



THE ASSESSMENT OF TRU-CUT BIOPSIES OF BREAST MASSES IN RELATION TO ULTRASOUND FINDINGS IN A SAMPLE OF IRAQI PATIENTS

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ABSTRACT

Background: Breast cancer is the most common invasive cancer and the second leading cause of cancer deaths among women globally, diagnosed through clinical exams, radiological imaging, and biopsy. Breast ultrasounds, favored for their safety and lack of ionizing radiation, are key in evaluating breast masses. Tru-cut biopsies are preferred over Fine Needle Aspiration Cytology for providing ample tissue for accurate diagnosis and treatment planning. Objective: Compare clinico-pathological aspects of breast masses obtained by Tru-cut biopsies to ultrasonography results and evaluate their validity. **Method:** A retrospective study spanning January 2022 to January 2023 analyzed 100 breast Tru-cut biopsies from Al-Imamain Al-Kadhmain Medical City, Oncology Teaching Hospital, and private labs, focusing on histopathological reports, slides, and clinical parameters. Histopathological diagnoses and ultrasound findings were collated from reports. Additionally, H&E stained slides were re-examined by a supervisor pathologist at Al-Nahrain University's College of Medicine for diagnostic revision. **Results:** In a study sample aged 21-85 years (mean 49.9±12.5), 82% were married and multiparous, with 68% presenting palpable masses predominantly in the right breast's upper outer quadrant (31%). The majority (77%) of biopsies revealed malignancy, with invasive ductal carcinoma being the most common tumor (60%). Ultrasound findings predominantly showed BIRADs IV (58%) and V (33%) classifications, indicating a high likelihood of malignancy. **Conclusion:** The majority of core biopsy results were cancerous. Most cancers were invasive ductal carcinoma. Ultrasound was significantly associated with histopathology (tru-cut needle biopsy). Radio-pathological correlation is crucial for reliable outcomes. Tru-cut biopsy sensitivity, specificity, and accuracy (98%, 100%, 95%).

KEYWORDS: The Assessment, Tru-Cut Biopsies, Breast, Masses, Ultrasound, Iraqi Patients.

INTRODUCTION

Breast cancer stands as the most prevalent invasive cancer affecting women globally and in North America, ranking second only to lung cancer in mortality among women. Despite an increase in incidence rates due to enhanced detection methods, mortality rates have seen a decline. This improvement is partly due to a better understanding of breast cancer's epidemiology, encompassing reproductive, genetic, and environmental risk factors. Such knowledge has been pivotal in refining patient counseling, screening, and management practices.^[1] The triple evaluation protocol, consisting of clinical examination, radiological imaging, and biopsy, is pivotal in determining the nature of breast lumps.^[2] Breast ultrasound emerges as a critical imaging modality in evaluating breast lumps, favored for its safety, non-invasiveness, and lack of ionizing radiation exposure. It's

particularly useful in women under 40 years old, while mammography is recommended for those over 40 with less dense breasts.^[3,4] When ultrasounds reveal abnormalities, such as suspicious solid masses or structural distortions, ultrasound-guided breast biopsies are employed. This method uses sound waves to locate abnormalities and extract tissue samples for microscopic examination. Although it's less invasive than surgical biopsies, with minimal scarring and no exposure to ionizing radiation, its limitations include the potential to miss lesions or underestimate disease extent. In cases where lesions are not clearly visible on ultrasound, especially with clustered calcifications, or are too small, surgical biopsy may be necessary.^[5,6] The Tru-cut biopsy is favored over Fine Needle Aspiration Cytology (FNAC) for diagnosing breast lesions, offering ample tissue for an accurate pathological diagnosis. This

