldinger technique⁶ and a 7F Cournand catheter passed into a branch of the right hepatic vein. After pressure measurements in the free and wedged positions, if required, an hepatic venogram is performed. The catheter is then exchanged for a 9F size (William Cook Ltd), which is advanced into the wedged position with gentle pressure. The biopsy needle is advanced within the catheter to its tip, and the specimen then taken by protruding the Trucut tip into the hepatic parenchyma, and advancing the cutting sheath over it afterwards. The needle and specimen are withdrawn leaving the catheter in place, and the specimen retrieved unfragmented. Further insertions of the needle are then easily made down the catheter. Fluoroscopy is required for positioning the catheter and electrocardiographic monitoring is advisable.

Attempts were made to reach the hepatic vein *via* the femoral vein, as this might be easier for those not experienced in internal jugular vein catheterisation. Although the needle entered the hepatic veins, however, it was not possible to advance it into the liver parenchyma from this mechanically unfavourable angle.

The needle and cable were sterilised by autoclaving after ultrasonic cleaning.

Results

A biopsy specimen adequate for histological assessment was obtained in 188 (97%) of the 193 patients. The mean length of the tissue obtained was 1.8 cm; this was sometimes made up of several fragments. No compression of the outer parts of the specimens, as reported by Henriksen *et al*,⁵ was seen. The

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Table 1 *Indications for transjugular liver biopsy in 193 patients*

Abnormal blood clotting	107 (55%)
Patient preference	24 (12%)
Cooperation likely to be poor	18 (9%)
Multiple specimens required	14 (7%)
Previous percutaneous biopsy difficult	16 (8%)
Venography or manometry required	2 (1%)
Others – small liver, ascites etc	12 (6%)

histological diagnoses are shown in Table 2. Eighty four (45%) specimens revealed cirrhosis, the diagnosis of which by percutaneous biopsy is often difficult. The 15 patients with venous congestion were referred by cardiologists who believed the abnormalities of liver function tests to be out of proportion to the cardiac failure. All these patients were receiving anticoagulants, and several had prosthetic heart valves.

There were five unsuccessful investigations. In only two was the specimen too small for diagnosis. In two, non-hepatic tissue (one kidney; one skeletal muscle) was obtained but no complications arose, while in only one, and early in our experience, it was not possible to enter an hepatic vein.

COMPLICATIONS

The complications encountered are shown in Table 3. A fever for up to 24 hours frequently occurred early in this series, occasionally with rigors, but blood cultures were sterile. The incidence of post-biopsy pyrexia was greatly reduced after ultrasonic cleaning of the biopsy needle.

In five patients a supraventricular tachyarrhythmia was induced during passage of the catheter through the right atrium. In each case, cardioversion was performed rapidly and uneventfully at the end of the procedure.

Subcutaneous bleeding in the neck occurred in two patients. In one there was an haematoma around the puncture site, and in another there was intermittent cutaneous ooze over several weeks

Table 2 *Histological diagnoses from 187 successful transjugular liver biopsy specimens*

Cirrhosis	84 (45%)
Hepatitis	41 (22%)
Hepatic venous congestion	15 (8%)
Cholestasis	9 (5%)
Normal	9 (5%)
Lymphoma	7 (4%)
Granulomatous hepatitis	6 (3%)
Secondary carcinoma	5 (3%)
Hepatoma	3 (2%)
Others	8 (4%)

Table 3 *Complications from 193 transjugular liver biopsies*

Fever ± rigors	30
Dysrhythmias	5
Bleeding from skin puncture	2
Bleeding from liver	2

before the patient died in liver failure; no other local complications in the neck were seen. In two patients intra-abdominal bleeding occurred. In one there was transient hypotension and pleuritic pain associated with an hepatic rub. An hepatic subcapsular haematoma was confirmed by computed tomography, but this settled uneventfully. In another the procedure may have contributed to death one day later, as at necropsy there was an haemoperitoneum with a puncture wound on the external surface of the right lobe of the liver. The patient already had severe liver failure from alcoholic hepatitis, however, and recovery had been thought unlikely. Since then, contrast medium has been injected through the 9F catheter immediately after the biopsy; on several occasions contrast has escaped either under the capsule or into the peritoneal cavity, but without pain or evidence of bleeding.

