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Comparison of the results of ultrasonography-guided percutaneous liver mass biopsy performed with 18 and 20 gauge needles

Ultrasonografi kılavuzluğunda 18 ve 20 gauge kesici iğneler ile yapılan perkütan karaciğer kitle biyopsisi sonuçlarının karşılaştırılması

Cenk Eraslan[1] Ömer Faruk Kutsi Köseoğlu[2] Nezih Meydan[3] Nil Çulhacı[4] Aylin Oral[5]

[1]Ege University Faculty of Medicine, Department of Radiodiagnostics, İzmir, Turkey

[2]Adnan Menderes University Faculty of Medicine, Department of Radiodiagnostics, Aydın, Turkey

[3]Adnan Menderes University Faculty of Medicine, Department of Medical Oncology, Aydın, Turkey

[4]Adnan Menderes University Faculty of Medicine, Department of Pathology, Aydın, Turkey

[5]Ege University Faculty of Medicine, Department of Nuclear Medicine, İzmir, Turkey

Abstract

Aim: To evaluate the role of using 18 Gauge (G) and 20G sharp needles in ultrasonography (US)-guided percutaneous liver mass biopsy regarding diagnostic success and efficacy is aimed.

Materials and Methods: Sixty patients who underwent US-guided liver mass biopsy using 18G and 20G cutting needles were included in the study. Definite diagnosis was established based on results of histopathological examinations of the biopsied lesions, follow-up clinical and imaging findings and for performed patients the results of repeated biopsy. In addition, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated for 18G and 20G needles.

Results: Among 60 liver masses, definite diagnosis was malignant in 54 (90%) masses and benign in 6 (10%) masses. Sensitivity, specificity, PPV, NPV, and diagnostic accuracy were 90.7%, 100.0%, 100.0%, 75.0%, and 91.6%, respectively, for the liver mass biopsies performed with 18G needles. These values were 87.0%, 100.0%, 100.0%, 66.7%, and 88.3%, respectively, for the liver mass biopsies performed with 20G needles. No significant difference was determined between the results found for the use of 18G needle and 20G needle in US-guided cutting needle biopsy performed in hepatic masses (p=0.540)

Conclusion: The present study demonstrated that 18G and 20G sharp needles had similar diagnostic success and efficacy in US-guided percutaneous biopsy of liver mass lesions. Owing to its fine calibration, 20G sharp needle can be preferred in high-risk patient groups, particularly in those with bleeding disorder.

Keywords: Ultrasonography-guided biopsy, liver mass, cutting needle biopsy.

Öz

Amaç: *Çalışmamızda, ultrasonografi (US) kılavuzluğunda perkütan karaciğer kitle biyopsisinde kullanılan 18 Gauge (G) ve 20G kalınlıktaki kesici iğnelerin tanısal başarılarının ve etkinliklerinin karşılaştırılması amaçlanmıştır.*

Gereç ve Yöntem: *Çalışmaya karaciğer kitlesi sebebiyle 18G (18G-Kİ) ve 20G kalınlıkta kesici iğnelerle (20G-Kİ) US kılavuzluğunda biyopsisi gerçekleştirilen 60 hasta dahil edildi. Biyopsi yapılan lezyonun histopatolojik değerlendirme sonuçları, takip, klinik ve görüntüleme bulgularıyla, tekrar biyopsi yapılan hastalarda biyopsi sonuçları incelenerek lezyonun kesin tanısı belirlendi. 18G-Kİ ve 20G-Kİ için duyarlılık, özgüllük, pozitif öngörü değeri, negatif öngörü değeri ve tanısal doğruluk oranları hesaplandı.*

Bulgular: *Değerlendirilen 60 karaciğer kitlesinin 54'ünün (%90) kesin tanısı malign iken altısının (%10) benign idi. 18G-Kİ'nin karaciğer kitle biyopsisi için duyarlılığı %90,7; özgüllüğü ve pozitif öngörü değeri %100,0; negatif öngörü değeri %75,0 ve tanısal doğruluk oranı %91,6 bulundu. 20G-Kİ'nin karaciğer kitle biyopsisi için duyarlılığı %87,0; özgüllüğü ve pozitif öngörü değeri %100,0; negatif öngörü değeri %66,7 ve tanısal doğruluk oranı %88,3 olarak hesaplandı. US kılavuzluğunda karaciğer kitlelerine yönelik yapılan kesici iğne biyopsisinde 18G-Kİ ve 20G-Kİ'nin kullanımıyla elde edilen sonuçlar arasında istatistiksel anlamlı fark bulunmadı (p=0,540).*

