

Comparison of Ultrasonography and Fine Needle Aspiration Cytology in the Diagnosis of Malignant Breast Lesions

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ABSTRACT

Introduction: Breast cancer is the most common cancer of women worldwide and usually presents as lump in the breast. Ultrasonography and Fine Needle Aspiration Cytology (FNAC) are two investigational tools often used to differentiate malignant breast lump from benign one.

Aims and Objects: To find out and compare the sensitivity, specificity and predictive values of ultrasonography and FNAC in diagnosing malignant breast lump.

Material and Methods: Patients who presented with clinically palpable breast lump at the department of Surgery, RIMS, India, from September, 2010 to August, 2012, were included. Recurrent lumps, breast abscess and cystic breast lumps were excluded. All the patients underwent Ultrasonographic evaluation using 7.5 MHz probe (©SIEMENS, Sonoline Versa Plus) at the department of Radiodiagnosis, RIMS and FNAC at the department of Pathology, RIMS. All the patients underwent excision of the

lumps and tissues were sent for Histopathological examination. Sensitivity, specificity and predictive values of ultrasonography and FNAC were calculated taking Histopathological result as the gold standard. Values were compared.

Results: Sixty patients with 62 breast lumps (40 benign and 22 malignant) were included. FNAC reported 42 lumps as benign and 19 as malignant and was indeterminate in 1 case. Ultrasonography reported 36 cases as benign, 18 as malignant and 6 as indeterminate; it failed to detect breast lump in 2 cases. Sensitivity, specificity, positive and negative predictive values of ultrasonography and FNAC in diagnosing malignant breast lump were respectively 94.74%, 100%, 100%, 97.22% and 90.48%, 100%, 100%, 95.24%.

Conclusion: Ultrasonography and FNAC are 100% specific in diagnosing malignant breast lesion. Although Ultrasonography appears more sensitive than FNAC, the percentage of indeterminate report is higher with Ultrasonography.

Keywords: Breast lumps, Ultrasonography, FNAC

INTRODUCTION

Cancer of breast is the most common cancer affecting women worldwide and is the second most common cause of cancer death next to lung cancer [1]. It usually presents as lump or nipple discharge [2]. "Lump" in breast, is therefore, a cause of great anxiety both to the patient and family members. The main motive behind the evaluation of such a newly detected palpable lump is basically to rule out malignancy. Evaluation of breast lumps involves the rational use of a detailed history, clinical breast examination, imaging modalities and tissue diagnosis. Though the final diagnosis is made by histopathological examination of the excised tissue, routine excision of all breast lumps would not be rationale, because as much as 80% of lumps are benign [3]. Thus the need is the utilisation of less invasive and cost effective method(s) of diagnosis without resorting to a more painful and invasive surgical biopsy. The modality should also be acceptable to the patient, accurate, easy to apply, reproducible and must not need too much preparations [2]. Given the common occurrence of breast cancer and the importance of accurately diagnosing a clinically palpable breast lump, with non invasive techniques without routinely resorting to formal biopsy which is much invasive, the study is proposed to evaluate the accuracy of Ultrasonography (USG) and Fine Needle Aspiration Cytology (FNAC) in the diagnosis of newly detected clinically palpable breast lumps in comparison to the final histopathological (HPE) report of the biopsied specimens. Although the accuracies of FNAC and Ultrasonography in the diagnosis of breast lumps have been tested individually in other studies, study comparing FNAC and Ultrasonography using upon the same population is not reported in literature. Our study is designed to compare the results of FNAC and Ultrasonography in the diagnosis of newly detected clinically palpable breast lumps in the same population.

MATERIAL AND METHODS

The study was conducted to both outdoor and indoor patients of the Department of General Surgery, RIMS, Imphal, India, presenting with clinically palpable breast lump(s), within a period from 1st September, 2010 to 31st August, 2012. The term "palpable breast lump" meant area of denser breast tissue felt different from the surrounding breast tissue and / or from similar area of the contra lateral breast, which could be subjectively and reproducibly felt. Recurrent lump at the same site of any previous operation and history of prior irradiation to chest or breast were excluded. Cystic breast lesions diagnosed clinically or by USG, and breast abscess presenting as lump and yielding pus on aspiration were also excluded as such lesions were managed by aspiration or incision and drainage and were not excised. Informed consents were obtained and approval of the Institutional Ethics Committee, Regional Institute of Medical Sciences, Imphal was taken.

