Role of Intraoperative Scrape Cytology in Diagnosis of Palpable Breast Lump

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Abstract

Background: Diseases of the breast constitute a significant proportion of surgical cases and frequently, the need arises to distinguish benign from malignant lesions prior to definitive treatment. So far, Frozen Section (FS) is the standard technique with high level of validity. However, intraoperative scrape cytology can be adopted when special facilities of FS are not available. **Methods:** This study designed with the aim to evaluate the value of Intraoperative Scrape Cytology (IOSC) in providing rapid and accurate diagnosis for breast lump and to compare its diagnostic yield with that of paraffin sections. This cross sectional descriptive study was carried out in the Department of Pathology, Chittagong Medical College in collaboration with Department of Surgery of this institution from October 2013 to September 2014. The study conducted on 123 patients with breast lumps who underwent operative treatment. Scrapings were taken from each specimen before formalin fixation and stained by rapid Papanicolaou staining. In each case their accuracy was compared to histopathological diagnosis. Statistical analysis done employing χ^2 test. **Results:** Out of 123 cases studied, 122 could be correctly differentiated into benign and malignant tumors with an accuracy rate of 99.19%. **Conclusion:** Intraoperative Scrape Cytology (IOSC) is a simple, accurate, rapid and cost-effective diagnostic tool, not requiring specific instruments in contrast to frozen section, can be used per-operatively for both diagnosis and management of breast lump.

Key words: IOSC; Palpable breast lump; Intraoperative diagnosis.

INTRODUCTION

Lesions of the breast which are predominantly confined to the female have gained a great deal of global attention because of increasing mortality and morbidity caused by breast cancer[1]. In developing countries, breast cancer usually ranks second, after cervical cancer[2]. Increase incidence of breast cancer related to late marriage, birth of child in later age, shorter period of breast feeding and nulliparity or low parity[3].

The palpable breast lump is a common diagnostic problem to the general practitioners and surgeons[4]. A breast lump is the most common symptom associated with breast cancer. 1 in 10 women with a breast lump will have breast cancer[5]. In the assessment of breast lesions, the most important role of diagnostic cytology is in making the binary decision between benign and malignant categories[1]. Fine Needle Aspiration Cytology (FNAC) of breast lump is an accepted and established method to determine the nature of the lump[3]. FNAC has its own limitations in terms of sensitivity and specificity. Many a times FNAC leads to a diagnosis that is 'suspicious, but not confirmatory'[6].

There are authors who advocate that mastectomy be performed solely based on cytology reports, whereas others advise Frozen Section (FS) confirmation. According to Silverman et al, by utilizing FNA biopsy with frozen section confirmation in a specific situation, a more accurate diagnosis can be offered with virtual elimination of false positive diagnosis and, thereby, unnecessary mastectomies[7].

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Frozen section is routinely used by the surgical pathology laboratories for intraoperative diagnosis. Many studies have been done in the past to evaluate the role of cytology in intraoperative diagnosis of tumor. These studies have concluded that cytology has the advantage of being much less time consuming, easy to adopt, reliable and does not require special instruments. Hence, scrape cytology can be employed routinely in the intraoperative diagnosis of tumors. The use of either frozen section or intraoperative scrape cytological examination alone has an acceptable rate (93-97%) of correct diagnosis with regard to interpretation of benign versus malignant[8].

Scrape cytology avoids tissue artifacts produced during freezing sectioning done in frozen section, requires minimal tissue for diagnosis and saves the specimen for permanent sections and special studies. It has greater ability to detect micro metastasis, can be done inexpensively with materials available in most surgical laboratories, avoids contamination by infected tissues of the cryostat used in frozen section and provides clearer cellular details[9].

Many studies have demonstrated that the diagnostic efficacy of intraoperative cytology is comparable to that of frozen section[10].

Commonly used methods for obtaining and preparing cells for intraoperative cytological evaluation are imprint cytology, Fine Needle Aspiration Cytology (FNAC) and scrape smear preparation.[8] Scrape cytology is a modification of imprint cytology and its diagnostic accuracy is better than imprint cytology. Scraping of the cut surface prior to smearing facilitates the harvesting of cells. Hence, scrape cytology can be preferred over imprint cytology as the former technique will yield much more material than the latter[11]. So this study has been undertaken to know the utility of scrape cytology in the intraoperative diagnosis of tumor to improve the diagnostic accuracy of palpable breast lumps.

