ULTRASOUND GUIDED FINE NEEDLE ASPIRATION CYTOLOGY VERSUS CORE BIOPSY IN THE PREOPERATIVE ASSESSMENT OF NON-PALPABLE BREAST LESIONS

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Background: Breast screening is a method of detecting breast cancer at a very early stage. Most of the lesions detected by screening are not malignant. Objective of this study was to compare ultrasound guided fine needle aspiration cytology and core biopsy in the preoperative assessment of non-palpable breast lesions. **Methods:** The study was conducted prospectively at Department of Radiology, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Pakistan from March 2004 to February 2005. All the patients underwent fine needle aspiration cytology and core biopsy. Later on, all of them had excision biopsy/ mastectomy. Prospectively 80 patients were studied; information was collected on a specifically designed form according to inclusion criteria. The patient age, sex, medical record number and side of lesion were recorded. Clinical history of duration of lump was also taken. Informed consent was obtained. **Results:** The age of patients were ranges from 20–71 years, with mean of 44.31±11.002 and the maximum number of patients 28 (35.3%) was between the ages 50–59 years. The sensitivity of FNAC was 92.85%, while the specificity of was 90% and the accuracy rate was 92.1%. The sensitivity of core biopsy was 94.64%, specificity 91.30% and accuracy rate was 94.87%. **Conclusion:** Fine Needle Aspiration has been found to be an extremely useful method for the diagnosis of lumps of breast. The accuracy and the sensitivity of diagnosis on fine needle aspiration cytology were high.

Keywords: fine needle biopsy, core biopsy, ultrasound guided, non-palpable breast cancer, breast lesion

INTRODUCTION

Breast screening is a method of detecting breast cancer at a very early stage. The first step is a mammogram that can detect small changes in breast tissue that may indicate cancers that are too small to be felt either by the woman herself or by a doctor. Most of the lesions detected by screening are not malignant.[1–5]

The suspicious abnormalities detected on mammography require further evaluation with biopsies. Palpable breast lesions are generally biopsied by pathologists or clinicians. Non-palpable breast lesions require imaging guidance for localization.[6–7] Fine needle aspiration cytology (FNAC) and core biopsies are techniques that have largely replaced excision biopsies and frozen sections for the diagnosis of breast lesions.

The FNAC is being extensively practiced since its introduction. The advances in the hardware and technique of the procedure have increased the efficacy of the procedure even for smaller lesions. The procedure has been said to be inherently inaccurate because only a limited amount of material is obtained; the difficulty of interpreting the aspirated material has been used in criticism.[8]

The FNAC is an approximation to a specific histological diagnosis. The radiologist can obtain a full and accurate history and assess the mass and examine imaging data. Using real-time guidance, the radiologist can obtain the aspirate representative of the mass and repeat the FNAC if necessary. There are benefits to the patient in that diagnosis and management can be decided in a single visit thus reducing the number of patient attendances, referral for surgery. Treatment can be prioritized and cancer counselling can start immediately if necessary. The rate of unsatisfactory aspirates declines by using real-time ultrasound guidance and there are cost reductions as the number of cases referred for surgery declines. There are improvements in diagnostic yield if multiple aspirations are obtained in the presence of a pathologist to give feedback on the adequacy of each sample.[9]

Aspiration cytology is different from core biopsy where a core of tissue is obtained from a solid organ by using a thick bore needle and a spring-loaded instrument. Fine needle aspiration is a rapid, accurate and safe procure. FNAC is useful in selecting patients for surgery, thereby avoiding un-necessary operations.[10]

Fine needle aspiration has established its utility in the diagnostic protocol of the patient with breast lump.[11] At present fine needle aspiration of the breast is a first line procedure that is fully accepted in the diagnostic work up of patients with suspicious breast lesions. The main purpose of breast fine needle aspiration is to distinguish between patients with malignant and possibly malignant breast lumps and benign nodules.[12,13] Mammography alone cannot truly differentiate malignant and benign nodules in about 10–20% of the cases.[14]

The FNAC and core biopsy results should always be interpreted in the context of the triple test.[15,16] The triple test is the recommended approach for the investigation of palpable or impalpable breast lesions detected by imaging. It comprises the following

components: clinical breast examination and medical history, imaging-mammography and/or ultrasound, and non-excision biopsy, i.e., FNAC and/or core biopsy. The triple test is positive if any of the three components is positive, and negative if all the components are negative. The triple test has sensitivity (true positive rate) of 99.6%, and a specificity of 93%.[8]

At our institute, dedicated one-stop breast clinics are run using multi-disciplinary approach. Fine needle aspiration cytology offers quick preliminary diagnosis, results in early diagnosis and management of breast cancers.

