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Research Article

Prospective study of fine needle aspiration cytology of clinically palpable breast lump with histopathological correlation

Ashwin K. Hebbar[1]*, Harish Iyanna[2]

[1]Assistant Professor, Department of General Surgery, Shimoga Institute of Medical Sciences, Shimoga, Karnataka, India
[2]Senior Resident, Department of General Surgery, Shimoga Institute of Medical Sciences, Shimoga, Karnataka, India

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***Correspondence:**
Dr. Ashwin K. Hebbar,
E-mail: hebbar2000@yahoo.com

ABSTRACT

Background and objectives: This study was conducted to compare the diagnostic accuracy of fine needle aspiration cytology in differentiating the benign and malignant lesions of palpable breast lump with histopathological correlation and also to study the accuracy of the needle tip localizing the tumor during fine needle aspiration cytology procedure.
Methods: Two years prospective study was conducted in our institution and in that 100 patients underwent fine needle aspiration cytology of the palpable breast lump after thorough physical examination. The cytological diagnosis was classified in to 3 groups benign, suspicious and malignant. After this reporting all the patients were later subjected to open/excision biopsy and its histopathological confirmation. Later diagnostic accuracy of cytology reporting was compared with that of histopathology. Accuracy of the needle tip in localizing the tumor in fine needle aspiration cytology was also studied by comparing the normal glandular cell aspirate with tumor cell aspirate. Repeat cytology was carried out before open/excision biopsy if the pathologist reports the cytology slide as "inadequate".
Results: We had accuracy rate of 100% for benign lesion and 93.10% for malignant lesion with false negative rate of 6.9% and false positive rate of zero with fine needle aspiration cytology in the diagnosis of palpable breast lump. The overall sensitivity of fine needle aspiration in diagnosing the palpable breast lump is 93.10%, specificity is 100%, positive predictive value is 100% and negative predictive value is 90.47%. Since inadequate sampling rate is 2% in our study, the accuracy rate of needle tip in localizing the tumor in fine needle aspiration cytology is 98%.
Conclusion: Since our diagnostic accuracy rate and predictive values are very high and comparable to any other published series it can be advised that the patients in which fine needle aspiration cytology is unequivocally diagnostic for cancer can be managed directly by mastectomy (or any other definitive therapy). A diagnosis of suspicious for cancer must be confirmed by an open biopsy or intraoperative frozen section or rapid hemotoxyline and eosine staining (depending on availability). Since the accuracy of the needle tip in localizing the lump is very high (98%), the diagnostic accuracy of fine needle aspiration cytology can be increased by performing repeat aspiration on the lump for which previously being reported as inadequate or unsatisfactory sampling before advising for open biopsy.

Keywords: FNAC, Breast lump, Carcinoma breast, Diagnosis of breast lump

INTRODUCTION

Fine needle aspiration cytology has become an increasingly popular technique utilized in the diagnosis of palpable breast masses owing to its distinct advantages of being sensitive and specific, expedient, economical and safe. It is commonly used as a part of diagnostic triad, which in addition to the fine needle aspiration

cytology includes clinical breast examination and mammography.

In recent time the fine needle aspiration cytology has largely replaced excisional/incisional breast biopsy. Its distinct advantage is that it can be done during the out patient visit without the need of the anesthesia, thus eliminating the cost of out patient surgery. It also allows discussion with the patient of various treatment plans for malignant mass on the same visit. This has been confirmed by earlier several studies that aspiration cytology is superior to tru-cut needle biopsy in establishing the diagnosis of clinically suspicious breast masses; however the sensitivity can be improved by increasing the number of core taken.

The purpose of this study is to evaluate our experiences with fine needle aspiration cytology in a series of patient and compare the diagnostic accuracy of fine needle aspiration cytology with postoperative histipathology. Accuracy of the needle tip in localizing the tumor in fine needle aspiration cytology was also studied by comparing the normal glandular cell aspirate with tumor cell aspirate. Since the needle aspiration cytology was done for palpable tumor ultrasound guidance was not followed.