facilitates crafting a targeted therapeutic strategy for managing breast masses, with less invasiveness, minimal deformation, and scarring, alongside lower costs. Despite possible complications like hematoma and infection, its primary goals include achieving high diagnostic accuracy and providing detailed tumor information, such as type, grade, invasiveness, and receptor status. Preoperative core needle biopsy is increasingly becoming the standard in breast carcinoma diagnosis.^[7,8] While FNAC might still be used for image-detected lesions, Tru-cut biopsy is preferred for its ability to provide larger tissue samples suitable for histological analysis. Unlike FNAC, Tru-cut biopsy doesn't allow for same-day results due to the need for paraffin processing, which, however, offers the advantage of distinguishing between invasive and non-invasive diseases and determining ER, PR, HER-2 status.^[9] A review of 160 studies on Tru-cut biopsy techniques revealed high sensitivities (over 97%) and specificities (92 to 99%) for both US-guided and mammography-guided biopsies, outperforming non-imaging-guided free-hand biopsy methods.^[10] The study aims to explore the connection between clinical-pathological features of breast masses, as determined by Tru-cut biopsies, and ultrasound results, encompassing factors like age, marital status, and histopathological diagnosis. It seeks to assess and compare the diagnostic accuracy of ultrasound imaging and Tru-cut biopsies in identifying breast masses.

METHOD

A retrospective study was conducted from January 2022 to January 2023, analyzing 100 randomly selected patients who underwent breast Tru-cut biopsies. These samples were collected from the Teaching Laboratory of Al-Imamain Al-Kadhmain Medical City, the Oncology Teaching Hospital's Pathology Departments, and private laboratories throughout 2023. The study aimed to examine the histopathological and clinical parameters associated with breast masses, including age, location, size, presentation, marital status, parity, and findings

from both pathology reports and ultrasounds. The study focused on female patients with breast masses who had been evaluated through Tru-cut biopsies and ultrasound examinations. Male patients, cases of metastatic breast cancer, and untreated breast cancers were excluded from the study. This exclusion criterion was set to ensure a focused and relevant patient cohort for analyzing the relationship between clinical-pathological features and imaging findings. In the Pathology Department at the College of Medicine, Al-Nahrain University, hematoxylin and eosin (H&E) stained slides were re-examined by supervising pathologists to verify or revise initial diagnoses, emphasizing the rigorous quality control and accuracy of the study's pathological assessments. Statistical analysis was a crucial component of this study, utilizing "Minitab" version 20.1 for data analysis. The presentation of data involved bar charts and pie charts generated with "Microsoft Excel 2019" to visually represent data distribution and facilitate a clearer understanding of the findings. Contingency tables were used to employ the Chi-squared test, evaluating the significance of correlations between variables. A p-value of less than 0.05 was considered statistically significant, which is crucial for establishing the validity of the study's findings. This statistical approach allowed for a thorough examination of the relationship between the clinical-pathological features of breast masses and the outcomes of Tru-cut biopsies and ultrasound findings, aiming to assess the effectiveness and correlation of these diagnostic methods in breast mass evaluation.

RESULTS

The age of the studied sample range from 21-85 years with a mean of (49.9±12.5SD). Most of the studied sample was ≥ 50 years. The number of married studied sample 82% cases and the number of unmarried studied sample 18% cases and the number of multiparous are 82% cases and the number of nulliparous 18 cases and mean parity 5.3 as illustrated in (Table 1).

Table 1: Patients' Sociodemographic Characteristics.

Characteristics	Total patients [n = 100]	
	Mean ± SD	Range
Age (years)	49.9 ± 12.5	(21.0 – 85.0)
Marital status	Married No. (%)	Unmarried No. (%)
	82 (82.0)	18 (18.0)
Parity	Multiparous No. (%)	Nulliparous No. (%)
	82 (83.0)	18 (17.0)
Mean Parity (Range)	5.3 (2-8)	Nil

Most sample studied were palpable mass, the number of palpable mass 68% and number of no palpable mass 32%, and most sample studied were right breast mass in upper outer quadrant (31%) followed by left breast mass in upper outer quadrant (13%), right breast mass in lower outer quadrant seen in (10%), and Left breast - Lower outer quadrant seen in (4%). Other sites in right breast at

6 o'clock and in left breast at 6 o'clock seen in (6%), Left breast at 12 o'clock seen in (6%), left breast at 3 o'clock (2%). Other different sites seen in (21%), and bilateral mass seen in 3% as illustrated in (Table 2). Mass diameter range (10-55) mm and mean diameter ± SD (19.1±9.7) as illustrated in (Table 2).

