

Indications, methods, and outcomes of percutaneous liver biopsy in England and Wales: an audit by the British Society of Gastroenterology and the Royal College of Physicians of London

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Abstract

The liver section of the British Society of Gastroenterology and the research unit of the Royal College of Physicians collaborated to set up a nationwide audit to investigate the practice of percutaneous liver biopsy in England and Wales. Each of 189 health districts in England and Wales was approached to provide a list of 10 consecutive percutaneous biopsies performed during 1991, and details of demographic data, indications, suspected diagnosis, investigations, biopsy technique, outcome, and influence on patient management were collected. Data were retrieved on 1500 (79%). The age distribution showed 6% of biopsies were done in those over 80 years of age and as many over 90 as under 10 years of age. Suspected malignancy and chronic liver disease each contributed one third of the indications. In 34% the procedure was carried out by radiologists under ultrasound image control. The remainder were done by general physicians and gastroenterologists, with the operator in the second group being more senior and experienced. The Trucut biopsy needle accounted for two thirds of biopsies, the remainder being the Menghini type. For both needles the samples were recorded as excellent or satisfactory in 83% and inadequate in only 5%. Bleeding complicated 26 procedures (1.7%), requiring transfusion in 11, and was commoner when clotting was impaired or serum bilirubin raised. There were two definite and three possible procedure related deaths, given an overall mortality of 0.13-0.33%. The diagnosis made before biopsy was confirmed in 63% of patients, and the clinician found the biopsy helpful in treatment in 75%. Day case biopsy and techniques to reduce the risk of bleeding were surprisingly rare in this series, which has given a unique opportunity to examine everyday practice across a wide range of hospitals.

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While liver biopsy for histological examination has been central to the investigation of hepatic

disease for about 50 years,^{1,2} the current indications will probably be profoundly influenced by new investigative techniques, especially the imaging modalities of ultrasonography, computed tomography, and magnetic resonance. For instance, since the advent of dependable ultrasonography and, for equivocal cases, endoscopic retrograde cholangiography, liver biopsy is rarely part of the investigation of cholestasis unless extrahepatic obstruction has been confidently excluded. Also, indications for liver biopsy have been expanded by the availability of new treatments, most notably liver transplantation.^{3,4} Thus its place in the current everyday management of patients, especially outside specialist referral centres, and how patient management is changed is uncertain. It is also unclear whether developments in technique of percutaneous liver biopsy, such as image guided,⁵⁻⁸ plugged⁸⁻¹² or transjugular biopsy,¹²⁻¹⁵ have had any impact on everyday practice. Finally, the information on the complications of liver biopsy is heavily biased towards reports from specialist centres performing many hundreds of procedures each year, and it is not certain that this reflects what happens more generally. There is therefore an outstanding concern about safety.

For these reasons, the committee of the liver section of the British Society of Gastroenterology (BSG) felt that a national audit of the practice of liver biopsy throughout England and Wales would be timely in answering these questions. In collaboration with the Royal College of Physicians of London (RCP), a prospective study was designed, the results of which are reported here.

Methods

The steering group set up jointly between the BSG and RCP identified a coordinator in each of the 13 NHS regions in England and one in Wales. Through this regional coordinator, a BSG member in one general hospital in each district was approached and the local histopathologist asked to provide a list of the last 10 consecutive percutaneous liver biopsies performed during 1991. Operative (open and laparoscopic) and fine needle aspiration biopsies were excluded. There were 189 districts in all, making a possible 1890 biopsies for analysis. The case records of these 10 were

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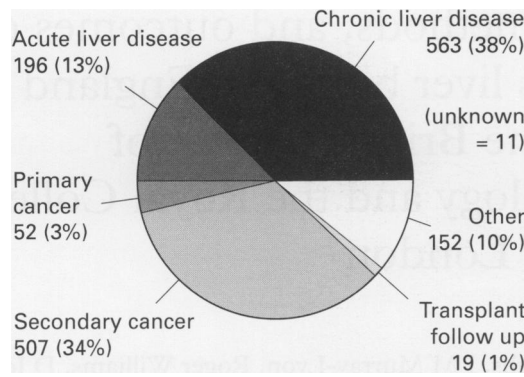


Figure 1: The main indications for liver biopsy.

made available for the regional coordinator or assistant to inspect and then fill in a standard proforma of 40 items. These covered demographic data, suspected diagnosis, indications, pre-biopsy investigations, preparations for biopsy, technique, complications, histology report, and influence on overall treatment. The final questionnaire used had been refined in a pilot study of 80 liver biopsy procedures in four districts.

