

# Morbidity after percutaneous liver biopsy

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**SUMMARY** The safety of percutaneous liver biopsy with a 1.2 mm Menghini needle in infants aged one year or less was investigated. One hundred and eighty four procedures performed from 1975 to 1985 were reviewed. There were no deaths or major complications within 48 hours associated with the procedure. In five instances specific complications occurred: a drop in haemoglobin concentration (three), transient hypotension (one), and haematoma at the biopsy site (one). The result of liver biopsy was diagnostic in 83% of cases, compatible with unspecified metabolic disease in 8%, and normal or not diagnostic in 9%. This study suggests that percutaneous liver biopsy can be performed with relative safety in small infants if coagulation is normal and there are no major contraindications, and the results yield important diagnostic information which cannot be obtained using less invasive procedures.

Percutaneous needle biopsy of the liver is an important procedure in diagnosing liver disease in infants as it often provides diagnostic information not obtainable by other methods.<sup>1 2</sup> The technique has been widely used in adults for over 30 years. Recent reports have confirmed the low incidence of complications of liver biopsy as long as results of coagulation tests are normal.<sup>3-5</sup> Percutaneous liver biopsy was first reported in children in the late 1950s<sup>6-9</sup> and is regarded as safe in this age group.<sup>10</sup> The safety of this procedure in infants, however, is sometimes questioned. No recent series to our knowledge specifically examines the mortality and morbidity in children less than 1 year old.

We studied the safety of percutaneous liver biopsy in infants and report the morbidity in children aged 1 year or less at this hospital from 1975 to 1985.

## Methods

The hospital records of all children aged 1 year or less who underwent a percutaneous liver biopsy from 1975 to 1985 were reviewed. Data collected before biopsy included age and weight of the patient, haemoglobin concentration, platelet count, prothrombin time, partial thromboplastin time, and presence of ascites. The Menghini technique with minor modifications was used for all biopsies.<sup>11-12</sup> The liver biopsy needle was 1.2 mm in diameter. The number of attempts at biopsy required to obtain an acceptable specimen was recorded when reported. The histological diagnosis was noted.

Morbidity within 48 hours of biopsy was assessed by examining the hospital chart for the following information: haemoglobin concentration before and after biopsy; need for transfusion after the biopsy; acute change in clinical state; excessive irritability, abdominal distension, or fussiness; difficulty in breathing or pneumothorax; gradual deterioration of clinical state including worsening of liver function test results; fever, infection, or peritonitis; and abnormal vital signs.

## Results

One hundred and eighty four consecutive needle biopsy procedures in 174 children were reviewed. Table 1 summarises ages and weights of the patients reviewed. The median age was 3 months. Twenty

Table 1 Summary of age and body weight of 184 patients undergoing liver biopsy

Age group (months)	No of biopsies	Mean weight (kg)	Weight range (kg)	% Of total No of cases
< 1	16	3.36	2.7 - 4.3	8.7
1 - < 2	36	3.32	1.2 - 5.7	19.6
2 - < 3	35	4.12	2.6 - 5.3	19.0
3 - ≤ 6	61	5.11	2.1 - 10.2	33.2
Total ≤ 6	148			80.4
Total group	184	4.81	1.2 - 14.1	100.0

seven infants weighed  $\leq 3$  kg and three of these were  $< 2$  kg.

Liver biopsy was tolerated well by the children, and no deaths occurred. In addition, no child developed haemoperitoneum, haemothorax, bile peritonitis, pneumothorax, or sepsis.

In five children specific complications occurred (Table 2). Three had a drop in haemoglobin concentration, for which two were given transfusions. Only one of these was symptomatic. A further patient with haemoglobin concentration before the procedure of 8.7 g/dl had an episode of hypotension after the biopsy; no treatment was required, and we did not know whether this reflected bleeding or sensitivity to the sedation. One child developed a small subcutaneous haematoma at the biopsy site; it resolved without treatment.

