Needle Liver Biopsy in Benign and Malignant Disease: Comparison of the Menghini and Vim-Silverman Technics

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PERCUTANEOUS LIVER BIOPSY has become widely accepted as of value[1-5] in providing histologic proof of pathologic changes of the liver. Such information has assumed great clinical importance in the proper care of patients. The only reservation with respect to the procedure concerns its safety, particularly in patients with metastatic liver disease. We found that complications are few and essentially the same in patients with both metastatic and benign liver disease.

This paper presents our experience with 568 needle liver biopsies performed on 518 patients at Montefiore Hospital between January 1950 and December 1960. Included are the results of 221 biopsies done in patients suspected of having metastatic liver disease. The value of the information gained, the morbidity, and the mortality will be discussed. Since mid-1959, the Menghini needle has practically replaced the Vim-Silverman one. Results with these needles will be compared.

MATERIALS AND METHODS

Biopsies were taken from any patient with suspected liver disease in whom histologic evidence might establish the clinical diagnosis. We also performed biopsies to obtain information relative to therapy or prognosis, and in the presence of unexplained hepatomegaly, splenomegaly, or fever. Patients were screened to exclude any with possible bleeding tendencies. Prothrombin times and platelet counts were performed prior to biopsy, and if indicated, bleeding and clotting times were determined. Absolute contraindications, apart from abnormal bleeding tendencies, were limited to the unwillingness or inability of the patient to cooperate. As we primarily employed the transthoracic approach, the presence of severe pulmo-

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nary insufficiency was a relative contraindication, since there was a danger that respiration would be further limited due to pleuritic or diaphragmatic pain incident to the biopsy. Age alone was not considered a deterrent.

The biopsy was always performed in the patient's bed. Patient preparation consisted of omitting breakfast and prebiopsy analgesia or sedation as needed. After the biopsy, the patient fasted 2–4 hours and was kept in bed for the remainder of the day, with a 24-hour check on vital signs.

Those performing the biopsies included interns, residents, and attending physicians. No effort was made to confine the performance of the procedure to a specially designated group. The only restriction was the provision of supervision by residents or attending physicians for interns performing the biopsy. The majority of biopsies (405) were taken by residents. Interns performed 85 of the procedures, and attending physicians, 71. In 7 instances, information as to the hospital rank of the physician performing the procedure was not available.

The Vim-Silverman[6] and Menghini[4] technics were followed. When the latter was employed, the 1.2-mm. or 1.4-mm. Menghini needle was used.

Of the 568 biopsies, 384 were done with the Vim-Silverman needle, and 126 with the Menghini needle. In 56 biopsies, the type of needle used was not recorded; most likely, the Vim-Silverman needle was employed in all these instances. In 2 instances, a modified procedure with a special needle was followed.

Although multiple biopsies were obtained in a number of patients, these were usually not performed on the same day.

RESULTS

The number of biopsies performed during the period of the study is indicated in Table 1. Patients were primarily in the 50- to 79-year-old age group. The sex distribution was approximately equal (Table 2).

The patient material was divided into two main categories: those biopsied because of suspected liver metastases and those biopsied for other clinical indications.

TABLE 1. DISTRIBUTION OF BIOPSIES ACCORDING TO NUMBER PER PATIENT

No. of biopsies per patient	*No. of patients*	*Total No. of biopsies*
One	478	478
Two	30	60
Three	10	30
TOTAL	518	568

TABLE 2. DISTRIBUTION OF PATIENTS UNDERGOING BIOPSY ACCORDING TO AGE AND SEX

Age (years)	*Male*	*Female*
0–9	0	0
10–19	2	1
20–29	6	6
30–39	20	16
40–49	30	31
50–59	53	65
60–69	101	61
70–79	58	51
80–89	10	6
90–99	1	
TOTAL	281	237

Table 3 summarizes the 221 biopsies performed on 190 patients with suspected or proved carcinoma and possible liver metastases. Twenty-two of the biopsies in this group, or nearly 10 per cent, were inadequate, in that no interpretable tissue was obtained. Of importance are the 94 biopsies which revealed metastatic disease of the liver. The total number of patients with proved hepatic malignancy was 123 (Table 3, Types 1 and 2). Of these, 94, or 76.4 per cent, were demonstrated by biopsy, while 29, or 23.6 per cent, were missed at biopsy.

