Original Article

Role of Fine Needle Aspiration Cytology (FNAC) in the Diagnosis of Breast Lump and Its Histopathological Correlation

Authors
Dr Sandip Kumar Singh[1], Dr Manoj Kumar[2], Dr Bhartendu Kumar[3], Dr Satyendu Sagar[4]
[1]MBBS, MD (Post Graduate Trainee)**,** Department of Pathology, Sri Krishna Medical College, Muzaffarpur
[2]Associate Professor & HOD, Department of Pathology, Sri Krishna Medical College, Muzaffarpur
[3]Associate Professor, Department of Surgery, Sri Krishna Medical College, Muzaffarpur
[4]Assistant Professor, Department of Microbiology, NMCH, Patna
Corresponding Author
Dr Satyendu Sagar
Assistant Professor, Department of Microbiology, NMCH, Patna

Abstract
Objective: *Worldwide, the most accepted protocol for diagnosis of breast lumps is "Triple Assessment", which includes clinical assessment, radiological imaging and pathological diagnosis. FNAC forms the most important aspect of cytopathology as a part of triple assessment. The aims of present study were to evaluate our results of aspiration cytology of breast lump and to establish the diagnostic accuracy of the technique by comparative evaluation with histopathological diagnosis of respective breast lump.*
Materials and Methods: *A prospective study of 50 patients was conducted at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. Patients were randomly selected, irrespective of their age, sex, religion, marital status, occupation or social status. FNAC was performed on 50 patients with breast lump attending the surgical OPD and admitted in the surgical ward. Irrespective of clinical diagnosis, patients underwent FNAC when a lump was palpated by Surgeon and subsequently every patient underwent a definitive surgical procedure for histopathological examination. The results thus obtained from FNAC and histopathology was matched and a correlation was obtained based on statistical tests.*
Results: *Age group of the patients ranged from 16 to 65 years. There were only one male patient of gynaecomastia and all other 49 were females. Statistical analysis was performed on the tabulated data and accuracy with false positive and false negative results were obtained. Accuracy of malignant lesions was 90%. Among benign lesions, gynaecomastia and chronic mastitis were diagnosed with 100% accuracy. The accuracy rate in diagnosing fibroadenoma and fibroadenosis was 90% and 85.71% respectively. Thus overall accuracy rate found to be 90%.'*
Conclusion: *FNAC of breast is simple, cost effective and less traumatic method for diagnosis of breast lump. FNAC can provide a preoperative diagnosis with reasonable accuracy as compare to histology. In advanced carcinoma or unwilling patients for surgery, it can form the basis of management. So FNAC should be used as a routine method for determining the nature of breast lump.*
Keywords: *FNAC, breast lump, neoplasm.*

Introduction

Fine Needle aspiration cytology in the diagnosis of malignancy has been a controversial issue since its inception. Although the technique of aspiration cytology has been clinically available since it was first introduced in the year 1930 by Martin and Ellis, the use of this procedure as a diagnostic and therapeutic measure has gained wide spread acceptance in the last few years only. Reactions to this procedure vary from enthusiastic acceptance to almost total rejection. The main objections have been the possibility of tumor spread along the needle track or distal embolisation through the efferent lymph or blood vessels. These objections have been ruled out by the work of Berg et al (1962), Engzell (1971), Robbins et al (1974), Zajicek (1979), Z A Karcioglu (1985), S. Shinohara (2001) and M A Silva (2008).

For a technique to be accepted, it should be easy to perform, causing minimum discomfort to the patient, little time consuming with early availability of results and have good diagnostic accuracy. Aspiration cytology meets with all these requirements and hence the reasons for its gaining popularity.

In breast lesions rapid diagnosis by aspiration cytology can be particularly useful for allaying the apprehension and anxiety of the patient whose apparent solid mass may turn to be a cyst thus reducing the anguish and morbidity associated with unnecessary surgical procedures. If the lesions turn out to be malignant, the patient can be referred for immediate treatment on priority so that treatment is not unnecessarily delayed.

Thus, aspiration cytology is used more and more in the diagnosis of benign and malignant lesions of the breast. Moreover the results of aspiration cytology do not carry the same weight for different people and its diagnostic accuracy needs to be evaluated. Needless to say that diagnostic accuracy and its clinical acceptance depends upon the experience and keen interest of the reporting cytologists.

