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Comparison of percutaneous liver aspiration biopsy and tru-cut biopsy results

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ABSTRACT

Aims: The aim of this study was to compare the diagnostic rates, complications and histopathologic diagnoses of aspiration biopsy and tru-cut biopsy procedures in liver parenchyma and to reveal the differences between the technical methods.

Methods: Patients who underwent liver parenchymal biopsy in our hospital were identified. While tru-cut biopsy needle was used in the radiology department, aspiration biopsy needle was used in the gastroenterology department. Patients who underwent parenchymal biopsy were included in the study, while lesion biopsies were excluded. Type of biopsy needle, biopsy size, number of samples taken and number of portal areas, size of biopsy material, pathologic diagnosis and post-biopsy complications were evaluated in all patients.

Results: Of the 113 patients who underwent liver biopsy, tru-cut biopsy needle was used in 46 patients and aspiration biopsy needle was used in 67 patients. Pathologic diagnosis was made in 111 of 113 patients who underwent liver biopsy. The diagnosis rate was 98.2%. There was no statistically significant difference in pathological diagnosis, Ishak fibrosis score and complication development between tru-cut and aspiration biopsies. The number of specimens taken and biopsy sizes was significantly higher in aspiration biopsy ($p<0.001$). The number of portal areas were statistically significantly larger in aspiration biopsy compared to tru-cut biopsy ($p=0.005$).

Conclusion: Percutaneous aspiration and tru-cut biopsies are reliable diagnostic methods with high diagnostic rates and low complication rates. The fact that biopsy is performed by experienced hands, under US guidance, and the number of biopsies is limited reduces the development of complications.

Keywords: Liver, biopsy, needle, aspiration, tru-cut

INTRODUCTION

Liver biopsy is mostly used for the diagnosis and staging of chronic liver diseases and histopathologic examination of response to treatment. Apart from these, there are other reasons such as elevated liver function tests, diagnosis of lesions in the liver, evaluation of liver involvement in systemic diseases, evaluation of the donor in liver transplantation, differentiation between simple fatty liver disease and steatohepatitis.[1]

There are different biopsy techniques for obtaining liver tissue including percutaneous, transjugular, laparoscopic and intraoperative. Percutaneous biopsies can also be performed under imaging guidance. Ultrasonography (USG), computed tomography (CT) or magnetic resonance imaging (MRI) can be used as imaging modalities.[2,3]

In percutaneous liver biopsy, aspiration, cutting and spring cutting needles are used for this purpose.[4]

The aim of our study was to compare the diagnostic rates, complications and histopathologic diagnoses of aspiration biopsy and tru-cut biopsy procedures in liver parenchyma and to reveal the differences between the technical methods.

METHODS

This study was conducted in Kırıkkale University Faculty of Medicine Hospital according to the principles of the Declaration of Helsinki after Kırıkkale University Ethics Committee approval (Date: 26.06.2024, Decision No: 2024.06.2022). Patients who underwent liver needle biopsy in radiology and gastroenterology departments between January 2018 and January 2023 were identified retrospectively. Demographic information of the patients was obtained by scanning the files in the hospital registration system.

Patients who underwent parenchymal biopsy were included in the study. While tru-cut biopsy needle was used in the radiology department, aspiration biopsy needle was used in the gastroenterology department.

These patients were not included in the study because of the anatomical location of the focal lesion and the increased risks depending on the localization.

Type of biopsy needle, biopsy size, number of samples taken and number of portal areas, size of biopsy material, pathologic diagnosis and post-biopsy complications were evaluated in all patients.

Biopsy Procedure

Anticoagulant drugs that would affect bleeding were discontinued at least 5 days before liver biopsy. Complete blood count activated partial thromboplastin time and prothrombin time/INR were obtained from all patients before the procedure. The procedures were performed after at least 6 hours of fasting. All patients were informed in detail about the procedure and its complications by the attending physician and written informed consent was obtained.

Tru-cut biopsies were performed under the guidance of a convex probe on a USG device. A sterile sheath was put on the probe before the procedure. The most appropriate place for the needle to enter was determined by USG. After marking with US, local anesthesia (1% lidocaine) was applied under the skin and then a small incision was made at the needle entry site. The patient was made to hold his/her breath, and a biopsy sample was obtained by entering the biopsy needle from the edge of the probe with a free hand technique (**Figure**). The biopsy material was placed in formol solution. If the material was macroscopically appropriate, the procedure was completed, otherwise the procedure was repeated. Each patient was observed for at least 6 hours after the procedure. Patients with no complications at the end of these periods were discharged.

