

The diagnostic accuracy of fine needle aspiration cytology versus core needle biopsy for palpable breast lump(s)

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ABSTRACT

Objectives: Breast lump is one of the most common surgical problems in females. Surgical biopsy of palpable breast lump was considered the gold standard for the diagnosis of breast lump(s). Emphasis has been placed on improving method for establishing a definitive diagnosis of breast mass prior to surgery. Our aim was to compare the diagnostic accuracy of fine needle aspiration cytology (FNAC) and core needle biopsy (CNB) in patients with palpable breast masses.

Methods: Prospective randomized controlled clinical trial included 296 Female patients with breast lumps, presented to Al-Thawra Teaching Hospital, Sana'a, Yemen between May 1998 - May 2002. All the patients submitted either to FNAC or CNB equally. The results were then compared with the final diagnosis by histopathology.

Results: The patient age ranged from 15-74 years with

a mean of 33.77 ± 11.91 years. Married patients were 69.3% and the most common presentation was breast lump(s) (88.5%). The mean size of the tumor was 3.47 ± 1.43 cm in diameter. The FNAC sensitivity was 66.66%, 81.8% specificity, 75.7% accuracy, positive predictive value (PPV) 100% and negative predictive value (NPV) 90%, while in core needle breast biopsy sensitivity was 92.3%, 94.8% specificity, 93.4% accuracy, PPV 100% and NPV 100%. The diagnostic accuracy of CNB was higher than the FNAC, which was statistically significant ($p < 0.05$).

Conclusion: Both procedures are simple, easy, safe, cheap and reliable, but CNB is more accurate than the FNAC.

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Breast lump is one of the most common surgical problems in females. Cancer of the breast is the most common site of cancer in women and patients usually present with a palpable breast lump.¹ However, it is sometimes difficult to determine whether a suspicious lump is benign or malignant by a simple clinical assessment. Therefore, a method for definitive diagnosis of patients who present with breast lump at the outpatient clinic is needed. This method must be accurate and easy to perform. It must also be acceptable to the patients

and must not require too much preparation or expensive equipment. The role of fine needle aspiration cytology (FNAC) in establishing the diagnosis of breast cancer has increased. Recent studies have shown the high accuracy and cost effectiveness of FNAC for identifying cancer in patients with clinically suspicious palpable lesions and small breast tumors.^{2,3} A definitive diagnosis sometimes cannot be made by FNAC alone, either due to inherent limitations of cytological examination or the inability to obtain adequate

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Table 1 - Clinical analysis of the patients.

Characteristics	FNAC (n=148)	CNB (n=148)	p value*
Mean ± SD age (years)	33.36 ± 12.47	34.18 ± 11.36	0.559
Marital status			
Married (n=205)	96	109	0.126
Single (n=85)	50	35	
Widow (n=6)	2	4	
Menopausal status			
Premenopausal (n=234)	116	118	0.775
Postmenopausal (n=62)	32	30	
Children			
Number (n=206)	94	112	0.553
Mean ± SD	3.37 ± 2.26	3.55 ± 2.10	
Presentation			
Lump (n=262)	129	133	0.647
Mastalgia (n=28)	15	13	
Nipple discharge (n=6)	4	2	
Side			
Right	74	75	0.907
Left (n=147)	74	73	
Mean ± SD tumor size (cm)	3.41 ± 1.46	3.53 ± 1.41	0.468
FNAC - Fine needle aspiration cytology, CNB - Core needle biopsy, *p<0.05 statistically significant			

material for diagnosis.¹ Core needle biopsy (CNB) has been performed to evaluate breast lesions and it has the advantage of having a core of tissue possessed by traditional histopathological techniques.^{4,5} Due to this controversy our aim was to compare the diagnostic accuracy of FNAC and CNB and determine which of them could be used to avoid surgical biopsy in patients with palpable breast masses. The hypothesis was that CNB is more accurate than FNAC, but neither CNB nor FNAC can replace open biopsy in the diagnosis of breast lump.

Method. This prospective randomized clinical trial was carried out at Al-Thawra Teaching Hospital, Sana'a, Yemen between May 1998 - May 2002, involving 296 patients with breast lump(s) who gave their consent to take part. Patients were randomly assigned for FNAC or CNB by a numbered sealed envelopes. After complete history and clinical examination, the patients were submitted to either FNAC or CNB. Fine needle aspiration cytology was performed using 23-gauge needle and 10 ml syringe without local anesthesia and with an average of 4-6 passes after sterilizing the skin. The aspiration was examined after standard Giemsa and Papanicolaou staining.

Cytology was classified as benign, malignant or inadequate sample. Unsatisfactory aspirates (Inadequate specimen (IS)) were those not representative in regard to sampling, cellularity and quality of the smear or staining or both. Core needle biopsy was performed using a core biopsy needle (Trucut needle, manufactured by Travenol Laboratories, Inc.). After sterilizing the skin, approximately 1 ml of 1% lidocaine was given to anesthetize the area, where small stab incision was carried out. The specimen was removed from the needle and transferred into formalin. The patients were treated according to the final diagnosis made by histopathology.