Patients with a potentially higher than average risk of morbidity after liver biopsy include very small infants, those with anaemia, and, as shown in previous studies in adults, those with thrombocytopenia, abnormal coagulation test results, or severe ascites. Twenty six of the 27 children weighing  $\leq 3$  kg had no complications; one infant, who weighed 2.7 kg, had a drop in haemoglobin concentration. In the entire series there were 21 patients with haemoglobin concentrations  $< 9.5$  g/dl; none experienced any difficulties except the child with transient hypotension. No complications occurred in

seven patients with platelet counts ranging from 60 to  $90 \times 10^9/l$  or in one patient with a platelet count of  $48 \times 10^9/l$ . Three children had abnormal results of coagulation tests (prothrombin time  $> 14$  seconds; partial thromboplastin time  $> 47$  seconds). Two were given vitamin K or fresh frozen plasma before the biopsy and one received no supplementation: none had a complication. Three children had obvious

Table 3 *Histological diagnoses in 174 patients*

Diagnosis	No of cases
Idiopathic neonatal hepatitis	45
Extrahepatic biliary atresia	41
$\alpha$ -1-Antitrypsin deficiency	9
Cholestasis associated with total parenteral nutrition	13
Alagille's syndrome	4
Cytomegalovirus infection	5
Galactosaemia	3
Cystic fibrosis	1
Glycogen storage disease	6
Zellweger's disease	3
Hereditary fructose intolerance	2
Metabolic disease, no specific diagnosis	14
Reye's-like syndrome	2
Miscellaneous	20
Normal, no pathological diagnosis	7

One infant underwent biopsy twice: neonatal hepatitis diagnosed on first, and extrahepatic biliary atresia on second, biopsy.

Table 2 *Details of patients with complications after liver biopsy*

Case No	Age (months)	Weight (kg)	Underlying diseases	Prothrombin time; partial thromboplastin time; platelet count ( $10^9/l$ )	Ascites present	General anaesthetic	Clinical course
1	2.5	3.6	Transposition of great vessels, mitral atresia, pulmonary stenosis, Blalock-Taussig shunt, intravenous nutrition	13.7; 35.9; 158	Yes	No	Patient moved during biopsy; hypotension, tachycardia, drop in haemoglobin concentration necessitating blood transfusion.
2	1	2.7	Neonatal hepatitis	9.6; 35.1; 323	No	No	Routine procedure; no distress after biopsy; drop in haemoglobin concentration necessitating blood transfusion.
3	5	4.1	Hepatomegaly; malabsorption	10.5; 26.7; 397	No	Yes	Routine procedure; no distress after biopsy.
4	3	4.4	Neonatal hepatitis	10.5; 38.4; 192	No	No	Routine procedure; hypotension two hours after biopsy; increased intravenous fluid replacement; recovery.
5	7	4.8	Neonatal hepatitis	10.2; 39.3; 412	No	No	Routine procedure; haematoma at site of biopsy five to six hours later; no distress.

ascites at the time of biopsy. One had a fall in his haemoglobin concentration after biopsy, which required a blood transfusion. Two had no complications. Thus even those infants at increased risk tolerated the procedure well.

The number of attempts was noted in only 73 instances. One attempt was made in 43, two in 27, and three in three. There was no increase in complications associated with multiple attempts.

The liver biopsy specimen was diagnostic in 146 (83%) cases, and the histological diagnoses are summarised in Table 3. Apart from idiopathic neonatal hepatitis and changes consistent with extrahepatic biliary tract obstruction (most probably extrahepatic biliary atresia), metabolic disease predominated. Miscellaneous diagnoses included fibrosis or cirrhosis of uncertain aetiology and myeloproliferative or neoplastic disease. Two patients showed progression from neonatal hepatitis to fibrosis or cirrhosis in serial biopsy specimens.

## Discussion

These data show that percutaneous liver biopsy is safe in infants. Nearly all babies were active and eating within one to two hours after the procedure.