In our hospital, we have been using fine needle aspiration cytology for diagnosis of various lesions of breast, thyroid, lymph nodes etc, and the present study aims at evaluating our results of aspiration cytological diagnosis of breast lump and to establish the diagnostic accuracy of the technique by comparative evaluation with histopathological diagnosis.

Materials and Methods

This is a prospective study, in which Fine Needle Aspiration Cytology was performed on 50 patients with breast lesions attending the surgical outdoor and admitted in the surgical wards of Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, During the period of June 2015 to January 2018. Irrespective of clinical diagnosis, patient underwent FNAC when a lump was palpated by Surgeon.

Instrument

Tight fitting 10 ml plastic disposable syringes and fine 22 Gauge needles of 38 mm length were used for FNAC.

Slides: Two to three dry clean slides were used for preparing the smears. All slides were labelled.

Technique

The skin overlying the lump was cleansed with antiseptic solution after determining the site by palpation. Local anaesthesia was not used. The tumor was gripped by one hand in position suitable for needling. Lesions were held between the index finger and thumb of one hand and were punctured. When the needle had entered the tumor mass, the plunger of the syringe was retracted to create a vacuum in the system while the needle was guided in a straight line through the lesion. This was maintained with the thumb and index finger of another hand, and the needle was moved through the tumor three or four times in different directions. Throughout this procedure the negative pressure was maintained by keeping the plunger retracted. When the aspiration was completed, the syringe was allowed to equalize before the needle was withdrawn.

Preparation of smears

The needle was then removed from the tumor and the syringe was disconnected from the needle. The

syringe was filled with air and reconnected to the needle. The contents of the needle were then carefully expressed on clean dry slides and smears of adequate density was prepared by gentle pressure with the flat surface of another slide. Aspirate containing blood or cystic fluid were spread like that of a case of ordinary blood smears and large tissue fragments that were collected at the end of the smear, then gently squeezed with the flat pressure with the glass slide.

Fixation and staining of smears

Air dried smears followed by staining with May-Grunwald-Giemsa stain for Fine Needle Aspiration cytology, and alcohol (95%) fixed smears followed by staining with Haematoxylin-Eosin stain for tissue sections were used.

Results

The observations and results of our study were tabulated and analyzed as below:

Table-1 Age and sex of patients with breast lesions:

Age (in years)	Male	Female	Percentage (%)
12-20	-	7	14.0
21-30	1	15	32.0
31-40	-	12	24.0
41-50	-	10	20.0
51 yrs & above	-	5	10.0
Total	1	49	100.0

In this study the maximum number of 16 (32%) cases were belong to the age group of 21-30 years followed by age group of 31-40 years in which there were 12 (24%) cases, while the minimum incidence of 5 (10%) cases were in the age group of 51 years and above. There was only one (2%) male patient in this series and rest 45 (98%) cases were female.

Table-2 Cytological report in 50 cases of breast lump:

Cytological diagnosis	No. of cases	Percentage (%)
Malignant	27	54.0
Benign	18	36.0
Suspicious or Atypical	4	8.0
Scanty	1	2.0
Total	50	100.0

Cytology revealed malignant lesion in 27 (54%) cases and benign lesion in 18 (36%) cases. In 4 (8%) cases, the cytology showed suspicious changes of malignancy. Scanty yield of material, insufficient for opinion, was obtained in 1 (2%) cases.

Table-3 Cytological subclassification of benign breast lump

Cytological diagnosis	No. of cases	Percentage (%)
1. Fibroadenoma	9	18.0
2. Fibroadenosis	6	12.0
3. Mastitis	2	4.0
4. Gynaecomastia	1	2.0
Total	18	36.0

Cytological subclassification of benign lesions comprised of largest groups of fibroadenoma, 9 (18%) cases. Next group was of fibroadenosis which comprised of 6 (12%) cases. 2 (4%) cases were diagnosed as chronic mastitis and 1 (2%) as Gynaecomastia.

Table-4 Histopathological diagnosis of breast lump:

Histological diagnosis	No. of cases	Percentage (%)
Malignant		
Carcinoma	30	60.0
Benign		
Fibroadenoma	10	20.0
Fibroadenosis	7	14.0
Mastitis	2	4.0
Gynaecomastia	1	2.0
Total	50	100.0

Histopathological diagnosis of 50 cases of breast lump, 30 (60%) were diagnosed as carcinoma and remaining 20 (40%) cases as benign lesions. Of the benign lesions, 10 (20 %) cases were of fibroadenoma, while fibroadenosis, mastitis and gynaecomastia consisted of 7 (14%), 2 (4%) and 1 (2%) cases respectively.