Discussion

The transvenous approach to the liver was first studied in dogs by Dotter,⁷ and then introduced for transjugular cholangiography,^{8 1 9} liver biopsy,^{1 9} and portal venography and obliteration of the left gastric vein for bleeding varices.^{9 10} Cholangiography, however, frequently led to septicaemia¹¹ and the percutaneous route is now preferred for this and for portal venography. Experience with transjugular liver biopsy is now widespread in Europe¹²⁻¹⁵ and the United States.^{1 9 10 16}

In this, the second largest reported series of transjugular liver biopsies, samples of liver suitable for histological assessment were obtained in 97% of patients, a much higher success rate than reported from other centres; moreover, the samples were larger, less fragmented and with less artefacts than those obtained with alternative designs of needle.¹⁻³ The majority were performed in patients in whom percutaneous liver biopsy would have been hazardous. In addition, sampling errors are reduced when multiple samples are obtained,¹⁷ but while the risk of complications with the percutaneous route increase when more than two passes are made,¹⁸ this is less likely with the transjugular route. Multiple samples can also be obtained for chemical or histological analysis, while it is possible to position the catheter to aim at localised lesions, to combine it

with hepatic venography, and to measure hepatic vein free and wedged pressures.

Patients who, through illness or for other reasons, are unable to cooperate in the respiratory manoeuvres necessary for safe percutaneous biopsy are suitable for the transjugular approach, as breathing can continue and need not be held. We have obtained biopsy specimens in all patients in whom percutaneous biopsy had been unsuccessful, or was considered technically too difficult, such as in those with small livers and gross ascites. Twenty four patients had previous experience of the percutaneous technique, and stated they preferred the transjugular approach, but this may have only been because of sedation with diazepam.

Two significant complications were encountered; one subcapsular hepatic haematoma and one intra-peritoneal bleed. Intrahepatic haematomata occur in about 7% of patients undergoing percutaneous biopsy,¹⁹ but we have not performed liver scans or ultrasonography to assess their frequency after transjugular biopsy.

Undoubtedly there is a risk of puncture of the capsule if the catheter is positioned in a peripheral vein and rotated anteriorly,² particularly if the liver is small due to cirrhosis.^{8, 10} It is usually possible, however, to wedge the catheter in a proximal vein and thus reduce this risk. Unless contrast medium is injected after biopsy the frequency may be underestimated.

The intraperitoneal bleed was in a patient with severe liver and renal failure from alcoholic hepatitis, the biopsy being performed to detect any sign of liver regeneration before proceeding to haemodialysis. Another peritoneal haemorrhage was been reported.² Many of our patients had severe liver disease with disturbed blood clotting, and so the complication rate was satisfactorily low. It has been argued that commonly used indices of coagulation are of little value in predicting the few who will bleed after liver biopsy,²⁰ but this is contrary to the experience of others,²¹ and thus at present abnormal coagulation tests should preclude percutaneous biopsy without infusion of clotting factors.

The transient fever and occasional rigors were presumably due to bacteria or pyrogens being introduced on the needle, since ultrasonic cleaning of the needle before sterilisation by autoclaving reduced them. No organism was identified in multiple blood cultures. Fever and rigors have been reported in others.²

Lebrech *et al*²² have also recently updated their experience with this technique. Their results confirm the superiority of our modified needle,⁴ probably because its flexibility allows easier entry into the hepatic veins²² and because of the superiority of the

Trucut needle over the Menghini for sampling fibrotic tissue. They also observed occasional intra-peritoneal bleeding due to the needle entering the peritoneal cavity.

Other attempts⁵ have been made to improve the original needle and so reduce failure, damage to the catheter, and compression artefacts of the tissue specimens, but, judging from published reports, our needle is on all counts to be preferred. The technique is more time consuming than percutaneous biopsy, electrocardiographic and radiographic equipment is needed, and the operator needs experience in angiographic techniques. We do not therefore recommend it for the patient without special indications, for whom percutaneous needle biopsy should continue to be preferred. It provides, however, a means of investigating an important group of patients in whom liver histology would otherwise be obtainable only by infusing coagulation factors or at laparotomy, and it should be particularly valuable to units that act as referral centres for liver disease. The contra-indication of suspected hydatid disease remains,² but vascular tumours need not be feared.

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