In 18 patients (8.1 per cent) with proved carcinoma in whom metastatic liver disease was suspected, no malignancy was found at biopsy, with confirmation at postmortem examination. In 58 instances (26.2 per cent) biopsies negative for carcinoma could not be evaluated properly because proof based on study of tissue obtained at surgery or autopsy was lacking.

Table 4 summarizes the 347 biopsies performed in patients with nonmalignant disease. The Vim-Silverman needle was used in 220 instances, and the Menghini needle in 93. On 34 occasions, the type of needle was not specified. We believe that the Vim-Silverman needle was used in these instances, but this cannot be verified.

To determine the effect of biopsy on clinical diagnosis, the biopsy diagnoses were grouped according to whether they confirmed, changed, or did not affect the clinical diagnoses. When the biopsy finding varied from the one considered most likely on clinical grounds, the biopsy was considered to have changed the diagnosis. Confirmation of a diagnosis is self-explanatory. When the biopsy revealed histologic findings considered essentially normal and therefore of no help in establishing a diagnosis, the biopsy was considered as not affecting the clinical diagnosis. With the Vim-Silverman needle, a total of 50 of 220 biopsies (22.7 per cent) was in-

TABLE 3. RESULTS OF BIOPSIES IN PATIENTS WITH SUSPECTED LIVER METASTASES*

Type of patient	*No. of biopsies*	*% of total*	*% of Types 1 and 2*	*Type of needle used*			
				V.-S.	*Menghini*	*Unknown*	*Modified spinal needle*
1. Hepatic malignancy proved by biopsy†	94	42.5	76.4	66	15	11	2
2. Metastases not proved by biopsy but demonstrated at surgery or post mortem	29	13.2	23.6	22	5	2	
3. Metastases not proved by biopsy with lack of surgical or post mortem confirmation	58	26.2		44	7	7	
4. Metastases not proved at biopsy and absent at post mortem	18	8.1		13	3	2	
5. Inadequate specimens for study	22	10.0		19	3	0	
TOTAL	221	100		164	33	22	2

*In 58 instances, or 26.2 per cent of the total, biopsies negative for carcinoma could not be evaluated properly because subsequent proof by surgery or autopsy was lacking.

†Includes 10 patients with hepatomas and 84 with metastatic lesions.

TABLE 4. RESULTS OF BIOPSIES IN PATIENTS WITH BENIGN LIVER DISEASE

Type of needle	*No. of biopsies*	*Effect of biopsy on clinical diagnosis**			*Biopsy adequacy*	
		Confirmed	*Changed*	*Unaffected*	*Adequate*	*Inadequate*
Vim-Silverman	220	97 (44%)	27 (12.3%)	46 (20.9%)	170 (77.3%)	50 (22.7%)
Menghini	93	51 (54.8%)	11 (11.8%)	26 (26.9%)	88 (94.6%)	5 (5.4%)
Unspecified needle	34	18 (52.9%)	5 (14.7%)	8 (44.4%)	31 (83.3%)	3 (16.7%)
TOTALS	347	166 (47.8%)	43 (12.4%)	80 (23%)	289 (83.3%)	58 (16.7%)

*All percentages are calculated on the basis of the number of adequate biopsies in each category.

adequate for histologic interpretation, while with the Menghini needle, only 5 of 93 (5.4 per cent) were similarly unsatisfactory. The inadequate biopsies totaled 58 of 347, or 16.7 per cent, in the group of patients with benign disease. These 58 biopsies were not included in the tabulation of the effect of biopsy on clinical diagnosis.