Table 5 Comparison between cytological and histological diagnosis of 50 cases of breast lump:

Type of lesion	No. of cases diagnosed by cytology	No. of cases diagnosed by Histology	Accuracy %
Carcinoma	27	30	90.00
Fibroadenoma	9	10	90.00
Fibroadenosis	6	7	85.71
Gynaecomastia	1	1	100.00
Chronic mastitis	2	2	100.00
Suspicious/ Atypical	4	-	00
Scanty	1	-	00
Total	50	50	

Of the 50 cases with available histological diagnosis, carcinoma was found in 30 cases. The cytology had shown 27 cases of these as malignant. Thus the accuracy of cytology had shown 27 (90%) of these as malignant. Of the benign lesions diagnosed by cytology, 9 cases of fibroadenoma out of 10 cases and 6 cases of fibroadenosis out of 7 cases by histological diagnosis. 2 cases of chronic mastitis and single case of gynaecomastia were correctly diagnosed by aspiration cytology as compare to histological diagnosis.

Thus in benign lesions, gynaecomastia and chronic mastitis were diagnosed with 100% accuracy by aspiration cytology. The accuracy rate in diagnosing fibroadenoma and fibroadenosis was 90% and 85.71% respectively by aspiration cytology. Thus overall accuracy rate of aspiration cytology was found to be 90%.

Table 6 Accuracy and false results by 2 different methods for benign and malignant lesions

	No. of cases	No. of cases diagnosed correctly	False positive	False negative
1. Aspiration Cytology	50	45 (90%)	0 (0%)	5 (10%)
2. Histology	50	50	0	0

Taking into account the total number of cases of this series, malignant as well as benign, it was observed that aspiration cytology gave correct diagnosis in 45 (90%) cases. There were 5 (10%) false negative. There were no false positive in this study.

Discussion

FNAC of breast lump is an accepted and established method to determine the nature of breast lump with high degree of accuracy. The application of FNAC for the diagnosis of palpable breast masses was first introduced by Martin and Ellis in 1930, and since then, it has been established as an important tool in the evaluation of breast lesions. FNAC is simple, cost effective and less traumatic. Most of the patients with breast lump are in a state of anxiety, so to reduce anxiety and unnecessary surgical procedures as well as to minimize delay in diagnosis, FNAC plays important role.

The present study was done on 50 cases of breast lump to determine the diagnostic accuracy of fine needle aspiration cytology and its histopathological correlation. In all 50 cases, Fine needle aspiration cytology were done and subsequently histopathological examinations of the tissue were also done after surgery. So a correlation between cytological and histopathological finding were available.

Out of 50 cases studied, 30 were histologically confirmed cases of carcinoma. Remaining 20 cases were of benign lesions, of which there were 10 cases of fibroadenoma, 7 cases of fibroadenosis, 2 cases of chronic mastitis and one case of gynaecomastia. 27 cases of carcinoma and 18 cases of benign breast lesions were diagnosed correctly by fine needle aspiration cytology with a diagnostic accuracy of 90%. The cytological diagnosis of fibroadenoma was easy in most cases and a correct diagnosis was given in 9 (90%) out of 10 cases, while one case yielded scanty smear. Correct cytological diagnosis was made in 6 (85.71%) out of 7 cases of fibroadenosis. Hyperplastic epithelium mixed with foamy histiocytes, apocrine cells and cells showing suspicious changes of malignancy were found in one case. There were 4 suspicious smears in aspiration cytology, of which 3 were proved to be carcinoma and one case of fibroadenosis histologically.

Aspiration cytology was found to be useful in not only differentiating benign from malignant lesions, but it could also pin point the exact histological type of lesions. There were no false positive cases in the study. False negative diagnosis was made in 10% of the smears.

Table 7 Diagnostic accuracy of FNAC by different workers with present series:

Name of Authors	Total no. of cases with available histopathological report	Diagnostic accuracy
1. Gupta et al (1979)	152	84.86%
2. Dandapat el al (1986)	81	93.83%
3. Sreenivas et al (1989)	182	91.35%
4. N A Homesh (2005)	91	90.00%
5. A. Khemka (2009)	50	96.00%
6. A. F. Kocaay (2016)	123	95.00%
7. Present series (2017)	50	90.00%

The most series (including present study), the overall diagnostic accuracy of aspiration cytology has been above 90% or near to 90%. In the majority of series the diagnosis was more correct for malignant than benign lesions. The relative better accuracy in malignant disease is probably due to loss of adhesive power of malignant cells.

