BREAST IMAGING SOCIETY, INDIA

BEST PRACTICE GUIDELINES – BREAST ULTRASOUND

INTRODUCTION

Breast Ultrasound is a well established and effective diagnostic modality for evaluation of breast diseases. The Indian radiologist is well versed with ultrasound as this is an easily available technique, both in large teaching hospitals as well as in small diagnostic centres across the country. Ultrasound breast is the primary imaging modality for younger women less than 30 years of age. It is an important adjunct tool to mammography especially for women with dense breasts. Technological advances and newer applications like Elastography and Automated Breast Volume Scanner (ABVS) have made ultrasound even more exciting and interesting. This document details the indications for breast ultrasound studies and also discusses the equipment, technique and reporting of breast ultrasound examinations.

INDICATIONS

Ultrasound breast is to be used as the initial imaging evaluation tool for palpable masses in younger women (less than 30 years of age) at average risk of developing breast cancer.[1] Based on the ultrasound findings and clinical features mammography may be performed as required.

Pregnant and lactating women: Absence of radiation makes ultrasound evaluation of breast symptoms in pregnant women a safe investigation. It is also an excellent tool for lactating women who are more likely to demonstrate dense breasts on mammography. Mastitis, breast abscess and galactocele are the common pathologies seen in these women and these are very well demonstrated on ultrasound.[2]

Nipple discharge: Evaluation of women with serous or sanguineous nipple discharge with high resolution ultrasound gives direct visualization of dilated ducts and their contents. Colour Doppler helps in differentiating between inspissated secretions and intraductal masses such as papillomas.

Focal persistent pain: Focal pain in the breast which is noncyclical can be because of multiple reasons such as focal mastitis, fat necrosis, breast abscess, haemorrhage in a cyst. Most of these conditions can be diagnosed and followed up on ultrasound. Diffuse bilateral cyclical breast pain does not warrant an ultrasound breast study.

As an adjunct imaging modality: It is used as an adjunct imaging modality for further assessment of suspected or apparent abnormalities which are detected on mammography. These include abnormalities demonstrated on screening mammograms as well as diagnostic mammograms. Ultrasound is very useful to differentiate a palpable solid mass from a benign cyst. In malignant masses it effectively demonstrates ductal extension of masses and is very useful to identify multifocal and multicentric disease in dense breasts.

Second-look ultrasound after magnetic resonance imaging (MRI): This allows identification of about 68% of abnormalities seen only at MR imaging.[3] Second-look ultrasound is helpful in many situations. For example screening MRI for women at high risk for breast cancer or preoperative breast MRI performed to assess multicentricity in known breast cancer patients may demonstrate MR abnormalities that were not demonstrated on mammography or ultrasound performed prior to MRI breast. Second-look ultrasound studies are highly recommended in such situations.

Breast Screening: Ultrasound breast is to be used as an adjunct to screening mammography for women with dense breasts and is deemed useful in the detection of mammographically occult cancers. Ultrasound replaces MRI for screening of women in the high risk category if they are not suitable candidates for MRI or have no availability of MRI. [1,4,5,6] However ultrasound is not established as a primary screening modality for general populations and should not to be used as a standalone breast cancer screening tool.

Follow-up of breast lesions: Sonographically well visualised BIRADS 3 lesions are best followed up in six months' time on ultrasound as there is no risk of radiation. However if the lesion is not visualised on ultrasound mammographic follow up becomes necessary.

Ultrasound guided intervention: Ultrasound is the preferred imaging modality for image guided procedures due to excellent real time needle visualisation, easy availability, patient comfort and absence of radiation. Image guided breast biopsy and other interventional procedures like marker clip placement for patients treated with neoadjuvant chemotherapy and preoperative guided hook wire localization of nonpalpable masses are all preferably performed under ultrasound guidance if the lesions are visualised sonographically. [7- 8] During treatment planning for radiation therapy ultrasound is a valuable tool that helps assess large seromas, aspirate if clinically indicated and also is essential for ultrasound guided boost irradiation of tumour cavity.[1,9]

Imaging the Axilla: Ultrasound is the modality of choice to image the axilla as well as to perform image guided procedures in the axilla such as biopsy of axillary lymph nodes.

Developing breast: Ultrasound is excellent for evaluation of developing breasts in young girls. Asymmetric breast development in this age group can be reassuringly differentiated from other pathologies by ultrasound in this age group.

Male breast: Ultrasound evaluation of the male breast helps differentiate gynaecomastia from breast masses like breast carcinoma and breast abscess. It is also the modality of choice for guided procedures in the male breast.