Table 2: Distribution of patients' presentation & breast mass characteristics.

Items	Total [n = 100]
Presentation, No. (%)	
Palpable breast mass	68 (68.0)
Non-palpable breast mass	32 (32.0)
Site of mass No. (%)	
Right breast - upper outer quadrant	31 (31.0)
Left breast - upper outer quadrant	13 (13.0)
Right breast - lower outer quadrant	10 (10.0)
Left breast	7 (7.0)
Right breast	6 (13.0)
Right breast at 6 o'clock	6 (6.0)
Left breast at 6 o'clock	6 (6.0)
Left breast at 12 o'clock	6 (6.0)
Left breast - Lower outer quadrant	4 (4.0)
Bilateral masses	3 (3.0)
Left breast at 3 o'clock	2 (2.0)
Other different sites...	6 (6.0)
Mass diameter measured by Ultrasound (mm)	
Mean diameter ± SD	19.1 ± 9.7
Mass Diameter range	(10-55)

Most biopsies of the studied sample were malignant (77%). The most common tumor was invasive ductal carcinoma seen in 60% cases, followed by ductal carcinoma in situ followed by invasive lobular carcinoma seen in 6% cases, invasive mixed carcinoma in 3% cases, papillary carcinoma in 1% cases, and atypical ductal hyperplasia 1%, while benign lesions were 23%,

fibroadenoma (18%) seen in (Figure 2), fibrocystic diseases (2%), duct ectasia (2%) seen in (Figure 1), and necrotizing mastitis (1%). Most cases of the studied sample in ultrasound finding were BIRADs IV (58%). Followed by BIRADs V (33%) and BIRADs III (5%), and BIRADs II (4%) as illustrated in (Table 3, 4).

Table 3: Distribution histopathological features of breast mass among the studied patients.

Histopathological features	No. (%) [Total n=100]
Invasive ductal carcinoma	60 (60.0)
Ductal carcinoma in situ	6 (6.0)
Invasive lobular carcinoma	6 (6.0)
Invasive mixed carcinoma	3 (3.0)
Papillary carcinoma	1 (1.0)
Atypical ductal hyperplasia	1 (1.0)
Fibroadenoma	18 (18.0)
Fibrocystic disease	2 (2.0)
Duct ectasia	2 (2.0)
Necrotizing mastitis	1 (1.0)

Table 4: Distribution of ultrasonic features of breast mass among the studied patients.

Ultrasonic BIRADs Score	No.(%) [Total n=100]
BIRADs V	(33,0) (33)
BIRADs IV	58 (58.0)
BIRADs III	5 (5.0)
BIRADs II	4 (4.0)
BIRADs I	0 (0.0)

The Validity of the ultrasound test in the diagnosis of breast malignancy in comparison to the gold standard (histopathology). As shown in (Table 5) has a Sensitivity

(98.1%) and Specificity (100%), Positive Predictive Value (99.4%) Negative Predictive Value (97.6%) and Accuracy (95.6%) as illustrated in (Table 5).

Table 5: Validity indicators of the tru-cut biopsy test in the diagnosis of breast malignancy.

Ultrasound test	Value	95% CI
Sensitivity	98.1%	96.75% to 99.17%
Specificity	100 %	86% to 95.13%
Breast ca prevalence in Iraq (*)	0.04%	
Positive Predictive Value	99.4%	88.9% to 94.8%
Negative Predictive Value	97.6%	99.7% to 100.00%
Accuracy	95.6%	88.9% to 96.6%

* Based on 2019 data from Iraqi Ministry of Health.

A statistically significant association was detected between age and histopathological diagnosis (p value=0.001), significant association was Detected between parity and histopathological diagnosis (p

value=0.001), significant association was detected between marital status and histopathological diagnosis (p value= 0.001) as illustrated in (Table 6).

Table 6: Distribution of sociodemographic characteristics to histopathological features of breast mass among studied patients.