The process of assessment of significant breast lesions involves the correlation of clinical imaging and the cytological/histological findings. This is best achieved with a multidisciplinary open forum with the clinician, radiologist and pathologist reaching a consensus on the management of each case using predefined protocols. The highest levels of diagnostic accuracy are achieved if such a triple approach of imaging, clinical diagnosis and biopsy is used. If the cytology is negative in the face of strong clinical or radiological evidence of malignancy the core biopsy should be performed.

In cases where cancer is reported, such an approach allows for preoperative counselling of the woman regarding treatment options, and may assist in the planning of single-stage surgery.[6,17,18] In cases where a benign diagnosis is reported or confirmed the need for excision biopsy is eliminated, the woman can be reassured and appropriate management options discussed.

The advantages of this approach includes improved diagnostic accuracy in breast disease, the preoperative diagnosis of cancer, the proportion of excision biopsies for diagnostic purposes, and proportion of benign excision biopsies for diagnostic purposes.

The main problem with FNAC is inadequate sampling which may be caused by the small size of the lesion. Objective of this study was to compare the accuracy of results of FNAC and core biopsy in non-palpable breast lesion.

MATERIAL AND METHODS

This Comparative Diagnostic Procedure Study was carried out at Department of Radiology, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore from March 2004 to February 2005.

All women referred for breast biopsy to Radiology Department with a suspicious lesion on mammogram or ultrasound were included in the study.

Women with a previous diagnosis of breast cancer, having a primary malignancy other than breast cancer, and lesions not visualised on ultrasound were excluded from the study.

All the patients underwent fine needle aspiration cytology and core biopsy. Later on all of them had excision biopsy or mastectomy. Prospectively 80 patients were studied. Written informed consent was obtained. Information was collected on a proforma according to inclusion criteria. Age, sex, medical record number and side of lesion were recorded. Clinical history of duration of lump was also taken. Aseptic technique was used to minimise the risk of infection.

Sterilised skin preparation was done using pyodine solution and 2% lignocaine was used as local anaesthetic agent. Usually a 21-gauge needle was used for FNAC. 10–12 MHz linear probe was used for localisation of the lesion. The skin was penetrated tangentially with a long needle. All biopsies were performed using direct visualisation by ultrasound. All FNAC slides were reported by the experienced cyto-pathologists and core biopsies by the histopathologists.

Criteria for adequacy

There should be at least six clusters of ductal cells on each smear comprising 10 cells per cluster. At least 2–3 passes are made from the lump from all aspects.

Cytology reporting was based on the following NHS guidelines: C1=Not representative of the lesion, C2=Benign, C3=Borderline Benign, C4=Malignant/ suspicious for malignancy, and C5=Malignant

Criteria for malignancy

The morphological characteristics that were employed to distinguish benign from malignant cells are given below:[19]

i) Abnormal grouping of cells, ii) Decreased mutual adhesiveness, iii) Presence of alien or foreign cells, iv) Changes in the nucleus, v) Increased/abnormal mitoses, vi) Variation in size and shape of cells, and vii) Abnormal cytoplasmic inclusions.

SPSS-11.0 was used for data analysis. Master data sheet was developed and later on data was entered. Screening test was applied to calculate sensitivity, specificity and accuracy of test.

RESULTS

Eighty fine needle aspiration cytology and core biopsy specimens of patients presenting with a suspicious breast lesion were included in this study. The age range of patients was 20–71 years with mean of 44.31±11.002. Maximum number of patients 28 (35.3%) were between the age 50–59 years, (Table-1).

Out of 80 patients 19 (23.8%) were diagnosed to have a benign aetiology on fine needle aspiration cytology and 54 patients (67.5%) were given a diagnosis of malignancy (Table-2). Comparison of fine needle aspiration cytology and final diagnosis made on excision biopsy showed that four cases were erroneously diagnosed as benign on fine needle aspiration cytology whereas it was found to be

malignant on excision biopsy; seven cases were declared inadequate.