Patients who have malignancies were subsequently submitted to the appropriate treatment options depending on the tumor stage. For patients with benign biopsy the confirmatory excision biopsy was the appropriate treatment (follow-up was difficult, due mainly to the level of education and residence of patients). Excision biopsy was carried out in case of clinically diagnosed benign lesions, but in case of clinically malignant (not confirmed by either FNAC or CNB), either frozen section (rarely available) or open biopsy prior to definitive surgical procedure was done. The diagnostic accuracy, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of both FNAC and CNB were compared with the final histopathological diagnosis obtained either by excision biopsy or mastectomy. They were calculated according to Hatada et al⁶ as follow: Sensitivity = TP/TP+FN+ISa, Specificity = TN/TN+FP+ISb, Accuracy = TP+TN/TP+TN+FN+FP+ISa+ISb, PPV = TP/TP+FP, NPV = TN/TN+FN. Where TP = true positive, FN = false negative, IS = inadequate sample (specimen), TN = true negative, FP = false positive, IS-a = inadequate specimen rate for malignant lesions, IS-b = inadequate specimen rate for benign lesions. The primary end point was to compare FNAC and CNB in regards to easy performance and diagnostic accuracy. The secondary end point was to assess the accuracy of clinical diagnosis in comparison to the final histopathological diagnosis.

Statistical methods. Where appropriate, the Statistical Package for Social Sciences version 11, student t-test and chi-square tests were used. A p value of less than 0.05 was taken as significant.

Results. This study included 296 consecutive patients and performed over 4 years. Randomization generated 2 groups with similar demographic, physical and clinical characteristics with no significant difference ($p>0.05$) **Table 1**. The patient age ranged from 15-74 years with a mean of 33.77 ± 11.92 years. Married patients were 69.3% and 79% were premenopausal. The most common

Table 2 - Diagnostic value of FNAC and CNB

Characteristics	FNAC n=148 (%)	CNB n=148 (%)	p value*
Sensitivity	(66.66)	(92.3)	<0.0001
Specificity	(81.8)	(94.8)	0.0006
Accuracy	(75.7)	(93.9)	0.0001
Positive predictive value	(100)	(100)	
Negative predictive value	(90)	(100)	
Inadequate sample	(18.9)	(6.08)	<0.05

FNAC - Fine needle aspiration cytology, CNB - Core needle biopsy,
*p<0.05 statistically significant

presentation was breast lump(s) (88.5%), followed by mastalgia (9.45%) and only 2% with nipple discharge. Of the complaints 50.3% involved the right breast while 49.7% involved the left breast. The mean size of the breast lumps was 3.47 ± 1.43 cm in diameter with a range of 2-10 cm. The sensitivity of the clinical diagnosis in comparison to the final histopathological diagnosis was 76.8%, 95.7% specificity and 88.5% accuracy. There was no significant difference in the sensitivity between FNAC and clinical diagnosis of malignancy ($p>0.05$), while the specificity and over all accuracy of the clinical diagnosis were more significant than the FNAC ($p<0.05$). The sensitivity of FNAC procedure was 66.66%, 81.8% specificity, 75.7% accuracy, 100% PPV and 90% NPV, while CNB was 92.3% sensitive, 94.8% specific, 93.9% accurate, 100% PPV and 100% NPV. The diagnostic value (sensitivity, specificity and accuracy) of CNB is higher than FNAC and statistically significant with a p value of less than 0.05, **Table 2**.

The biopsy was unsuccessful (example, yielded an IS) in 28 patients undergoing FNAC (12 of them were finally found to have malignant and 16 had benign lesions), in 9 patients undergoing CNB (4 had malignant lesions and 5 had benign lesions). The inadequate biopsy rate of CNB was significantly lower than that of FNAC ($p<0.05$), **Table 2**.

All the IS were classified as false results as no cytologic or histopathologic information was provided. There were no false positive results in either FNAC or CNB, but 8 false negative (benign cells proved by final histopathology to be malignant) in the FNAC, while no false negative results were recorded in CNB. There were no major complications with these methods, except mild pain

in 23 patients and very minimal bleeding in 7 patients of CNB.

Discussion. The study groups were nearly similar with no significant difference in the demographic or clinical characteristics. The mean age was 33.77 years and 69.3% of the patients were married. The most common presentation was breast lump (88.5%) with a mean size of 3.47cm in diameter. Similar findings were reported by other investigators,^{3,7} as regards to the size of tumor, but differ in the mean of age, Hatada et al⁵ reported a mean age of 52 years, Yong et al⁶ reported a mean age of 57 years and mean age of 60 years was reported by Agarwal et al⁷ In this study, only the standard CNB (Trucut) was available (without image guidance or automated biopsy instrument).