All patients underwent ultrasonographic evaluation at the Department of Radiodiagnosis, RIMS using 7.5 MHz probe (© SIEMENS, Sonoline Versa Plus) and the reports were grouped into four categories for easy analysis as benign, indeterminate, malignant and otherwise (failed to detect any lump). The cases were then sent to Aspiration Cytology room (Pathology) at OPD, RIMS for Fine Needle Aspiration Cytology examination of breast lump. Aspiration was done using disposable 23 gauge needle and 20cc syringe mounted on a suitable holder (Cameco). Reports were collected and grouped into four categories as benign, malignant, indeterminate and inadequate sample. Irrespective of the results of Ultrasonography and FNAC, all the breast lumps were biopsied (excisional and/or incisional) and the specimens were sent in formalin solution for Histopathological examination at the

Department of Pathology, RIMS, India. The final histopathological report was taken as the gold standard for diagnosis and reports were grouped into benign and malignant for analysis.

Data were analysed so as to determine the specificity, sensitivity and predictive values of FNAC and USG taking histopathological results as gold standard.

RESULTS AND OBSERVATIONS

All together 60 patients with 62 breast lumps (two patients had 2 lumps) were included in the study. The demographic profile is shown in [Table/Fig-1]. The final histopathological results of the examined 62 breast lumps are given in [Table/Fig-2].

Result of the fine needle aspiration cytology

Out of the total 62 breast lump examined, 42 (67.74%) breast lumps were reported as benign and 19 (30.65%) were reported as malignant. In one case the result was indeterminate as the cytopathologist reported as “papillary lesion”. The final histopathological result, however, turned out to be “ductal carcinoma in situ with solid, cribriform and micropapillary patterns”. Indeterminate reports are neither false positive nor false negative and should be understood as expressing the need of core needle biopsy or open biopsy [4]. So, one case of indeterminate case was not included in the calculation [Table/Fig-3].

| Age | Age in year | Number of patient | | |
|---------------------------|---------------------|-----------------------|-----------|-------|
| | ≤15 year | 02 | | |
| | 16-25 year | 13 | | |
| | 26-35 year | 11 | | |
| | 36-45 year | 18 | | |
| | 46-55 year | 10 | | |
| | ≥56 year | 06 | | |
| Side and Location of Lump | Quadrant | Number of breast lump | | |
| | | Right | Left | Total |
| | Upper-outer | 11 | 15 | 26 |
| | Lower-outer | 04 | 04 | 08 |
| | Sub areolar | 06 | 03 | 09 |
| | Upper-inner | 05 | 07 | 12 |
| | Lower-inner | 03 | 04 | 07 |
| | Total | 29 | 33 | 62 |
| Size of Lump | Max dimension in cm | Number of breast lump | | |
| | | Benign | Malignant | Total |
| | ≤1cm | 01 | 00 | 01 |
| | 1-<2cm | 07 | 02 | 09 |
| | 2-<3cm | 10 | 01 | 11 |
| | 3-<4cm | 20 | 09 | 29 |
| ≥4cm | 02 | 10 | 12 | |

[Table/Fig-1]: Demographic profiles of the 60 patients (62 lumps)

| HPE result | Number of breast lump | | |
|---|-----------------------|-----------------|-------|
| | ≤35 year of age | >35 year of age | Total |
| Fibroadenoma | 25 | 06 | 31 |
| Adenosis | 00 | 04 | 04 |
| Ductal hyperplasia | 01 | 02 | 03 |
| Papilloma | 00 | 02 | 02 |
| Lymphoma (Diffuse large cell non Hodgkins Lymphoma) | 00 | 01 | 01 |
| Ductal carcinoma in situ | 00 | 01 | 01 |
| Invasive ductal carcinoma (NOS) | 01 | 19 | 20 |
| Total | 27 | 35 | 62 |

[Table/Fig-2]: Result of the Histopathological examination (HPE) of the 62 breast lumps

Result of Ultrasonographic examination of 62 breast lumps

Out of 62 breast lumps examined, 36 (58.06%) were reported as benign and 18 (29.03%) as malignant. Six (9.68%) cases were indeterminate and in 2 (3.23%) cases, ultrasound could not detect the breast lump. Like in case of FNAC, here also, the indeterminate cases and cases where USG could not detect the lump were excluded in the calculation. So, altogether 54 cases were taken into account. Of these 19 cases turned out to be malignant and 35 cases benign on HPE. The result can also be calculated separately for those with age ≤35 year and >35 year as shown in [Table/Fig-4].