MATERIALS AND METHODS

It was a cross-sectional descriptive study which was carried out in the Department of Pathology, Chittagong Medical College (CMC) Chittagong, Bangladesh in collaboration with Department of Surgery Chittagong Medical College Hospital (CMCH) from October 2013 to September 2014. Total 123 patients with palpable breast lump who has given written consent to participate in this study were the study subjects. All consecutive patients with palpable breast lumps diagnosed by preoperative FNAC and underwent elective surgeries of breast lump were included. Intraoperative scrape smear was taken peroperatively in the Department of Surgery, CMCH. Institutional ethical clearance was obtained. Clinical history, questionnaire, thorough physical examination and relevant investigations were recorded in details in all cases.

Intraoperative scrape smears were taken. At first, the tumor was bisected to note the macroscopic features. Then the cut surface was wiped off the excess blood, if present, with the help of a filter paper. The most appropriate area thought to be representative of the lesion was chosen. The area was scraped with a sharp scalpel or the end of a glass slide. A semi fluid drop thus obtained was spread over a glass slide. On an average, four slides per case were prepared from different representative areas, immediately putted into 95% ethyl alcohol for fixation and stained with rapid Papanicolaou (Pap) stain. The slides were examined immediately and reported as benign or malignant.

The specimens were then fixed in 10% formalin. Paraffin blocks of the sections were processed in the routine way and 5 micrometer thick sections were stained with Hematoxylin and Eosin (H & E) stain. The stained sections were examined in the light microscope to get a definitive diagnosis of the lesions and its type.

The diagnosis obtained by intraoperative scrape cytology was compared with those of paraffin sections. Preoperative FNAC report also collected. The overall diagnostic accuracy of intraoperative scrape cytology for specific type of benign and malignant breast lesion was also found out.

All the patients included in this study were informed and explained about the nature of study. Informed written consent was taken from all the subjects after full explanation of the nature, purpose and potential risks of all the procedures to be taken out for the study.

The data analysis was done using the 'SPSS version-18' software. The association between intraoperative scrape cytology and histopathology was tested by Chi square test. Various indices such as sensitivity, specificity, false positive rate, false negative rate, positive predictive value, negative predictive value and accuracy were calculated.

RESULTS

The age range of 123 patients was 12 years to 65 years with a mean age 31.41 years (SD ± 14.31). On the basis of age, patients were divided into six groups and it was seen that maximum number of patients 39 (31.7%) were in age group 21-30 years followed by 20 years group 36 (29.3%) (Table 1).

Among 123 the cases, 89 (72.4%) cases were married and 34 (27.6%) cases were unmarried women. Among married women, 54 (60.7%) had contraceptive history and 35 (39.3%) had no contraceptive history. Maximum numbers 84 (68.3%) were from average socioeconomic condition and incidence of breast lump was more common in housewives, which were 74 (60.2%) (Table-2). The breast lumps of variable sizes were noted. Breast lump sizes were categorized into three groups according to American Joint Committee on Cancer (AJCC) staging system. Maximum numbers 93 (75.6%) were 2-5 cm size, 21 (17.1%) were < 2 cm size and 09 (7.3%) were >5 cm size.

Intraoperative scrape smears were taken from all 123 cases. Out of them, 71 (57.7%) cases were benign and 52 (42.3%) were malignant. Among benign cases, 66 (53.7%) were fibroadenoma(Figures-1,2), 03 (2.4%) cases were fibrocystic disease, 01(0.8%) was benign phylloides tumour and 01(0.8%) was granulomatous inflammation (FNAC impression of this case was ductal carcinoma & histopathological diagnosis was invasive lobular carcinoma). Among malignant cases, all were duct cell carcinoma (Figures- 3,4). Histopathological diagnosis showed 70 (56.9%) benign lesions and 53 (43.1%) malignant lesions.

Out of 71 benign IOSC impressions 70 proved to be benign histologically and 1 case was malignant. Out of 52 malignant IOSC impressions, all were proved to be malignant histologically. The association between IOSC impression and histopathological diagnosis was done using Chi-square test (Table 3). True Positive (TP) cases are 52, False Negative (FN) case is 01, True Negative (TN) cases 70 and no False Positive (FP) cases, p= 0.000. Highly significant (p≤0.001).

In Intraoperative Scrape Cytology (IOSC) the sensitivity was found 98.11%, specificity 100%, PPV 100%, NPV 98.59% and accuracy was 99.19%.