As in all previous studies, a multiplicity of findings was encountered:

Diagnosis	*No. of biopsies*
Metastatic carcinoma	84
Hepatoma	10
Cirrhosis, Laennec's	96
Cirrhosis, biliary	4
Postnecrotic cirrhosis	1
Fatty liver	48
Amyloid	2
Granuloma	9
Bile stasis	24
Hepatitis, viral	20
Extramedullary hematopoiesis	1
Focal hepatitis	7
Congestion of liver	2
Hemosiderosis	3
Cholangitis	14
Hemochromatosis	1
Normal tissue	159
Inadequate tissue	83
TOTAL	568

Of the total of 568 biopsies, 83, or 14.6 per cent, were inadequate for any interpretation. Of the 159 biopsies in which normal liver tissue was found,

76, or 48 per cent, were encountered in the search for metastatic lesions. Of the abnormal findings, Laennec's cirrhosis was encountered more often than any other entity. Sarcoidosis and probable tuberculosis comprised the granulomatous category. The biopsies showing chronic passive congestion were found in patients with myocardial insufficiency.

Mortality and Morbidity

Two patients in this series are believed to have died as a direct result of complications of liver biopsy, while in a third who died 14 days later, the relationship between the death and the procedure was questionable. If these 3 subjects are included, the mortality in these series would be 0.6 per cent of the 518 patients, or 0.5 per cent of the total 568 biopsies. If the third death is excluded, as it probably should be, the mortality would be reduced to 0.4 per cent of the total number of patients and essentially the same for the total number of biopsies. Brief summaries of the histories of these patients follow.

Patient 1 (Montefiore Hospital No. 86183)

This was a 90-year-old man with complete heart block, benign prostatic hypertrophy, and severe arteriosclerosis obliterans. Portal cirrhosis was suspected. Abdominal examination revealed hepatomegaly and no other palpable masses. Laboratory findings included an alkaline phosphatase level of 30 B.L.* units, a 4+ cephalin flocculation, and normal bilirubin, hematocrit, and prothrombin time. A transcostal percutaneous liver biopsy was performed with a Vim-Silverman needle to determine the cause of the hepatomegaly. Histologic examination revealed portal cirrhosis. Immediately after biopsy, the patient complained of severe right upper-quadrant abdominal pain. Diffuse abdominal and rebound tenderness were noted. No significant hematocrit drop or change in vital signs occurred. Twenty-four hours later, irreversible shock abruptly developed, and death occurred 48 hours after the biopsy. Postmortem examination was not performed.

The course of events indicates that death was the result of hemorrhage and shock subsequent to the biopsy.

Patient 2 (Montefiore Hospital No. 82263)

In a 68-year-old male who was critically ill from carcinomatosis of unknown primary origin, examination revealed marked cachexia and hepatomegaly. The alkaline phosphatase level was 31.5 B.L. units. A right epigastric biopsy was performed with a modified spinal needle. Immediately after the biopsy, the patient complained of perspiration and increasing weakness. Blood pressure dropped from 140/60 to 112/92, with no hematocrit change. Three days later, further hepatic enlargement was detected. Six days after the biopsy, hematemesis occurred, and the patient expired the next day. The histologic diagnosis of the biopsy tissue was metastatic adenocarcinoma. Postmortem examination was not performed.

*Bessie-Lowry.

Although we have neither surgical nor autopsy proof of the immediate cause of this patient's death, the sequence of events is highly suggestive of a fatal complication caused by the biopsy.

Patient 3 (Montefiore Hospital No. 111053)

The patient was a 72-year-old male who 6 months before had had choledochojejunostomy for palliation of pancreatic carcinoma. He was readmitted because of recurrent severe jaundice and marked nontender hepatomegaly.

