INVESTIGATION OF BREAST LUMPS: AN EVALUATION

Maj A KUMAR *, Lt Col LS VOHRA +,
Lt Col S BHARGAVA, # Col PS REDDY **

ABSTRACT

70 patients with 72 palpable breast lumps were assessed by Physical Examination (PE), Mammography (MG), Ultrasound Scan (USS) and Fine Needle Aspiration Cytology (FNAC). The individual and collective value of these investigations have been assessed and a cost effective algorithm suggested.

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KEYWORDS: FNAC; Mammography; Palpable breast lump; Physical examination.

Introduction

Of all breast disorders in women, palpable breast lump is the second most common presentation, the first being pain. This is an important cause of anxiety and fear of cancer.

Skilful physical examination is followed by different investigations to pinpoint the nature of disease, viz. Benign, Equivocal and Malignant.

Each of these investigations have their own cost, advantages and disadvantages and are also not universally available. For optimal and cost effective management of breast lumps, a working algorithm would prove useful [1].

Material and Methods

This study was carried out at Army Hospital (R & R), over a period of 23 months. In this study, a definite protocol of investigations was followed to arrive at a final diagnosis and the same was confirmed and correlated with histology. All patients with palpable breast lump were assessed by careful physical examination and followed by Mammography, Ultrasound scanning of breast and FNAC, as indicated. Histological diagnoses were obtained in all cases. Findings of investigations were correlated with histology, individually and in combination, using standard formulae to arrive at the test characteristics. Result obtained as above have been compared with already published studies, inferences deduced and a working algorithm has been formulated for evaluation of breast lumps.

Results

In this study, 70 patients presented with 72 breast lumps. All the patients were subjected to physical examination (PE). However, only 45 patients (47 lumps) were subjected to mammography (MG), excluding all patients below the age of 35 years. USS of breast was carried out in 45 patients (47 lumps) and FNAC was done in all cases. 27 patients with 29 lumps underwent investigations by all four modalities (Table 1). Histological diagnoses were obtained in all cases. The results of each investigation were recorded as Benign, Equivocal, or Malignant. The following criteria

were used for calculating the various test results:

True Positive: Malignant+ Equivocal test results proved histologically malignant.

True Negative: Benign test results proved histologically benign.

False Positive: Malignant + Equivocal test results proved histologically benign

False Negative: Benign test results proved histologically malignant.

TABLE 1

Patients and diagnostic methods

Total number of patients	70
Total number of lumps	72
Physical examination	70 patients (72 lumps)
Mammography	45 patients (47 lumps)
USS Breast	45 patients (47 lumps)
FNAC of lump	70 patients (72 lumps)
PE+MG+USS+FNAC	27 patients (29 lumps)

Since the possibility of malignancy is high in equivocal lesions, such lesions were considered malignant for calculating the various test characteristics in this study. The age of patients ranged from 16 to 67 years (mean 41.2 years). A summary of results as compared to histology is given in Table 2.

Summary of various test characteristics is shown in Table-3. It is evident that when used alone, FNAC had highest sensitivity, specificity and positive predictive value, zero false positive rate and minimal false negative rate. PE had a reasonable sensitivity, though lowest specificity and highest false positive rate. The combination of all four investigative modalities showed 100% sensitivity and Negative predictive value and zero false negative rate; however there was sharp decline in specificity, positive predictive value and accuracy rate, in addition, it had resulted in high false positive rate (71.4%). There was no equivocal result on FNAC in this study. The results indicate that FNAC alone was able to give a definitive diagnosis in most of cases where the mass was easily felt and well defined. It was unable to give a correct diagnosis in one lesion (False negative rate-2.4%) due to small size of lesion.

* Surgeon Trainee, # Classified Specialist, Radiodiagnosis, ** Senior Adviser, Pathology, Army Hospital (R & R), Delhi Cantt, + Classified Specialist, Surgery and Oncosurgery, MDTC, Command Hospital (SC), Pune 411 040.

TABLE 2
Summary of test results

Test results	Confirmed Histological Status		
	Benign (n=30)	Malignant (n=42)	Total (n=72)
PE (72 lumps)			
Benign	22	02	24
Equivocal	06	10	16
Malignant	02	30	32
MG (47 lumps)			
Benign	11	02	13
Equivocal	03	05	08
Malignant	00	26	26
USS (47 lumps)			
Benign	24	02	26
Equivocal	02	08	10
Malignant	00	11	11
FNAC (72 lumps)			
Benign	30	01	31
Equivocal	00	00	00
Malignant	00	41	41

TABLE 3
Test characteristics for diagnostic modalities

Test characteristics	PE	MG	USS	FNAC	Combined PE+MG+ USS+FNAC
Sensitivity	95.2	92.6	90.0	97.6	100.0
Specificity	73.3	85.0	92.6	100.0	28.6
False positive rate	26.7	21.4	7.7	0.0	71.4
False negative rate	4.8	6.0	9.5	2.4	0.0
Positive predictive value	83.3	89.3	90.0	100.0	60.0
Negative predictive value	91.7	89.5	92.6	96.8	100.0
Accuracy rate	86.1	89.4	91.5	98.6	65.5

Table 4 shows the various individual test characteristics of this study as compared to the results of other authors [2,3].