Parameters	Benign [n = 25]	Malignant [n = 75]	All [n = 100]	P-value*
Age group				
20-29 Years	3	0	3	0.001
30-39 Years	6	8	14	
40-49 Years	8	28	36	
>50 Years	8	39	47	
Marital status				
Married	15	67	82	0.001
Unmarried	10	8	18	
Parity				
Multiparous	14	68	82	0.001
Nulliparous	10	18	18	

* Chi-square test was used.

A statistically no significant association was detected between mass diameter and histopathological diagnosis (p-value=0.883). A statistically significant association was detected between BIRADS score and histopathological diagnosis (p-value =0.001). A

statistically no significant association was detected between breast mass site and histopathological diagnosis (p-value =0.559). A statistically significant association was detected between presentation and histopathological diagnosis (p-value =0.048), as illustrated in (Table 7).

Table 7: Distribution of ultrasonic features to histopathological diagnosis of breast mass among studied patients.

Parameters	Benign [n = 25]	Malignant [n = 75]	All [n = 100]	P-value*
Mass diameter				
10-19 mm	14	37	51	0.883
20-29 mm	7	23	30	
≥30 mm	4	15	19	
BIRADS score				
BIRADS II	3	1	4	0.001
BIRADS III	3	2	5	
BIRADS IV	17	41	58	
BIRADS V	2	31	33	
Breast mass site				
Right	13	44	57	0.559
Left	10	30	40	
Bilateral	2	1	3	
Presentation				
Non-palpable mass	12	20	32	0.048
Palpable mass	13	55	68	

* Chi-square test was used.

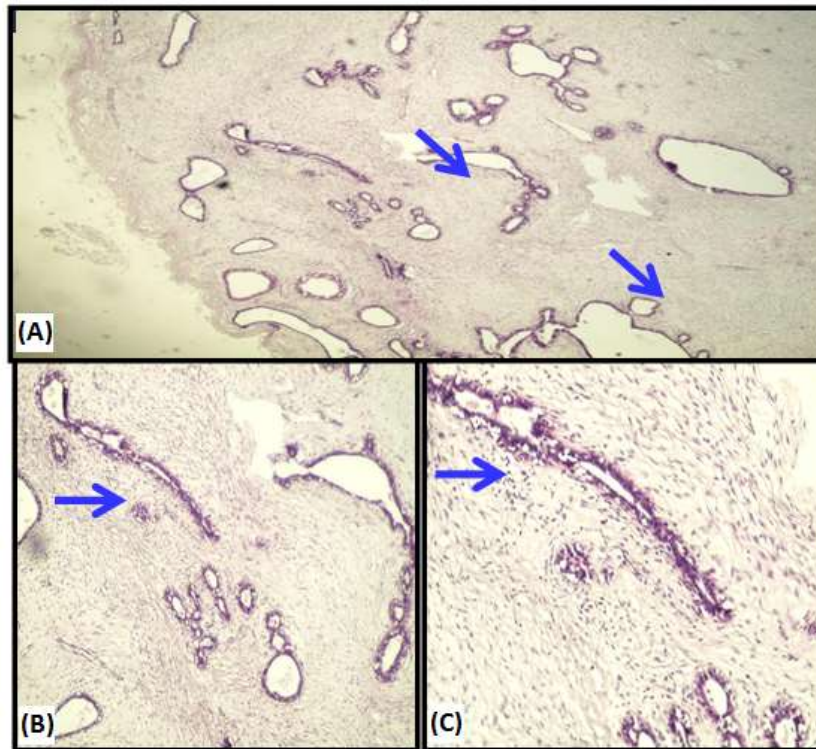


Figure 1: Section of fibroadenoma. A, at (4x) showing the circumscribed border, mixed glandular and stromal growth (arrow). B, at (10x) show pericanalicular fibroadenoma when the regular round or oval configuration of the gland is preserved (arrow). C, at (20x) the gland composed of cuboidal or low columnar cells with round regular nuclei resting on myoepithelial layer (arrow), H&E stain.