Corresponding Author: Cenk Eraslan
Ege University Faculty of Medicine, Department of Radiodiagnostics, İzmir, Turkey
E-mail: *eraslancenk@hotmail.com*
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Sonuç: *Çalışmamızda karaciğer kitle lezyonlarının US kılavuzluğunda perkutan biyopsisinde; 18G-Kİ ve 20G-Kİ'nin benzer tanısal başarı ve etkinliğe sahip olduğu saptandı. İnce kalibrasyonu nedeniyle özellikle kanama bozukluğu varlığı gibi yüksek riskli hasta grubunda 20G-Kİ tercih edilebilir.*

Anahtar Sözcükler: *Ultrasonografi kılavuzluğunda biyopsi, karaciğer kitle biyopsisi, kesici iğne biyopsisi.*

Introduction

Histopathological evaluation by liver biopsy is one of the main cornerstones in the assessment and treatment of liver diseases (1). Nowadays, along with the advancements in high-sensitivity and high-resolution imaging techniques such as ultrasonography (US), computed tomography (CT), and magnetic resonance imaging, the detectability of incidental and expected focal hepatic lesions is increased (2,3). Although peripheral tumor markers and other biochemical markers are used for the diagnosis of hepatic lesions, tissue diagnosis by liver biopsy remains as the most important assistant of the clinician for treatment planning (4). Along with the use of guided imaging techniques, US is preferred more commonly in liver mass biopsies since it is easily accessible, cheap and portable, enables visualization of needle along biopsy tract, provides real time image, and is not associated with exposure to ionizing radiation (5).

Size, structure, and localization of lesion, general status of patient, as well as experience and familiarity of surgeon are effective in the selection of type and diameter of the needle, which will be used in liver biopsy (6). In the studies in which cutting needles of various gauges have been used for liver biopsy, a single type of fine or thick cutting needle has been used generally and the results have been compared with the results of other studies (7,8). Although the use of thick needles enables obtaining qualitative specimens appropriate for histopathological examination, relatively high complication rate is the most important known disadvantage (9). To the best of our knowledge, there isn't any study in the literature in which the same researcher obtained tissue samples from the same lesion using cutting needles in different gauges. The present study aimed to evaluate histopathological outcomes of US-guided percutaneous cutting needle biopsies performed using 18G thick needle and 20G fine needle in patients with liver mass and to determine the effects of needle type on the efficacy and success of the procedure.

Materials and Methods

Sixty adult patients, who were referred to the Interventional Radiology Unit of our hospital due to liver mass and underwent US-guided percutaneous cutting needle biopsy within one-year period were included in the present study. Patients with severe coagulation disorders were excluded. The present study was approved by local ethical committee and informed consents of the patients were obtained.

The patients were questioned about demographic characteristics, presence and type of liver parenchymal disease, and history of a known malignancy. All biopsy procedures were performed by a radiologist, experienced in the field of interventional radiology. Before the procedure, appropriate position and potential biopsy tract were determined by evaluating the cross-sectional image findings of the patients and by ultrasonographic evaluation. In the patients with more than one liver mass, the lesion that was more suspicious for malignancy based on imaging findings or the lesion that was more suitable for the procedure regarding size and location was determined.

The same US device (Toshiba Xario, Tokyo, Japan) was used for guidance in all procedures. The size of the lesion, which would undergo cutting needle biopsy and its distance to the skin were determined. Local anesthesia (Citanest, AstraZeneca, Germany) was performed in all patients.

Sampling procedure was performed by free-hand method and by single-needle technique using an automatic gun (Bard Magnum, Bard Peripheral Vascular Inc., AZ, USA). The first sample was obtained using a 18G 16 cm disposable cutting needle (Bard Magnum Disposable Core Tissue Biopsy Needles, Bard Peripheral Vascular Inc., AZ, USA). The second sample was obtained by a 20G 16 cm disposable cutting needle (Bard Magnum Disposable Core Tissue Biopsy Needles, Bard Peripheral Vascular Inc., USA). Each sample was 22 mm in length. Single samples obtained for both 18G and 20G cutting needles were histopathologically evaluated by a pathologist, experienced in the field of gastrointestinal system. Definite diagnosis was established by evaluating histopathological diagnosis in the pathology report, follow-up clinical and imaging findings, and the results of repeated biopsy if performed.

Data were analyzed by the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 15.0. Kolmogorov-Smirnov test was used to test the normality of data. Descriptive statistics were expressed as median (25%-75% percentile) for the non-normally distributed variables and Mann-Whitney U test was used for comparisons between the groups. Pearson's chi-square test was used for the analysis of categorical data. A p value of <0.05 was considered statistically significant.

