



Comparative and Correlative Study of Sonological and Histopathological Findings in Various Benign and Malignant Breast Lesions

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Introduction: Breast tissue can be defined as the modified sweat glands. Various benign and malignant lesions are seen to arise from fibroglandular tissue. Ultrasonography is usually performed as a first step in the assessment of musculoskeletal soft tissue masses. Using B-mode and Doppler ultrasonography we can differentiate benign from malignant musculoskeletal soft tissue masses.

Aim: to study the role of b-mode and doppler ultrasonography analysis in differentiating benign from malignant breast lumps.

Methods: Sixty four patients with breast lumps (48 benign, 16 malignant) were prospectively evaluated using B-mode and doppler ultrasonography analysis to assess their role in differentiating benign from malignant lesions. Later the findings obtained were confirmed by histopathological study of masses.

Results and Discussion: B- Mode ultrasonography and dopler study showed 93.7% sensitivity, 93.7% specificity, 83.33% positive predictive value, 97.8% negative predictive value and 93.7% accuracy in differentiating benign from malignant lesions. Our study showed that conventional sonography and doppler sonography reliable for diagnosing malignancy, it has good accuracy, good sensitivity, good specificity, good positive predictive value and good negative predictive.

Conclusion: Sonomammography and colour doppler assessment of breast lumps represent an important supplement to histopathological examination and should always be performed when evaluating the same.

Keywords: Doppler ultrasonography; B-mode sonomammography; Breast lumps.

Introduction

Breast is modified sweat gland that is composed of 15-20 lobes that are not well delineated from each other, that

overlap, and that vary greatly in size and distribution. Most breast carcinomas are thought to arise in the terminal duct near the junction of the intralobular and extralobular segments. Lobar ducts give rise to much less pathology than do terminal ductolobular unit. However, most invasive ductal carcinomas have ductal carcinoma in situ components that can use the ductal system as conduits for growth into other parts of the breast. Breast lumps are common problem affecting females, which require proper workup, early diagnosis and treatment. Breast cancer is most common cause of cancer death in women and overall fifth common cause of cancer deaths in the world. In developing countries like India, females are unaware of breast pathologies and are hesitant to reveal, hence they are detected usually in advanced stages. According to GLOBOCAN (WHO), 70218 women died in India due to breast cancer in the year 2012, more than any other country in the world. Hence, a palpable mass in a woman's breast requires proper evaluation and appropriate imaging. The established management of palpable breast lesions includes the triple assessment, which includes physical examination, imaging and fine needle aspiration or core biopsy. Various benign breast lesions like fibroadenomas, simple cyst, breast abscess, galactocele, duct actasia, enlarged lymph nodes and different malignancies are common pathologies of female breast. Delay in the detection causes, malignancy to progress in advanced stage. Usually it comprises of inoperable masses, metastasis and eventually leads to mortality. Albert Soloman (1913) for the first time, after the invention of X rays, studied the breast under X rays and suggested that X rays can be used for diagnostic purpose for breast pathologies. Mammography was used primarily for early detection of malignancies in their curable stages, to decrease the malignancy related mortality. It is screening tool which is easily available, cheap and fairly accurate with minimal radiation to detect

microcalcifications, speculated masses and small lymph nodes seen in malignancies. Incidence of breast cancer can be reduced by 30% by the routine mammographic screening of healthy women. In the history of USG in 1951 Wild and Reid first developed equipment specially designed for breast scanning. Once limited for differentiating between solid and cystic lesions, breast ultrasound now proposes an attempt to characterize the breast nodules and to differentiate them as benign and malignant. Breast ultrasound has evolved as an indispensable problem solving tool in patients with dense breasts, post-radiation breasts, and women less than 35 years of age, pregnant and lactating patients. Mammography is cost efficient and accepted technique for evaluation of clinically suspected breast lesions, it is also used for screening of breast cancer. High-resolution ultrasonography is a useful modality that helps to additionally evaluate breast lesions and also helps to characterize a mammographically non-detected palpable abnormality in dense breast. Since breast cancer prevention is still theoretical, efforts have focused on early detection. Breast cancer is more easily treated and often curable if it is diagnosed early. But noninvasive diagnosis of breast cancer remains a major clinical problem. The distinction by physical examination of physiological nodularity from abnormal masses can be difficult. The clinical differentiation of a malignant mass from a benign one is difficult and consequences of missing a palpable carcinoma are high. Therefore a study was conducted to evaluate the role of ultrasound in diagnosing breast lesions. Also, to evaluate correlation between ultrasound and prognostic indicators like histological type and tumour grade.

