E22. Ultrasound-guided breast biopsy

Robin Wilson

Breast Unit, Nottingham City Hospital, UK

Introduction

It is now well accepted that a definitive breast diagnosis should be achieved without surgical biopsy. The triple approach, involving clinical examination, imaging (mammography and ultrasound) and histology/or cytology is the recognised 'gold standard' for breast diagnosis [1–3].

Percutaneous needle biopsy is fundamental to non-operative breast diagnosis and image-guided techniques are superior to free-hand methods [3]. Ultrasound guidance has several advantages over X-ray or magnetic resonance (MR) guidance; ultrasound equipment is freely available, the procedure is of relatively low cost and is associated with minimum patient morbidity. Ultrasound guidance is also the only image-guided technique that provides real-time visualisation of the area being sampled and is, as a result, the most accurate of the image needle biopsy techniques. For this reason, ultrasound guidance is the preferred method of obtaining biopsy, even of palpable breast abnormalities. Using higher frequencies (10 to 15 MHz), ultrasound guidance provides high sensitivity for even the smallest of lesions (3 to 4 mm in diameter). The only limitation is those lesions that are not easily seen on ultrasound, such as most microcalcifications and some architectural distortions, when X-ray-guided stereotactic biopsy is usually required. The recent introduction of colour and power Doppler has further improved the sensitivity of ultrasound for subtle changes facilitating ultrasound-guided biopsy of lesions not previously visible, including reactive change surrounding malignant microcalcifications. Approximately 80% of breast lesions are suitable for ultrasound-guided biopsy.

Methods of sampling

Fine-needle aspiration cytology (FNAC) was the main technique used for breast diagnosis, but now core biopsy is considered the 'method of choice' using spring-loaded core biopsy "guns" and vacuum-assisted mammotomy. Core biopsy has the advantage of providing structural tissue detail allowing pathologists to provide more clinically useful information.

There is clear evidence that core biopsy 14-gauge needles provide significantly better tissue samples than smaller gauge needles. In most circumstances, 2–3 separate cores are sufficient to provide a definitive diagnosis, but for certain lesions, such as possible radial scars or microcalcifications, more samples are required; in some cases up to 15 or 20 core biopsies may be required [4]. Vacuum-assisted mammography is preferred where larger tissue samples are required and when conventional core biopsy has failed to provide a definitive diagnosis.

Indications for large core biopsy

A high level of accuracy in diagnosis (at least 90%) can be achieved by hand-held automated core biopsy and ultrasound guidance is the preferred method for most breast lesions [5,6]. However, conventional core biopsy does not provide a clear answer in a substantial proportion of cases (10 to 25%). Vacuum-assisted mammotomy has been shown to be very effective in these cases.

Indications for ultrasound-guided Mammotome biopsy include the following:

- Mammographically-detected architectural distortion vis ible on ultrasound (differentiation of radial scar from malignant disease)
- Focal and suspicious microcalcifications visible on ultrasound (with or without Doppler)
- Lesions too small for conventional core biopsy
- Lesions too superficial or deep in the breast for conventional core biopsy
- Previous failed conventional core biopsy
- Further evaluation of core or fine-needle aspiration showing suspicious changes of uncertain malignant potential (e.g. atypical ductal hyperplasia or lobular carcinoma *in situ* or radial scar) [7,8]
- Diagnosis of recurrent disease in patients treated by conservation surgery
- Abnormalities where wide sampling is considered important (e.g., mammographic asymmetric density with a non-specific ultrasound correlate)
- Removal of benign lesions such as fibroadenoma as an alternative to surgery [9].

Mammotomy, with its ability to sample larger volumes of breast tissue, has been shown to be more reliable in confirming that no frankly malignant change is present in association with conditions such as radial scar and atypical ductal hyperplasia [4]; in this situation, open surgical biopsy can be avoided in some cases. Similarly,

1359-6349/$ – see front matter

mammotomy has been shown to accurately exclude invasive malignancy adjacent to ductal carcinoma *in situ;* such patients can avoid extensive surgery and may not need to undergo axillary surgery.

Practical techniques – Ultrasound-Guided Biopsy

For lesions that are mammographically-detected, a careful analysis of the mammogram should be performed to identify as closely as possible the site of the lesion within the breast. Ultrasound should only be used where the operator is convinced that the abnormality visible on ultrasound corresponds to the lesion under suspicion shown on the mammogram.

Ultrasound-guided biopsy involves the patient lying supine with the effected side elevated by 20–30 degrees. With the arm raised above the head, the operator has free access to the entire breast area. The breast should be carefully scanned to identify the most advantageous route for the passage of the needle. Local anaesthetic combined with adrenaline is recommended for the needle biopsy and localisation techniques as this minimises bleeding during the procedure.