Inadequate samples were considered as a false result, which is in agreement with the findings of Hatada et al.⁵ In case of non-conclusive FNAC or CNB results, we proceed to either frozen section (rarely available) or to open biopsy if the clinical diagnosis is malignant. This is consistent with Rubin et al⁸ who mentioned that all lesions classified as clinically highly suspicious need to be resolved ultimately with excisional biopsy in those cases in which FNAC is either suspicious or negative. The diagnostic accuracy of clinical examination was 76.8% sensitive, 95.7% specific and 88.5% accurate. These high results could be explained by the late presentation of the patients, where the local signs of malignancy and even metastases are very clear. This is in contrast to those patients who underwent a screening program or those who presented early and sought medical advice, in which the differentiation between benign and malignant is difficult. In this study, the clinical diagnosis was clearly superior to the FNAC particularly in terms of specificity (95.7% versus 81.8%).

In the 1980s and early 1990s the surgical biopsy of palpable breast lumps was considered the gold standard for the diagnosis of breast lumps.⁹ Fine needle aspiration cytology has been used as a diagnostic modality and is currently used as one of the modalities of triple assessment for breast lesions.⁷ Fine needle aspiration cytology proved to be cheaper, faster and somewhat more sensitive and superior than the standard CNB.^{5,10} It should be the diagnostic procedure of choice for solid palpable breast tumor and by using it as the initial diagnostic procedure in those patients, it is possible to avoid open biopsy, and go directly to definitive therapy.¹¹ Ibrahim and Awatif,¹² in their study, which included 72 patients concluded that FNAC is an efficient tool and yields a definitive diagnosis. However, FNAC has its own limitation and its accuracy depends on the skill of the cytopathologist and the operator and

many breast surgeons will not rely on the result of FNAC alone.⁵ Some studies mentioned that FNAC may fail to diagnose even palpable lobular carcinoma and cannot distinguish between *in situ* versus invasive lesions.^{10,13,14} Moreover, the need for an expert cytopathologist on site is a limiting factor at various district hospitals.¹¹ Core needle biopsy provide a large tissue sample, an advantage for histological examination, which cannot be obtained with FNAC.⁵ Also, it has the additional advantage of providing tissue for histological typing of tumor, evaluation of hormone receptor status, expression of oncoprotein status and confirmation of invasive disease and it has a superior diagnostic power when compared with FNAC.^{7,15} On the other hand, there is more patients' morbidity in terms of pain and bleeding when using a Trucut needle as compared to FNAC needle.⁶ Also, CNB do not have the advantage of immediate reporting and in fact the needle may even push the lesion away and sample only normal breast tissue.^{6,7} In our study, the sensitivity, specificity, accuracy, PPV and NPV were higher and statistically significant in CNB, **Table 2**. This is in agreement with Hatada et al⁷ who found that ultrasound guided - core needle biopsy (US-CNB) was significantly higher than ultrasound guided - fine needle aspiration cytology (US-FNAC) and with Agarwal et al⁷ who reported in their study that free hand core biopsy (FHCB) was clearly superior to FNAC. Other studies^{6,8} reported contradictory result. Yong et al⁶ reported a higher detection rate (90%) for FNAC compared to 67% for Trucut biopsy. Rubin et al⁸ found that the FNAC was a reliable diagnostic step with a PPV of 100% and NPV of 89%.

In this study, IS was recorded in 6.08% in CNB and 18 (9%) in FNAC with a statistically significant difference of $p < 0.05$. This significant difference also recorded in many studies, where insufficiency rate of 2-10% reported on CNB.¹⁶⁻¹⁹ Also, insufficiency rate of 26.6% and between 0-28% reported on FNAC.^{8,19-21} In contrast to our study, Agarwal et al⁷ reported 0% insufficiency rate by using FHCB. This is consistent with Hatada et al⁷ who mentioned in their study that the IS rate of US-CNB was significantly lower than that of US-FNAC. In this study, there were no FP results in both FNAC or CNB, while FN results was recorded in 8 cases of the FNAC, but no FN result recorded in the CNB. Other studies demonstrated variable results, where FN rates ranged between 0-35% and FP rates ranged between 0-2% by using FNAC.^{8,21,22} Sadler et al¹¹ reported a 13% FN results with FNAC. Agarwal⁷ in his study reported no FP or FN results (0%) in using FHCB.

In conclusion, this study described the experience of FNAC and CNB in our hospital. Regardless of the limitation of these procedures, both FNAC and CNB provide an excellent opportunity to avoid

unnecessary open biopsies. However, from these results, we conclude that CNB has a superior diagnostic power when compared with FNAC. Anyway, it is our standard practice to excise the lesion for diagnostic purposes if a pre-operative cancer diagnosis cannot be made.

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