Table 1 : Age distribution among the cases (n = 123)

Age in Groups	Frequency	Percentage (%)
≤ 20 Years	36	29.3
21 – 30 Years	39	31.7
31 – 40 Years	18	14.6
41 – 50 Years	16	13.0
51– 60 Years	12	9.8
> 60 Years	02	1.6
Total	123	100.0

Mean- 31.41, SD- 14.31, Median- 26.00, Range- 12-65 years

Table 2 : Socio-demographic variables among the cases (n = 123)

Socio-demographic Variables		Frequency	Percentage (%)
Marital Status	Married	89	72.4
	Unmarried	34	27.6
Socio-economic Status	Poor*	29	23.6
	Average**	84	68.3
	Affluent***	10	08.1
Occupation	House Wife	74	60.2
	Student	22	17.9
	Service Holder	15	12.2
	Garments Worker	12	09.7
Family History of	Yes	14	11.4
Breast Lump	No	109	88.6
Contraceptive	Yes	54	60.7
History	No	35	39.3

* Poor class:-Family income Tk. 5000 or below per month
**Average class:-Family income between Tk. 5000-15000 per month ***Affluent class:-Family income above Tk. 15000 per month

Table 3 : Association between IOSC & histopathology (With χ^2 test significance)

Intra-Operative Scrape Cytology (IOSC)	Histopathology			
	Benign Lesion	Malignant Lesion	χ^2 test Total	Significance
Benign Lesion	70	01	71	$\chi^2 = 118.980$ p = 0.000
Malignant Lesion	00	52	52	Highly
Total	70	53	123	Significant

Sensitivity-98.11 %, Specificity-100.00 %, PPV-100.00 %, NPV-98.59%, Percentage of False Negative-1.89%, Percentage of False Positive-0.00 %, Diagnostic Accuracy- 99.19%.
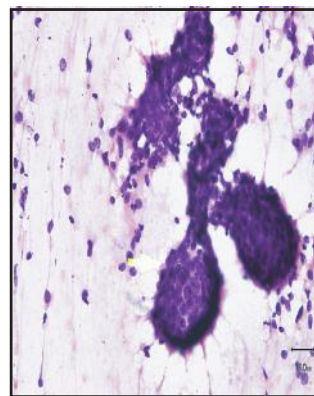
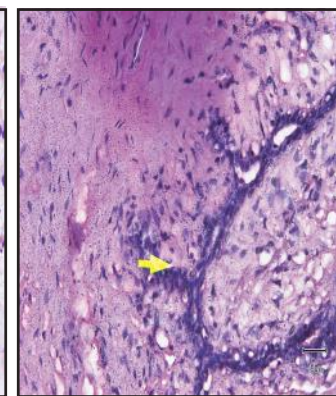

Figure 1 : Fibroadenoma (IOSC Smear) (Pap stain) 400X
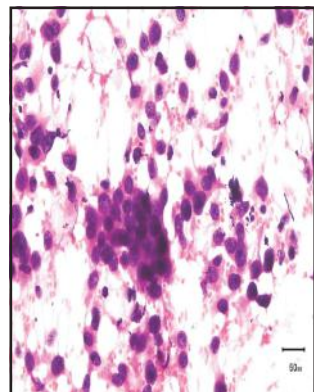

Figure 2 : Fibroadenoma (Histopathology) (H & E stain) 400X

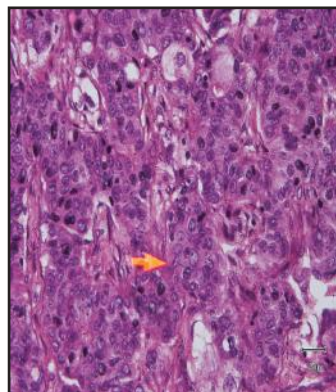**Figure 3 :** Duct cell carcinoma (IOSC Smear) (Pap stain) 400X

Figure 4 : Invasive Duct cell carcinoma (Histopathology) (H &E stain) 400X

DISCUSSION

The age range of 123 patients was 12 to 65 years with maximum number of patients were in 21-30 years group, 39 (31.7%). Rahman and Islam in their study showed highest number of patients (38.13%) were in 21-30 years age group which is similar to our study[12]. Study done by Ramraje et al[13]. patient's age ranged from 12 to 70 years, majority of cases were between 21 to 40 years and 41 to 60 years respectively.