Results

A total of 1500 completed forms were returned of the possible 1890, making a recovery of 79%. In some cases returns were incomplete because of local difficulty, but in others it was because liver biopsies were rarely performed. Six districts stated they were not done at all and patients were referred elsewhere if necessary. From the time intervals between the 10 biopsies in each hospital and the fact that there is usually only one major hospital per district, it is possible to estimate the approximate number of biopsies performed in England and Wales each year as 8162.

AGE AND SEX

There were 806 male (54%) and 694 female (46%) patients. While the median age was 60–69 years, 83 biopsies were in those over 80 years (6%) and nine were in those over 90

years. There were 11 in the under 10 age group.

INDICATIONS

Figure 1 shows the main indications for percutaneous liver biopsy. Of those performed for suspected malignancy, one tenth were seeking definitive evidence of a primary hepatocellular carcinoma. Follow up of liver transplantation, although a common indication for biopsy in transplant centres, accounted for only 1% overall. The indications varied by age; in those under 65, 50% were performed for suspected chronic liver disease and 25% for suspected malignancy, whereas in those over 65 these percentages were reversed to 25% and 50% respectively.

PRE-BIOPSY INVESTIGATIONS

In 11% of patients blood was cross matched before biopsy. In most, 64%, blood was grouped and serum saved, but in the remaining 25% neither was done. Blood was cross matched more often when the platelet count was $<80 \times 10^9/l$ (35%) or the prothrombin time ratio (INR) >1.2 (22%). In 84%, pre-biopsy imaging, usually an ultrasound scan, had been performed.

SPECIALITY AND EXPERIENCE OF OPERATOR

Among the operators, there was a roughly even distribution between those describing themselves as working predominantly in gastroenterology (28%), general internal medicine (33%), and radiology (34%), with 5% in other specialities. The surprisingly high percentage performed by radiologists is accounted for by the percentage of biopsies performed under image guidance. There were differences in the grade of operator. Within radiology, most were performed by consultants (78%). When comparing gastroenterology and general internal medicine (Fig 2), it is apparent that the distribution curve is shifted to a more senior level for gastroenterology. Only 13% of biopsies were performed by pre-registration or senior house officers and 37% by consultants compared with figures of 43% and 13% respectively for general internal medicine. The grade of operator was reflected in experience. All the pre-registration house officers and 74% of the senior house officers had performed less than 20 previous biopsies and none had done more than 100, whereas for the consultants who did biopsies the corresponding percentages were 2% and 74%.

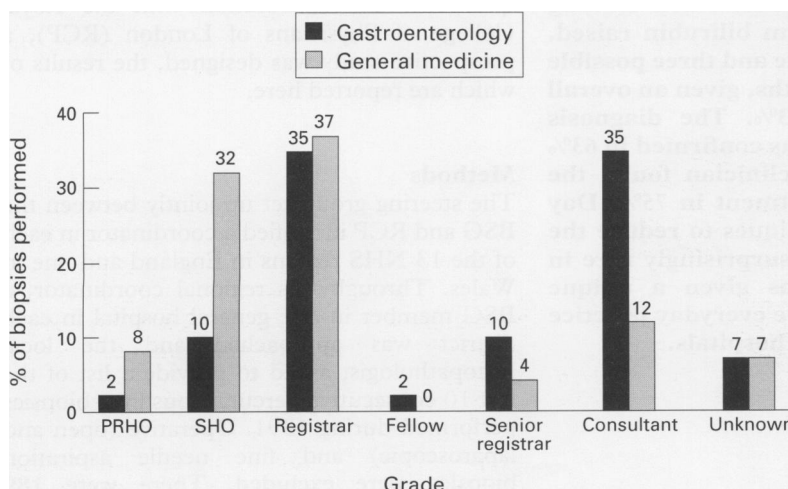


Figure 2: The grade of the operator when the operator speciality was gastroenterology or general medicine. PRHO=pre-registration house officer, SHO=senior house officer.