Table 8 Incidence of false positive and false negative results in the present study as compared to other workers:

Name of cytologists	Incidence of false positive results	Incidence of false negative results
1) Gupta et al (1979)	2.2%	2.2%
2) Dandepat et al (1986)	1.23%	2.46%
3) Hammond et al (1987)	1.12%	5.71%
4) A. Khemka (2009)	0.0%	4.0%
5) A.F.Kocaay (2016)	0.0%	5.0%
6) Present series (2017)	0.0%	10.0%

There was no false positive result in the author's cases. A.Khemka (2009) and A.F.Kocaay (20016) also had no false positive results in their study too. In author's series aspiration cytology resulted in 5 (10%) false negative results. Thus frequency of fallacious results in this series was more or less similar to those of other workers.

The factors which influenced the accuracy of diagnosis were:

1. Adequate clinical information of the case.

2. Observation made at the time of aspiration regarding the nature and quantity of the material aspirated.

3. Experience of the cytopathologist in reading the smear.

Conclusion

Following conclusions can be derived from the above finding:

1) FNAC can be used as an outpatient procedure as it is easy to perform causing minimal discomfort to the patient, is little time consuming with early availability of results and have good diagnostic accuracy.

2) FNAC can provide a pre operative diagnosis with reasonable accuracy.

3) FNAC can suggest further investigation without delay if carcinoma could be diagnosed.

4) In advanced carcinoma or unwilling patients for surgery, it can form the basis of management.

References

1. Kreuzer,G. and Zajicek,J. Cytologic diagnosis of mammary tumors from aspiration biopsy smears. Acta.Cytol. 16:249. 1972.

2. Zadjela,A. The value of aspiration cytology in diagnosis of breast cancer. Experience at the Foundation Curie. Cancer. 35:499. 1975.

3. Furnival et al. Aspiration cytology in breast cancer, its relevance to diagnosis. Lancet, 2:446. 1975.

4. Gupta et al. Evaluation of needle biopsy in the diagnosis of tumor. Indian J. of cancer. 12:257. 1975.

5. Wallgren. Cytologic presentation of mammary carcinoma on aspiration biopsy smears. Acta.Cytol. 20:469. 1976.

6. Struve-chirstensen,E. Itrogenic dissemination of tumor cells. Dan. Med. Bull. 25:82. 1978.

7. Zajicek, J. The aspiration biopsy smear in Diagnostic cytology and its Histopathologic bases Ed. by Koss L.G. Vol 2. 534 Philadepphia. J.B.Lippincott co. 1979.

8. Ferruci,J.T. et al. Malignant seeding of the tract after thin needle aspiration biopsy. Radiology. 130:345. 1979.

9. Gupta et al. Aspiration cytology in the diagnosis of breast cancer. Indian Jr. of cancer. 16:1. 1979.

10. Singh et al. Aspiration cytology in diagnosis of breast lumps. Indian Jr. Surg. 556. 1980.

11. Martin,R.E. and Graham,R. Office evaluation of breast tumor, with emphasis on needle aspiration therapy. Md. State Med. Jr. 31(9):51. 1982.

12. Frable, W.J.; Fine needle aspiration biopsy: A Review. Hum. Patho. 14(1) 9. 1983.

13. Holmer,M.J. et al. Outpatient needle localization and biopsy for nonpalpable breast lesions. JAMA 252:2452. 1984.

14. Smith et al. Accuracy and cost effectiveness of fine needle aspiration biopsy. Am. Jr. Surg. 149:540. 1985.

15. Bansal, R.L., Sankaran, V.Valiath, A.J.; Role of fine needle aspiration cytology in the diagnosis of breast lumps and its histopathological correlation. J.Cyto. 2:62. 1985.

16. Karcioglu Z.A., Gordon R.A., Karcioglu G.L., Tumor seeding in ocular fine needle aspiration biopsy. Ameri. Aced. Ophal. Vol. 2, 1763-1767, Dec. 1985.

