

Complications and Efficiency of Liver Biopsies using the Tru-Cut Biopsy Gun

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Abstract

Objectives: The study aimed to evaluate the complications and quality of the specimens of percutaneous liver biopsy in patients with chronic viral hepatitis who were scheduled for treatment and also to evaluate the contribution of the knowledge of ultrasound guided (USG) biopsy localization to the existing data.

Methodology: Liver biopsies conducted at our clinic between 2003 and 2008 were retrospectively evaluated. In 53.8% of the cases, hepatobiliary USG was performed to mark the localization of the biopsy site. An automatically triggered Tru-Cut biopsy gun was used.

Results: Biopsies were taken from the livers of 236 patients (46.6% male, 53.4% female) with a mean age of 47.1 ± 12.5 years. The majority of patients had hepatitis C (61.9%); 1.6% experienced major complications (3 patient biliary peritonitis, 1 patient liver bleeding); 52.1% of the samples were ≥ 1 cm in length; And 69.7% of the biopsy samples with specified portal area had ≥ 4 portal areas. There was no statistically significant difference between the patients with localized and non-localized biopsy site in terms of major complications and length of biopsy samples (respectively $p = 1.000$, $p = 0.209$).

Conclusion: We believe that percutaneous liver biopsy using Tru-Cut biopsy gun can be performed safely, with complications in 1.6% of the procedures. The length of the biopsy specimen is shorter than ideal values. Evaluation of the patients with and without USG-guided biopsy revealed no significant difference in terms of major complications and specimen size.

Key words: liver biopsy complications; Tru-Cut biopsy guns; liver biopsy and USG; biopsy specimen evaluation

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Introduction

Chronic viral hepatitis is a major indicator for liver biopsy even though the procedure prior to treatment is still controversial. However, liver biopsy is recommended to enable the grading of the disease, determine the indications for treatment, and evaluate the treatment [1-3]. Although liver biopsy is an easy procedure for hospitalized patients and outpatients, it is not entirely without risks. In addition to minor complications including transient pain, epigastric discomfort and nausea, major complications including haemorrhage, bile leakage and biliary peritonitis, haemobilia, pneumothorax, septic shock and death may also develop rarely. The radiologically guided biopsies and the technical advances in biopsy needles have reduced the development of such complications [4].

This study aimed to evaluate the complications and the quality of biopsy specimens obtained by percutaneous liver biopsy using automatic the Tru-Cut biopsy gun in patients with chronic viral hepatitis

who were scheduled for treatment. In addition, the contribution of the knowledge of ultrasound guided (USG) biopsy localization to the existing data was also evaluated.

Materials and Methods

In this study, liver biopsies were retrospectively evaluated on 236 chronic viral hepatitis cases who attended the Infectious Diseases Clinic, Eskişehir Yunus Emre General Hospital, between 2003 and 2008.

Patient selection

Patients followed up with a diagnosis of chronic viral hepatitis were subjected to percutaneous liver biopsy for evaluation of disease severity and planning of the treatment regimen. All patients underwent routine coagulation tests (*i.e.*, platelet count, international normalized ratio-INR, activated partial thromboplastin time-aPTT, prothrombin time-PT), complete blood count, and hepatobiliary USG for the

determination of clinically silent mass lesions. Biopsy was performed in those patients with a haemoglobin (Hb) value of > 10.0 gr/dL, platelet count of > 80,000/l, and an a-PTT time of not longer than four seconds. Patients were recommended to stop using any medications (antiinflammatory, antiaggregation and antithrombotic agents etc.) five to seven days before liver biopsy. Patients with decompensated liver diseases, presence of ascites, alcoholic liver diseases, symptoms of a mass or hemangioma, and with coagulation test results not within the pre-specified ranges were not included in the study. From January 2006 onwards, hepatobiliary USG marking for localizing the accurate anatomical biopsy site was performed before the procedure. All patients were informed about the procedure and the probable complications and consent was obtained before performing the biopsy.

The biopsy needle

In the study, an automatically triggered Tru-Cut biopsy gun (ASCUT, GTA Medical Product and Service, Italy) in 16 gauge x 16 cm size with a 20 mm specimen notch was used.

Biopsy procedure

All biopsies were taken by four physicians (infectious diseases and clinical microbiology specialists) working in the same clinic. Patients were taken into the biopsy room and prepared for vascular access. After disinfection of the needle area, local anaesthesia was achieved by giving 4-6 ml of 2% prilocaine either through the most dense dullness detected by percussion on the midaxillary line, or the intercostal space marked with the aid of hepatobiliary USG, first into the subcutaneous tissue, then into the intercostal area and finally into the liver capsule. The biopsy needle was inserted through the same area (the pre-determined site in USG-marked patients).