On core biopsy, 23 (28.8%) patients were called benign and 55 (68.8%) patients were labelled to have malignancy. Two cases were non-diagnostic. Comparison of core biopsy and final diagnosis on excision biopsy was made (Table-3). The results were comparable apart from four cases. Two were non-diagnostic and two were erroneously labelled as malignant as there was no residual malignant tissue on excision biopsy.

The validity of screening test was calculated by sensitivity, specificity and accuracy. The sensitivity of FNAC was 92.85%. The specificity of FNAC was 90% and the accuracy rate was 92.1%. The sensitivity of core biopsy was 94.64%, specificity was 91.30% and accuracy rate was 94.87%.

Table-1: Age distribution of the subjects

Age (Year)	Number	Percentage
20–29	6	7.6
30–39	22	27.7
40–49	18	22.6
50–59	28	35.3
60–69	4	5.2
≥70	2	2.5
Mean±SD	44.31±11.002	

Table-2: FNAC vs final diagnosis

	FNAC		Final Diagnosis	
Finding	**Number**	**%**	**Number**	**%**
Benign	19	23.8	23	28.8
Malignant	54	67.5	57	71.3
Inadequate	7	8.8	-	-
Total	80	100.0	80	100.0

Table-3: Core vs final diagnosis

	Core		Final diagnosis	
Finding	**Number**	**%**	**Number**	**%**
Benign	23	28.8	23	26.0
Malignant	55	68.8	57	74.0
Non-diagnostic	2	2.5	-	-
Total	80	100	80	100.0

DISCUSSION

For decades, small samples of tissue have been obtained using a needle to diagnose lesions in many anatomical locations.[20] Breast lesions were identified as particularly suitable for the technique due to their accessibility.[20] The use of smears obtained by aspiration for diagnostic purposes was reported as early as 1933, when Stewart's series of 2,500 specimens included almost 500 breast lesions.[21]

Breast changes can be detected as a mammographic lesion at screening, as a breast symptom found by the woman or as a sign found by her doctor. The investigation of these changes using the triple test approach will often involve FNAC or core biopsy to help determine the nature of the lesion.

The FNAC and core biopsy were originally used to diagnose palpable breast lesions. Both methods have a high degree of sensitivity and specificity. The FNAC is an excellent method for diagnosing palpable lesions; its sensitivity has been reported to be between 89% and 98%[5] and its specificity between 98% and 100%.[22]

Following the introduction of mammographic screening, FNAC and core biopsy are now also used to diagnose impalpable breast lesions. The sensitivity and specificity of stereotactic FNAC with impalpable lesions have been reported to be 77–100% and 91–100% respectively.[22] The use of core biopsy has increased, especially in the evaluation of lesions that are associated with high inadequacy rates with FNAC such as mammographically or sonographically detected lesions that are very small, suspected radial scars or microcalcifications.[22] Both the sensitivity and specificity of core biopsy for the diagnosis of impalpable lesions are usually reported to be at least 90%.[20] In a multidisciplinary breast setting it has been shown that ultrasound-guided core biopsy has a sensitivity of 82% and a specificity and a positive predictive value (PPV) for malignancy of 100%. In general, core biopsy has been shown to be superior for the confirmation of benign lesions, as the rate of samples reported as unsatisfactory is less than for FNAC (12.5% versus 34.2%).

Although several studies have demonstrated a high degree of diagnostic accuracy in breast cancer with aspiration cytology[17,23] its role in the management of breast lesions is still controversial.[15] Many surgeons are reluctant to consider positive cytology results as the only criterion for performing definitive surgery[11,12,24,25] since no distinction is possible between infiltrating and non-infiltrating lesions. In some studies they use surgical biopsy to confirm cytologically negative and suspicious cases and directly operate only on those cases with positive cytologic diagnosis.[11,24]

In the UK, 62% of cancers detected in 1996–1997 in the National Health Service Breast Screening Program were diagnosed preoperatively by FNAC or core biopsy.[23] Even though this is still short of the National Health Service Breast Screening Program target of 70%, however it is argued that it represents an improvement over previous years, and an improvement that is likely to continue as a result of improved technological expertise by the radiographers, radiologists and pathologists involved.