Materials and Methods

This prospective study was conducted in Department of Radiodiagnosis in collaboration with Department of Surgery and Department of Pathology, G.S.V.M. Medical

College, Kanpur from January 2017 to October 2018. Female patients with palpable masses of all age groups were included. Cases with very large, very tender breasts, very apprehensive patients and trauma were excluded from the study. All patients were examined by means of available equipment SonoSite FUJIFILM EDGE, MICROMAXX Ultrasound System, SonoSite Inc., Bothell, WA 98021 USA. Depending on the size and depth of the lesion, curved array or linear probes were used 5-1 MHz and 15-6 MHz, respectively. Color Doppler parameters were optimized for low blood flow velocities. Power Doppler was also used for showing more clearly the number and course of afferent and intralesional vessels. Sonographic features evaluated were growth pattern, margins, echogenicity, and internal texture. Growth pattern was defined as expansive (rounded or ovoid lesion compressing adjacent structures), infiltrating (poorly detectable lesion distorting normal structures), or mixed (association of both aspects). Margins were defined as regular (smooth), irregular (shaggy), or blurred (poorly defined). Echogenicity was defined as hypoechoic, hyperechoic, or isoechoic relative to adjacent muscle tissue. Internal texture was defined as homogeneous, heterogeneous, or complex (mixed, with fluid components). Malignancy was suspected on the basis of the following criteria: infiltrating or mixed tumor growth, irregular margins, hypoechoic pattern, heterogeneous texture. On Color Doppler examination, the extent and configuration of tumor vascularity were assessed on the basis of the following features: presence or absence of flow signals, vessel arrangement within the lesion (regularly distributed or randomly dispersed), vessel course (linear or tortuous), and presence or absence of abrupt variations in calibre (greater than 50%). Malignancy was suspected on the basis of the following criteria: randomly dispersed arrangement of tumor vessels, tortuous vessel course, or presence of abrupt variations in

calibre. Definitive diagnosis was provided by histologic study for all 64 patients.

Results

Histologic examination showed the presence of 48 benign and 16 malignant lesions. Among the benign lesions the histologic diagnoses were benign fibroadenoma (n = 44), fibroadenoma with cystic degeneration (n=2), lipoma (n=1), galactocoele (n=1). Among the malignant lesions the histologic diagnoses were duct adenocarcinoma (n = 15), infiltrative duct carcinoma (n = 1). Among the features examined (growth pattern, margins, echogenicity, texture)—all morphologic criteria showed significant (p-value < 0.001) except flow signal in tumour. B-Mode ultrasonography showed 93.7% sensitivity, 93.7% specificity, 83.33% positive predictive value, 97.8% negative predictive value and 93.7% accuracy in differentiating benign from malignant breast lump. Features that showed significant or highly significant correlation with malignant nature of the lesion include irregular margins, ill-defined margins, heterogeneous internal texture, hypoechoic lesion, attenuated lesion, thick internal capsule, fixed lesion, microcalcifications, random vessel distribution > 50% abrupt variation of vessel and tortuosity of vessels. Features that showed significant or highly significant correlation with benign nature of the lesion include oval shape, > 1.4 tall/width ratio, homogenous echo texture, isoechoic lesion, edge shadowing, posterior enhancement, mobile lesion, regular vessel distribution and < 50% abrupt variation of vessels.

All Color Doppler analysis data showed highly significant (p-value < 0.001) correlation with their respective kind of nature of the lesion (benign/malignant). A regularly distributed arrangement of vessels with linear course and lesser than 50% abrupt variation in calibre of vessels showed highly significant correlation with benign nature of the lesion. In contrast, randomly dispersed arrangement of vessels with tortuosity and greater than 50% abrupt

variations in calibre of vessels showed highly significant(p-value <0.001) correlation with malignant nature of the lesion. Diagnostic accuracy was improved by combining sonographic findings with color Doppler data.

Discussion

Ultrasonography is an established technique for examining superficial structures, such as the breast, skin, tendons, or thyroid, and usually it is the initial imaging study. Breast diseases range from mild changes in the tissue to full-fledged malignant change. These cause considerable physical and psychological morbidity. A palpable mass in a woman's breast represents potentially a serious lesion and requires prompt evaluation.

	PRESENT	Yumjaobabu Singh
Sensitivity	93.7%	94.7%
Specificity	93.7%	100%
Positive predictive value	83.3%	100%
Negative predictive value	97.8%	97.22%
Accuracy	93.7%	98.15%