Results

The present study included 60 patients (32 male, 28 female) with a mean age of 63±12 years (range, 39-87 years). The diagnosis established based on the pathological evaluation was malignant in 54 (90%) patients and benign in 6 (10%) patients. Diagnoses of the patients are demonstrated in Table-1.

Malignant histopathological diagnosis was reported in at least one of the samples obtained by 18G and 20G needles from 53 of 54 masses, the definite diagnosis of which was malignant. The follow-up findings were consistent with the pathological diagnosis in all these patients. Histopathological diagnosis wasn't malignant in both samples obtained by 18G and 20G needles in 1 patient. The result of repeated biopsy, which was performed in this patient due to continuing clinical suspicion of malignancy, revealed hepatocellular carcinoma.

Histopathological diagnosis of the samples obtained with 18G and 20G needles was benign in six patients, of whom the definite diagnosis was benign. During the follow-up, while regression was observed in five of these lesions with medical treatment appropriate for the diagnosis, 1 patient died 57 days after the biopsy procedure due to the complications associated with liver cirrhosis. None of the patients developed treatment-requiring complications within the first 24 hours or in the long term.

Concordance between the histopathological diagnoses and the definite diagnoses is demonstrated in Table-2. While the concordance between the definite diagnosis and the histopathological diagnosis was 91.7% for the biopsies performed with 18G needle, it was 88.3% for the biopsies performed with 20G needle.

The sensitivity, specificity, accuracy, and positive and negative predictive values (PPV and NPV) of the diagnoses for each needle are demonstrated in Table 3. According to these findings, no significant difference was determined between the accuracy rates found for the use of 18G needle and for the use of 20G needle in US-guided cutting needle biopsy performed in hepatic masses (Pearson's correlation test, p=0.540).

Table-1. Histopathological Diagnoses Of Hepatic Masses Undergoing Biopsy.

Malignant lesions (n=54)	**n**
Malignant epithelial tumor metastasis	30
Adenocarcinoma metastasis	13
Hepatocellular carcinoma	7
Cholangiocellular carcinoma	1
Malignant mesenchymal tumor metastasis	1
Squamous cell cancer metastasis	1
Renal cell carcinoma metastasis	1
Benign lesions (n=6)	
Acute inflammation	2
Fungal infection	1
Abscess	1
Hemangioma	1
Regenerative nodule	1

Table-2. Concordance of the Histopathological Diagnoses of the Tissue Samples With the Definite Diagnoses.

	Malignant masses (n=54) n (%)	**Benign masses (n=6) n (%)**
Histopathological diagnosis with 18 G needle		
Concordance with definite diagnosis	49 (90.7)	6 (100.0)
Non-concordance with definite diagnosis	5 (9.3)	0 (0.0)
Histopathological diagnosis with 20 G needle		
Concordance with definite diagnosis	47 (87.0)	6 (100.0)
Non-concordance with definite diagnosis	7 (13.0)	0 (0.0)

Table 3. Comparison of the Results Obtained by 18 G and 20 G Needles.

	Sensitivity	**Specificity**	**PPV**	**NPV**	**Accuracy**
18 G Needle	90.7%	100.0%	100.0%	75.0%	91.6%
20 G Needle	87.0%	100.0%	100.0%	66.7%	88.3%

PPV: Positive predictive value; NPV: Negative predictive value.

Discussion

Success of percutaneous biopsy techniques has rapidly increased in the last quarter century along with the rapid advancements in biopsy devices and in US and CT technologies, which are the guided imaging techniques in percutaneous biopsy procedure and this technique has become essential in the clinical practice for tissue diagnosis of hepatic mass lesions (10,11). In addition, it

has been stated that US-guided biopsy enables histological diagnosis with a high accuracy even in small (≤1 cm) lesions (12). In the present study as well, biopsies were performed under the guidance of US.

Numerous different biopsy devices and needles that provide to obtain high-quality specimens appropriate for histopathological examination have been introduced for the use of operators (10). In general, a side-notch cutting needle in 18G thickness, which is compatible with automatic biopsy gun, is used in our clinic for liver biopsy procedures. In the present study, it was aimed to compare diagnostic success and efficacy of 18G cutting needle and 20G cutting needle, which have the same design, in US-guided liver biopsy.

In the present study, among 60 liver biopsy samples, 54 (90%) had a definite diagnosis of malignancy and six (10%) had a definite diagnosis of benignancy. Appelbaum et al. (13) performed US-guided cutting needle biopsy in 205 liver masses and reported that 176 (85.9%) were diagnosed as malignant and 29 (14.1%) were diagnosed as benign.