When the UK National Health Service Breast Screening Program was established, FNAC was the method of choice in the assessment of image- detected lesions. However, in recent years there has been an increase in the use of core biopsies to facilitate a preoperative diagnosis.[23] There are two principal explanations for this trend. One is the increased rate of inadequate specimens in impalpable lesions, sampled by

FNAC. The other is the lack of expertise among pathologists in the interpretation of fine needle aspirates.

FNAC and core biopsy are complementary procedures. The studies found that there is insufficient evidence to decide if one method is better than another. These authors recommend the use of the appropriate combination of FNAC and/or core biopsy as the best approach for the diagnosis of breast lesions at different settings.[17,26]

In this study we found out that fine needle aspiration cytology from predominant number of patients had similar results as compared to core biopsy and then results were comparable to the final diagnosis on excision biopsy.

In some of the cases immunohistochemical stains were required to reach a definite diagnosis, core biopsies were helpful for obtaining tissue. Smooth muscle action (SMA) IHC stain was used in few cases for the demonstration of myoepithelial layer for diagnosis of benignity of a lesion.

A five category system for reporting of cytology of breast has been found very useful.[26] We come across two groups of lesions, i.e., benign and suspicious for benign and malignant and suspicious for malignancy. First a considerable number of the cytology samples were termed inadequate because it did not represent the lesion as seen on mammography. However, we also encountered problems when needle aspiration were done from areas with microcalcification and fibrosis[27] as the yield was much less and non diagnostic. Another problem we faced during the study was cases falling in the grey zone that were benign but suspicious; these included proliferative breast disease that may mimic carcinoma on cytology.[28] Some of these are essentially benign but require core biopsy to exclude associated malignancy.

Our series contained a small (6.25%) population of inadequate cases. In a similar study a 10% inadequacy rate has been reported.[29] Furthermore unlike our study, that study calculated the sensitivity and specificity after excluding the inadequate cases.[35] If we were to combine the data gained from radiological assessment, breast FNAC and needle core biopsy there would be no false negative cases and both sensitivity and specificity would rise to 100%. This also illustrates the requirement of good clinico-pathological correlation and further regular multidisciplinary meetings before further treatment is planned.

CONCLUSION

Fine-needle aspiration has been found to be an extremely useful method for the diagnosis of lumps of breast. The accuracy and sensitivity of diagnosis on fine needle aspiration cytology was high. Although a number of inadequate cases preclude a definitive role as compared to core biopsy, we suggest that there are advantages in combining fine needle aspiration cytology, clinical impression and imaging findings to reach to a definitive diagnosis.