The safety of percutaneous liver biopsy in adults has been discussed on many occasions<sup>13-15</sup>; the most recent large study reported a mortality of 0.005% with the Menghini technique.<sup>5</sup> Serious complications included bleeding from the liver (causing haemoperitoneum or haemothorax), pneumothorax, bile peritonitis, and sepsis. Liver biopsy can also cause traumatic haemobilia.<sup>16</sup> Complications occur most commonly within the first 10 hours after biopsy; in a large study in adults only 4% of complications occurred later (one to six days after the procedure).<sup>5</sup> Intrahepatic haematoma may be asymptomatic.<sup>17-18</sup> Percutaneous liver biopsy can be performed in adults with extrahepatic biliary obstruction with a low incidence of complications.<sup>19</sup> The possible presence of a tumour or congestion is not necessarily a contraindication.<sup>20</sup>

Liver biopsy has been adopted as a procedure in children without the same extensive examination of its safety as in adults. Reports from the late 1940s of large numbers of children being investigated for malnutrition suggested that percutaneous liver biopsy by a subcostal approach was safe.<sup>21</sup> Early reports of small series in children using either the Vim Silverman or the Menghini technique showed no major complications.<sup>6-9</sup> Walker *et al* reported no life threatening complications in a series of 210 biopsies performed in 166 patients, of whom 67 were aged 1 year or less and 24 were aged 1 week to 2 months.<sup>10</sup> Three minor complications were re-

ported in the entire series, but the ages of the patients were not stated. In a prospective study of the risks of certain procedures in children Ament found a rate of complications of 4% in 584 liver biopsies performed at 25 centres in 1978.<sup>22</sup> These complications included bleeding, pneumothorax, and pain; clinical details including ages of the patients, number of infants with and without complications, condition of patients, and biopsy technique were not given.<sup>22</sup>

In infants the indications for liver biopsy are similar to those in adults. Severe cholestasis is not a contraindication to liver biopsy in this age group, although in most cases ultrasound examination of the liver will have been performed before biopsy to exclude the presence of cysts or large bile lakes likely to be punctured by the biopsy needle. Likewise liver congestion per se is not a contraindication. Any highly vascular mass such as a haemangioma, arteriovenous malformation, or vascular liver tumour, however, is not suitable for percutaneous liver biopsy, neither should biopsy be done if there is infection of the adjacent lung, pleura, or skin, or peritonitis.

Both in infants and adults some complications of liver biopsy can be avoided if patients at high risk of bleeding are excluded. Despite claims that hepatic bleeding after biopsy is a random event<sup>23</sup> patients with abnormal results of clotting studies seem to be at risk. Although no patients in our series underwent biopsy if the prothrombin time was > 15 seconds or the partial thromboplastin time was > 49 seconds, 15 infants with slightly abnormal coagulation profiles did so. Some patients received fresh frozen plasma at the time of the liver biopsy.<sup>24</sup> The platelet count was > 60 × 10<sup>9</sup>/l in all but one. In individual patients it may be necessary to estimate bleeding time before biopsy to be certain of adequate platelet function when there is reason to suspect thrombasthenia despite a normal platelet count. Severe ascites makes the liver difficult to biopsy and may interfere with haemostasis. In our series only three patients with obvious ascites underwent biopsy.

In adults the theoretical risk of this procedure has been determined by pooling individual series of liver biopsies. Data on infants from other studies in which the Menghini method was used are difficult to interpret because of insufficient information, and if these are added to our series they raise the total number of infants to about 250, which is still too small to eliminate the  $\beta$  error entirely.<sup>9-10</sup> Our data from one centre with only one biopsy technique suggest that percutaneous liver biopsy is safe in infants. The rate of minor complications was 2.7%. Recently there has been some enthusiasm for

performing liver biopsies in adults as an outpatient procedure.<sup>4, 25</sup> We do not think that our data can be extended to support a policy of routine outpatient liver biopsy for infants.

The decision about whether to perform a liver biopsy in an infant should be based on the usefulness of the histological information to be gained as well as on technical considerations. Delay in diagnosis of liver disease in infants can have serious consequences. Liver biopsy specimens are prepared at this hospital for histochemical studies and light and electron microscopic examination. We obtained diagnostically important information in 83% of cases.

We conclude that a percutaneous liver biopsy performed by the Menghini technique is safe even in small infants. The patient should have normal coagulation, and there should be no other major contraindications to the procedure. Ultrasound examination of the liver should be performed before liver biopsy. Potentially vascular lesions should not be biopsied percutaneously. The relative risks and benefits of percutaneous liver biopsy in infants weighing < 2 kg should be carefully considered. Young age or small body size, however, are not in themselves high risk exclusion criteria for this procedure.

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