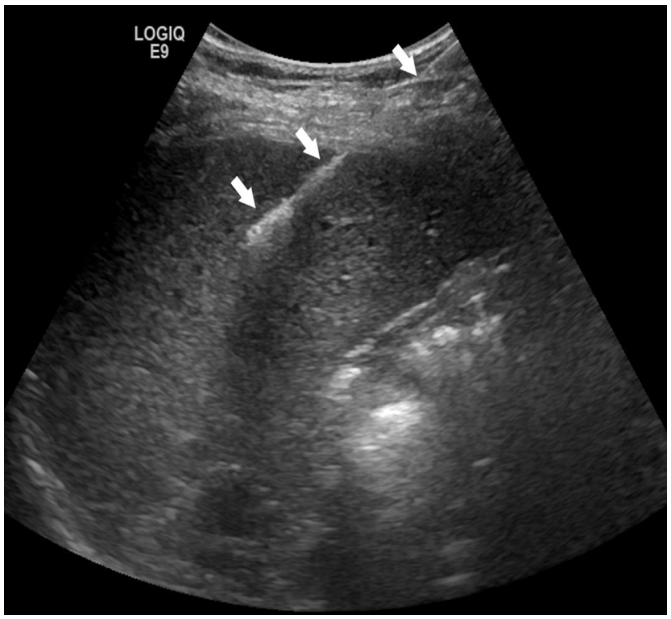

Figure. Gray scale US image of USG-guided percutaneous sharp needle biopsy. Needle tracing in the right lobe of the liver is indicated by the white arrow
USG: Ultrasonography

Evaluation

Patients were divided into two groups as aspiration and tru-cut biopsy. Complications, diagnostic rate, reasons for biopsy and presence of hepatitis were evaluated in both groups. Complications were evaluated in two groups as minor and major. Transient discomfort localized to the biopsy area, pain with or without anelgesia, vasovagal symptoms, vomiting were considered minor complications. Bleeding, infection, visceral perforation, hemothorax, pneumothorax, subcutaneous emphysema, anesthetic reaction, needle breakage were considered major complications.[5]

Necroinflammatory activity and fibrosis were evaluated with the Ishak scoring system. Patients were divided into three groups according to the Ishak fibrosis score: mild fibrosis (F≤2), moderate fibrosis (F3-4), and advanced fibrosis (cirrhosis) (F5-6).[6]

Statistical Analysis

Data were analyzed using SPSS 20.0 statistical package program (Statistical Package for the Social Sciences, version 20.0, SPPSS Inc, Chicago, IL, USA). Kolmogorov-Smirnov analysis was used to test for normal distribution. Variables were expressed as arithmetic mean±standard deviation (SD). Chi-square test was used for categorical variables and means and percentages were calculated. Student t test was used for comparison of groups. $p<0.05$ was considered significant.

RESULTS

Of the 113 patients who underwent liver biopsy, tru-cut biopsy needle was used in 46 patients and aspiration biopsy needle was used in 67 patients. Among the patients who underwent tru-cut biopsy, 31 were male and 15 were female, while among the patients who underwent aspiration biopsy, 43 were male and 24 were female. There was no statistically significant difference ($p=0.724$). Pathologic diagnosis was made in 111 of 113 patients who underwent liver biopsy. The diagnosis rate was 98.2%. There was no statistically significant difference in pathological diagnosis between tru-cut and aspiration biopsies. Also, according to the Ishak fibrosis score, there was no significant difference between trucut and aspiration biopsies (**Table 1**).

After the procedure, 110 patients did not develop any complications, while pain was observed in 3 patients. Our complication rate was calculated as 2.7%.

The number of specimens taken and biopsy sizes was significantly higher in aspiration biopsy ($p<0.001$). The number of portal areas were statistically significantly larger in aspiration biopsy compared to tru-cut biopsy ($p=0.005$). Complications, biopsy size, number of samples taken and number of portal areas in the sample in liver biopsy procedure are shown in **Table 2**.

DISCUSSION

Liver biopsy is a diagnostic tool used for the staging of chronic liver diseases, determination of treatment indications, histopathologic evaluation of treatment responses, liver dysfunctions of undetermined cause, space-occupying lesions in the liver and evaluation of liver involvement of systemic diseases.[7] Our study included patients with elevated viral liver function tests (LFTs) and patients with elevated non-viral LFTs.