REFERENCES

1. Silverstein MJ, Gamagami P, Colburn WJ, Gierson ED, Rosser RJ, Handel N, *et al*. Nonpalpable breast lesions: diagnosis with slightly overpenetrated screen-film mammography and hook wire-directed biopsy in 1014 cases. Radiology 1989;171:633–8.
2. Alexander HR, Candela FC, Dershaw DD, Kinne DW. Needle-localized mammographic lesions: results and evolving treatment strategy. Arch Surg 1990;125:1441–4.
3. Layfield LJ, Parkinson B, Wong J, Giuliani AE, Basset LW. Mammographically guided fine-needle aspiration biopsy of nonpalpable breast lesions Can it replace open biopsy? Cancer 1991;68:2007–11.
4. Thompson WR, Bowen JR, Dorman BA, Pricolo VE, Shahinian TK, Soderberg CH. Mammographic localization and biopsy of nonpalpable breast lesions. Arch Surg 1991;126:730–4.
5. Fajardo LL, Pisano ED, Caudry DJ, Gatsonis CA, Berg WA, Connolly J, *et al*. Stereotactic and sonographic large-core biopsy of nonpalpable breast lesions. Acad Radiol 2004;11:293–308.
6. Apestegu´a L, Pina L, Inchusta M, Mellado M, Franquet T, De Miguel C, *et al*. Nonpalpable, well-defined, probably benign breast nodule: management by fine-needle aspiration biopsy and long-interval follow-up mammography. Eur Radiol 1997;7:1235–9.
7. Thurfjell E. Mammographically-guided fine needle aspiration in differential diagnosis of cystic versus solid rounded masses smaller than 2 cm detected at mammographic screening. Breast Cancer Res Treat 2002;75:221–6.
8. Frable WJ. Thin needle aspiration biopsy. Philadelphia: WB Saunders Co; 1983. p.1–71.
9. Pennes DR, Naylor B, Rebner M. Fine needle aspiration biopsy of the breast. Influence of the number of passes and the sample size on the diagnostic yield. Acta Cytologica 1990;34:673–6.
10. Bibbo M. Scheiber M, Cajulis R, Keebler CM, Wied GL, Dowlatshahi K. Stereotaxic fine needle aspiration cytology of clinically occult malignant and premalignant breast lesions. Acta Cytol 1988;32:193–201.
11. Das DK, Sodhani P, Kashyap V, Parkash S, Pant JN, Bhatnagar P. Inflammatory Lesions of the Breast: Diagnosis by Fine Needle Aspiration. Cytopathology 1992;3(5):281–9.
12. Dejmek A, Lindholm K. Frequency of Cytologic features in fine needle aspirates from histologically and cytologically diagnosed fibroadenomas. Acta Cytol 1991;35:695–9.
13. Bottles K, Chan JS, Holly EA, Chiu SH, Miller TR. Cytology criteria for fibroadenoma: A step-wise logistic regression analysis. Am J Clin Pathol 1988;89:707–9.
14. Bright RA, Morrison AS, Brisson J. Burstein NA, Sadowsky NL, Kopans DB, *et al*. Histologic and mammographic specificity of risk factors for benign breast disease. Cancer 1989;64:653–7.
15. Garre Sánchez MC, Sola Pérez J, Bas Bernal A, Mercader Martínez J, López Alanis A. Ultrasound guided fine needle aspiration biopsy. Study of the cost per patient and comparison with computed tomograpgy guided biopsy. Rev ESP Enferm Diag 1997;89:297–304.
16. Collacol M, deLima RS, Werner B, Torres IFB. Value of fine needle aspiration in the diag of breast lesions. Acta Cyto 1999;43:587–92.
17. Alderson MR, Hamlin I, Staunton MD. The relative significance of prognostic factors in breast carcinomas. Br J Cancer 1971;25:646–56.

18. Howat AJ, Hoda RS. Correspondence. Why pathologists should take needle aspiration specimens. Cytopathology 1995;6:419–20.
19. Wells CA, Ellis I. O, Zakhour HD, Wilson AR. Cytology subgroup of the national coordinating committee for breast cancer screening pathology. Guidelines for cytology procedures and reporting of fine needle aspirates of the breast. Cytopathology 1994;5;316–34.
20. Abele AS, Miller TR, Goodson WH 3rd, Hunt TK, Hohn DC. Fine needle aspiration of palpable breast masses: A Program for staged implementation. Arch Surg 1983;118:859–63.
21. Rimm DL, Stastny J, Rimm EB, Ayer S, Frable WJ. Comparison of the costs of fine needle aspiration and open surgical biopsy as methods for obtaining a pathological diagnosis. Cancer 1997;81:51–6.
22. Adye B, Jolly PC, Bauermeister DE. The role of fine-needle aspiration in the management of solid breast masses. Arch Surg 1988;123:37–9.
23. Dixon JM, Clarke PJ, Crucioli Vl. Dehn TC, Lee EC, Greenall MJ. Reduction of the surgical excision rate in bening breast disease using fine needle aspiration cytology with immediate reporting. Br J Surg 1987;74:1014–6.
24. Quershi N, Usman N. Comparison of fine needle aspiration cytology with histology in palpable breast lesions. Biomedica 1998;14:98–100.
25. Bodó M, Döbrössy L, Sugár I, Boeck's sarcoidosis of the Breast: Cytologic findings with aspiration biopsy cytology: a case clinically mimicking carcinoma: Acta Cytol 1978;22:1–2.
26. National Health System Breast Screening program. Guidelines for cytology procedures and reporting in breast cancer screening. Sheffield: NHSBSP publication; 1993.
27. Hirst C, Davis N. Core biopsy for microcalcification in the breast. Aust N Z J Surg 1997;67:320–4.
28. Schimazu K, Masana N, Yamada T, Okamoto K, Kanda K. Cytologic evaluation of phylloides tumour as compared to fiberadenoma of breast. Acta Cytol 1994;38:891–7.
29. Lifrange E, Kaidelka F, Collin C. Stereotaxic needle-core biopsy and fine-needle aspiration biopsy in the diagnosis of nonpalpable breast lesions: controversies and future prospects. Eur J Radiol 1997;24:39–47.

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