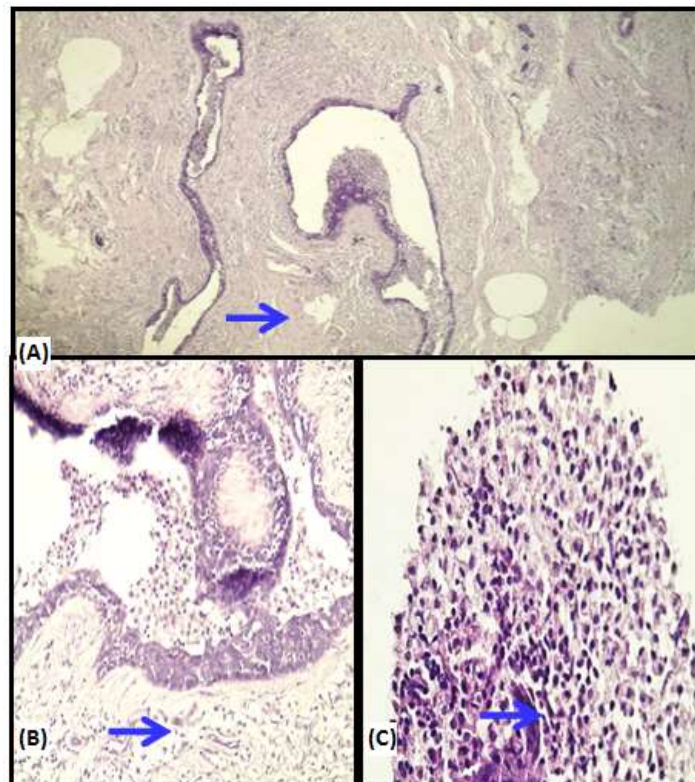


Figure 2: Section of mammary duct ectasia, A at (4x) show dilated of large duct (arrow), B, at (10x) show dilated duct with accumulation of lipid rich detritus in the lumen and florid inflammatory reaction rich in macrophage and plasma cells (arrow). C, at (40x) show marked inflammation many macrophage and plasma cells (arrow). H&E stain.

DISCUSSION

The study, conducted from January 2022 to January 2023, aimed to assess the clinico-pathological features of breast masses through Tru-cut biopsies and their correlation with ultrasound findings. The mean age of participants was 49.9 years, aligning closely with similar studies conducted in India and South Korea but slightly lower than those in Puerto Rico, Spain, Turkey, and Canada, suggesting geographical and methodological differences could influence age demographics in breast cancer studies.^[11,12] The study highlighted the importance of age as a crucial risk factor for breast cancer, emphasizing the need for early mammography screening, particularly for women aged 40 and above, reflecting the increased incidence of breast cancer with age.^[13,14] Marital status and parity were also examined, with a majority of patients being married and multiparous. These demographic factors are noteworthy as marriage has been associated with better cancer survival rates, and early first pregnancy has been linked to reduced breast cancer risk.^[15,16] The study further discussed mass size, which ranged from 10-55mm, and its implications for treatment decisions, indicating that accurate assessment of tumor size through imaging techniques like mammography, US, and MRI is vital for choosing the appropriate treatment modality.^[17,18] The predominance of palpable masses (68%) in the study reflects the necessity of imaging evaluation for accurate characterization, with most masses located in the upper outer quadrant of the right breast. This distribution underscores the importance of targeted breast ultrasound and diagnostic mammography for proper diagnosis, especially since the physical palpation of masses has limitations.^[19,20] Histopathologically, 77% of biopsies were malignant, with invasive ductal carcinoma being the most common type, mirroring findings in other studies and highlighting the pivotal role of Tru-cut biopsy in the diagnostic pathway for breast cancer. This technique is noted for its accuracy, low cost, minimal complications, and quick procedure time, making it an essential step towards effective breast cancer care.^[12,21,22] Ultrasound findings predominantly showed BIRADs IV and V classifications, indicating a higher likelihood of malignancy, which is consistent with other research. However, discrepancies in BIRADs categorization across different studies suggest that factors like patient age, breast surgery history, and technical aspects of the imaging process can influence diagnostic accuracy.^[23,24] The association between ultrasound BIRADs categories and histopathology was statistically significant, with a high sensitivity and specificity of Tru-Cut biopsy in diagnosing breast cancer, confirming its superiority over ultrasound findings alone. This underlines the importance of combining imaging techniques with needle biopsy for enhanced diagnostic sensitivity and addressing the challenges of false-negative and false-positive cases, which may result from sampling errors or misinterpretation.^[25-27] The study underscores the synergy between clinical, radiological, and histopathological assessments in diagnosing breast