TECHNIQUE

The 'Trucut' (Abbott) cutting type of needle accounted for 66% of biopsies and the Menghini type of aspiration needle for the remainder. Sixty two per cent were performed by the standard 'blind' percutaneous method and the remainder image guided, mainly under ultrasound control. There were only seven cases in which the needle track was plugged

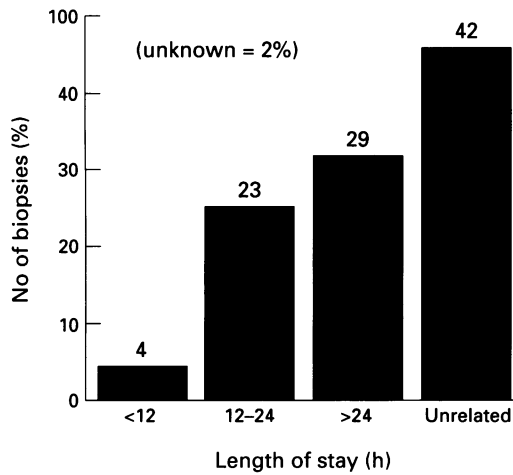


Figure 3: The length of stay in hours of patients having liver biopsies.

with gelfoam and one biopsy performed by the transjugular route. Local anaesthetic was given except for the 0.5% of cases performed under general anaesthesia. Only 4% were recorded as having received sedation before the procedure. Forty two per cent of the patients had their biopsies while they were already in hospital; only 4% were admitted as day cases specifically for the procedure, 23% were kept overnight after it had been carried out, and a further 29% had a biopsy related admission of greater than 48 hours (Fig 3). There were more day case biopsies performed by gastroenterologists (6.9%) than general physicians (3.5%).

SAMPLE

The adequacy of the samples obtained were arbitrarily divided into four categories on the basis of the histopathologist's report. Eighty three per cent of the samples were reported as excellent or satisfactory and only 5% inadequate for histological assessment. Inadequate samples were seen more commonly in biopsies performed by less experienced operators (<20 biopsies) than experienced ones (>100 biopsies), the respective percentages being 7.1% and 2.9%. There were no differences in the frequency of inadequate (4.9% v 4.6%) or fragmented (13% v 10%) biopsies between the Menghini and Trucut needles. There were not enough samples using the spring loaded gun to judge on the sample quality. The data suggest

that samples taken under image guidance were less often unsatisfactory (2.9%) than standard biopsies (5.6%), but this is probably because of the preponderance of suspected malignancy in the indications for the guided ones and of suspected cirrhosis in the others. The subjective criteria of adequacy are likely to be different. If a biopsy sample was >10 mm in length the chances of its being judged inadequate by the histopathologist were remote (0.4%).

COMPLICATIONS

Some bleeding was thought to have complicated 26 procedures (1.7%). Blood transfusion was required in 11 instances and in only one was active intervention required. This was a patient with primary biliary cirrhosis requiring a transfusion of nine units followed by emergency laparotomy. A 3 cm tear in the right lobe of the liver was repaired and the patient made an uncomplicated recovery. No other patient had a laparotomy for bleeding. Bleeding was commoner if the INR was raised, 3.3% when INR was 1.3-1.5, and increasing to 7.1% above an INR >1.5. It was also more frequent when the serum bilirubin was raised above normal (2.7% v 1.1%). In those with a platelet count of <150x10⁹/l the rate was 2.9% compared with 1.6% in those with platelet counts above this. There was only one instance of bleeding when the platelet count was <80x10⁹/l. When the operator had performed less than 20 previous biopsies the frequency was 3.2%, compared with 1.1% for those with experience of more than 100. In patients in whom the liver was palpable more than 10 cm below the costal margin, the bleeding frequency was two of 28 (7.1%), but the numbers are small. The frequency of bleeding with the Menghini and Trucut types of needle was 1.3% and 2.2% respectively. There were no differences in the frequency of bleeding between the different techniques (standard v image guided) and specialties of the operator. Pain after biopsy was recorded in about 30% of patients receiving percutaneous liver biopsy and a similar percentage required some analgesia (Fig 4). This was usually paracetamol, but 40% needed opiate analgesia. There was no relation between the frequency of pain and the experience or speciality of the operator, the needle used or the technique used.

