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DIAGNOSTIC ACCURACY OF ULTRASONOGRAPHY-GUIDE PERCUTANEOUS LIVER MASS CORE BIOPSY BY USING 16 AND 18 GAUGE NEEDLES

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ABSTRACT

Background: Histopathological examination is the definitive method for diagnosing liver masses. **Aim**: to assess the accuracy of ultrasonography-guided percutaneous liver mass core biopsy, with concentration on the diagnostic success and efficacy of using 16 and 18 gauge needles. **Materials and Methods:** This retrospective study included 180 patients who had ultrasound-guided liver mass biopsies using 16G and 18G cutting needles. A conclusive diagnosis was established based on histological analyses for the lesions that were biopsied, the results of further biopsies for certain individuals, and any follow-up clinical and imaging findings. For 16G or 18G needles, the following metrics were computed: sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy. **Results**: A conclusive diagnosis revealed that 162 (90%) of the 180 liver tumors were can malignant and 18 (10%) were benign. For liver mass biopsies using 18G needles, the corresponding sensitivity, specificity, positive predictive value (PPV), Diagnostic accuracy and negative predictive value (NPV) were 90.7%, 100.0%, 75.0%, and 91.6%, respectively. 87.0%, 100.0%, 100.0%, 66.7%, and 88.3% were the comparable findings for liver mass biopsies used with 16 G needles. There was no discernible difference between the two outcomes (p=0,28). **Conclusion**: The current research showed that a safe and reliable method for identifying liver pathology is percutaneous liver core biopsy guided by ultrasonography. In US-guided liver mass core biopsy, both 16G and 18G sharp needles show comparable diagnostic success and effectiveness; however, the larger 16G needle may be more likely to cause minor complication such as pain and local bleeding. Because of its fine calibration, the 18 G sharp needle is recommended for patient populations at high risk, particularly those who having blood disease.

KEYWORDS: Ultrasonography, liver mass, cutting needle biopsy, diagnostic technique.

INTRODUCTION

An essential part of diagnosing and treating liver illnesses is histopathological examination by liver biopsy guided by ultrasonograghy.[1] the detectability of both accidental and anticipated focal hepatic lesions has improved recently due to developments in imaging techniques with grea t sensitivity and resolution, such as ultrasound (US), magnetic resonance imaging(MRI), computed tomography (CT) and PET scan.[2,3] Liver biopsy is still the most important tool for clinician in treatment planning, even when liver problems are diagnosed by laboratory testing using tumor markers alongside with other biochemical markers.[4] Due to its many benefits over other modalities like CT and MRI, ultrasonography is becoming more and more popular for liver mass biopsies when used as guided imaging methods: Reducing false negative biopsies, facilitating needle visualization along the biopsy tract, providing real-time imaging, allowing intra-procedural visualization of the needle biopsy and target lesion, allowing procedures in almost any anatomical plane, having short procedure times, and not exposing patients to ionizing radiation are all benefits of this portable, affordable, and easily accessible device.[5]

The kind and diameter of the cutting needle utilized in liver biopsy are determined by a number of important parameters, including the lesion's size, and location; the patient's overall health; and the operator's expertise and familiarity.[6] In studies utilizing cutting needles of various gauges for liver biopsy, a single type of either fine or thick cutting needle has typically been employed, and the outcomes have been compared with those of other studies.[7.8] The use of thick needles (G16) facilitates the acquisition of qualitative histopathological specimens for high-level examination; however, it may carries high complication rate while fine needle (G18) can be used in selected cases with blood disorders.[9]

This research assessed the histopathological results of ultrasound-guided cutting needle biopsies of liver masses utilizing 16G and 18G needles, with the objective of analyzing the influence of needle type in procedural effectiveness and success rates.

Figure 1: Needle Biopsy.

Figure 2: Needle Biopsy.