Laboratory findings included an alkaline phosphatase level of 36 B.L. units and a bilirubin level of 12.2 mg.%, with other laboratory results being normal. A transcostal liver biopsy revealed active cholangitis and bile stasis. There was transient hypotension and right shoulder pain immediately after the procedure. A few rales were heard at the right lung base. Hematocrit was unchanged. The following day abdominal pain and guarding developed, and a right pleural friction rub was heard. Coffee-ground material was vomited. Four days after the biopsy, laparotomy was performed because of continuing abdominal pain, and a purulent right subphrenic abscess was drained. There was no evidence of peritonitis or hemorrhage. An obstructing stricture of the common bile duct was discovered, and T-tube drainage was instituted. The postoperative course was stormy, and death occurred 9 days after laparotomy (14 days after biopsy). Autopsy revealed an intact liver capsule covered by fibrinopurulent exudate. There was severe ascending cholangitis and bile stasis, but no evidence of hemorrhage. There was invasion of the bile ducts, jejunum, and inferior surface of the liver by pancreatic carcinoma. Additional findings were acute bacterial endocarditis with mycotic abscesses in lung, liver, heart, adrenals, and kidneys.

Patients 1 and 2 were thought to have died as direct results of complications of biopsy. In Patient 3, the connection between the death and the procedure was tenuous.

Four additional patients in whom biopsies were performed died within 3 weeks of the procedure. Postmortem examination revealed no evidence of liver-capsule tear, hemorrhage, infection, or any other abnormality attributable to the biopsy. Three of these patients with widespread carcinomatosis had uninterrupted progression of their disease, which culminated in death. The fourth patient had chronic myelogenous leukemia involving bone, liver, spleen, and kidney. Of interest was the biopsy finding of Laennec's cirrhosis in this patient. In view of the lack of evidence of hepatic injury subsequent to the liver biopsy, we do not believe that these deaths can in any manner be attributed to the procedure.

The incidence of minor local reactions cannot be adequately determined in a retrospective study of the type reported here because of the probability that they were not recorded in all instances. When observed or recorded, they generally consisted of moderate local pain and tenderness at the biopsy site, with occasional radiation to the right shoulder or pleuritic pain, persisting for less than 24 hours.

Six patients had nonfatal complications of sufficient severity to warrant description.

Patient 4 (Montefiore Hospital No. 76025)

A 26-year-old male underwent intercostal Vim-Silverman needle biopsy. Following withdrawal of the needle, there was a brisk hemorrhage requiring ligation of an intercostal artery. The biopsy findings were essentially normal.

Patient 5 (Montefiore Hospital No. 62987)

A 48-year-old female had an intercostal Vim-Silverman needle biopsy. No liver tissue was obtained, and urine escaped through the needle. The febrile reaction ensuing was controlled with antibiotics, and there were no further sequelae.

Patient 6 (Montefiore Hospital No. 76023)

A 67-year-old male with miliary tuberculosis developed abdominal rigidity and a mild drop in hematocrit following an intercostal Vim-Silverman needle biopsy. He recovered spontaneously. Seventeen days later, he succumbed to a massive cerebral hemorrhage. Autopsy also revealed an organizing 8 × 6 × 4-cm. hepatic subcapsular hematoma. The liver biopsy had revealed granulomas.

Patient 7 (Montefiore Hospital No. 77045)

A 76-year-old female had an acute psychotic reaction 24 hours following two consecutive intercostal Vim-Silverman biopsies. The consulting psychiatrist attributed the psychotic episode to excessive barbiturate ingestion. The biopsy revealed metastatic carcinoma.

Patient 8 (Montefiore Hospital No. 117659)

A 45-year-old male with diabetes and intercapillary glomerulosclerosis had a needle biopsy followed by right upper quadrant and right shoulder pain and a blood pressure drop from 190 to 104 systolic, requiring the use of vasopressors for 24 hours. Recovery was complete, and no further sequelae were encountered. The biopsy findings were those of normal liver.

In one patient, an unsuspected complication of liver biopsy was discovered at autopsy following death from unrelated causes.

Patient 9 (Montefiore Hospital No. 57708)

A 67-year-old female had two Vim-Silverman needle biopsies performed a week apart. No complications were observed. She died 6 months later of carcinomatosis. Autopsy revealed an old organized hematoma within the right leaf of the diaphragm.

