Guidelines for Ultrasound Guided Breast Biopsy

Indications

- Focal mass or other lesion of unknown nature – palpable or non-palpable
- Architectural distortion
- Microcalcifications
- Cyst aspiration

General remarks

Percutaneous needle biopsy of the breast provides reliable diagnosis of both benign and malignant disease and is a proven alternative to open surgical biopsy. Percutaneous image guided biopsy avoids unnecessary open surgical biopsy in the vast majority of cases with benign disease. For cases of malignancy it provides accurate pre-treatment diagnosis and facilitates informed treatment choices. Ultrasound guidance is an accurate and reliable biopsy guidance technique and is the method of choice and suitable for all breast lesions visible on ultrasound.

Percutaneous biopsy is indicated in patients with suspicious lesions on mammography, breast ultrasound or clinical examination. For mammographic lesions risk assessment categories can be described using the BI-RADS mammography and ultrasound lexicons of the American College of Radiology (1). Biopsy is indicated for all BI-RADS category 4 (suspicious for cancer) and category 5 (highly suggestive of malignancy) lesions, while category 3 (probably benign) can be managed by either needle biopsy or short-interval follow-up (6 months to one year). BI-RADS 1 and 2 do not require any further intervention.

Automated core needle biopsy (CNB) and fine needle aspiration biopsy (FNAB) are effective methods for the diagnostic sampling of most breast lesions, although CNB has higher sensitivity and positive predictive value for certain abnormalities such as microcalcifications and distortions of architecture. Vacuum assisted mammotomy (VAM) may be preferred for certain lesions, such as small clusters of microcalcifications and architectural distortions and where complete removal of the abnormality is required, as this technique is associated with significantly less understaging of pathology.

Comments

- ***Focal mass or other lesion of unknown nature – palpable or non-palpable***
  Any focal mass or other focal alteration of breast tissues in women over 25 years of age should be evaluated by core needle biopsy (CNB) or FNAB. There are few exceptions, but calcified fibroadenomas, lipomas, fat necrosis and surgical scars usually do not need further evaluation (2, 3). Any focal mass in younger women that does not have clearly benign features on ultrasound, as defined by Stavros et al (4), should also be evaluated by CNB or FNAC. Where FNAB or CNB fails to provide a definitive diagnosis VAM or surgical biopsy is required. A suspicious focal mass seen on mammography that is not visible on ultrasound should be evaluated using x-ray guided biopsy techniques.

- ***Architectural distortion***
  Architectural distortion may be the first sign of malignancy and is associated with malignancy in 10 to 40% of cases. Many of this type of abnormality are not clearly visible on ultrasound and require x-ray guided biopsy. CNB or VAM is recommended for sampling architectural distortion and in cases showing epithelial atypia surgical biopsy will also be required. A minimum of 10 core samples should be obtained.

- ***Microcalcification***
  All suspicious microcalcifications should be biopsied using CNB with specimen radiography to confirm representative sampling(5,6). Vacuum assisted mammotomy (VAM) may be preferred for sampling tissue containing microcalcifications. FNAB is not recommended where microcalcification is the sole abnormality. Most microcalcifications in the absence of a mass are not visible on ultrasound and require evaluation using x-ray guided CNB or VAM.

- ***Cyst aspiration***
  Ultrasound is the technique of choice for guiding fine needle aspiration of symptomatic simple cysts. Asymptomatic cysts do not require aspiration unless their appearance on ultrasound is atypical (e.g. thickened wall or thickened internal septa, mural mass, complex internal echoes and absence of posterior acoustic enhancement). Such complex cysts should always be further investigated by aspiration, or CNB or surgical excision.

Relative contraindications to ultrasound guided biopsy

- Abnormal coagulation time-assessment of the risk of bleeding should be made prior to considering biopsy
- Therapeutic excision as treatment of malignant lesions - contraindicated as there is no evidence of efficacy.

Complications

- Bleeding and haematoma – Bruising is common at or around the biopsy site but significant bleeding and haematoma are rare occurring in less than 1% of cases for FNAB, CNB and VAM. (10).
- Tumour cell seeding along the biopsy tract-seeding i.e. epithelial displacement is rare (8): using a careful puncture technique seeding is a rare phenomenon that is generally felt to be of minimal clinical or biological significance.
- Collapse/vasovagal reaction – Vasovagal reaction is a problem limited to procedures carried out with the patient seated and occurs in less than 5% of cases. It is not a significant problem for ultrasound guided procedures.
- Accidental puncture of neighbouring structures e.g. pneumothorax is reported to occur in around one in 10,000 FNAC biopsies.