Aims and Objectives

1. To compare the diagnostic accuracy of fine needle aspiration cytology in differentiating the benign and malignant lesions of palpable breast lump with histopathological correlation.
2. To study the accuracy of the needle tip localizing the tumor during fine needle aspiration cytology procedure.

METHODS

The two years prospective study of fine needle aspiration cytology of clinically palpable breast lump with histopathological correlation was carried out in Shimoga Institute of Medical Sciences And Mc Gann hospital, Shimoga, Karnataka, India during July 2010 to June 2012.

Source of data

Women who were having palpable breast lump attending our hospital formed the subject of the study. Our sample size was 100 patients. All women with palpable breast lump of any age attending our hospital during that period were included in the study Patient with acute and tender breast lump like breast abscess, patient with ulcerated breast lump, recurrent breast lump of previously operated case of confirmed malignancy were excluded from the study.

Methods of collection of the data

In out patient department a detailed history and thorough physical examination of the patient having palpable breast lump was carried out and entered in the proforma. The patient was informed about the procedure and informed consent was obtained from the patient before subjecting to fine needle aspiration cytology of the breast lump.

The standard procedure was followed, making use of a 10ml syringe bearing a 22-gauze needle (external diameter of 0.6mm) or rarely even 23 and 24 gauze needles. The mass was located clinically and fixed in position with free hand. The skin over the puncture site was sterilized with spirit or iodine. The needle was placed over the skin and its direction was determined before it was introduced in the mass in one swift motion. This minimized the discomfort to the patient. Once the tumor was engaged (as indicated by the resistance to the needle) full vacuum was applied, while the needle was moved back and forth in the mass with short strokes. The syringe was observed for appearance of any specimen. When this appeared, the syringe pistol was slowly released and allowed to return to the neutral position. The needle was then withdrawn from the mass. The needle was temporarily removed from the apparatus, and the syringe was filled with air by pulling back the plunger. The needle was reattached. The specimen was expressed on to a glass slide. It was then immersed in a fixative 95% methyl alcohol. The slides were stained with papanicolaou or giemsa stain. The interpretation of the slide was made by the same cytopathologyst.

The clinicocytological diagnosis was based upon palpation of the mass, degree of resistance at the aspiration biopsy, combined with microscopic examination of the aspirated cells. The final cytological report was described as malignant, suspicious, benign or unsatisfactory (inadequate) due to insufficient epithelial cells being present.

The patients were informed about the cytological diagnosis. If the lumps on the cytological examination were reported as malignant, then mastectomy or modified radical mastectomy was performed and the specimen sent for the histopathological confirmation of the diagnosis. In those cases, which were reported as suspicious of malignancy (2 cases), they underwent intraoperative rapid haemotoxylin and eosine staining (frozen section) for confirmation of malignancy before underwent modified radical mastectomy and histopathological confirmation.

Accuracy of the needle tip in localizing the tumor in fine needle aspiration cytology was also studied by comparing the normal glandular aspirate with tumor cell aspirate. Since the fine needle aspiration was done for palpable tumor ultrasound guidance was not followed and repeat fine needle aspiration was carried out before open/ excision biopsy if the pathologist reports the cytology slide as “inadequate”.

RESULTS

100 patients having the palpable breast lump underwent fine needle aspiration cytology between July 2010 and

June 2012 in our hospital. All 100 patients were female. The age incidence of the patient was as follows.

Table 1: The age incidence of the patient was as follows.