cancer. The integration of Tru-cut biopsy and ultrasound findings, coupled with demographic factors like age, marital status, and parity, plays a critical role in the early detection and management of breast cancer, ultimately influencing treatment outcomes and survival rates.

CONCLUSION

The majority of core biopsy results confirmed malignancy, with invasive ductal carcinoma being the most prevalent type. A significant statistical correlation was found between ultrasound and histopathological findings from Tru-cut needle biopsies. Radiopathological correlation is crucial for accurate diagnoses, with Tru-Cut biopsy demonstrating high sensitivity (98%), specificity (100%), and accuracy (95%).

REFERENCES

1. Kumar V, Abbas AK, Aster JC. Robbins basic pathology e-book. Elsevier Health Sciences, 2017 Mar 8.
2. Kachewar SS, Dongre SD. Role of triple test score in the evaluation of palpable breast lump. *Indian J Med Paediatr Oncol*, 2015 Apr-Jun; 36(2): 123-7.
3. Rakhlin, A., Shvets, A., Iglovikov, V., Kalinin, A.A. Deep Convolutional Neural Networks for Breast Cancer Histology Image Analysis. In: Campilho, A., Karray, F., ter Haar Romeny, B. (eds) *Image Analysis and Recognition. ICIAR 2018. Lecture Notes in Computer Science*, 2018; 10882. Springer, Cham. https://doi.org/10.1007/978-3-319-93000-8_83
4. Rosai J. Rosai and Ackerman's surgical pathology e-book. Elsevier Health Sciences, 2011 Jun 20.
5. Liberman L. Percutaneous image-guided core breast biopsy. *Radiol Clin North Am.*, 2002; 40: 483–500.
6. Schoonjans JM, Brem RF. Fourteen-gauge ultrasonographically guided large-core needle biopsy of breast masses. *J Ultrasound Med.*, 2001; 20: 967–972.
7. Roberts JG, Preece PE, Bolton PM, Baum M, Hughes LE. The 'tru-cut' biopsy in breast cancer. *Clin Oncol.*, 1975; 1: 297–303.
8. Parker SH. Percutaneous large core breast biopsy. *Cancer*, 1994; 74: 256–262.
9. Parker SH, Burbank JRJ, et al. Percutaneous large-core breast biopsy: a multi-institutional study. *Radiology*, 1994; 193: 359–364.
10. Smith DN, Rosenfield Darling ML, Meyer JE, et al. The utility of ultrasonographically guided large-core needle biopsies. *J Ultrasound Med.*, 2001; 20: 43–49.
11. C. Shashirekha A., R. Rahul Singh, H. Ravikiran R., Krishna Prasad and P. Sreeramulu N. "Fine needle aspiration cytology versus trucut biopsy in the diagnosis of breast cancer A comparative study", *International journal of biomedical research*, 2017; 8(9): 497-500.
12. Radhakrishna S, Gayathri A, Chegu D. Needle core biopsy for breast lesions: An audit of 467 needle core biopsies. *Indian Journal of Medical and*

