Plugged-Percutaneous Liver Biopsy in Patients with Impaired Coagulation and Ascites

Pieter W. Kamphuisen^a Tjeerd G. Wiersma^b Chris J.J. Mulder^c
Richard A. de Vries^{a,c}

Departments of ^aInternal Medicine, ^bRadiology and ^cGastroenterology, Rijnstate Hospital, Arnhem, The Netherlands

Key Words

Liver disease · Coagulation abnormalities · Ascites ·
Liver biopsy, plugged-percutaneous

Abstract

In liver cirrhosis coagulation is impaired due to decreased synthesis of vitamin K-dependent and vitamin K-independent coagulation factors. In such patients routine liver biopsy is contraindicated due to the increased risk of bleeding. Treatment with recombinant factor VIIa or fresh frozen plasma reduces the complication rate of liver biopsy, but both have disadvantages. In this observational study, we evaluated the safety and efficacy of plugged-percutaneous liver biopsy in 36 patients with ascites (n = 9), impaired coagulation (n = 22), or both (n = 5) due to severe chronic liver disease. Among patients with clotting disorders, mean prothrombin time was 16.3 s (range 11.4–20.3) and the mean platelet count was $53 \times 10^9/l$ (range 19–153). Plugged-percutaneous liver biopsy was in none of the cases associated with bleeding complications (95% confidence interval 0–0.097). All biopsies were adequate for histological interpretation and therefore diagnostically successful. In our experi-

ence, plugged-percutaneous liver biopsy seems a safe and reliable method in patients with chronic liver disease associated with impaired coagulation and/or ascites needing histological evaluation.

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Introduction

Liver biopsy is in general a safe and reliable method in the diagnostic work-up of hepatic disease. Since mortality (0.01%) and morbidity (0.2%) are relatively low, this procedure is widely used [1, 2]. Severe haemorrhage is the most common serious complication of liver biopsy as a result of damage of the arterial tree or a distended portal vein radicle. McGill et al. [3] found that among 9,212 liver biopsies 0.11% were complicated by fatal and 0.24% by non-fatal haemorrhage.

In patients with chronic liver disease coagulation is impaired due to a decreased synthesis of vitamin K-dependent and vitamin K-independent coagulation factors, and this reduction is most pronounced for factor VII. A deficiency of factor VII results in an increased risk of bleeding complications, since factor VII initiates coagula-

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Pieter W. Kamphuisen, MD
Department of Internal Medicine
University of Medical Center Nijmegen Hospital, PO Box 9101
NL–6500 HB Nijmegen (The Netherlands)
Tel. +31 24 3618819, Fax +31 24 3617482, E-Mail p.kamphuisen@aig.umcn.nl

tion by complex formation with tissue factor. Blind percutaneous liver biopsy is generally considered to be contraindicated in these circumstances because of the increased risk of bleeding [4]. As a consequence, a histological diagnosis in these patients is difficult to achieve. The presence of ascites is also a contraindication for liver biopsy, since it is associated with an increased bleeding risk, infection or postbiopsy ascitic leakage [5]. In these circumstances the distance between the abdominal wall and the liver is greater, so an adequate biopsy specimen is more difficult to obtain.

In most hospitals transjugular biopsy is the standard procedure in impaired coagulation and can be safely performed. This technique, however, is invasive since the internal jugular vein has to be cannulated, is time-consuming, and the diagnostic yield is often disappointing due to small biopsies. Percutaneous liver biopsy in which the needle is plugged with absorbable foam is a well-known procedure in coagulation disorders [6]. It is easy to perform, requires no intravenous cannulation, and is less time-consuming than transjugular biopsy. A previous report has suggested that this method might be more effective compared to transjugular liver biopsy in obtaining adequate liver tissue and is in general not associated with an increased incidence of bleeding [7]. One other study found a slightly higher incidence of bleeding episodes in patients with impaired coagulation undergoing plugged-percutaneous liver biopsy [8].

In the present study we evaluated the safety and efficacy of ultrasound-guided plugged-percutaneous liver biopsy in consecutive patients with severe liver disease associated with impaired coagulation, ascites or both disorders.

Patients and Methods

From 1995 to 2000, 39 patients had contraindications for conventional percutaneous biopsy due to severe liver disease associated with impaired coagulation and/or ascites. Contraindications for the routine biopsy were prothrombin time >14 s (normal range 11.5–13.5 s) and/or platelet count below $80 \times 10^9/l$ ($150\text{--}450 \times 10^9/l$) and/or ascites diagnosed by ultrasound. In all patients prothrombin time, platelet count, bleeding time, and haemoglobin were measured prior to the procedure. After biopsy, patients were clinically closely monitored and the measurement of haemoglobin was repeated twice a day during hospitalisation. The average length of hospitalisation was 4 days (range 2–13). Haemorrhage was defined as an acute bleeding event requiring blood transfusion. Patients were excluded if within 7 days before treatment either prothrombin complex (1 patient) or fresh frozen plasma (2 patients) had been given. So, 36 patients were included in this study. This study was approved by the local ethical committee.

Table 1. Patient characteristics

All patients	36
Male	19
Female	17
Age ^a , years	60 (23–82)
Coagulopathy ^b	
Prothrombin time ^a , s	16.3 (11.4–20.3)
Platelets ^a , $\times 10^9/l$	53 (19–153)

27 patients had clotting disorders, 5 of whom also had ascites. 9 patients had ascites without clotting abnormalities.

^a Figures represent mean with the range in parentheses.

^b Including 5 patients with ascites.