The ultrasound Mammotomy procedure

An initial ultrasound scan is carried out to identify the best direction for access to the abnormality. Local anaesthetic is then injected into the skin, the breast tissue down to the lesion and liberally inferior to and around the lesion itself. A longer-acting local anaesthetic may also be used to provide anaesthesia at the biopsy for several hours afterwards. This is best done with a 9 cm 20-gauge needle. The injection of anaesthetic is used to identify the best direction and angle in which to insert the Mammotome probe. The patient should be made aware of the sounds of the suction and the rotating cutting blade before the needle is inserted into the breast.

An incision in the skin just large enough to allow passage of the probe is made and the probe advanced into the breast tissue under direct ultrasound vision. The probe is placed under direct real-time ultrasound vision so that the biopsy notch lies immediately behind, and not through, the lesion. The position of the sampling notch can be easily identified on the scan by moving the cutting trocar. Once in place the automated sampling procedure can be operated by either the control buttons on the probe or using a foot switch. Samples are obtained by incremental rotating of the probe through various angles up to 90 degrees on either side of the 12 o'clock horizontal notch position. If the patient experiences any significant discomfort during sitting or operation of the probe, local anaesthetic can be injected through the probe itself into the biopsy site. The number of samples taken depends on the type and size of the abnormality. In a small number of cases, there may be difficulty in advancing the probe to the required site through dense, uncompressed breast tissue. In these circumstances, forming a track for the probe with the local anaesthetic injection is usually effective.

Management of the result

It is very important that image-guided biopsy is kept in clinical context and that all results are discussed at a multidisciplinary clinical meeting at which the radiologists and pathologists attended. It is not appropriate to manage patients entirely on the result of the histology or cytology – in a few circumstances, there may be a sampling error and any abnormality that appears strongly suspicious of malignancy on clinical examination or on imaging requires further biopsy (if necessary surgical biopsy), if the cytological or histopathological findings are discordant.

Summary

Definitive breast diagnosis can be achieved with a conventional hand-held 14-gauge core biopsy in 50 to 80% of impalpable breast lesions. Ultrasound is the preferred method of image-guided biopsy with stereotaxis used only for those abnormalities not visible on ultrasound. In the remainder, mammotomy has the potential to increase non-surgical diagnosis, for both benign and malignant cases, to approaching 100%. Mammotomy is also the technique of first choice for biopsy of suspicious microcalcifications, architectural distortions and other borderline lesions, where a larger volume of tissue is usually required for an accurate diagnosis. A hand-held Mammotome provides the clinician with a flexible and easy to use accurate method of breast biopsy under ultrasound control and has proven potential as a means of complete removal of benign lesions such as fibroadenomas, where it is an effective alternative to open surgical excision. For malignant lesions, mammotomy must be regarded as a diagnostic and not a therapeutic procedure.

References

[1] Teh WL, Evans AJ, Wilson ARM. Definitive non-surgical breast diagnosis: the role of the radiologist. Clinical Radiology 1998; 24: 1–9.

[2] Wilson ARM, Teh W. Mini Symposium: Imaging of the breast. Ultrasound of the breast. Imaging 1998; 9: 169–85.

[3] Liberman L. Percutaneous image-guided core breast biopsy: state of the art at the millennium. American Journal of Roentgenology 2000; 174: 1191–1199.

[4] Michell MJ, Andrews DA, Humphreys SEA. Results of 14 gauge biopsy of architectural distortion stellate lesions using a dedicated prone biopsy system. The Breast 1996; 5: 442.

[5] Parker SH, Klaus AJ, McWey PJ, Schilling KJ, Cupples TE, Duchesne N, et al. Sonographically guided directional vacuum-assisted breast biopsy using a handheld device. American Journal of Roentgenology 2001; 177(2): 405–8.

[6] Simon JR, Kalbhen CL, Cooper RA, Flisak ME. Accuracy and complication rates of us-guided vacuum-assisted core breast biopsy: initial results. Radiology 2000; 215(3): 694–7.

[7] Jackman RJ, Burbank F, Parker SH, et al. Atypical ductal hyperplasia diagnosed at stereotactic breast biopsy: improved reliability with 14-guage, directional, vacuum-assisted biopsy. Radiology 1997; 204: 485–8.

[8] Dennis MA, Parker S, Kaske TI, Stavros AT, Camp J. Incidental treatment of nipple discharge caused by benign intraductal papilloma through diagnostic Mammotome biopsy. American Journal of Roentgenology 2000; 174(5): 1263–8.

[9] March DE, Coughlin BF, Barham RB et al. Breast masses: removal of all US evidence during biopsy by using a handheld vacuum-assisted device – initial experience. Radiology 2003; 227: