E4. Minimally invasive diagnostic techniques

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It is now well accepted that definitive breast diagnosis should be achieved wherever possible without open surgical biopsy and that the triple approach, involving clinical examination, imaging (mammography and ultrasound) and histology/or cytology, provides the method for doing so. This approach provides maximum sensitivity and specificity for malignancy, avoiding unnecessary surgery for benign disease and facilitates informed consent and single procedure therapeutic surgery for malignant disease [1].

Needle biopsy is now fundamental for accurate breast diagnosis and image-guided techniques are superior to freehand methods. Ultrasound guidance has several advantages over X-ray guidance; ultrasound equipment is freely available, the procedure is of relatively low cost and is associated with the least patient morbidity [2,3]. 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 of up to 15 MHz, ultrasound guidance provides high sensitivity for even the smallest of lesions (3 to 4 mm in diameter). The only limitation is the few lesions that are not easily seen on ultrasound, such as the majority of microcalcifications and some architectural distortions, when X-ray-guided stereotactic biopsy is 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.

It is now generally accepted that core biopsy is superior to fine needle aspiration for cytology for breast diagnosis [4]. A high level of accuracy in diagnosis can be achieved by hand-held automated core biopsy and ultrasound is the preferred method for biopsy of most impalpable breast lesions. Automated core biopsy can accurately confirm the presence of invasive cancer when seen, but cannot reliably exclude tumour invasion when only ductal carcinoma *in-situ* (DCIS) is present in the specimen. Between 10 and 40% of such cases will have an invasive component at excision. The presence of atypical ductal hyperplasia (ADH) on core biopsy has also been shown to be significantly associated with established malignancy and its presence indicates the need for surgery [5]. One third to a half of women with ADH detected on core biopsy have been shown to have DCIS and, occasionally, invasive cancer on surgical excision. Difficulties in achieving accurate and reliable diagnoses of ADH and DCIS with core biopsy have led to the development of new image-guided biopsy techniques. The two new techniques currently available are the Mammotome and Advanced Breast Biopsy Instrumentation (ABBI) systems [6,7]. Both devices are designed to improve on core biopsy by providing a one-step procedure capable of obtaining multiple contiguous cores (Mammotome) or a single large core of tissue (ABBI). Core biopsy does not provide a clear answer in a significant proportion of cases (10 to 25%) and mammotomy has been shown to be highly effective in these cases. Although most significant impalpable breast lesions are visible on ultrasound to date, the emphasis has been on image-guided mammotomy using X-ray guidance (stereotaxis). For certain abnormalities, particularly architectural distortions and calcifications, X-ray-guided mammotomy is required, but mammotomy can be routinely carried out under ultrasound guidance for the majority of breast lesions, particularly with the recent introduction of the hand-held mammotomy device.

Mammotomy, with its ability to sample larger volumes of breast tissue, has been shown to be highly reliable in confirming that no frankly malignant change is present in association with conditions such as radial scar and ADH; in this situation, open surgical biopsy can be avoided. Similarly mammotomy has been shown to accurately exclude invasive malignancy adjacent to DCIS; such patients can avoid extensive surgery and may not need to undergo axillary surgery.

For malignant lesions, where ascertaining excision margins is fundamental to confirming adequate treatment, mammotomy is unlikely to be considered a therapeutic procedure. Orientation of the piecemeal cores of tissue is difficult and clear excision margins impossible to ascertain with any degree of certainty. However, for some benign lesions, such as fibroadenoma, mammotomy can be used for therapeutic excision.

The mammographical and histological appearances of radial scars and tubular carcinomas share similarities. The

frequent association of a radial scar with *in-situ* and invasive malignancy means that a core biopsy result of a radial scar should not be taken at face value. In such cases, surgical excision is required. There is recent evidence to suggest that with multiple cores, a diagnosis of radial scar can be made with some certainty, but until these have been confirmed with larger studies, surgical excision of these lesions must continue to be recommended.

The ABBI system is an alternative to large core vacuum mammotomy, but this device is not suitable for use with conventional ultrasound and must currently be used with a prone table. The published experience of this device has been mixed with high rates of complications (bleeding) and biopsy failure (up to 30%) [8]. Mammotomy on the other hand has been used extensively with very low complication and excellent sample retrieval rates. Both devices are considerably more costly than conventional core biopsy and larger studies are required to accurately determine their effectiveness and appropriate use.

The results of breast needle biopsy should always be interpreted in the light of associated imaging and clinical findings before any treatment decisions are made; for instance, a core biopsy result of "benign breast tissue" is clearly unacceptable when imaging shows a discrete lesion. This is best achieved in regular (at least weekly) clinical meetings involving the surgical, radiological and pathology members of the "breast team". Incongruous results should be treated with caution; therapeutic surgery should only proceed if all elements of the triple assessment agree; otherwise needle biopsy should be repeated or surgery limited to a diagnostic biopsy.

Definitive breast diagnosis can be achieved with a conventional hand-held 14-gauge core biopsy in 50 to 95% of cases. In the remainder, mammotomy or ABBI have the potential to increase non-surgical diagnosis for both benign and malignant cases to rates approaching 100%. Mammotomy appears to be superior to the ABBI system as it provides a greater degree of flexibility, can be used with conventional breast ultrasound and is associated with fewer complications. While there have been some reports of successful removal of the malignant process using large core biopsy techniques for malignant lesions, mammotomy and ABBI should be regarded as diagnostic and not therapeutic procedures. However, mammotomy has potential as a means of complete removal of benign lesions such as fibroadenomas and, therefore, may be an alternative to the surgical excision of these abnormalities being achieved with significantly better cosmetic results. For some breast abnormalities (e.g. microcalcifications), large core biopsy requires stereotactic guidance. However, ultrasound guidance should be the preferred method for large core biopsy of all lesions visible on ultrasound and is highly accurate and well tolerated [9].

References

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