MATERIALS AND METHOD

Over the course of two years, from August 2020 to April 2022, 180 adult patients who were sent to aur private radiology clinic for a liver mass ultrasound-guided core biopsies. The research did not include those with severe coagulation problems. A history of known malignancy, the kind of liver parenchymal illness that is present, or demographic data were evaluated for each patient. A radiologist with(7year) experience in interventional radiology performed each biopsy procedure. Cross-sectional imaging results and patient ultrasonographic evaluation were used to determine the proper placement and possible biopsy tract before the procedure. In patients with numerous liver masses, the lesion considered most indicative of malignancy from imaging results, or the lesion best suitable for the procedure given its size and location, was determined. The our US device (Samsung HS40 from South Korea) was used as a guidance in all procedures. The lesion's dimensions, amenable to cutting needle biopsy, as well as how close it was to the skin, were assessed. All patients were administered local anesthetic with a (2% Xylocaine solution) with intravenous analgesia by (nefopam injection). The sampling procedure was conducted using a free-hand method and a single-needle technique with a semiautomatic needle. The initial sample was acquired utilizing an 18G X 15cm length disposable cutting needle (Disposable Semiautomatic Biopsy Needle-GEOTEK). As shown in figures 1 and 2. the second sample was taken using a 16GX 15 cm length disposable cutting needle (Disposable semiautomatic biopsy needle-GEOTEK). The length of each cutting sample was 20 mm. Individual samples obtained with both 18G and 16G cutting needles were subjected to histopathological assessment by a pathologist. The pathology report's histological findings, any follow-up clinical and imaging data, and the outcomes of any repeated biopsies are evaluated in order to get a conclusive diagnosis.

RESULTS

The average age of the 180 patients in our research was 63 ± 12 years (range: 40-85 years), with 120 of them being men and 60 being women. According to the pathological assessment, 18 patients (10%) were categorized as benign, and 162 patients (90%) were diagnosed as malignancy (primary or secondaries). The patients' diagnoses are shown in Table 1.

Table 1: Histological Diagnosis of liver lesions core Biopsy.

Malignant lesions	N=162	Benign lesions	N=18
Malignant epithelial tumor metastasis	90	Acute inflammation	**6**
Adenocarcinoma metastasis	30	Adenoma	**6**
Renal cell carcinoma metastasis	17	Hemangioma	**3**
Hepatocellular carcinoma	10	Abscess	**1**
Malignant mesenchymal tumor metastasis	6	Regenerative nodule	**1**
Squamous cell cancer metastasis	5	Old hydatid cyst	**1**
Cholangiocarcinoma	4		

A single sample taken from 160 of 162 masses using 16G and 18G needles was used to confirm the malignant histological diagnosis; any of these masses were categorically malignant. In all cases, the results aligned with the pathological diagnosis.

In both samples taken from two individuals using 16G and 18G needles, the histological evaluation showed no cancer. Due to a prolonged clinical suspicion in malignancy, this patient had repeated biopsies, which proved the existence of hepatocellular carcinoma.

Samples taken using 16G and 18G needles showed benign histopathological findings in 18 patients, each receiving a conclusive benign diagnosis. Regression was observed in (15) lesions following appropriate medical treatment for the diagnosis.

Regarding complication rates, (14) patients (7,77%)experienced minor complications within the first 24 hours (3) (1,6%) of them developed mild bleeding, (10) patients(5,5%) developed localized pain both groups not requiring treatment, while only one patient (0,55%) developed marked bleeding when using G16 needle required blood transfusion.

Table 2 shows the agreement between definitive diagnosis and histological diagnoses. For biopsies done with an 18G needle, the agreement between the definite diagnosis and the histological diagnosis was 91.6% compared to (88,3%)for those conducted with 16G needle.

The positive and negative predictive values (PPV and NPV) of the diagnosis associated with each needle, as well as its sensitivity, accuracy, and specificity are shown in Table 3. The results show that using 18G or 16G needles for ultrasound-guided cutting needle biopsy of hepatic masses does not significantly alter accuracy rates (Pearson's correlation test, p=0.28).

Table 2: Concordance of the Histological Diagnosis of the core biopsies With the Definite diagnosis.

Needle type	Malignant masses (n=162)	n(%)	Benign lesions(n=18)	(%)n
Histological diagnosis with 18 G needle				
Concordance with definite diagnosis	147	90.75%	18	100%
Non-concordance with definite diagnosis	15	9.25%	0	0%
Histological diagnosis with 16 G needle				
Concordance with definite diagnosis	141	87%	18	100%
Non-concordance with definite diagnosis	21	13%	0	0%

Table 3: Comparison of the Results Obtained by two needle size (16 G and 18 G).

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

Figure 3: US Guide Needle Biopsy Showing Needle Targeting Liver Mass.

DISCUSSION

Over the last 25 years, as biopsy equipment and imaging technology like computed tomography and ultrasound have advanced, so significantly increasing the successfule rate of percutaneous liver biopsy procedures.

