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RESEARCH ARTICLE
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COMPARATIVE ANALYSIS OF THE DIAGNOSTIC ACCURACY OF FINE-NEEDLE ASPIRATION CYTOLOGY (FNAC) VERSUS TRUE-CUT BIOPSY IN THE DETECTION OF MALIGNANCY WITHIN DETECTABLE BREAST MASSES.

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Abstract

Background: Breast cancer remains the prevailing malignancy affecting women universally and is a leading contributor to cancer-related fatalities among the female population, with a significant burden in developing nations.

Objective: This research aimed to evaluate the diagnostic precision of needle aspiration Cytology (FNAC) in the identification of malignancy within palpable breast lumps. A parallel objective was to conduct a comparative analysis with a Tru-Cut biopsy.

Study design: An analytical cross-sectional study

Place and Duration: This study was conducted in Peoples University of medical and Health sciences for women Nawabshah from May 2022 to May 2023

Methodology: The inclusion criteria encompassed patients visiting the hospital's breast clinic who presented with detectable breast lumps. Histopathological evaluations were performed on specimens procured via FNAC, Tru-Cut biopsy, and excisional biopsy. Subsequent application of Hematoxylin and Eosin (H&E) staining facilitated the histological examination of both the Tru-Cut biopsy and tissue samples from the excision procedures.

Results: Out of the 110 cases under investigation, malignancy was identified in 31.82% (n=35). The diagnostic precision of Tru-Cut biopsy in detecting cancer within patients displaying palpable breast lumps, with histopathology examination after excision biopsy (HPE) as the gold standard It

demonstrated a sensitivity of 82.86%, a specificity of 95.24%, a positive predictive value (PPV) of 88.57%, a negative predictive value (NPV) of 92.31%, and an accuracy rate of 89.09%. The calculated likelihood ratio was 19.75. Conversely, FNAC biopsy's diagnostic accuracy in detecting malignancy within palpable breast lumps, utilizing HPE as the reference standard, yielded a sensitivity of 71.43%, a specificity of 92.68%, a PPV of 80.95%, NPV of 85.71%, and an accuracy rate of 81.82%. The calculated likelihood ratio was 10.21.

Conclusion: Regarding the diagnosis of cancer within patients presenting palpable lumps in the breast, both FNAC and Tru-Cut biopsy demonstrate commendable diagnostic accuracy. However, Tru-Cut biopsy exhibits heightened accuracy in comparison to FNAC for detecting this pathological condition.

Keywords: FNAC, Diagnosis, diagnostic accuracy, malignancy, breast lump, Tru-Cut biopsy.

Introduction

Breast cancer prevails as the dominant affliction among women in developing nations, constituting majority of the cancer cases and associated mortalities [1]. Each year, a considerable number of new instances emerge globally. Timely diagnosis and intervention contribute significantly to favorable long-term outcomes [2].

Every palpable breast lump warrants a comprehensive assessment for potential indicators of malignancy prior to any surgical procedures. Standard protocols for evaluating breast lesions encompass clinical breast examinations, radiographic assessments, and pathological analyses [3]. Pathological evaluations encompass several techniques, including FNAC, Tru-Cut biopsy (core needle biopsy), and incisional or excisional biopsy. The definitive diagnosis of malignant tumors necessitates tumor excision followed by histological scrutiny [4]. The central goal of pathological diagnosis is to distinguish between aggressive cancerous lesions necessitating rigorous treatment and benign lesions that allow for more conservative approaches [5] .

Pathologists like to use Tru-Cut biopsy because it gives a lot of tissue, which makes it possible to diagnose cancer before surgery, classify cytology, and stain receptor status. This information guides surgeons and oncologists in determining optimal treatment strategies for patients harboring benign breast masses detected during evaluations [6], But it has some problems, like not being good enough for tumors with necrosis, bleeding, or a small size due to fibrosis, which could mean that more biopsies or other methods are needed [7].

FNAC serves as a crucial and prompt diagnostic tool in the assessment of palpable breast lumps and is recognized for its reliability, cost-effectiveness, and accuracy over an extended period. The procedure minimizes patient discomfort and can be repeated as needed with minimal health risk [8]. Nevertheless, operator-dependent variables introduce the possibility of false positive or false negative results, even when the specimen is appropriate for a precise cancer diagnosis [9]. Notably, histopathology investigation of the lump remains the gold standard for confirming malignancy within tumors [10].