A study of double combination by combining mammography, USS or FNAC with physical examination was done, the results of which are given in Table 5. It is seen that the best diagnostic results were obtained by the combination of PE and FNAC, which were comparable to the results of combination of all four modalities

TABLE 4
Comparative study of test characteristics

Test characteristics	PE		MG		USS		FNAC	
	A	B	A	B	A	B	A	C
Sensitivity	95.2	88.0	93.9	94.0	90.5	78.0	97.6	49.0
Specificity	73.3	71.0	78.6	55.0	92.3	89.0	100.0	99.5
False positive rate	26.7	27.0	21.4	35.0	7.7	14.0	00.0	*
False negative rate	4.8	*	6.0	*	9.5	*	2.4	*
Positive predictive value	83.3	73.0	91.2	65.0	90.5	86.0	100.0	98.0
Negative predictive value	91.7	87.0	84.6	91.0	92.3	82.0	96.8	*
Accuracy rate	86.1	81.0	89.4	73.0	91.5	84.0	98.6	*

A : Current study (1998), B : Study by Peter A Van Dam et al (1988) [2], C : Study by Steinberg et al 1996 [3], * : Data not available

ties and was cost effective also.

Histology revealed 30 (41.7%) lesions to be benign whereas 42 (58.3%) lesions were malignant (Table 5).

TABLE 5
Comparison of double combinations

Test characteristics	PE+MG	PE+USS	PE+FNAC
Sensitivity	95.2	97.6	100.0
Specificity	56.7	70.0	78.6
False positive rate	43.3	30.0	26.7
False negative rate	4.8	2.4	0.0
Positive predictive value	75.5	82.0	84.0
Negative predictive value	89.5	95.5	100.0
Accuracy rate	79.2	86.0	88.9

TABLE 6
Final diagnosis : histological results

Histological diagnosis	72 palpable breast lumps
Benign (True negative)	30
Fibroadenoma	25
Fibrocystic disease	04
Adenosis with cystic changes	01
Malignant (true positive)	42
Infiltrating duct carcinoma	38
Infiltrating lobular carcinoma	03
Duct carcinoma in situ	01

Discussion

The objective of investigation of breast lumps is to detect breast cancer at the earliest possible stage, yet to keep unnecessary biopsies to a minimum so that the management is cost effective.

PE is the initial step in the investigation of palpable breast lumps. In this study, PE showed a high sensitivity (95.2%). Although PE had high false positive and false negative rates (26.7% and 4.8% respectively), the test forms the basis for further evaluation. On PE, if the mass is well defined and dominant, further clas-

sification is usually possible as benign, equivocal or malignant. In this study, the positive predictive value of PE was 83.3% and false negative rate was 4.8%, which is consistent with studies carried out by other authors [2,3].

USS of breast is highly accurate in detecting cysts as small as one cm in diameter [4]. At the same time, its value in defining the lesions is better in younger women with dense breast. In this study, USS gave reasonable high accuracy (91.5%) in cancer detection and 100% correct diagnosis of cystic lesions. Though the sensitivity was less than PE, specificity was reasonable high (92.6%). These results are comparable to the results of the studies carried out by other authors [2-6]. It is recommended that all well defined dominant lumps of breast which are benign/equivocal on PE should be subjected to USS for further tissue characterization. The diagnosis of a cyst virtually excludes malignancy and aspiration of the cyst is almost always curative. Solid lesions can be further classified as benign, equivocal or malignant based on ultrasonic tissue characterisation. USS is also valuable in defining the nature of an ill defined indeterminate lump in women less than 35 years of age, where MG is not advisable [5,6].

MG is advantageous in cases of ill defined, indeterminate, non -dominant masses that are doubtful clinically and in which USS is unlikely to characterize the nature of disease, particularly so in subjects beyond 35 years of age. MG can detect many occult lesions suspicious of malignancy and is particularly indicated in women with family history of breast cancer and in follow up of the remaining breast after mastectomy on one side for cancer [7,8]. The mammographic results of this study are similar to those of other authors [2,3]. It is recommended that MG should be used in cases of equivocal nature of lesions preferably excluding the younger patients. This will give a better delineation of the lesion as well as a baseline record for further reference and comparison during follow-up. FNAC alone gave results as compared to other individual modalities in detection of breast cancer with sensitivity, specificity and positive predictive value of 97.6, 100 & 100% respectively. The results are slightly better as compared to previous studies [2,3,6,8].

Combination

Various combinations of diagnostic modalities (PE, MG, USS, FNAC) result in greater sensitivity and are superior to any single modality. A number of studies have been carried out using double combination [2,3,7] and triple combinations [5-7].

Double combinations employ PE and either of USS, MG or FNAC. In our study, a combination of PE and FNAC gave a reasonably accurate and cost effective diagnosis, with a sensitivity of 100 percent and formed the basis of definitive cancer management in most cases. It is recommended that all such masses which are highly suggestive of malignancy on PE, should be subjected to FNAC.

The triple combination uses PE and FNAC with either USS or MG [5,7]. The results are superior to the single modality as well as double combination though addition of an investigation increases the cost and has only marginal benefit over double combination.

The quadruple combination of all four modalities together was done in current study which has limitations of high cost, limited availability, high false positive rate and very low specificity. Such quadruple combination has not been used earlier and is as such not recommended in all cases.

In the study the results of combination of all four modalities gave a sensitivity of 100% though the specificity dropped to 28.6% (Table-3).

The overall results of our study showed better test results and a high incidence of malignancy as compared to previous studies. The possible explanation for this situation is that majority of cases seen at

Fig. 1 : Algorithm for investigation of breast lump
PE-Physical examination, MG-Mammography, USS-Ultrasound scanning, FNAC-Fine needle aspiration cytology, M-Malignant, E-Equivocal, B-Benign, FU-Follow up, Def Surg-Definitive surgery, Ex Bx-Excision biopsy

Army Hospital (R & R) have already undergone screening at other hospitals and only suspicious cases at physical examination are referred to this centre for specialized investigations, expert opinion and management. Based on the result of this study an algorithm for the investigation of palpable breast lump has been formulated as in Fig. 1.

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