There are studies on biochemical tests that are thought to indicate liver fibrosis. In the study conducted by Karlıdağ et al.[8]

Table 1. Comparison of histopathological diagnostic features and fibrosis score between groups

		Tru-cut biopsy (n=46)	Aspiration biopsy (n=67)	p values
Histopathological diagnoses n (%)	Low-scoring hepatitis	6 (13%)	0	>.05*
	Chronic active hepatitis	2 (4.3%)	0	
	Chronic hepatitis	37 (80.4%)	64 (95.5%)	
	Cirrhosis	0	2 (3%)	
Stage of fibrosis n (%)	Mild fibrosis (stage ≤2)	38 (84.4%)	43 (65.2%)	>.05*
	Moderate fibrosis (stage 3-4)	7 (15.6%)	16 (24.2%)	
	Cirrhosis (stage 5-6)	0	7 (10.6%)	

Values are expressed as number (percent). * Chi-Square analysis

Table 2. Comparison of biopsy sample characteristics and complications between groups

	Tru-cut biopsy (n=46)	Aspiration biopsy (n=67)	p values
Sample size, mm	16.91±5.32	31.40±10.51	.000*
Mean number of samples, n	1.52±0.6 (1-3)	2.57±1.6 (1-8)	.000*
Mean number of portal triads, n	6.26±2.8 (0-16)	8.03±4.3 (0-18)	.005*
Complication, n (%)	1 (2.2%)	2 (3%)	.794**

Values are expressed as number (percent) and mean±SD (range). * Chi-square analysis. **Student t test, SD: Standart deviation

it was predicted that some biochemical tests may be associated with advanced fibrosis. In the same study, it was stated that noninvasive tests may reduce the need for liver biopsy, but will not eliminate it.

The role of liver biopsy in chronic viral hepatitis is to confirm the diagnosis of chronic hepatitis, to confirm the histologic activity score (grade), to evaluate structural changes, to assess the presence of any concurrent disease, to evaluate the response to treatment before and after treatment, to detect iron accumulation, and to interpret preneoplastic changes.[9,10] Histologic grade and stage are of prognostic importance in determining the severity and progression of disease in chronic hepatitis. Grade is an indicator of inflammation and hepatocellular damage in the liver, indicating differentiation and suggesting that this damage may progress to fibrosis. Stage indicates the presence and extent of fibrosis. In our study, there was no statistical difference in Ishak fibrosis score of tru-cut and aspiration biopsies.

The choice of liver biopsy technique is based on the patient's coagulation status, the presence of ascites, whether the liver is cirrhotic or not, and the presence of space-occupying lesions in the liver.[11]

There are several approaches to obtaining liver tissue, percutaneous, transjugular, laparoscopic and intraoperative, each with its advantages and disadvantages.[11] In percutaneous liver biopsy, suction, cutting and spring-loaded cutting needles are used for this purpose.[4] In our study, we used aspiration needle and tru-cut needle.

USG-guided liver biopsy is an easy, inexpensive, non-ionizing, non-ionizing, simultaneous technique with high diagnostic value.[12,13] In our study, tru-cut biopsies were performed under USG guidance, but USG was not used in aspiration procedures.

In many previous studies, 16G cutting biopsy needles were used in focal liver masses and it was shown that there was no significant difference between 16G and 18G needles in obtaining adequate specimens.[14] In another study conducted by Arıbaş et al.[13] in recent years, it was reported that there was no significant difference between 14G, 16G and 18G needles in obtaining adequate specimens from focal liver mass biopsies performed with cutting needles. In the tru-cut biopsy performed in our study, we used 18G diameter automatic cutting needles because it was more comfortable for all patients.

The size of the biopsy sample varies according to the diameter of the needle and the technique. Generally, the volume and length of the biopsy taken with aspiration and cutting needles are the same.[9,15] However, there are also studies that suggest that the material taken with cutting needles is larger compared to aspiration needles.[16,17] This larger material allows for diagnosis and a more complete understanding of the histologic structure of the liver.[17] The minimum size for adequate liver biopsy is controversial, but studies have reported that a biopsy of 1.5 to 2.5 cm in length may be sufficient.[9,15] In the study by Meral et al.[18] the sample size was found to be 2.98 in 432 trucut biopsy patients. In a study by Gerant Riveara-Sanfeliz et al.[19] the mean liver biopsy length was 2 cm in 152 (98.7%) of 154 patients and this was found to be sufficient for pathologic diagnosis. In our study, the number of specimens taken was significantly higher in aspiration biopsy. Biopsy sizes and number of portal areas were statistically significantly larger in aspiration biopsy compared to tru-cut biopsy. This difference may be due to the larger number of specimens obtained in aspiration biopsy and the use of a small-diameter needle in tru-cut biopsy.

