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Ultrasound- an evaluation tool for assessment of breast tumour and axillary lymph node size

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Abstract: Aims: The present study was taken up in carcinoma breast patients to evaluate clinical examination and Ultrasound in estimating the breast tumour size and axillary lymph node size taking histopathological examination as the gold standard. Material & Methods: The study carried out between December 2008 to June 2010 included thirty seven carcinoma breast patients. Ethics committee clearance obtained. Twenty four patients received neoadjuvant chemotherapy followed by surgery. 13 patients were taken up directly for surgery. Largest dimension of the primary tumour and axillary lymph nodes were assessed clinically, sonologically and histopathologically. Results were analyzed using paired-t test and Pearson correlation coefficient. Results: Clinical examination overestimated breast tumour size, while underestimated axillary lymph node size in majority of the patients. Sonological examination underestimated both breast tumour size and axillary lymph node size in majority of patients. There was strong correlation (r =.719, p=<.001) between clinical and histopathological breast tumour size, however for axillary lymph nodes the correlation was moderate (r=.536, p= .001). A moderate correlation (r=0.601; p=<.001) was observed between sonological and pathological breast tumour size, while strong correlation (r=.652, p <0.001) was found for axillary lymph nodes. For breast tumour, the difference between mean clinical and histopathological size was 0.01cm and statistically not significant (t=.064, p=.949). However, the difference between mean sonological and histopathological size for breast tumour was 1.10cm, and statistically highly significant (t=-3.93, p<.001). For axillary lymph nodes, the difference in mean size between clinical and histopathological assessment was 0.46 cm (p=0.007) as against mean difference of 0.48 cm between sonological and histopathological assessment (p=0.001). Conclusion: In the present study, for primary breast tumour size estimation clinical assessment was as good as histopathological examination, however, ultrasound was found to be inferior. Whereas for axillary lymph node size estimation both clinical assessment and ultrasound were indifferent .

Keywords: Ultrasound, Breast Cancer, Tumor and Lymph Node Assessment

1. Introduction

Breast cancer is the most prevalent cancer and also of leading cause of cancer death in women worldwide. Both tumour size and presence of metastatic regional lymph nodes have been found to be prognostic factors (1-4) and strong predictor of distant metastasis, disease-free and overall survival(5-6). Tumor size is one of the most powerful predictors of tumor behavior in breast cancer [4, 8]. The size of the primary tumour ranks among the strongest predictor of distant metastases, disease-free and overall survival. Survival rates varied from 45.5% for tumor diameters equal to or greater than 5 cm with positive axillary nodes to 96.3% for tumors less than 2 cm and with no involved nodes [1].

Accurate staging in cancer breast patients also directs management.(7-9).

For evaluation of primary tumour and regional lymph nodes different methods have been in practice. Clinical assessment of tumour size are difficult when the tumor is less than 2 cm, irregular or diffuse because the margins cannot be delineated precisely. Tumor measurements can also be affected by overlying edema or fibrosis.

Clinical assessment has been found to have low sensitivity and specificity (36% and 39% respectively) in

the evaluation of axillary lymph nodes (10). It cannot assess the number of nodes, nodes in depth and nodes of small size. Also it cannot distinguish between reactive and malignant nodes or detect extracapsular extension.

Sentinel node mapping and complete axillary dissection are considered the ‘‘standard of care’’ for the evaluation of nodal disease in patients with clinically negative axillae (11). However, axillary lymph node dissection is associated with substantial cost and morbidity, including seroma formation and arm edema.

Increasingly, however, pre-operative non-invasive imaging techniques, including ultrasound, CT, MRI, and nuclear medicine scintigraphy, are being used with the same purpose (12-13). The use of ultrasound to evaluate mammographically detected breast lesions has increased rather dramatically in recent years. In individuals with a nonspecific asymmetry demonstrated on two mammographic views, ultrasound evaluation can be used as a part of further diagnostic work up. Scope of ultrasound has been extended with the introduction of newer techniques like harmonic scanning, spatial compounding (14), extended field of view, 3D imaging, contrast agents, elastography (15). The sonographic examination of a patient with breast cancer should include the ipsilateral axilla in order to detect any pathological lymph nodes. The criteria for pathological nodes include not only the size but also the form and the internal structure. Axillary ultrasound has been shown in many comparative studies to have demonstrated superior diagnostic accuracy (10,12,16) the sensitivity of which is further increased if combined with ultrasound-guided fine needle aspiration cytology of any sonographically suspicious or indeterminate lymph nodes (17).