Age in years	Benign	Malignant	Total
11-20 years	10	-	10
21-30 years	16	-	16
31-40 years	12	14	26
41-50 years	-	18	18
51-60 years	-	10	10
61-70 years	-	18	18
71 onwards	-	2	2
Total	38	62	100

The age incidence was ranged from 16 to 74 years (mean age 41.68 years). The age incidence for the benign lesions ranged from 16 years to 39 years (means age 27.89 years). The incidence for the malignant lesions ranged from 34 to 74 years (mean age 52.25 years). The most common age group for benign lesions was between 21 to 30 years and for the malignant lesion was 41 to 50 years. All the 100 patients complained of lump in the breast. The other symptoms were pain in the lump, discharge per nipple and lump in the axilla. The duration of symptoms varied from few weeks to few years

One patient was having lump in the right breast, which was diagnosed as carcinoma who had previously underwent modified radical mastectomy for her left breast carcinoma 5 years back. One patient was having multiple lumps in both the breasts, fine needle aspiration cytology as diagnosed as fibroadenoma. On local excision of these tumors the histopathology reported as benign serous cystadinoma. In two of the 100 patients of palpable breast lump the fine needle aspiration cytology was reported as 'inadequate sampling' (showing normal glandular cells only). Following repeat fine needle aspiration cytology both reported as fibroadenoma, later confirmed by histopathology.

Of the 42 cases of benign report by fine needle aspiration cytology, 38 were confirmed by histopathology. False negative were 4 cases. The results of the benign lesions were as follows. Accuracy rate for benign lesions was 100%, false positive was 0%, and unsatisfactory specimen rate was 4.76%.

Of the total 62 cases of malignant lesions, fine needle aspiration cytology reported 54 as malignant, 4 as benign and 4 as suspicious lesions. False negative was 4 and false positive was zero. Two fine needle aspiration cytology were reported as suspicious lesion for malignancy. They underwent intraoperative rapid hemotoxyline and eosine staining for confirmation of malignancy before undergoing modified radical mastectomy and later histopahological confirmation. There was no unsatisfactory (inadequate) sampling for malignant lesions. The results of the malignant lesions were as follows. Accuracy rate for malignant lesion was 93.10%, false negative rate was 6.90%, and unsatisfactory specimen rate was 0%.

Table 2: Statistic table.

Test result	Disease (Malignant)	Not diseased (Benign)
Positive	54 (a) (True positive)	0 (b) (False positive)
Negative	4 (c) (False negative)	38 (d) (True negative)

Among 4 cases of false negative, two cases of right breast lump was diagnosed as fibrodinoma in a 48 and 50 years old females depending on the presence of uniform cells in sheets with myoepithelial cells with minimal nuclear atypia on fine needle aspiration cytology. On local excision biopsy, the histopathology confirmed as infiltrating ductal carcinoma. Later both underwent modified radical mastectomy on the same stay. In another two cases of left breast lump in 35 and 40 years females, they were diagnosed as benign proliferative breast disease with mild atypia by fine needle aspiration cytology. On local excision biopsy of that breast lump, histopathology confirmed as infiltrating ductal carcinoma. Later both underwent modified radical mastectomy.

In our research fine needle aspiration cytology revealed benign in 38 patients, suspicious in 4 and malignant in 54 patients with false negative results of 4 and false positive zero. The diagnostic accuracy of fine needle aspiration for benign lesions was 100% and malignant lesions were 93.10% with false negative rate of 6.9% and false positive rate of 0%. The overall sensitivity of fine needle aspiration cytology in diagnosing the palpable breast lump in our study was 93.10%, specificity was 100%, positive predictive of 100% and negative predictive value of 90.47%.

Two cases among the 100 fine needle aspiration cytology reported as inadequate sampling (unsatisfactory) based on the presence of normal glandular cells on cytology. On repeat fine needle aspiration it was reported as fibroadenoma. Patient underwent local excision of the tumor and histopathological confirmation later. Thus inadequate sampling rate was 2%. Accuracy rate of the needle tip in localizing the tumor in fine needle aspiration cytology was 98%.

DISCUSSION

Breast is an important and popular site for fine needle aspiration cytology. In 1984 Wanebo et al suggested fine needle aspiration in place of open surgical biopsy for the diagnosis of breast cancer.[1] There is an increasing

tendency to confirm the diagnosis of the breast cancer at first consultation by some form of needle biopsy technique. This allows better investigation and wiser preoperative discussion than was possible when excision biopsy and frozen section confirmed the clinical diagnosis.