Follow-up after the biopsy

After the biopsy, all patients were followed up or any hemorrhages or other complications. That is, the patients were observed in the bed in the biopsy room for the first hour and in the ward for another 24 hours. Their respiratory rate, blood pressure and pulse values were followed up during this period. Immediately after the procedure, and at the 8th and the 24th hours, the patients underwent a systemic examination and were evaluated in terms of complications. Complete blood count, chest X ray and USG were checked for complications in the same

patients. The patients were also re-evaluated two weeks later for late complications.

Biopsy specimen

The biopsy specimens were placed in 10% formaldehyde solution and transferred to one of two pathology laboratories consecutively on the same day. Trichromate and Silver specific histochemical staining methods were performed on histological samples. The size, number of portal areas, and Knodell scoring of the samples were evaluated under light microscopy at pathology centers. Chi-square test was used for the comparison of qualitative variables. All data were analyzed using the SPSS 13.0 software package.

Results

Of the 236 patients enrolled for the evaluation, 46.6% were males. The mean age was 47.1 ± 12.5 years (range, 17-69 years). The etiology included chronic hepatitis B (36.4%), chronic hepatitis C (61.9%), chronic hepatitis B+C (1.3%) and chronic hepatitis B+D (0.4%).

There was no mortality in the study population. The most frequent post-biopsy complaints were pain in the biopsy site and/or right shoulder pain. Major complications developed in a total of four patients. Three patients (1.3%) experienced very severe right hypochondiac pain within the first two hours of the biopsy. Physical re-examination revealed the presence of peritoneal irritation symptoms. These patients were seen by the consulting general surgeon. Total blood counts showed normal hemoglobin values and there were no signs of hemorrhage with abdominal USG. These patients were considered as having biliary peritonitis secondary to biopsy and treated with a conservative treatment regimen.

In one (0.4%) patient, severe abdominal pain and sweating developed three hours after the biopsy. Physical examination showed that the patient had irregular blood pressure and abdominal tenderness, but there were no symptoms of peritoneal irritation. The complete blood count values showed a > 2 g/dl reduction in hemoglobin concentration within 24 hours. Platelet count ranged between 137,000 and 242,000 / μ l. The prothrombin time-PT, activated partial prothrombin time-aPTT and the international normalized ratio-INR values were within the normal limits. Abdominal USG on the same day showed diffuse hemorrhage in the right lobe of the liver. After further questioning, the patient admitted to irregular use of clopidogrel (an inhibitor of platelet

aggregation), which neither the patient nor the patient’s parents had told us during the initial patient-history interview. After consultation among the general surgery team, the patient was treated conservatively. On the third day post-biopsy, there was a decrease in Hb concentration by 5 g/dl. The patient was transfused with four units of platelet suspension and two units of erythrocyte suspension as recommended by a hematology specialist. On the sixth day of admission to the hospital, the patient was discharged and followed up on an outpatient basis due to the regression of his complaints, improvement of Hb values, and change of the hemorrhage area in the right lobe into a bounded focal hematoma.

The patients were also re-evaluated two weeks later for late complications. No complications were observed.

Evaluation of the biopsy specimen demonstrated that 52.1% of them were ≥ 1 cm in length. In specimens with portal area counts, 69.7% had ≥ 4 portal areas. The percentage of samples insufficient for Knodell scoring was 12.3%. The biopsy procedure and the findings of the specimens are summarized in Table 1.

Table 1. Biopsy procedure and findings.

N = 236 (%)	
Pre-biopsy USG	
Yes	127 (53.8)
No	109 (46.2)
Specimen length	
< 1 cm	113 (47.9)
≥ 1 cm	123 (52.1)
Portal area	
< 4	40 (16.9)
4-10	73 (30.9)
> 11	19 (8.1)
Not described	104 (44.1)
Biopsy diagnosis and scores	
Knodell 0-4	33 (14)
Knodell 5-12	136 (57.6)
Knodell ≥ 12	23 (9.7)
Cirrhosis	6 (2.5)
Chronic hepatitis	9 (3.8)
Insufficient specimen for Knodell scoring	29 (12.3)

The results also showed that 53.8% (127/236) of the patients were marked with the aid of hepatobiliary USG to determine the anatomical entry point for biopsy. The relationship between the use of

USG to determine the biopsy site and the risk of a major complication and the specimen length were evaluated.

There was no significant difference between the patients with or without pre-determined biopsy site in terms of development of a major complication when the relationship between the use of USG to determine the biopsy site and the risk of development of a major complication was evaluated ($p = 1.000$). There was no significant difference between the patients with or without pre-determined biopsy site in terms of biopsy specimen length when the relationship between the use of USG to determine the biopsy site and the specimen length was evaluated ($p = 0.209$). These findings are shown in Table 2.