The present study in carcinoma breast patients using Colour Doppler as an evaluation tool was taken up to test the accuracy of clinical examination and ultrasound, taking measurement on histopathological examination as the standard in estimating the breast tumour size and axillary lymph nodes size.

2. Material and Methods

Thirty seven histopathologically proven cases of carcinoma breast were studied between December 2008 to June 2010. Patients who had received any chemotherapy/ Surgery/Radiotherapy prior to the study were not included in the study. The Institute postgraduate research board and the departmental research committee have approved the study and the informed written consent of the subjects was recorded individually on the case records. Twenty four patients received neoadjuvant chemotherapy (CAF) and and then underwent modified radical mastectomy. 13 patients were taken up directly for modified radical mastectomy. Clinical measurement of the breast tumour and axillary lymph nodes were done using vernier calipers, taking two perpendicular diameters. Maximum diameter were recorded.

Ultrasound examination was performed by a single experienced sonologist who was blinded to the patients' clinical profile, treatment history and the pre chemotherapy findings. Normal and B-mode images were taken to define the tumour margin. The scan was done in multiple planes to include whole of the breast and axilla. The probe was held orthogonal to the skin and moved over the tumour till maximum diameter was demonstrated. Two measurements were made perpendicular to each other and the thickness of the lesion was recorded using the electronic calipers.

The resected specimens were examined histopathologically. The clinical and sonological breast tumour and axillary lymph node size were compared with the histopathological size. Results were analyzed using paired-t test and Pearson correlation coefficient.

3. Results

Mean age of the patients was 45.10±11.32 yrs, (range 25-80yrs). T4b status was seen in majority (56.8) % of the patients and 86.5% of the patients had N1 status. Clinical size of breast tumour matched the histopathological size in 27.03% patients. Clinical examination overestimated the breast tumour size in 45.54% patients and underestimated it in 32.43% patients. Overestimation and underestimation in size was by 0.51-1cm in majority of the patients (40.0% and 57.14%). Sonological size of breast tumour matched the histopathological size in none of the patients. Sonology overestimated the breast tumour size in 18.92% patients and underestimated it in 81.08% patients. Overestimation and underestimation was by >1 cm in majority of the patients (57.14% and 66.67%). Clinical size of axillary lymph node matched the histopathological size in 19.44% patients. Clinical examination overestimated axillary lymph node size in 27.78 % patients and underestimated it in 52.78% patients. In majority of the patients overestimation in size was by ≤0.5cm and underestimation was by >1cm (60.0% and 47.37% respectively). Sonological size of axillary lymph node matched the histopathological size in none of the patients. Sonology overestimated axillary lymph node size in 27.78 % patients and underestimated it in 72.22% patients. In majority (70%) of the patients, sonological examination overestimated the axillary lymph node size by ≤0.5cm. In majority (42.31%) of the patients, the underestimation was by 0.51-1 cm.

The statistical analysis results for breast tumour size and axillary lymph node size estimation by clinical examination and sonology against histopathological size has been shown in Table-2. For breast tumour, the difference in the mean size between clinical and histopathological method was -0.01 cm, while the difference in the mean size between sonological and histopathological method was 1.10 cm. Clinical examination overestimated the breast tumour size, but the difference was not statistically significant (t=.064, p=.949). However, sonology underestimated the breast tumour size and the difference was statistically highly significant (t=-3.93, p=<.001).

For axillary lymph nodes, the difference in the mean size between clinical and histopathological method was 0.46 cm,

whereas the difference in the mean size between sonological and histopathological method was 0.48 cm. Both clinical examination and sonology underestimated the axillary lymph node size while considering histopathological examination as the gold standard, but the difference with clinical method is less significant than sonology (t=-2.84, p=.007 Vs t=-3.45, p=.001).