There may occur minor (post-procedure pain, temporary hypotension, and bleeding not requiring treatment, etc.) and major complications (bleeding requiring transfusion, adjacent organ injury, pneumothorax, hemothorax, peritonitis, sepsis, death, etc.) associated with US-guided liver needle biopsy. Rivera-Sanfeliz et al. (14) performed 154 liver biopsies using automatic device and reported that there were no major complications and that pain (18.2%) was the most frequent minor complication. Cakmakci et al. (15) reported localized pain, vasovagal syncope, and nausea to be the most common complications in the outpatients (n=1018) undergoing US-assisted needle biopsy performed by tru-cut biopsy gun (18-20G); however, they reported no death. Moreover, they observed all vasovagal syncope episodes during the preparation phase prior to the biopsy. Padia et al. (16) performed biopsies (n=539) using 18G automated needle and reported the complication rate to be 2%. They observed severe post-procedural pain, symptomatic hemorrhage, infection, and rash; however, no sedation-related complications or procedure-related death occurred. Caliskan et al. (17) suggested that complications would be minimized with the use of lesion-focused approach technique. In the present study, no minor or major complications were encountered. We thought that being sensitive about coagulation disorders and performing the procedure in the patients with an INR value of ≥1.5 after adjusting the coagulation values influenced the results critically. Besides, sampling from subdiaphragmatic lesions was avoided as much as possible in the presence of more than a single lesion. Moreover, attention was paid to obtain samples from the lesions that were distant from great vessels and main biliary ducts, if possible. We believe this contributed to low complication rates.

Since US-guided biopsy procedure requires technical skill, the operator may have a role in success rate. Liver biopsies are primarily performed by two groups of specialists; gastroenterologists (hepatologists) and radiologists (18). Anania et al. (18) compared the liver biopsy procedures performed by gastroenterologists (US-guided with 16G needle) and interventional radiologists (US-guided with 18G needle) performing in terms of adequacy of samples and complications and they found no significant difference. Free-hand technique was used in the present study; however, the fact that all biopsy procedures were performed by a single specialist who was experienced in the field of interventional radiology eliminated the operator-related difference.

In the present study, tissue sampling was performed by the same researcher using cutting needles with different thickness but with the same structure and from the same lesion. Accordingly, lesion-related variables (such as size, localization, and distance to the skin of the lesion), patient-related variables (such as patient cooperation and presence of ascites or parenchymal disease), and biopsy procedure-related variables (such as the use of different biopsy devices, the use of different transducers, and obtaining different numbers of samples) which could affect diagnostic success of different needles, were eliminated.

The sensitivity, specificity, PPV, NPV, and diagnostic accuracy in our study were evaluated by using the histopathological results of each single tissue sample obtained with 18G and 20G cutting needles. Yu et al. (19) obtained a mean of 2 tissue samples from each of 137 liver masses under US guidance using 18G cutting needle and reported the sensitivity, specificity, PPV, NPV, and diagnostic accuracy to be 96.4%, 100.0%, 100.0%, 94.6% and 97.8%, respectively. In our study, the histopathological examination of the samples, which were obtained from the liver masses with 18G needle in US guidance, revealed sensitivity, specificity, PPV, NPV, and diagnostic accuracy of 90.7%, 100.0%, 100.0%, 75% and 91.6%, respectively. It was thought that lower NPV was associated with low number of patients with benign lesions. Duysburgh et al. (20) obtained a single tissue sample from each of 77 liver masses of 72 patients using 21G needle. They reported that the technique had a sensitivity of 88%, a specificity of 100%, a NPV of 77%, and a diagnostic accuracy of 91% in distinguishing the malignant lesions from the benign lesions. In our study, the sensitivity, specificity, PPV, NPV, and diagnostic accuracy were found to be 87.0%, 100.0%, 100.0%, 66.7%, and 88.3%, respectively, for

20G needle. The results of the two studies were quite close to our study.

In the present study, comparison of the data from the histopathological examination of the samples obtained using 18G cutting needle and 20G cutting needle revealed no significant difference between the two techniques in terms of accuracy rates (p=0.540). The results of the present study, which was designed to compare the diagnostic success of only the needle types by eliminating all variables related to the lesion undergoing biopsy, to the patient, and to the operator performing the procedure, are worth to consider. Limited number of patients and the number of patients with benign diagnosis being very small within the study population were the limitations of the present study.

Conclusion

According to our study, 20G cutting needle has similar diagnostic success and efficacy as compared to 18G cutting needle and both needles can be safely used in US-guided percutaneous biopsy of liver mass lesions**.**

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