The morbidity in the 518 patients was 1.2 per cent, and in the 568 biopsies, 1 per cent. Of the 6 patients with morbidity, 2 had hematomas as a result of the biopsy, one hepatic subcapsular and one in the right leaflet of the diaphragm. These were asymptomatic and would not have been

recognized if the patients had not been autopsied when death occurred of causes unrelated to the biopsy. The acute transient psychotic reaction after two successive biopsies in one patient was ascribed by the psychiatrist to oversedation, but the relationship to the biopsies is, we believe, important. The obvious puncture of a kidney in one patient was to our knowledge the only such complication.

DISCUSSION

Our results demonstrate the usefulness and safety of percutaneous liver biopsy. We consider a bleeding tendency a contraindication to liver biopsy. Even if all tests for bleeding tendency are normal, in a patient with unusual bleeding from the skin puncture site prior to biopsy, the procedure should be postponed until the clotting mechanism is rechecked. As outlined by Schaffner,[7] other contraindications are the presence of infection in the liver, in the peritoneum, or in the biliary tree, because of the danger of introducing an infecting agent into the peritoneal cavity or blood stream. Similarly suppuration in the site is a contraindication and requires a different approach.[8] In the presence of ascites, we always attempted to reduce the ascites before the biopsy was performed. No ill effects were encountered in several severely jaundiced patients subjected to Menghini-type biopsy. Formerly, the presence of jaundice was considered a contraindication.[1, 10, 11] This is no longer valid when the Menghini needle is used. As with any procedure, marked debility of the patient may be a contraindication. Certainly, age alone is not a deterrent; 78 per cent of our patients were 50 years or older, and 44 per cent were above the age of 60. This parallels the age distribution reported by Nelson and Salvador.[13] That the variation in the physicians performing the biopsies did not make for a more significant morbidity or mortality demonstrates that even with untrained physicians, proper and close supervision is usually sufficient to prevent untoward results in this relatively benign procedure. However, that 14.5 per cent of the biopsies were inadequate for pathologic interpretation was probably a direct result of this inexperience. The frequency with which uninterpretable tissue was taken is greater than the 6 per cent reported by Ward and co-workers.[10]

The effective aid supplied by a liver biopsy in confirming or altering a clinical diagnosis is well demonstrated in this study. Of the total of 347 biopsies in the group of patients with benign disease, the biopsy supplied information of diagnostic value in 209 instances, or 60.2 per cent. If the 58 inadequate biopsies are excluded from the total of 347, we then find that 209 of 289 adequate specimens, i.e., 71.6 per cent of the biopsies, served a

useful clinical purpose in establishing or refuting the diagnosis. This is similar to the results reported by Parets *et al.* and by others.[11-13] Even though the remaining 27.7 per cent of the biopsies were not of value in establishing a diagnosis, a liver biopsy not demonstrating abnormalities may also be useful in the clinical management of the patient.

Similar results were obtained in patients with metastatic liver disease. Of 123 patients with metastases of the liver, 94, or 76.4 per cent, were demonstrated on biopsy, while 23.6 per cent were missed. This again corresponds closely to the reports by Parets,[14] Ward *et al.*,[12] and Nelson and Salvador.[13] Of interest were the 18 patients, or 8.1 per cent of the total, in whom carcinoma was present and liver metastases were suspected but absent at biopsy and also at portmortem examination. A negative biopsy finding in the presence of carcinoma elsewhere in the body has limited clinical value. No comparable statistics have been uncovered in an extensive review of the literature.

The percentage of inadequate biopsies was greater in the patients with benign disease, as compared to those with metastatic liver disease. This is probably related to the fact that the inexperienced clinician finds it easier to obtain tissue from a liver enlarged with metastatic disease than from a normal-sized liver. Of interest in this respect was the finding that 18.1 per cent of the Vim-Silverman biopsies were inadequate, while only 5.4 per cent of the Menghini attempts were unsatisfactory in the group of patients with nonmalignant liver disease. Since the physicians using the two types of needles were equally proficient, this would seem to speak for the greater simplicity and success of the Menghini technic. The 5.4 per cent failure with the Menghini needle is comparable to that reported by Parets *et al.*,[11] who failed to obtain adequate biopsies in 3.3 per cent of subjects.