There was strong correlation (r =.719, p=<.001) between clinical and histopathological breast tumour size, however for axillary lymph nodes the correlation was moderate (r=.536, p= .001). A moderate correlation (r=0.601; p=<.001) was observed between sonological and pathological breast tumour size, while strong correlation (r=.652, p <0.001) for axillary lymph nodes.

Table 1. *Percentage of matching, overestimation and underestimation by clinical and sonological examination in estimating the breast tumour and axillary lymph node size while taking Histopathological size as gold standard.*

	Matched		Overestimated		Underestimated	
	CL (%)	S (%)	CL (%)	S (%)	CL (%)	S (%)
BT	27.03	0	45.54	18.92	32.43	81.08
AXLN	19.44	0	27.78	27.78	52.78	72.22

BT- Breast tumour; AXLN- Axillary lymph node; CL- Clinical; S- Sonological

Table 2. *Clinical, Sonological breast tumour size and axillary lymph node size tested against respective Histopathological size.*

	Mean difference (cm)		t value		p value		r		p value	
	CL	S	CL	S	CL	S	CL	S	CL	S
BT	.01	-1.10	.064	-3.93	.949	.000	.719	.601	.000	.000
AXLN	-.46	-0.48	-2.84	-3.45	.007	.001	.536	.652	.001	.000

BT- Breast tumour; AXLN- Axillary lymph node; CL- Clinical; S- Sonological

4. Discussion

Breast cancer is the most prevalent cancer of women worldwide. The estimated incidence of cancer in India is 800,000 cases and prevalence is about two million cases. About 25% increase is expected by the year 2015 [18].

In the present study, clinical examination overestimated breast tumour size in 45.54% patients and underestimated in 32.43% patients. Sonological examination of breast tumour overestimated the size in 18.92% patients and underestimated it in 81.08% patients. Clinical examination overestimated axillary lymph node size in 27.78 % patients and underestimated in 52.78% patients. Sonological examination overestimated axillary lymph node size in 27.78 % patients and underestimated in 72.22% patients.

In the study of Apple et al [19] clinical examination overestimated tumor size in 67%, underestimated in 26% and predicted accurately in 7% patients. An accuracy of ±1 cm in 66% of patients by physical examination, 75% by ultrasonography, and 70% by mammography has been obtained in comparison to pathological breast tumour size [20]. Compared to the pathologic results, sonography has been shown to underestimate the extension of the residual disease but it was statistically not significant (r=0.571, P=0.0267) [21].

In the present study, a strong correlation with pathological tumour size was observed for primary tumour size estimation by clinical method (n = 37, r =.719, p=<.001). Moderate correlation was found for sonology (r=0.601; p=<.001).

Moderate correlation between pathological and clinical size (n = 51, r2 = 0.68, P < 0.0001) and close correlation with pathological tumour size was observed for ultrasonographic (n = 52, r2 = 0.89, P < 0.0001) tumour size measurement [22]. Physical examination demonstrated the highest correlation coefficient (r=.759) with histopathological size in measurement of the tumour size while high resolution duplex ultrasonography has been shown to be the most sensitive assessment method of axillary lymph node status [23]. MRI was a more accurate imaging study at baseline for T3/T4 tumor and physical examination (PE) correlated best with pathology finding while baseline PET and (PE) were shown to be more accurate and sensitive in predicting the final nodal status than the post-neoadjuvant evaluation by either PE or PET, but none was sufficient to replace pathological staging [24].

In the present study, the difference between mean size estimated by clinical and histopathological method for breast tumour was 0.01cm, which was statistically not significant (t=.064, p=.949). However, the difference between mean sonological and histopathological size of breast tumour of 1.10cm, was statistically highly significant (t=-3.93, p<.001). For axillary lymph nodes, the difference between mean clinical and histopathological size was 0.46 cm (p=0.007) as against the difference in mean size of 0.48 cm between sonological and histopathological assessment (p=0.001).

5. Conclusion

In the present study, for primary breast tumour size estimation clinical assessment was as good as histopathological examination, however, ultrasound was found to be inferior. Whereas for axillary lymph node size estimation both clinical assessment and ultrasound were indifferent.

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