The present series confirms the accuracy and clinical utility of fine needle aspiration cytology in the investigation of the patient with benign and malignant breast disease. The accuracy of the diagnosis in patients with malignant breast disease is in the range of 85 to 90% in most of the series.

In our study we had 38 benign lesions (38%), fibroadenoma being the most common benign lesion that presents for needle aspiration. This has been confirmed in other series also. Fibroadenoma form the 80% of the benign lesion aspirated for cytology. The fibroadenoma has been considered a significant cause for the false positive diagnosis. The over all activity of the epithelial cell in this tumor is probably the reason. We had no cases of false positive reports in our study. Breast carcinoma is one of the most common malignancies among women. The breast lump is usually discovered by the patient. In premenopausal women, up to 80% are benign; where as in patients over the age of 60 approximately 90% of the breast lumps are malignant. The fine needle aspiration cytology has become the investigation of choice for the diagnosis of the breast malignancy. The typical carcinoma presents a gritty resistance to the fine needle. The aspirate is usually copious and blood stained.

In our study we had 62 malignant lesions (62%), infiltrating ductal carcinoma being the most common malignant lesion that presented for needle aspiration. It forms the 90.32% of the malignant lesion aspirated for cytology. Although its incidence peaks in the postmenopausal women, it is seen as early as in the second decade. There were 4 cases reported as lobular carcinoma in our study. Mainly diagnosed on histopathology, where as cytology was able to explain the presence of malignancy only. Lobular carcinoma can not be consistently differentiated from ductal carcinoma by cytology.[2] The present study confirms the accuracy and clinical utility of fine needle aspiration cytology in the management of benign and malignant breast diseases. The high rate of diagnostic accuracy and other predictive values in our study is similar to those in various other published series like the largest series conducted between 1982 and 2000 at Rush Presbyterian St. Lukes medical college Chicago, USA, where the sensitivity was 98%, specificity was 97%, positive predictive value was 99% and negative predictive value was 86%.[3] Between September 1992 and may 1996 another study was conducted in department of surgery, St Joseph hospital, Denever, Colorado and concluded that the use of fine needle aspiration cytology for solid breast lesion is accurate and cost effective with 100% positive predictive value, 100% specificity, 87% sensitivity and 89% negative predictive value.[4] This high rate of accuracy in fine needle aspiration cytology permitted us for definite preoperative planning and discussion with the patient in whom the fine needle aspiration is positive or suspicious for malignancy.

In another prospective study of use of fine needle aspiration cytology and core biopsy in the diagnosis of breast cancer which was carried out on patients attending an open access breast clinic by Dennison et al. concluded that fine needle aspiration cytology and core needle biopsy is complementary in the accurate diagnosis of the breast cancer.[5]

Fine needle aspiration cytology compliments clinical and radiological diagnosis; thus triple assessment has been reported to produce 99% accuracy for benign and malignant lesions. The diagnostic accuracy of clinical examination, mammography and fine needle aspiration cytology was compared with the definitive histological findings. Comparative study of all 3 diagnostic techniques in the diagnosis of breast tumor has shown that the accuracy of 99% can be achieved.[6]

We had 4 false negative reports in our series. Although this can be regarded as a sampling error, the effect on management could be obvious. False negative rate in our series is 6.9%, which is comparable to various other series, which quoted false negative rate of 1 to 31% with average rage of 10%.[7] Great care must be taken to avoid false positive reports. Cellular fibrodenoma and papilloma bear a risk in this respect. We had no false positive cases in our study. Various other series have reported false positive reports with the range of 0 to 10%.[7] It must be reemphasized that proper clinical judgment should prevent an erroneous mastectomy being performed.