- Paediatric Oncology: Official Journal of Indian Society of Medical & Paediatric Oncology, 2013 Oct; 34(4): 252-256.
13. De Glas NA, Kiderlen M, Vandenbroucke JP, de Craen AJ, Portielje JE, van de Velde CJ, Liefers GJ, Bastiaannet E, Le Cessie S. Performing Survival Analyses in the Presence of Competing Risks: A Clinical Example in Older Breast Cancer Patients. *J Natl Cancer Inst.*, 2015 Nov 26; 108(5): djv366. doi: 10.1093/jnci/djv366. PMID: 26614095.
 14. Benz C.C. Impact of aging on the biology of breast cancer. *Crit. Rev. Oncol.*, 2008; 66: 65–74. doi: 10.1016/j.critrevonc.2007.09.001.
 15. Malherbe F, Nel D, Molabe H, Cairncross L, Roodt L. Palpable breast lumps: An age-based approach to evaluation and diagnosis. *S Afr Fam Pract* (2004). 2022 Sep 23; 64(1): e1-e5. doi: 10.4102/safp.v64i1.5571. PMID: 36226953; PMCID: PMC9575372.
 16. Osborne C, Ostir GV, Du X, Peek MK, Goodwin JS. The influence of marital status on the stage at diagnosis, treatment, and survival of older women with breast cancer. *Breast Cancer Res Treat*, 2005 Sep; 93(1): 41-7.
 17. Satyajit Samal,*, Phanindra Kumar Swain, Siddharth Pattnayak Clinical, pathological and radiological correlative study of benign breast diseases in a tertiary care hospital Department of General Surgery, SCB Medical College, Cuttack, Odisha, India *International Int Surg J.* 2019 Jul; 6(7): 2428- 2432.
 18. Saha A, Mukhopadhyay M, Das C, Sarkar K, Saha AK, Sarkar DK. FNAC Versus Core Needle Biopsy: A Comparative Study in Evaluation of Palpable Breast Lump. *J Clin Diagn Res.*, 2016 Feb; 10(2): EC05-8.
 19. Altintas Y, Bayrak M. Diagnostic utility of tru-cut biopsy in the assesment of breast lesions. *annalsmedres* [Internet]. 2021 May 25 [cited 2024 Mar. 5]; 26(3): 0505-9.
 20. Abdulwahid HM. Comparison between Mammography and Breast Ultrasound in the Detection of Breast Cancer in Dense Breast Tissue among a Sample of Iraqi Women. *J Fac Med Bagdad* [Internet]. 2019 Jul 29; 61(1): 25-9.
 21. Oluwasola AG, Adeoye AO, Afolabi AO, Adeniji-Sofoluwe AT, Salami A, Ajani MA, Ogundiran TO, Obajimi MO. Diagnostic accuracy of tru-cut biopsy of breast lumps at University College Hospital, Ibadan. *Afr J Med Med Sci.*, 2015 Jun; 44(2): 157-62.
 22. Muddegowda PH, Lingegowda JB, Kurpad R, Konapur P, Shivarudrappa A, Subramaniam P. The value of systematic pattern analysis in FNAC of breast lesions: 225 cases with cytohistological correlation. *J Cytol.*, 2011; 28: 13–9.
 23. Günes ME. Comparison of the ultrasound-guided tru-cut biopsy with postoperative histopathology results in patients with breast mass. *Ann Ital Chir.*, 2018; 89: 30-35. PMID: 29629888.
 24. Akinnibosun-Raji HO, Saidu SA, Mustapha Z, Ma'aji SM, Umar M, Kabir FU, Udochukwu UG, Garba KJ, Raji MO. Correlation of Sonographic Findings and Histopathological Diagnoses in Women Presenting With Breast Masses. *J West Afr Coll Surg.*, 2022 Apr-Jun; 12(2): 109.
 25. Irurhe NK, Adekola OO, Awosanya GO, et al. The accuracy of ultrasonography in the diagnosis of breast pathology in symptomatic women. *Nigerian Quarterly Journal of Hospital Medicine*, 2012 Oct-Dec; 22(4): 236-239. PMID: 24568056.
 26. Nabaa A, Abedtwfeq RH. Ultrasound guided core needle biopsy in the diagnosis of suspicious breast lesions: Radiologist's perspectives. *AL-Kindy Coll Med J.*, 2023; 19(1): 22-29.
 27. Bello N, Olarinoye-Akorede SA, Mohammed HM, Aliyu I, Abdullahi MZ, Ibrahim MZ, Lawal S, Rasheed MH. The Correlation of Sonographic and Histopathologic Findings in the Diagnosis of Palpable Breast Masses in Zaria. *J West Afr Coll Surg.*, 2023 Jan-Mar; 13(1): 74-78.