The mortality in this series was calculated both on the basis of the total number of patients and the total number of biopsies. Even when the death questionably following biopsy is included, the mortality was only 0.6 per cent of the total number of patients, or 0.5 per cent of the total number of biopsies. Our experience is in sharp contrast to that reported by Fisher and Faloon,[15] with their 12 per cent mortality in patients with metastatic liver disease. The mortality in our patients in whom biopsies were performed because of suspected liver metastases was 1 per cent, if the questionably related death is included, and only 0.5 per cent if this patient is excluded, as probably should be done. These results are similar to those reported by Battaglia *et al.*[16] In an extensive review of the literature covering 10,000 percutaneous liver biopsies, Terry[17] reported a mortality rate of 0.12 per cent. He mentioned that these numbers are undoubtedly too low, as he was personally aware of five unreported deaths from liver biopsy in England.

Zamcheck *et al.*[18] reviewed 20,000 biopsies and found a mortality of 0.17 per cent. This low number may be explained in terms of failure to report deaths following the procedure, as noted by Terry.[17] The mortality in our patients with suspected metastatic liver disease was comparable to the overall mortality of 0.6 per cent, and the 0.3 per cent mortality (1 death) in patients with nonmalignant disease of the liver. No deaths occurred in the 126 patients undergoing Menghini biopsies, in contrast to the patients in whom the Vim-Silverman or the unrecorded type of needle was used (the latter, as noted above, most probably was the Vim-Silverman needle).

The morbidity in our experience was about 1 per cent. This number was derived by a study of all postmortem material among our patients, even though clinical symptoms were absent. Thus 2 of the 6 patients included in our morbidity statistics were discovered to have hematomas secondary to biopsy only at postmortem examination. An 0.32 per cent morbidity was reported by Terry[17] in a review of 10,000 biopsies from the literature. Our finding suggests that true morbidity figures are probably greater than those reported in living patients alone. By the inclusion of the 2 patients, who were asymptomatic and were demonstrated to have silent, not clinically detrimental, complications of liver biopsy, our total of patients with morbidity was raised from 4 to 6.

We concur in the belief that liver biopsy is an important diagnostic aid in the clinical management of patients. In experienced hands, it is a relatively safe procedure if proper precautions are observed. In our study, the Menghini needle was found to be superior to the Vim-Silverman needle in that the yield of positive material was greater and because of its greater simplicity and comfort to the patient. Although no deaths resulted from the use of the Menghini needle, fewer biopsies were performed by this technic than by the Vim-Silverman procedure.

SUMMARY

1. A retrospective study of a series of 568 percutaneous liver biopsies performed on 518 patients is reported. Of the 568 biopsies, 382 were done with the Vim-Silverman needle, and 126 with the Menghini needle. In 56 instances, the needle used was not recorded but most probably was the Vim-Silverman one.

2. About 75 per cent of biopsies in patients with suspected carcinoma without adequate proof of liver metastases were positive for metastatic disease of the liver.

3. In patients with nonmalignant liver disease, 72 per cent of the biopsies served a useful clinical purpose in establishing or refuting a diagnosis.

4. At least two deaths—and possibly three—were related to the pro-

cedure, resulting in a mortality of 0.6 per cent in 518 patients, or 0.5 per cent in 568 biopsies. There were no deaths in the 126 Menghini-type biopsies.

5. The incidence of mortality and morbidity was no greater in patients with metastatic liver disease than in those with benign liver disease.

6. Metastatic liver disease is not a contraindication to liver biopsy and the latter may be of great help in clinical management of the patient.

7. Percutaneous liver biopsy is a simple and quite safe procedure when supervised by experienced physicians.

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