The accuracy of the needle tip in localizing the tumor in fine needle aspiration cytology was also studied in our series by comparing the normal glandular cell aspirate with the tumor cell aspirate. The unsatisfactory (inadequate) sampling in which there was little or no cellular material reported, we believe, to be an error in the technique of aspiration. In our study we had two aspirations were reported as unsatisfactory, bringing the inadequate sampling rate to 2%. The unsatisfactory specimen rate for benign lesion was 4.76%, whereas for malignant lesion was 0%. The proportion of inadequate sampling as reported by different studies varies from 9 to 18%.[8] Our study result is comparable to study of Zarbo et al, [8] who had reported that 17% of 2,254 aspirates in his institutional study were unsatisfactory for evaluation. Maintaining suction as the needle is withdrawn from the breast, leads to loss of cells in to the syringe at the time of withdrawal. This could probably be the common error done technically so as to produce an unsatisfactory material.

Since inadequate sampling rate is 2%, the accuracy rate of needle tip in localizing the tumor in fine needle

aspiration cytology is 98%. Repeat fine needle aspiration was performed on the inadequate sampling specimen and that time it was reported as fibrodinoma, which was confirmed by histopathology after local excision. By different studies also it has been concluded that accuracy of fine needle aspiration cytology in diagnosing the breast tumors increases by performing repeat aspiration in a lump for which previously been reported as inadequate sampling.[8]

Apart from the high accuracy rate of fine needle aspiration cytology, this technique is quite attractive because of its rapidity of execution and interpretation, its low cost (compare to open biopsy of any type), and its low rate of morbidity. Some have raised questions about the possible dangers of cell implantation from the needle aspiration. These rare reports have largely resulted from the use of larger cutting needle (18 gauze) rather than fine needles (22 gauze). With this fine needle technique, there is essentially no danger of implantation with breast aspiration.[9] Franzen and Zajicek in a review of 3479 consecutive breast aspirates found no evidence of seeding along the needle tract.[10] This is not surprising as the needle tract is invariably removed with definitive surgery.

The use of fine needle aspiration cytology as the main and direct indicator for mastectomy (without the needle for biopsy) remains controversial. The major concern is the danger of a false positive diagnosis, leading to unwarranted mastectomy. Since the false positive report is very rare (in our study it is zero), in the centers where the surgical staff is accustomed to performing mastectomy on the basis of fine needle aspiration cytology for diagnosis of cancer, there is necessary for a high level of confidence in and rapport with the cytopathologyst.[11] The danger of misdiagnosis of a cancer is studiously avoided by maintaining a cautious and conservative threshold for diagnosing a cancer. Any questionable diagnosis that is stated to be suspicious, an open biopsy is suggested where in centers an intraoperative frozen section analysis is not available.

CONCLUSION

The fine needle aspiration cytology is an important diagnostic adjunct in the management of patient with a breast lump.[12] Recently the fine needle aspiration cytology has become an increasingly popular technique utilized in the diagnosis of palpable breast masses owing to it distinct advantages of being sensitive, specific, expedient, economical and safe. It greatly compliments the clinical and radiological examination and permits rapid diagnosis in more than 95% of the cases. Thus it is commonly used as a part of diagnostic triad in case of breast lump, which in addition to fine needle aspiration cytology, includes clinical breast examination and mammography.

We had high accuracy rate of 100% for benign lesion and 93.10% for malignant lesion with false negative rate of 6.9% and false positive rate of zero with fine needle aspiration cytology in the diagnosis of palpable breast lump. Since, in our study the overall sensitivity of fine needle aspiration in diagnosing the palpable breast lump is 93.10%, specificity is 100%, positive predictive value is 100% and negative predictive value is 90.47%, it can be advised that the patients in which fine needle aspiration cytology is unequivocally diagnostic for cancer can be managed directly by mastectomy (or any other definitive therapy). A diagnosis of suspicious for cancer must be confirmed by an open biopsy or intraoperative frozen section or rapid hemotoxyline and eosine staining (depending on availability). Since the accuracy of the needle tip in localizing the lump is very high (98%), the diagnostic accuracy of fine needle aspiration cytology can be increased by performing repeat aspiration on the lump for which previously being reported as inadequate or unsatisfactory sampling before advising for open biopsy.

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