The average age of the patient with palpable breast lumps was 42 years. The highest incidence of breast lumps was in the age group of 16-30 years (53.1%) followed by 31-45 years (26.5%). This corresponds to a great extent with that of Yumjaobabu Singh et al in which sensitivity was 100% in the age group of <35 and 94.4% in the age group >35. Out of 64 cases in our study 64 were detected by ultrasound for the presence of lump, thus giving a sensitivity of 100%. In our study 100% of the cases of malignancy were married and Breast diseases range from mild changes in the tissue to full-fledged malignant change. A palpable mass in a woman's breast represents potentially a serious lesion and requires prompt evaluation. The average age of the patient with palpable breast lumps was 42 years. The highest incidence of breast

lumps was in the age group of 16-30 years (53.1%) followed by 31-45 years (26.5%). This corresponds to a great extent with that of Kailash et al 2008 age group of 20-29 years (44%) followed by 40-49 years (19%). Out of 64 cases in our study 64 were detected by ultrasound for the presence of lump, thus giving a sensitivity of 100%. This is in close conformity with results reported by Rubin et al (91%), Smallwood (92.5%), and better than the results reported by Fleishcher et al (84%) and Mansoor et al (86%). In our study 100% of the cases of malignancy were married and present in 61%, 50% & 40% respectively. In another study a sensitivity value of 95%, specificity of 94.10%, positive and negative predictive values of 95.50% and 93.75% were noted. Similarly another study suggested that Ultrasound use should be considered in most instances of a palpable breast finding, particularly in young women. A primary advantage is the ability to directly correlate the physical exam finding with imaging. Ultrasound is useful in characterizing palpable masses as well as detecting cancer in women with negative mammograms. The negative-predictive value of imaging for cancer in the evaluation of a palpable lump is very high, which may reassure women with low-suspicion palpable findings. Most recent study also suggests that the negative predictive value of sonography for palpable breast masses with probably benign morphology was very high (99.4%).



Figure 1 Benign Fibroadenoma Lesion

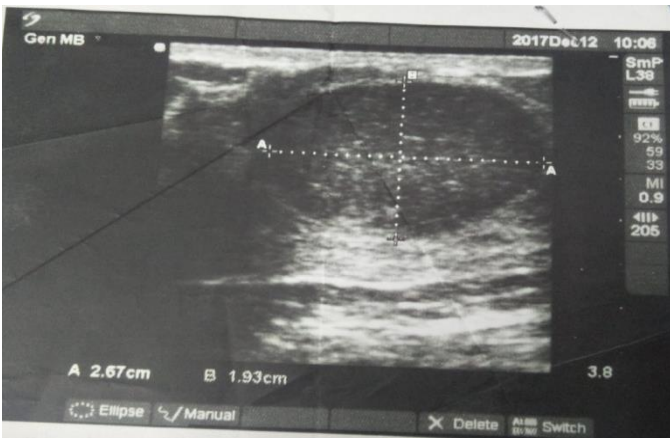


Figure 2 Benign fibroadenoma lesion



Figure 3 Benign Galactocoele.

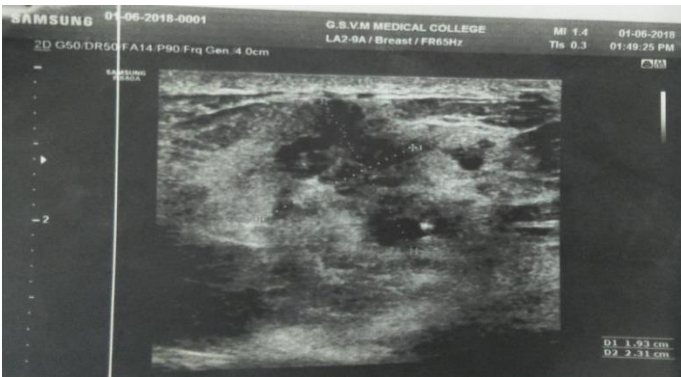


Figure 4 Malignant ductal adenocarcinoma



Figure 5 Irregular Vascular Distribution In Lesion Shown.



Figure 6 Malignant ductal adenocarcinoma.

Conclusion

Evaluation of breast lump is important to rule out malignancy. Ultrasonography is an imaging technique and FNAC is a tissue diagnostic technique for it. Specificity of ultrasonography as the diagnostic tools in diagnosing malignant breast lump was found to be 93.7% in our study, thereby giving the inference that a positive (malignant) result can add to great extent to form the treatment decision. The exact place of these diagnostic tools in the evaluation of breast lump would depend on the expertise and availability of these modalities in a clinical setup and also on the age factor of the patients as well as on the clinicians' degree of suspicion of nature of the lump. In aged, clinician may place USG at lower level of preference as it is less accurate in less denser breast of the adult. On the other hand a malignant report of FNAC of a hard, irregular lump in breast in adult nulliparous women may be better credited by the dealing clinician. The reverse may be true in younger patients where carcinoma is rare. Thus, both these diagnostic tools should be considered complementary. Further advancement in the technique of both these procedure like FNAC under imaging guidance, addition of immunohistochemistry in cytology and addition of Doppler in USG may increase their accuracy. Also with the gaining experience in

characterisation of solid breast mass using USG, the accuracy of USG in the diagnosis of breast lump is increasing. Certainly, more studies are required, addressing these recent advancements, to properly define the place of FNAC and USG in the management of breast lump.

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