Precautions to be taken

- Bleeding and haematoma can be minimised by applying manual pressure to the biopsy site for five to fifteen minutes and providing patients with simple instructions on applying local pressure should delayed bleeding occur. Compression time should be longer for patients with prolonged bleeding times or receiving aspirin therapy. Needle biopsy should be avoided in patients in whom the INR is greater than 2.0.
- Accidental puncture of adjacent structures (pleura and muscle) can be avoided by attention to technique ensuring that sampling is performed with the needle parallel to the chest wall. The needle should be advanced along the long axis of the ultrasound probe so that the tip of the needle is seen throughout its length. Particular care is needed with automated core biopsy devices with sufficient space allowed for the "throw" of the needle before sampling. There should be at least 2cm of breast tissue between the tip of the core needle and the chest wall before firing. With ultrasound guided VAM the risk of chest wall damage is minimal but may rarely occur during placement of the probe prior to sampling.

Needles and Ultrasound Equipment

General remarks

Breast biopsy using the various needle types is minimally invasive and associated with very low rates of morbidity. However, specialist training is required to ensure that adequate sensitivity and positive predictive values are achieved. While the technique for FNAB is relatively simple it has lower sensitivity and specificity compared to core needle bopsy procedures. Both automated core biopsy and vacuum assisted mammotomy are technically more difficult and require specific training but both techniques have high sensitivity and positive predictive values.

Types of needle and biopsy device

- Fine needle 23 to 21G
- Core biopsy needle 18 to 14G (best results are reported using 14G)
- Vacuum assisted mammotomy 7 to 11G

Technique of ultrasound-guidance

Free-hand puncture is the method of choice for all needle biopsy procedures carried out under ultrasound-guidance. The patient is best positioned lying supine with the arm on the side of the breast to be punctured raised above the head. For FNAB local anaesthesia is not normally required. Local anaesthetic injected into the skin puncture site should be routine for CNB and VAM. For VAM it is also routine to infiltrate local anaesthetic along the proposed introducing track and around the lesion to be sampled. There is some evidence that local anaesthetic combined with adrenaline reduces local bruising following biopsy. Puncturing through or close to the nipple-areolar complex should be avoided.

The needle should be introduced in a plain parallel to the long axis of the linear transducer so that the whole length of the needle and the needle tip can be seen throughout the procedure. For FNAB the needle is advanced to the margin of the lesion before it is agitated backwards and forwards through the lesion itself multiple times to sheer representative cells into the needle lumen. Sampling should be restricted to the lesion itself and not the surrounding tissue. For CNB the tip of the needle is advanced to the edge of the lesion before it is fired. Care is taken to ensure that there is sufficient breast tissue beyond the lesion to accommodate the 'throw' of the needle. For VAM the probe is advanced to a position immediately behind the lesion; this avoids the "ring down" effect of the probe so that the lesion is seen during the sampling process; the lesion is then sampled or removed anteriorly from its posterior margin.

Comments

- ***Fine needle aspiration biopsy***
  Although FNAB is regarded as the least traumatic of the techniques it has lower sensitivity and positive predictive value than NCB. Obtaining sufficient representative epithelial cells may be difficult, particularly from dense and fibrous lesions and

abnormalities lying in predominantly fatty tissue. FNAB is particularly operator dependent with sensitivities quoted as between 50 and 90%

– ***Core biopsy needle***
CNB is now regarded as the technique of choice for image-guided breast sampling procedures. The use of high-speed automated biopsy needles is particularly suited to ultrasound guidance. Best results are obtained with 14 gauge needles with at least a 2cm sampling chamber. Concordance between core biopsy and surgery is reported to be 67–96% (6). The number of samples required varies according to the type of lesion being sampled. A single core is often sufficient for the diagnosis of a solid mass while five or more samples may be required for less clearly defined lesions and microcalcifications.

– ***Vacuum assisted mammotomy***
Core biopsy may not provide a definitive diagnosis in very small lesions and is associated with significant understaging of borderline lesions and malignancy (ADH, DCIS and invasive carcinoma) (11). Vacuum assisted mammotomy, by harvesting significantly greater volumes of tissue per core sample, provides more reliable biopsy results and is associated with understaging of disease half as often as with CNB. Eleven and eight gauge VAM probes provide approximately 100mg and 300mg per core respectively compared to around 25mg for 14 gauge core biopsy. VAM can be used to remove circumscribed benign lesions up to 25mm in diameter. VAM should not be used for intentional therapeutic excision of malignant lesions.
Specimen radiography should be used to confirm representative sampling when CNB or VAM are used to sample microcalcifications.

Concluding remarks

Ultrasound guidance is the technique of first choice for sampling breast lesions. This technique is quick, accurate and widely available. FNAB, CNB and VAM can all be easily carried out with a high degree of accuracy under ultrasound guidance. FNAB in experienced hands provides accurate diagnosis but automated core needle biopsy is now regarded as the technique of choice because of its generally higher sensitivity and positive and negative predictive values. Vacuum assisted mammotomy provides a method for very accurate diagnosis of small lesions and histologically borderline lesions where larger volumes of tissue are required. VAM is also suitable for the therapeutic removal of circumscribed benign lesions.

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