Discussion

Despite all the recently developed serological and other laboratory methods, the importance of liver biopsy to determine the activity and the grade of chronic hepatitis is indisputable. However, it has major disadvantages: it is an invasive method, unsuitable for all patients; it has risks for complications; and there are difficulties in evaluation of the biopsy specimen.

According to the findings of the wide-scale investigations, the average incidences of mortality and the complications of this procedure are 0.01% and 0.06-0.32%, respectively [1,2]. There may be slight pain in the upper right quadrant, shoulder pain and epigastric discomfort in 30% of the cases. A sudden development of a very severe abdominal pain may suggest biliary peritonitis [5]. The most frequent major complications of liver biopsy are hemorrhages and biliary leakage. Other complications include hemobilia, organ injuries, arterio-venous fistula and septic shock [1,2,5]. Piccinino *et al.* investigated 68,276 biopsies over 10 years and the major complications were found to be shock, pneumothorax, hemoperitoneum and biliary peritonitis [6]. Çolakoğlu *et al.* evaluated 3,531 liver biopsies performed between 1975 and 1993, and the biopsy-related major complications. The incidence of major complications was 1.07% [7]. In our study the most frequent complaint after the biopsy was pain at the biopsy site and/or pain over the right shoulder. Major complications developed in four patients (1.6%). Our three patients who developed biliary peritonitis were successfully cured by conservative treatment without the need for surgical intervention.

Table 2. The relationship between with or without USG-guided biopsy and risk for development of major complication and specimen length.

	With USG-guided biopsy (n = 127)	Without USG-guided biopsy (n = 109)	p
Major complication	2	2	p > 0.05*
Specimen length			
< 1 cm	56	57	p > 0.05*
≥ 1 cm	71	52	p > 0.05*

* : Chi-square test

Hemorrhages may occur intraperitoneally, intrahepatically and/or subcapsular and may appear as hemobilia after the liver needle biopsies [8]. We observed intrahepatic hemorrhage in one patient (0.4%). The inconsistency of the data on hemorrhage-related complications may arise from the differences in the parameters designated for patient selection. In our patients, the platelet count, INR, aPTT and PT were evaluated as coagulation tests and biopsy was not performed for patients who did not meet the pre-specified criteria. This test was totally normal in our patient with intrahepatic hemorrhage after the biopsy; however, the history of the patient revealed irregular use of clopidogrel. This agent does not change the coagulation tests except the bleeding time. Since the bleeding time is known to be prolonged in patients using clopidogrel, the risk for hemorrhage and adverse hematological outcomes may occur. Patients are recommended to stop using any medications five to seven days before diagnostic or elective surgical interventions. In suspicious cases, the bleeding time should also be evaluated in addition to routine coagulation parameters.

Types of the percutaneous liver biopsy needles include the aspirating (Menghini, Klatskin, Jamshidi) needles, the cutting (Vim-Silverman, Tru-Cut) needles and the popular spring-loaded and triggered needles [1,2,4]. Although the cutting needles such as Tru-Cut needles were shown to be associated with a higher complication risk compared to that of Menghini type aspirating needles [2, 9], there are other reports suggesting no differences [10]. Tru-Cut needles (except for triggered ones) tend to remain longer inside the liver during the procedure and this increases the risk of complications. In needles with an automatic trigger system, the time spent inside the liver is shorter. Thus, in this case, the risk of complication is lower but the specimen size is smaller [8,11]. Today, novel biopsy guns operating like automatically triggered Tru-Cut needles have been developed [2,4,12]. We believe that the use of

biopsy needles with such properties for all patients contributed to the lower rate of complications in our study.

The liver specimen obtained by the liver biopsy constitutes 1/50,000 of the total liver mass. Some studies recommend that the specimen should be minimum 15 mm in length and comprise four to six portal areas [12]; however, other studies suggest that the ideal specimen size should be at least 40 mm in length, comprised of at least two pieces with a minimum of 8 portal areas on each piece [13,14]. The probability of false results decreases as the specimen size and number increase [13]. Colloredo *et al.* [15] recommended that the biopsy specimen should exceed 20 mm in length and contain ≥ 11 portal areas. In our study, evaluation of the specimens in terms of size and number of portal areas demonstrated that 52.1% of the specimens exceeded a length of 1 cm, and 69.7% contained ≥ 4 portal areas. These ratios were below the ideal values.

Previous studies have shown that USG biopsies are safe and that they reduce the complication rate [10,16]; however, other investigations have shown no differences between USG-guided biopsies and conventional methods [17]. In our study, hepatobiliary USG marking was performed in 53.8% of the patients to determine the biopsy site. The evaluation of the patients with or without USG marking in terms of major complications and sample size revealed no statistically significant difference (p = 1.000 and p = 0.209, respectively). The data of a study by Colombo *et al.* [18] were in accordance with our results. On the contrary, Lindor *et al.* [10] obtained specimens longer than ours using USG automatically triggered Tru-Cut needles.