When compared to FNAC results, false negatives from FNAC and false positives from Tru-Cut biopsy had sensitivities, specificities, PPVs, NPVs, and diagnostic accuracy rates of 86.3% and 69.9%, respectively [11]. Such statistics should be contextualized within a broader framework encompassing the benefits and drawbacks of both techniques. Variables like invasiveness, equipment requirements, financial implications, and other factors must be considered when evaluating FNAC. Nonetheless, trends indicate a declining utilization of FNAC in recent times [12]. Some researchers underscored the clinical efficacy of both FNAC and Tru-Cut biopsy, with FNAC maintaining its status as the preferred option for suspected non-palpable breast lesions [13].

The idea for this study came from the lack of local data about how accurate FNAC is as a diagnostic tool compared to Tru-Cut biopsy, as well as the fact that Tru-Cut biopsy requires specialized expertise and costs a lot of money.

Methodology

With HPE established as the gold standard, this study endeavored to investigate the diagnostic precision of FNAC and Tru-Cut biopsy in identifying cancer among individuals with palpable breast masses. Employing a cross-sectional (validation) methodology, the research design aimed to fulfil this objective.

Based on calculations of sensitivity and specificity, non-probability consecutive sampling was used to come up with a sample size of 110. This made sure that the results were accurate within a 95% confidence interval.

Inclusion criteria involved females with palpable breast lumps between the ages of 18 and 60 years, meeting the operational description.

Noteworthy, women under 18 and individuals with non-palpable breast lesions were excluded from the study. Likewise, cases marked by recurrent tumors, degraded tumors due to cancer treatment, skin affected by fungal infections, or open wounds were ineligible.

Data collection adhered to a well-defined procedure. Participants presenting at the hospital's breast clinic with breast lumps fitting the study criteria gained approval from the hospital's ethics committee after their summary was assessed. Consent was procured from study participants. A proforma was utilized to document the name, age, and pertinent biodata, including contact information. Comprehensive physical examinations were conducted, accompanied by a thorough medical history assessment, spot lighting established breast cancer risk factors. The confidentiality of the information provided by patients was strictly maintained. Subsequently, all participants underwent FNAC, Tru-Cut biopsy, and excision biopsy subsequently for histological assessment.

Utilizing local anesthesia, a spring-loaded core needle biopsy instrument was utilized to perform the Tru-Cut biopsy. Storing the obtained tissue samples in formalin-labelled containers with patient identifiers, these were forwarded to the pathology lab for scrutiny. FNAC procedures employed a 21G or 23G needle along with a 10-mL syringe, involving consecutive passages through the lump executed with negative pressure within the syringe. Air-dried slides with aspirate smears were dispatched to the laboratory and identified with the patient's hospital ID. Cellular cytology samples underwent staining with Papanicolaou and May Grunwald Giemsa, while Tru-Cut biopsy and tissue samples obtained from subsequent excision procedures were subjected to Hematoxylin and Eosin (H&E) staining. This facilitated a comprehensive examination of histological features.

Data processing and analysis were executed using SPSS V-26. Quantitative variables, including individual age, were subjected to calculations. For qualitative characteristics such as sensitivity, specificity, PPV, NPV, diagnostic accuracy, true positive, false positive, frequency, and percentages, they were computed.

Results

The study encompassed over 110 patients presenting with palpable breast lumps, all of whom participated in the exploration of the diagnostic accuracy of FNAC and Tru-cut biopsy in diagnosing malignancy post-excision biopsy (HPE). Among the 110 participants, 55.45% fell within the age range of 18 to 40, while 44.54% of the 82 individuals were aged between 41 and 60 years. The calculated mean age, along with its standard deviation, was determined as 41.21±8.12 years.

Malignancy was identified in 31.82% of the total samples, encompassing 35 instances, while the remaining 68.18% (n=75) demonstrated a lack of malignancy. Employing histopathology examination following excision biopsy (HPE) as the gold standard, the diagnostic accuracy of Tru-cut biopsy was ascertained. Assessing the precision of Tru-Cut biopsy in identifying malignancy within individuals presenting palpable breast lumps and utilizing histopathology examination after excision biopsy (HPE) as the benchmark revealed a sensitivity of 82.86%, a specificity of 95.24%, a PPV of 88.57%, a NPV of 92.31%, and an accuracy rate reaching 89.09%. The computed likelihood ratio stood at 19.75.