After local anaesthesia of the skin and subcutaneous tissue, the plugged liver biopsy was performed under ultrasound guidance with an 18-gauge true cut needle in a biopsy firing system, introduced in a 4-french plastic sheath. During held expiration the needle was passed into the liver. This technique allows the biopsy device to be positioned, fired and withdrawn with only one hand. The needle track, handled by a flexible plastic sheath held with the other hand, was then injected with Ivalon® (5 ml; 150/300 μm ; Nycomed, Paris, France) from a prefilled syringe as the sheath was gradually withdrawn. Ivalon is an embolisation particle made of polyvinylformaldehyde foam, supplied in a 5-ml vial of 1 ml polyvinyl alcohol foam (PVA) with 4 ml water. In all cases one passage was sufficient for adequate biopsy.

Results

The mean age of the patients was 60 years (range 23–82 years), 19 were men, 17 women. 27 patients had moderate clotting disorders: mean PT 16.3 s (range 11.4–20.3 s) and mean platelet count $53 \times 10^9/l$ (range 19–153 $\times 10^9/l$) (table 1, fig. 1). There was no clear association between prothrombin time and platelet count ($r = 0.39$, $p = 0.07$) (fig. 1). Bleeding time was neither associated with platelet count nor prothrombin time. Five patients had both coagulation disorders and ascites. In 9 patients ascites was present without clotting abnormalities. Clinical data are shown in table 1. Ultrasound-guided plugged-percutaneous liver biopsy was in none of the cases associated with bleeding complications (0/36, 95% confidence interval 0–0.097).

All biopsies were adequate for histological evaluation and diagnostically successful. As shown in table 2, half of the patients had cirrhosis.

Fig. 1. Prothrombin time and platelet count of the patients with coagulation disorders.

Table 2. Histological diagnosis (n)

All patients	36
Cirrhosis	18
Malignancy	8
Chronic hepatitis	5
Peliosis hepatitis	1
Venoocclusive disease	2
Primary biliary cirrhosis	1
Haemangioma	1

Discussion

This small observational study suggests that ultrasound-guided plugged-percutaneous liver biopsy is a safe and reliable method in patients with moderate coagulation disorders and/or ascites. Furthermore, this method is relatively easy to perform and yields adequate liver biopsies.

Since the paper by Riley et al. [6] in 1984, percutaneous liver biopsy with plugging of the needle track can be considered as an alternative method for obtaining liver tissue in patients with clotting disorders. It is easier to perform and much quicker than transjugular liver biopsy, which also seems to be safe, but is more time-consuming and more difficult to perform. In addition, biopsies ob-

tained by the transjugular method are on average smaller than in the case of percutaneous liver biopsy, as was shown by Sawyer et al. [7]. Transjugular and plugged-percutaneous liver biopsies are associated with a low incidence of complications in patients with clotting disorders, although 3.5% of the patients experienced a bleeding complication after plugged-percutaneous liver biopsy, whereas no haemorrhage was noted in patients with transjugular liver biopsy. In 100 consecutive patients presenting with liver disease and moderately severe coagulation defects, plugged-percutaneous liver biopsy did not lead to serious bleeding complications [7]. Our findings are in accordance with these data.

Like coagulation disorders, ascites is considered as a contraindication for percutaneous liver biopsy, due to increased bleeding risk, infection or postbiopsy ascitic leakage [5]. Two studies showed that CT- or ultrasound-guided liver biopsy was not associated with an increased complication rate [8, 9]. In our study no liver biopsy-related bleeding or inadequate liver tissue samples using ultrasound-guided plugged-percutaneous liver biopsy in patients with ascites were found. Also in patients with both moderate coagulopathy and ascites no complications have been recognized.

There was no association between prothrombin time and platelet count in patients with clotting disorders, and also no correlation between platelet count and bleeding time, in accordance with other reports [10, 11]. Measure-

ment of the bleeding time does not appear to provide additional information concerning the risk of bleeding [10].

Our study has several drawbacks. The expected bleeding rate in liver biopsy is 0.24%; our sample size is, therefore, probably too small (upper confidence interval 0.097) to safely exclude the possibility of bleeding complications. Furthermore, this was an observational study without a control group. Theoretically, percutaneous liver biopsy performed under ultrasound guidance by injection of a polyvinyl foam (Ivalon) in the needle track is an option in patients with moderate coagulation abnormalities. This plugging of the needle track will induce mechanical occlusion and local haemostasis, and seems to overcome the increased risk of bleeding in mild coagulopathy or ascites. Based on the findings in earlier reports, plugged-percutaneous liver biopsy is recommended in patients with liver disease and moderate coagulopathy, i.e. prothrombin time prolongation <6 s or platelet count $20\text{--}80 \times 10^9/l$ [5–7]. To our experience, this method also seems safe in ascites, and even in patients with the combination of coagulopathy and ascites.

Recently it has been shown that in patients with liver cirrhosis treatment with recombinant factor VII (rFVIIa) corrects prolonged prothrombin time [12] and reduces complication rate in laparoscopic liver biopsy [12]. In liver cirrhosis factor VII levels are markedly reduced and rFVIIa probably restores thrombin generation [13]. The main disadvantage of this new treatment modality is its high cost. Infusion with fresh frozen plasma is another good alternative in liver cirrhosis, but is associated with the risk of potentially transmitting blood-borne infections. These two treatment modalities might be indicated in patients with more severe coagulopathy [12]. Percutaneous liver biopsy with plugging of the needle track seems at least as safe as rFVIIa in patients with moderate clotting disorders, and is much cheaper.

In conclusion, in our experience ultrasound-guided plugged-percutaneous liver biopsy can be successfully and safely undertaken in patients with moderate coagulation disorders, ascites or both conditions.

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