There are three limitations to our study: 1) We used one style of needle (Tru-Cut) and therefore did not have a chance to compare two or more different needle types; 2) In 47.9% of cases we collected 1-cm specimens, which were shorter than the ideal values, because we did one shot for each case. It would have been advantageous to take another samples from

these cases; 3) We chose to sample only chronic viral hepatitis cases scheduled for treatment and did not include cases with decompensated liver diseases, presence of ascites, alcoholic liver diseases, or symptoms of a mass or hemangioma. We therefore may have found lower complications rates.

In conclusion, we consider that percutaneous liver biopsy using the Tru-Cut biopsy gun can be performed safely with a low complication rate; however, the length of the biopsy specimen is shorter than ideal values. Evaluation of the patients with and without USG biopsy revealed no significant difference in terms of major complications and specimen size.

References

1. Sherlock S, Dooley J (1997) Biopsy of the liver. In: Diseases of the Liver and Biliary System. 10th ed. Blackwell Scientific Publications 33-42.
2. Emin Altıparmak (2005) Karaciğer Biyopsisi. In: Viral Hepatitis. Ed: Tabak F, Balik I, Tekeli E. Viral Hepatit Savaşım Derneği Yayını 176-179.
3. Griffiths A, Viiala CH, Olynyk JK (2002) Liver biopsy in the 21st century: where and why? *MJA* 176: 52-53.
4. Paulson EK and Nelson RC (2000) Techniques of Percutaneous Tissue Acquisition. In: Textbook of Gastrointestinal Radiology. Ed: Gore RMG, Levine MS. Second edition. W.B. Saunders Company 1219-1233.
5. Hegarty JE and Williams R (1984) Liver biopsy: techniques, clinical applications, and complications. *British Medical Journal* 288: 1254-1256.
6. Piccinino F, Sagnelli E, Pasquale G, Giusti G (1986) Complications Following Percutaneous Liver Biopsy. *Journal of Hepatology* 2: 165-173.
7. Çolakoğlu S, Hafta A, Ergün Y (1997) Liver Biopsies and Complications. *Çukurova Üniversitesi Tıp Fakültesi Dergisi* 22: 32-38.
8. Reddy KR and Jeffers LJ (1999) Evaluation of the Liver B: Liver Biopsy and Laparoscopy. In: Schiff's Diseases of the Liver. 8th Edition. Lippincott-Raven Publishers 245-266.
9. Van Leeuwen DJ, Wilson L, Crowe DR (1995) Liver Biopsy in the mid-1990s: Questions and answers. *Seminars in Liver Disease* 15: 340-359.
10. Lindor KD, Bru C, Jorgensen RA, Rakela J, Bordas JM, Gross JB, Rodes J, McGill DB, Reading CC, James EM, Charboneau JW, Ludwig J, Batts KP, Zinsmeister AR (1996) The role of ultrasonography and automatic-needle biopsy in outpatient percutaneous liver biopsy. *Hepatology* 23: 1079-1083.
11. De Man RA, van Buuren HR, Hop WCJ (2004) A randomised Study on the Efficacy and Safety of an Automated Tru-Cut needle for liver biopsy. *The Journal of Medicine Netherlands* 62: 441-445.
12. Bravo AA, Sheth SG, Chopra S (2001) Liver Biopsy. *N Engl Med* 344: 495-500.
13. Bedossa P, Dargere D, Paradis V (2003) Sampling variability of liver fibrosis in chronic hepatitis C. *Hepatology* 38: 1449-1457.
14. Goldin RD, Goldin JG, Burt AD, Dhillon PA, Hubscher S, Wyatt J, Patel N (1996) Intra-observer and inter-observer variation in the histopathological assessment of chronic viral hepatitis. *J Hepatol* 25: 649-654.
15. Colloredo G, Guido M, Sanzogni A, Gioacchino L (2003) Impact of liver biopsy size on histological evaluation of chronic viral hepatitis: the smaller the sample, the milder the disease. *J Hepatol* 39: 239-244.
16. Younossi ZM, Teran JC, Ganiats TG, Carey WD (1998) Ultrasound-guided liver biopsy for parenchymal liver disease: an economic analysis. *Dig Dis Sci* 43: 46-50.
17. Ahmad M, Riley TR (2001) Can one predict when ultrasound will be useful with percutaneous liver biopsy? *Am J Gastroenterol* 96: 547-549.
18. Colombo M, Del Ninno E, de Franchis R, de Fazio C, Festorazzi S, Ronchi G, Tommasini MA (1988) Ultrasound-assisted percutaneous liver biopsy: superiority of the Tru-cut over the Meghini needle for diagnosis of cirrhosis. *Gastroenterology* 95: 487-489.

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