Hiregoudar et al also showed age ranged from 13 to 65 years with most common benign and malignant lesions were 21 to 30 years and 31 to 50 years respectively which was consistent with our study[6]. In this study, among 123 cases, 89 (72.4%) cases were married and 34 (27.6%) cases were unmarried women. This is probably due to more married women presented to the out-patient department than unmarried ones. Though not directly related to this study, these figures may indicate the relative reluctance of young unmarried women to present to the out-patient department for a breast examination[14]. Present study revealed that, 14 (11.4%) had family history of breast lump and 109 (88.6%) had no family history. Among 14 cases with family history of breast lump, 3 (21.3%) cases had family history of breast cancer. Tazzite et al showed 18.4% cases having family history of breast cancer which is nearer to our study[15].

Intraoperative scrape smears collected from 123 cases, reveal 71 (57.7%) benign lesions and 52 (42.3%) malignant lesions. On histological basis, among 53 malignant cases, 52 cases were diagnosed correctly by IOSC and 1 was diagnosed as benign, granulomatous mastitis (False negative) which subsequently confirmed histopathologically as lobular carcinoma. This may be due to similarity of monomorphic lobular carcinoma cells with chronic inflammatory cells and also due to resemblance of stromal cells to that of epithelioid cells. In a study we found that, Infiltrating Lobular Carcinoma (ILC) was missed for mastitis. This was explained as the inflammatory cells align themselves in the form of Indian files fashion and showed features typical of ILC. However, surgical and macroscopical examination findings were not conclusive for malignancy and the diagnosis on intraoperative cytology was that of mastitis[16]. There were no false positive cases in all scrape smears; similar finding was seen by Hiregoudar et al and Khudier et al[16,17]. This is probably because of the clear morphological features, adequate samples or results enhanced by using intraoperative cytology coupled with gross examination of surgical specimens[17]. All 70 histological benign cases were correctly diagnosed by IOSC.

Statistical analysis of the study cases was done considering the IOSC as screening test and histopathology as gold standard. In Intraoperative Scrape Cytology (IOSC) the sensitivity was found 98.11%, specificity 100.00%, PPV 100.00%, NPV 98.59% and accuracy was 99.19%. Akhter et al showed that sensitivity, specificity, PPV, NPV and accuracy for IOSC were remained 100%[1]. Issam et al showed sensitivity, specificity and accuracy for IOSC were 95.8%, 100%, 96.8% respectively[7]. Bukhari et al showed sensitivity, specificity, accuracy, PPV, NPV, for IOSC were 91.30%, 100%, 95%, 100%, 89%, respectively[18]. Hiregoudar et al showed that sensitivity, specificity, PPV, NPV and accuracy for IOSC were 95.24%, 100%, 100%, 95%, 97.5% respectively[6].

However, different studies have compared diagnostic efficacy of intraoperative scrape cytology with that of frozen section. Issam et al showed sensitivity, specificity and accuracy for IOSC were 95.8%, 100%, 96.8% respectively and for FS it were 91.7%, 100% and 90.3% respectively[7]. Bolkainy et al reported diagnostic accuracy of FS higher than IOSC and approved the relatively valid use of IOSC as an acceptable alternative in hospital with limited technical, financial and human supplies with available experienced cytopathologist[19].

In Bangladesh, breast lump is a common clinical problem, mostly in female. For proper surgical management and to achieve good prognosis, intraoperative scrape cytology will be very helpful. Most of the hospitals of Bangladesh including Chittagong Medical College Hospital are lacking facilities of frozen section. So intra-operative scrape cytology technique may fulfill the necessity of frozen section as it can be easily performed in many centers even in peripheral areas of this country.

Intraoperative scrape smears like frozen sections help in on-table diagnosis, with regard to the nature of tumours. This is of paramount importance wherein the FNAC is inconclusive or suspicious. Intraoperative scrape smears help in taking proper decisions with prior counseling of the patients, so that a repeat surgery is avoided. Intraoperative scrape smears are simple, accurate, rapid and cost effective diagnostic tool for intraoperative evaluation of breast tumours.The sensitivity and specificity support their utility intra-operatively wherein facilities for frozen sections are not available. In exact categorization of benign and malignant lesions of the breast, highest rate of diagnostic accuracy will be achieved when FNAC is combined with intraoperative cytology.

CONCLUSIONS

Intraoperative Scrape Cytology (IOSC) is a simple, accurate, rapid and cost-effective diagnostic tool, not requiring specific instruments in contrast to frozen section, can be used per-operatively for both diagnosis and management of breast lump.

DISCLOSURE

All the authors declared no competing interest.

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