In clinical practice, these guided imaging methods are now crucial for the tissue identification of hepatic mass lesions.[10,11] Additionally, even for tiny lesions (≤1 cm), US-guided biopsy has been shown to assist histological diagnosis with high accuracy[12] [figure3]. Numerous biopsy tools and needles have been created to provide high-quality samples appropriate for histopathological analysis. In our clinic, liver biopsy procedures are performed with a cutting needle with a side notch that is 18G works semiautomatically. Evaluation of the diagnostic efficacy and performance was the aim of this 18G and 16G cutting needles, which have the identical design, in liver biopsies performed under ultrasound guidance. Out of 180 liver biopsy samples, 18(10%) were found to be benign and 162(90%) to be malignant.

Post-procedure pain, transient hypotension, and untreated bleeding are examples of minor complication that might arise. Major complications, although rare, can include bleeding necessitating transfusion, injury to adjacent organs, pneumothorax, hemothorax, peritonitis, tumor seeding along the needle path, sepsis, and death.

The current study did not encounter any significant complications Apart from mild bleeding (3patient) (1,6%) and localized pain (10 patient) (5,5%) both groups not required treatment while only one patient (0,55%) developed marked bleeding require blood transfusion when using thick needle G16. We thought that to reduce complication rates should : first avoid or exclude patients with bleeding disorders by doing coagulation tests like prothrombin time & INR value of ≥1.5 will be accepted . Additionally, when there were many lesions present, sampling from subdiaphragmatic lesions should be avoided. alongside avoid taking samples from lesions located near major vessels and main biliary ducts and using fine needles like (G18, G20) as much as possible.

The success rate of US-guided biopsy procedures may be influenced by the operator's technical skill. the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy in our study were assessed using the histological results from individual tissue samples collected with 16G and 18G cutting needles.

Appelbaum et al. In a study involving 205 liver masses, is performed US-guided cutting needle biopsy, resulting in 176 (85.9%) diagnoses of malignancy and 29 (14.1%) diagnoses of benign conditions.[13]

Yu et al. Using an 18G cutting needle and ultrasound guidance, an average of two tissue samples were taken from each of the 137 liver masses. Positive predictive value (PPV), negative predictive value (NPV), sensitivity, specificity, and diagnostic accuracy were found to be, respectively, 96.4%, 100.0%, 100.0%, 94.6%, and 97.8%.[14]

in our study using an 18G needle to diagnose liver masses under ultrasound guidance, histological examination of the samples revealed 91.6% diagnostic accuracy, 90.7% sensitivity, 100.0% specificity, 100.0% positive predictive value, and 75% negative predictive value. a decreased frequency of individuals presenting with benign lesions was linked to a lower NPV. table -4.

Table 4: Comparison of Diagnostic Efficacy in US-Guided Liver Mass Biopsies: Between Yu et and. Current Study.

Metric	Yu et al. (2 samples per lesion)	Current Study (single sample per lesion)
Sensitivity	96.4%	90.7%
Specificity	100.0%	100.0%
Positive Predictive Value (PPV)	100.0%	100.0%
Negative Predictive Value (NPV)	94.6%	75.0%
Diagnostic Accuracy	97.8%	91.6%

Duysburgh et al. A single biopsy was obtained from each of the 77 liver lesions of 72 patients using a 16G needle. The study outcomes showed 91% diagnostic accuracy, 77% negative predictive value,positive predictive value100%, 100% specificity, and 88% sensitivity in distinguishing between benign and malignant masses[15], while in our study's results sensitivity, specificity, diagnostic accuracy, negative predictive value (NPV), and positive predictive value (PPV) for the 16G needle were 87.0%, 100.0%, 100.0%, 66.7%, and 88.3%, respectively, Our research's findings were consistent with those of the two studies mentioned above. table -5.

Table 5: Comparison of Diagnostic Efficacy in US-Guided Liver Mass Biopsies: Between Duysburgh et al. and the Current Study.

Metric	Duysburgh et al. (16G)	Present Study (16G)
Sensitivity	88.0%	87.0%
Specificity	100.0%	100.0%
Positive Predictive Value (PPV)	100.0%	100.0%
Negative Predictive Value (NPV)	77.0%	66.7%
Diagnostic Accuracy	91.0%	88.3%
Sample Count	77 masses	180 masses

US=ultrasound, PPV=positive predictive value, NPV =negative predictive value

In our study compared histopathological data from samples obtained with 18G and 16G cutting needles, revealing no significant difference in accuracy rates between the two techniques (p=0.28).

CONCLUSION

According to our research, a safe and reliable method for identifying liver pathology is percutaneous liver mass core biopsy guided by ultrasonography. When compared with a 18G cutting needle, the usage of a 16G cutting needle shows comparable diagnostic success and

effectiveness, and both choices are safe to use with low complication rate.

Conflicting of interest: No conflict of interest to report.

Limitation of study: No limitation occurred during the study.

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