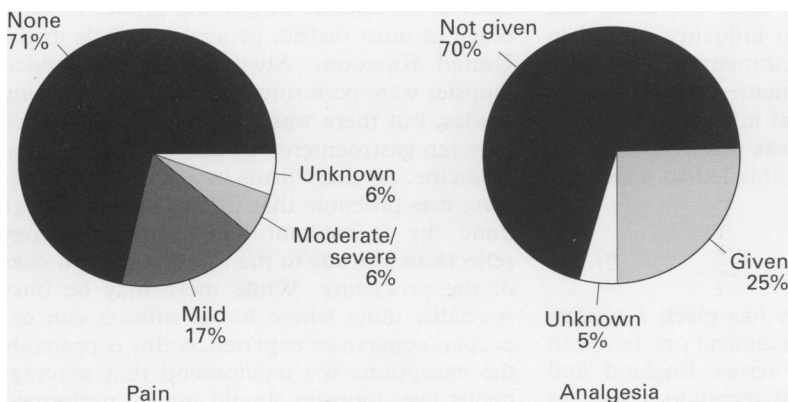


Figure 4: The frequency of pain and analgesia requirements in patients after liver biopsy.

DEATH

Nineteen per cent of the patients died during the follow up period, which averaged about three months. Most of these were the result of hepatic malignancy and some the result of advanced liver disease. The death rate was 43% in those in whom the INR was >1.5 compared with 17% in those in whom the INR was normal.

The details of the small number that died within a week of the biopsy were carefully scrutinised but in only two instances could the cause of death be unequivocally related to the procedure. The first of these was the result of intraperitoneal haemorrhage in a 44 year old

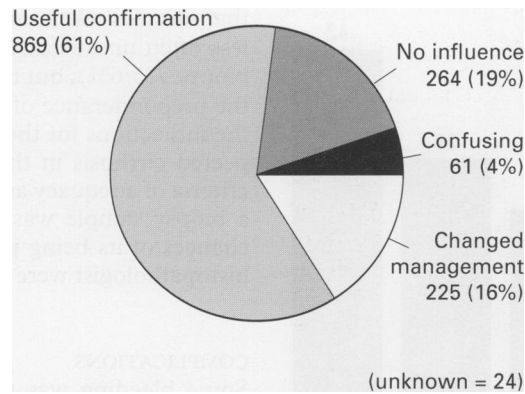


Figure 5: The influence of hepatic histology obtained at liver biopsy on subsequent patient management.

man with cirrhosis after standard percutaneous liver biopsy. The INR was 1.4 and platelet count $90 \times 10^9/l$. The patient received a transfusion of 26 units of blood, but did not have a laparotomy. The second death was again after standard, unguided biopsy (although she had had previous ultrasonography) in a 71 year old woman with rheumatoid arthritis who sustained biliary peritonitis after gall bladder perforation and died 48 hours later, again without laparotomy. There were three other deaths that may or may not have been related to the procedure. One was an unexplained cardiac arrest several hours after a liver biopsy; emergency examination of the specimen showed secondary adenocarcinoma and resuscitation was abandoned. In another case, a patient died of hypotension 24 hours after removal of a malignant breast lump and percutaneous liver biopsy. In the third instance, a patient died of unexplained septicaemia 48 hours after liver biopsy. There was no record of postmortem examination in these cases. The death rate attributable to the procedure in this series of 1500 biopsies is therefore between 0.13% and 0.33%.

ESTABLISHMENT OF DIAGNOSIS AND MANAGEMENT CHANGE

The pre-biopsy diagnosis was confirmed histologically in 63% of cases, with a slightly higher rate in the image guided biopsies (68%) where suspected malignancy predominated. A subjective judgement was made between four alternative categories in each case to decide whether management had changed, namely whether the biopsy had been confusing and counterproductive, of no influence, useful in confirming intended treatment or led to a specific change in treatment. Figure 5 shows the results suggesting that in three quarters of cases the biopsy result was positively helpful, and in 16% of all cases this led to a definite change in treatment.