Diagnostic rates; Buscarini et al.[2] in 2091 cases of USG-guided liver biopsy, Buscarini et al. reported an accuracy rate of 95.1% for the core. Gül et al.[11] reported an accuracy rate of 93.8%, which is consistent with the literature. In another study using a sharp needle, the diagnostic rate was 94.3%.[20]

The superiority of cutting needles emerges in the diagnosis of benign and well-differentiated malignant lesions and in determining the type of malignant lesions.[21] One of the most important indications for liver biopsies is to investigate whether the detected focal lesion is malignant.[22] In our study, lesion biopsies were not included.

As with any interventional procedure, some complications may develop in liver biopsy. Transient discomfort localized to the biopsy site, pain with or without anelgesia, vasovagal symptoms,

and vomiting are reported as minor complications.[9,14] The most common complication is pain, which usually disappears spontaneously 1-2 hours after the procedure. There are studies with different results on the relationship between the needle used and pain. Sheets et al.[23] reported that the incidence of pain decreased with the use of automatic needles, while recent studies have reported that automatic needles have a higher incidence of pain than manual needles. This may be due to the shorter duration of the aspiration needle in the liver.[24-27] Gül et al.[11] also reported a higher incidence of pain with tru-cut needle use. Some studies have reported that cutting needle biopsies provide more diagnostic tissue without increasing the complication rate compared to FNAB.[21,28] In our study, pain was observed in 1 patient with tru-cut biopsy and in 2 patients with aspiration biopsy. There was no statistical difference in the occurrence of pain between the two techniques.

Hemorrhage, peritonitis, biliary tract injury, pneumothorax, and hemothorax are major complications after liver biopsy.[9,15] The most common major complication is diffuse bleeding. Post-biopsy bleeding may be intraperitoneal, subcapsular and/or intrahepatic, and hemobilia.[5] Bleeding is symptomatic within three to four hours following biopsy. In the study by Gül et al.[11] the major complication rate was 1.08%. In the study by Özdemir et al.[20] using tru-cut needle, the major complication rate was reported as 1.4%. In the study by Gilmore et al.[9] the complication rate with the use of tru-cut method was 0.35%, while the complication rate with the use of aspiration method was reported as 0.1%. In this study, hemorrhage, pneumothorax, biliary leakage, peritonitis were more common with cutting needles, while other organ injuries and sepsis were more common with the aspiration method. In our study, no major complications developed in any patient who underwent biopsy.

Number of biopsies; Although it has been shown that the diagnostic value of the product obtained when liver biopsy is performed more than once, it has also been clearly shown that multiple procedures increase complication rates. In a study conducted by Maharaj et al.[29] with 2646 biopsy patients, patients were divided into 3 groups: patients who underwent one, two and three procedures, and patients who had no risk of complications before biopsy underwent two and three procedures. While an increase in minor complications was observed in the group with three procedures. No difference was observed in major complications between the three groups. In a study by McGill et al.[10] no correlation was found between the risk of bleeding and the number of procedures. In a study by Cadranel et al.[30] it was found that the rate of complications increased from 26.6% to 68% when the number of procedures increased from one to two. In the study by Gül et al.[11] pain was observed less frequently in the group with 1 procedure compared to the groups with 2 and 3 procedures. In our study, 1 piece was taken from the patient who had tru-cut biopsy and pain occurred, while 3 pieces were taken from 2 patients who had aspiration biopsy and pain occurred. Statistically, there was no significant difference in the number of complications and procedures.

The most important cause of mortality after liver biopsy is intraperitoneal bleeding. According to different studies, the incidence of mortality varies between 0.009% and 0.11%.[1,31] In a study by Gilmore et al.[9] the mortality rate after biopsy was 0.13-0.33%. McGill et al.[10] found the mortality rate due to fatal hemorrhage after percutaneous biopsy to be 0.11%. However, there are many studies in which mortality was not observed.[11,20] In our study, no mortality was observed.

Limitations

Our study has some limitations; firstly, the number of cases was relatively small. Secondly, tru-cut needles were used in the radiology department and aspiration needles in the gastroenterology department. This causes the procedures to be performed by different physicians. Performing all procedures by the same team may provide more accurate information.

CONCLUSION

Percutaneous aspiration and tru-cut biopsies are reliable diagnostic methods with high diagnostic rates and low complication rates. The fact that biopsy is performed by experienced hands, under USG guidance and the number of biopsies is limited reduces the development of complications.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Kırıkkale University Ethics Committee approval (Date: 26.06.2024, Decision No: 2024.06.2022).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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