The final comparison of FNAC and USG in the diagnosis of malignant breast lesions is shown in [Table/Fig-5].

| | | Histopathological (HPE) result | | |
|-------------|-----------|--------------------------------|--------|-------|
| | | Malignant | Benign | Total |
| FNAC result | Malignant | 19 | 00 | 19 |
| | Benign | 02 | 40 | 42 |
| | Total | 21 | 40 | |

[Table/Fig-3]: 2x2 table showing results of FNAC v/s HPE taking HPE as gold standard. 1 case of indeterminate result was excluded

| | | Histopathological (HPE) result | | | |
|------------|-----------------|--------------------------------|--------|-------|----|
| | | Malignant | Benign | Total | |
| USG result | Overall | Malignant | 18 | 00 | 18 |
| | | Benign | 01 | 35 | 36 |
| | | Total | 19 | 35 | |
| | ≤35 year of age | Malignant | 01 | 00 | 01 |
| | | Benign | 00 | 22 | 22 |
| | | Total | 01 | 22 | |
| | >35 year of age | Malignant | 17 | 00 | 17 |
| | | Benign | 01 | 13 | 14 |
| | | Total | 18 | 13 | |

[Table/Fig-4]: Results of USG v/s HPE using HPE as gold standard taking into age factor (overall, age ≤35 year and >35 year). 18 indeterminate cases and 2 cases where USG failed to detect were excluded

| | FNAC | Overall USG | USG (for ≤35 year of age only) | USG (for >35 year of age only) |
|--|--------|-------------|--------------------------------|--------------------------------|
| Sensitivity | 90.48% | 94.74% | 100% | 94.44% |
| Specificity | 100% | 100% | 100% | 100% |
| Predictive value of a positive result (malignant report) | 100% | 100% | 100% | 100% |
| Predictive value of a negative result (benign report) | 95.24% | 97.22% | 100% | 92.8% |
| Positive likelihood ratio (LR+) | ∞ | ∞ | ∞ | ∞ |
| Negative likelihood ratio (LR-) | 0.1 | 0.05 | 0 | 0.06 |

[Table/Fig-5]: Comparison of FNAC and USG in diagnosis of malignant breast lesion

DISCUSSION

Reported sensitivity of FNAC in diagnosis of breast lump in various studies varied from 68% to 97.4% as against our result of 90.48% [2,5,6]. These variations could be because of different inclusion criteria of breast lump (like size, palpable or non palpable) in different studies; inclusion of atypia/ suspicious result as malignant in calculation of sensitivity in some studies; and exclusion of inadequate results in some studies. The sensitivity has also been found to be dependent on the skill and experience of the aspirator [4]. Similarly a wide variation in the sensitivity of USG in the

diagnosis of malignant breast lesion ranging from 67% to 97% has been reported [7,8]. These wide variations amongst different study could be due to different methods of case selections, different resolution power of ultrasound equipment used, and due to the fact that ultrasound is an operator dependent technique.

When we compare FNAC and USG in the diagnosis of malignancy in breast mass, both was found to have 100% specificity and 100% positive predictive value. Thus a positive result (malignant report) of either test can be considered confirmatory and further treatment decision can be made solely on this report without any further additional diagnostic investigation. A sensitivity result of FNAC of 90.48% in our study suggest that only 9.52 out of 100 cases having malignant lesion would be missed if FNAC is solely used for evaluation of breast lump. Similarly a sensitivity of 94.74% of USG means that a negative (benign) result of USG does not completely rule out the possibility of malignant nature of the mass. Hence, in the event of a negative result (benign report) of either test physician should seek for additional investigations to rule out malignancy should his clinical skill and experience suspect malignant nature of the lump. Sensitivity of USG was found higher than that of FNAC (94.74% v/s 90.48%). LR- of USG was 0.05 and that of FNAC was 0.1. These values give an impression that USG is a better tool than FNAC in ruling out the probability of malignancy in breast mass. However, the percentage of indeterminate result was much higher in USG than in FNAC (1 out of 62 in FNAC and 6 out of 62 in USG). In addition two breast masses were missed by USG. Again, in four cases where USG was indeterminate, FNAC could correctly diagnose the lesions and in 2 cases of indeterminate USG results, FNAC was wrong in diagnosing the lesions. One case of indeterminate FNAC result was correctly diagnosed as malignant by USG. Thus both the diagnostic tools should be considered complementary and the physician should use the basis of his clinical findings and experience in choosing either one of or both the tools.