Regarding FNAC biopsy's precision in detecting malignancy within palpable breast lumps, with histopathology examination after excision biopsy (HPE) as the established benchmark, the outcomes

exhibited a sensitivity of 71.43%, specificity of 92.68%, a PPV of 80.95%, a NPV of 85.71%, and an accuracy rate standing at 81.82%. The calculated likelihood ratio was determined to be 10.21. These findings were recorded in individuals who presented palpable breast lumps and subsequently underwent histopathological analysis following excision biopsy (HPE), which was established as the gold standard. Table 1 shows the ages and malignant diseases of the study participants.

Table 1. Distribution of Ages and Malignant Disease Status in the Enrolled Patient Cohort			
Age distribution (n=110)	**Ages of the patients in years**	**Number of participants**	**Percentage**
	18-40	61	55.45
	41-60	49	44.54
	Total	110	100
	Mean±SD	41.21±8.12	
Malignancy frequency (n=110)	**Malignancy**	**Number of participants**	**Percentage**
	Present	35	31.82
	Absent	75	68.18
	Total	110	100

A comparison of the diagnostic performance metrics has been shown in Table 2.

Table 2. Comparison of the diagnostic performance metrics		
Variables	**Tru-cut biopsy**	**FNAC**
Sensitivity	82.86%	71.43%
Specificity	95.24%	92.68%
PPV	88.57%	80.95%
NPV	92.31%	85.71%
Accuracy rate	92.31%	81.82%

Discussion

Continuous advancements are unfolding worldwide to enhance the treatment landscape for breast cancer. Within its diverse spectrum of ailments, ranging from malignant neoplasms to inflammatory conditions and infections, breast cancer predominantly materializes through the manifestation of breast lumps in women. Accurate identification of this condition necessitates a profound comprehension of normal breasts.

In pursuit of a diagnostic technique that combines sensitivity, specificity, efficiency, and cost-effectiveness, a spectrum of diagnostic methodologies has emerged. In the pursuit of potential diagnoses for palpable breast lumps, an array of imaging modalities are employed.

Due to the lack of local data on how accurate FNAC is compared to Tru-cut or TRI-CUT biopsy, this study was made to find out how good FNAC is at diagnosing in the histopathological diagnosis process. Utilizing FNAC can lead to an accurate and early breast cancer diagnosis, making the operation financially affordable and eliminating the requirement for specialized theatre equipment.

Comparing Tru-Cut biopsy to other studies has shown that it has 88.3% sensitivity, 100% specificity, 100% PPV, 53.3% NPV, and 86% diagnostic accuracy, respectively. A notable trend has seen a diminishing utilization of FNAC in recent years. FNAC and Tru-Cut biopsy exhibit commendable clinical performance, with FNAC retaining prominence for diagnosing palpable breast lesions, as affirmed by Wang M. et al. [14].

Furthermore, findings from Rahul Singh R. and colleagues suggest FNAC's enhanced accuracy compared to TCNB for breast mass diagnosis, with FNAC displaying a sensitivity of 84.34% in contrast to TCNB's 97.1%.

Furthermore, it was noted that the value of core biopsy survived even in the presence of a combination of clinical, radiographic, and histological tests with systematic core biopsy applications for breast cancer screening [15].

In conjunction with the histological assessment of tissue specimens, a Tru-Cut biopsy of palpable breast lesions provides comprehensive insights, enabling the formulation of contemporary

therapeutic strategies by offering preoperative insights into histological type and prognostic indicators. Neoadjuvant treatment is an option, and Tru-Cut biopsy is now the best solution for tiny, palpable lesions because of its consistently reliable sample capture. [16].

Overall, Tru-Cut biopsy has the potential to establish itself as an integral facet of routine examinations concerning breast lesions, particularly in resource-constrained settings. This strategy circumvents unnecessary surgeries, frozen sections, and axillary dissections, thereby streamlining cancer surgeries and bolstering patient involvement in the diagnostic process. The implications extend beyond economic benefits, safeguarding patient rights while optimizing breast cancer diagnosis and treatment.

Conclusion

When it comes to identifying cancer in patients with palpable breast tumors, Tru-Cut biopsy displays noticeably improved diagnostic accuracy in comparison to FNAC. The adoption of this technique not only serves to protect the fundamental rights of patients but also significantly alleviates the considerable financial encumbrance associated with the comprehensive diagnosis and subsequent treatment.

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Conflict of Interest:

There were no conflicts of interest in the conduct of this study.

Permission:

Ethical committee approval was obtained prior to the commencement of the study.

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