Augmented breast: It is the primary imaging modality for evaluation of breast implant associated problems. Sonographic assessment of implant morphology, contour, content and assessment of peri-implant tissues help evaluate implant related complications such as infection, hematoma, capsular contracture and rupture of implant.

Investigation of an unknown primary: Ultrasound of the breast along with mammography is advised for investigation of patients presenting with metastases from an unknown primary.

EQUIPMENT AND TECHNICAL FACTORS

Ultrasound breast should be performed with a real time high resolution linear array transducer (such as 12 – 5 MHz, 18 – 6 MHz) which has a centre frequency of at least 10 MHz and preferably higher. [10, 11] Characterization of breast lesions on ultrasound is highly dependent on technical factors. Depth, gain, and focal zone settings should be optimized for high quality images. Use of different modes and settings like tissue harmonic imaging and compound imaging are helpful.

The patient should be positioned to minimize the thickness of the portion of the breast being evaluated. Ipsilateral arm should be up over/under the head. Image depth should be adjusted for complete visualization of breast tissue with chest wall on the posterior margin of the image. For evaluation of nipple areolar complex region and superficial lesions, use of a thick layer of gel may be helpful.

ULTRASOUND EVALUATION AND DOCUMENTATION

Breast ultrasound should be performed in correlation with patient symptoms, clinical signs, mammographic findings and other breast imaging studies. For example in a lady presenting with nipple discharge, detailed examination of the ducts must be meticulously performed.
Ultrasound findings should always be compared with previous breast imaging studies if any, including mammography and MRI studies.
Evaluation of breast lesions should be done in at least two perpendicular planes.
Measurements of masses should be taken in three dimensions, two measurements at 90 degrees to each other in the plane of maximum length of the mass and the third measurement with the probe turned 90^{o} to the initial plane. One image should be saved without calliper markings.[10]
Proper labelling of images should be done for each image mentioning side (right or left breast), location of the lesion with o'clock position and orientation of the transducer. The probe can be transverse, longitudinal, radial or antiradial in orientation. Distance from the nipple in centimetres should also be mentioned. These details can also be marked diagrammatically.

Description of ultrasound demonstrated breast masses should include size, shape, orientation and margin of the mass as well as echogenicity, posterior acoustic features and vascularity. Following a reporting system such as the ACR BI-RADS system is advisable.[10]

ELASTOGRAPHY

Elastography is the sonographic method for imaging the elasticity of compliant tissues and provides information about stiffness of the lesion under evaluation. [12] It is known that in general malignant breast masses tend to be harder due to their desmoplastic reaction when compared to the adjoining normal breast parenchyma and most benign lesions. The evaluation of breast masses to differentiate benign lesion from malignant is one of the most important applications of ultrasound elastography.[12] It can help the radiologist to better characterise BIRADS 3 and 4A masses, thus reducing unnecessary breast biopsies.[13] However elasticity of breast masses has been included only as an associated feature in the 5th edition of ACR BIRADS [10] and should only be used as an adjunct to B-mode ultrasound, not as a replacement for gray scale ultrasound. In strain elastography size ratio and strain ratio values should be documented. In shear wave elastography elasticity value should be documented in kilopascals (kPa) or meters/second (m/s).[13]

AUTOMATED BREAST VOLUME SCAN (ABVS)

ABVS acquires a whole series of consecutive B-mode images and reconstructs 3D data sets of the entire breast volume. ABVS devices use mechanically driven wide linear array transducers that can image whole breast volumes in three dimensions. The data can be sent to a separate workstation to be independently analysed by the radiologist. [14] ABVS has potential advantages over conventional hand-held breast ultrasound as it is a standardized reproducible examination which gives dynamic cineloops of ultrasound images facilitating multiplanar and 3D reconstructions. ABVS is less operator dependent and it is being explored as a potential tool for breast cancer screening.[15] Limited inclusion of the axillary tail and axilla and artifacts in the nipple area are some of the limitations of ABVS. Lesion detected on ABVS has to be further evaluated with hand-held ultrasound.

DISCLAIMER

The Best Practice Guidelines of Breast Imaging Society, India are the broad guidelines for investigation, intervention and management of clients opting for breast screening and patients with breast symptoms in India, and intended for the use of qualified medical caregivers only. These are based on various national and international guidelines and personal experiences and opinions of BISI members, as there is no large credible Indian data to formulate these guidelines. These guidelines are purely recommendatory and general purpose only in nature. Actual decisions for management of patients should be individualized according to own judgement of the caregiver and tailored on case-to-case basis. As scientific knowledge is continuously improving, a regular update of the same by the caregiver is essential. Failure to do so may result in untoward patient management or outcome and BISI members or BISI as the organization cannot be held responsible for that in any manner.

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