17. Dnadapat,M.C., Panda, B.K. Fine needle aspiration as a primary adjunct in the diagnosis of palpable breast lumps. Jr. Indian.M.A. 84(1):3. 1986.

18. Sharma R., Mondol A., Sahoo M., Kakar A., Shankar L.R., Khanna C.M., Chopra M.K. : Journal of the association of physicians of India. 47(5); 488-91, 1999.

19. Milde P. Sidawy M. K. : Department of pathology, The George Washington University edical centre, Washington , DC,

USA Somce-cytopathology. 10(6) : 415;9, 1999.

20. Shinohara S., Yamamoto E., Tanabe M., Maetani T., Implantation metastasis of head and neck cancer after fine needle aspiration biopsy. Scaud. J. Urol. Nephrol. 1:270-276. 2001.

21. Khatun,H., Enam,S., Hussain,M., diagnostic role of fine needle aspiration cytology in the breast lumps with its correlation with histopathology. TAJ; 14(2):65-69. 2001.

22. Tiwari M.; Role of FNAC in the diagnosis of breast lumps. Katmandu Univer. Medi. Jr.; vol.5. no.2 18,215-217. 2007.

23. Osako, T., Iwase,T., Takahashi,K., Miyagi,Y., Diagnostic Mammography and US for palpable and non palpable breast cancer in women aged 30-39 years. Jap. Breast Cancer Soci. 14(3):255-9. 2007.

24. Silva M.A., Hegab B., Miraz D.F., Buckeb JAC., Needle tract seeding following biopsy of liver lesion in the diagnosis of Hepatocellular carcinoma. Brit. Med. J. 57:1592-1596. 2008.

25. Khemka, A., Chakraberti,N., Sah,S., Patel, V., Palpable breast lumps: fine needle aspiration cytology verse histopathology, a correlation of diagnostic accuracy. Int.J.of surg.18(1). 2008.

26. Reyes C.V., Reyes E.A. : The role of fine needle aspiration cytology in medical-surgical missions. Acta Cytol. 53(5):524-6. 2009.

27. Khan,N., Afroz,N. and Khan,M.A. Role of cytological grading in prognostication of invasive breast cancer. Jr. Cytol. 26(2):65-68. 2009.

28. Bukhari, M.H., Arshad,M., Jamal,S., Niazi,S., use of fine needle aspiration cytology in evaluation of breast lumps. Patho. Resch.Intr. 2011:10.

29. Danny R. Youlden., Susanna M.C., Nathan A.M.D., The descriptive epidemiology of female breast cancer; an international comparison of screening, incidence, survival and mortality. Cancer epidemiology, 36:237-248. 2012.

30. Smsa Chaudhary, MK Alam, MS Haque.; The Role of FNAC in Diagnosis of Breast Disease at Different Ages. Jr.of Bangladesh. College of physician and surgeons. Vol.30,No.3. 2012.

31. Kaarthigeyan, K. Cervical cancer in India and HPV vaccination. Indian Jr. Med. 33(1):7-12. 2012.

32. Global Health Estimates, Breast cancer: prevention and control, WHO 2013.

33. Rosai and Ackerman's: Surgical Pathology, 10th Ed. vol 2, Page, 1660-1733. 2014.

34. Orell and Sterrett's: Fine Needle Aspiration Cytology, 5th Ed. Page, 9-18,156-202. 2014.

35. Robbins and Cotran: Pathological Basis of Disease, South Asia Ed.vol 2, Page 1043-1070. 2015.

36. Gupta.S. Breast cancer; Indian experience, data and evidence. South Asian Jr. Cancer. 5(3):85-86. 2016.

37. Sreedevi,C.H., Pushpalatha,K., Correlation of fine needle aspiration cytology and histopathology for breast lesions. Trop.J.of Pathol. and Micro. 2(3) 2016.

38. Ghoncheh, M., Momenimovahed,Z., Salehiniya, H., Epidemiology, incidence and mortality of breast cancer in Asian Pac. J.Cancer prev. 17(s3):47-52. 2016.

39. Maheshwari, A., Kumar,N., Mahantshetty, U., Gynecological cancer: A summary of publication Indian data. South Asian Jr. cancer 5(3):112-120. 2016.

40. Kocaay,A.F., Celik,S.U. and Alic, K.B. Role of fine needle aspiration cytology and core biopsy in the diagnosis of palpable breast masses. N.M.Jr. 57(2):77-80. 2016.