Discussion

The design of this study has given a unique opportunity to determine clinical practice with respect to liver biopsy across England and Wales. It has shown that techniques such as transvenous and plugged liver biopsy, the value

of which have been well shown in published reports, have had virtually no impact on clinical practice in the district hospitals included in this audit. Even the day case biopsy procedure, reported in several studies to be safe and cost effective,¹⁶⁻¹⁸ accounted for only 4% of biopsies done. Indeed, 29% had a biopsy related length of stay of over 48 hours. This suggests that many hospitals do not have in place an efficient protocol for admitting, preparing, and discharging patients, although it may also reflect a lack of confidence among clinicians that day case biopsy is safe. While the case can be made for restricting plugged and transjugular biopsies to specialist centres, this is not the case for standard liver biopsy as a day case procedure, which should be eminently suitable for district hospitals. It would be appropriate to extend the present audit into a prospective study of the safety and cost effectiveness of day case liver biopsy in district hospitals.

It was surprising that blood had been neither grouped or cross matched in 25% of instances. While facilities for providing urgent blood will vary, it is a minimum sensible requirement to know the patient's blood group and have a sample of serum available in the transfusion laboratory for urgent cross match if required.

The national picture has shown a surprisingly large 'geriatric' practice but little use of liver biopsy in paediatrics. There are large series of paediatric liver biopsies from specialist centres,¹⁹ but it seems that this is not mirrored nationwide. The indications for liver biopsy in adults are dominated by suspected cancer and chronic liver disease, with liver transplantation hardly represented because the sampling technique of this audit has resulted in a predominance of district hospitals.

Ultrasound imaging has become almost invariable in pre-biopsy investigation, and already about one third of all biopsies are performed under ultrasound control. Some of these are for diffuse disease rather than focal lesions, and a few were done by physicians rather than radiologists. This trend will probably continue and it may become increasingly difficult to justify blind needle insertion when ultrasonography is so widely available. Gall bladder perforation, the cause of one fatality in this series, should be completely avoidable under image control. The radiologists performing guided biopsies were usually consultants, and this probably reflects the small number of doctors in training grades in radiology in most district general hospitals in the United Kingdom. Most of the non-guided biopsies were performed by doctors in training grades, but there was a discernible difference between gastroenterology and general internal medicine. As these firms have the same structure, it is probable that the higher percentage done by consultants in gastroenterology reflects an attitude to the importance and risks of the procedure. While there may be busy specialist units where house officers can get proper, supervised experience, this is probably the exception. We recommend that percutaneous liver biopsies should not be performed by pre-registration house officers and that

there is adequate and experienced supervision of other trainees during their early experience.

The Trucut needle was used in about two thirds of cases and was the needle usually used by radiologists under image guidance. There were not enough spring loaded 'gun' devices used to comment on its results, but its use will probably increase because of the convenience of this one handed method.^{20 21} There was no significant difference in the samples obtained by Menghini or Trucut needles and the complication rates were similar. Previous studies have shown the Trucut to be superior in the diagnosis of cirrhosis^{5 22 23} but there have been concerns whether it has a higher complication rate.²⁴ We did not have available information on the number of passes made; there is probably a trade off between diagnosis and complication rate as the number of samples increases, although this has been questioned.^{25 26}

An overall death rate between 0.13% and 0.33% is higher than that reported in some large series of 0.01–0.02%.^{24 27} These are retrospective studies, however, and when the Mayo Clinic carefully evaluated the outcome of biopsies performed under standard protocol with prospective data collection there was a fatal haemorrhage rate of 0.11%.²⁸ Both patients with clear procedure related death in our series did not have laparotomies performed. Patients with suspected biliary peritonitis should have an early laparotomy and those with bleeding should be considered for either laparotomy or therapeutic angiography if the bleeding does not stop with transfusion alone. Neither patient had a postmortem examination. Such cases should be reported to the coroner because of the potential medicolegal aspects.

This national audit has shown that, while there is still a significant morbidity and mortality from percutaneous liver biopsy, it is helpful in patient management in most cases. New techniques designed to reduce the risk of bleeding have had little impact on practice, but there have been important changes brought about by ultrasound imaging. Day case biopsy practice is still rare and the opportunity to set up a prospective national audit of this should be explored.

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