In a similar study by Reinikainen et al., to evaluate the role of USG and FNAC in the diagnosis of palpable solid breast lesions, they retrospectively reviewed the mammograms and ultrasound images of 84 palpable breast lesions and the cytologic reports of 57 lesions. Results were compared to the final histopathological diagnoses. Eighty-one of the 84 lesions (96%) were visible as a local abnormality at USG thereby missing three lesions. Also, the sensitivity and specificity of FNAC were reported as 92 and 83% respectively. There were no false-negative malignancies in the three modalities (USG, mammography and FNAC) combined. They concluded that active and critical use of these three modalities could cut down the number of surgical biopsies of benign breast lesions [9].

Another important finding is that when we consider only younger patients (≤ 35 year of age), the sensitivity, specificity, positive and negative predictive values of USG in diagnosis of malignant breast mass were all 100% against the respective values of 94.44%, 100%, 100% and 92.86% when considering those older than 35 years. Again the chances of missing the lump or indeterminate result were less in ≤ 35 year of age group (11.11% v/s 14.29%). This clearly shows the more accurate value of USG in younger patients.

There are certain limitations of our study. First, the size of the breast lump was not taken into account. Larger sized lumps are less likely to be missed in USG. Secondly, cystic lesions and abscess were excluded in the study as they were treated mainly by aspiration and drainage and hence no tissue sample could be obtained for Histopathological examination. This selectiveness of cases may limit the generalisation of the findings in clinical practice. Thirdly, the indeterminate reports were excluded in calculation of specificity and sensitivity. The sensitivity of USG was higher than FNAC but the rate of inconclusive report was higher in case of USG than in

FNAC. So, the calculated value of sensitivity did not reflect this limitation of USG as against FNAC. Fourthly, age of the patient is known to largely affect the USG result and is also shown in this study. In actual clinical practice USG is seldom preferred in aged patient. However, we subject the patient to USG, bound by our protocol, irrespective of age. Such an approach appears clinically irrelevant.

There are certain strong points also of our study. First, the gold standard test used in our study is histopathological report which is valid, reproducible and has been accepted as the gold standard internationally. For a good study, the reference test against which the diagnostic test in evaluation is compared should be gold standard [10]. A very strong point, again of our study, is the fact that both the cytopathologist performing the FNAC and USG radiologist belonged to different departments of the institute and hence were blinded from each others' results. Nor, they were given the clinician's impression about the lump. Finally both the diagnostic tools in questions were tested upon the same study population.

CONCLUSION

Evaluation of breast lump is important to rule out malignancy. Ultrasonography is an imaging technique and FNAC a tissue diagnostic technique. Specificity of both the diagnostic tools in diagnosing malignant breast lump was found to be 100% in our study, thereby giving the inference that a positive (malignant) result of either test can alone solely form the treatment decision without additional diagnostic investigation. In our study specificity was found higher with USG than with FNAC but the percentage of inconclusive report was higher with USG. The exact place of these diagnostic tools in the evaluation of breast lump would depend on the expertise and availability of these modalities in a clinical setup and also on the age factor of the patients as well as on the clinicians' degree of suspicion of nature of the lump. In aged, clinician may place USG at lower level of preference as it is less accurate in less denser breast of the adult. On the other hand a malignant report of FNAC of a hard, irregular lump in breast in adult nulliparous women may be better credited by the dealing clinician. The reverse may be true in younger patients where carcinoma is rare. Thus, both these diagnostic tools should be considered complementary. Further advancement in the technique of both these procedure like FNAC under imaging guidance, addition of immunohistochemistry in cytology and addition of Doppler in USG may increase their accuracy. Also with the gaining experience in characterisation of solid breast mass using USG, the accuracy of USG in the diagnosis of breast lump is increasing. Certainly, more studies are required, addressing these recent advancements, to properly define the place of FNAC and USG in the management of breast lump.

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