

Alastair M. Thompson and Andrew Evans

6.1 Introduction

Breast lumps are common in women of all ages and may present clinically through a range of routes including the following:

- A symptomatic breast lump detected by the patient or her partner;
- A breast mass detected on incidental examination by a clinical practitioner;
- Breast screening.

A breast mass in a man, gynaecomastia, is secondary to systemic disturbance or medication or, rarely, male breast cancer [1].

The breast is an adapted sweat gland. In the adult female, the breast responds to cyclical changes under the influence of oestrogen, progesterone and other hormones; thus, the breast changes over a woman's lifetime and on a monthly basis during the reproductive years. The internal architecture of the breast comprises glandular, stromal (collagen, fibroblasts and infiltrating myeloid cells) and adipose tissues based on the anterior chest wall. The arterial blood supply is from the axillary vessels, the internal mammary artery and intercostal perforating vessels with lymphatic drainage predominantly to the axillary lymph nodes.

The diagnosis of a breast mass should be termed *triple assessment*, namely clinical (history and examination), imaging (usually mammography and/or ultrasound) and histopathological diagnosis (core biopsy or vacuum biopsy). Applying the use of triple assessment aims to minimise the

impact of any one modality of diagnosis being less than 100 % sensitive and 100 % specific to diagnose or exclude breast cancer; combining the three modalities means that only 1 in 500 cancers may be initially missed.

This chapter focuses on the evaluation of a breast mass in women from the perspective that a woman with a breast lump will usually consider the lump to be a cancer until proven otherwise. In well-organised health care settings, full assessment and confident diagnosis can be achieved as a single "one-stop" service. The approach presented therefore aims to establish or exclude the presence of breast cancer and thereafter define the nature of a breast mass and treat, if required, any benign lesion identified. This model of assessment of a breast mass requires multidisciplinary input from breast clinicians, radiologists, pathologists and technical/administrative staff working as a team.

6.2 Routes of Presentation

6.2.1 Symptomatic breast mass

Most commonly, a female patient or her partner has found a new lump in one or both breasts. Due to the high level of publicity about breast lumps, the patient will often be concerned that she has breast cancer and therefore seeks rapid review: in some healthcare settings, this will be to a qualified doctor and in others an appropriately trained clinical specialist. However, whatever the route of self-presentation, timely review in order to minimise the duration of anxiety is desirable. In some countries, there are official targets which stipulate that women should visit a specialist breast clinic, for example within two weeks of presenting to a healthcare professional. The efficacy of this approach is unproven and indeed may skew the service provision. Similarly, encouraging regular breast self-examination may not improve early detection of breast cancers but continues to be promoted in much of the Western media. Instead, many organisations promote breast awareness among women with the hope that

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breast cancer will be detected as a change in the appearance, feel or perception of the breast at an early stage.

6.2.2 Screening

Building on three decades of experience in the Europe and in North America, a number of countries currently have screening programmes for breast cancer, usually in the form of mammographic screening. National screening programmes may be based on balancing efficacy and financial considerations. In general, imaging comprises digital two-view mammography every 1–2 years, with the target group for national breast screening programmes starting for women aged 40–50 and continuing to the age of 70–74 years or more. However, for mammographic screening, there remains debate around the risks versus the benefits. The benefits are a reduction in breast cancer mortality of at least 20 % for women invited and at least 30 % for women who attend regularly. This has to be balanced against the harms of the over diagnosis and over treatment of indolent ductal lesions unlikely to impact on the patient’s lifespan [2].

In young women with a family history putting them at high risk or known gene carriers, magnetic resonance imaging (MRI) is increasingly being used and now has an evidence base for detecting breast cancers at an early stage. However, there is no good evidence of mortality reduction, especially in BRCA1 mutations carriers who have aggressive triple negative cancers where early diagnosis may not impact on mortality.

6.2.3 Incidental Detection of the Breast Mass on Clinical Examination

This is more frequently a route of presentation in the older women. Thus, it may be considered good practice that women over the age of 50 undergoing general physical examination should have a routine breast examination as part of an annual healthcare assessment. Certainly, on admission

to hospital, all women should undergo clinical breast examination, as this may detect an incidental breast cancer and potentially the cause of symptoms elsewhere in the body.

6.3 History of Presentation

The single best predictor of the probable underlying pathology of a breast mass or breast lump is the age of the patient (Table 6.1). Benign causes of a breast mass are most common at a young age, and breast cancer is increasingly common with age, particularly over the age of 65 years.

The presenting features of a lump (Table 6.2), as noted by the woman or her medical examiner, should include a number of key features which may give some hints as to the underlying pathology. These include whether the lump is single or multiple, any changes in the lump since first noticed (for example with the menses) and any history of trauma/bruising.

While associated features should be sought (Table 6.3), if present, they often reflect a larger and or more advanced breast cancer. Bleeding from the nipple (Fig. 6.1), skin tethering of the cancer on the ligaments of Cooper, reflected by indrawing of the nipple (Fig. 6.2), eczema of the nipple or areolar (which may be eczema or intraepithelial malignancy—Paget’s disease of the nipple) (Fig. 6.2), changes in the skin (erythema, peau d’orange—the appearance of the breast skin like that of an orange due to skin oedema). Skin nodules (Fig. 6.3) and enlarged axillary lymph nodes (Fig. 6.3) may be less common in an era of breast screening, but it is important that these features are sought to guide the clinical diagnosis, stage and future therapy.

Other relevant findings include an endocrine history, including hormone replacement therapy or contraceptive usage, gynaecological history, family history and other medical/surgical history. The relevant features of the patient’s history may be best recorded using a set proforma in the clinic (for example Fig. 6.4) where the key features of the patient’s present history and past medical history can be readily reviewed.

Table 6.1 Patient age and likely diagnosis of a breast mass

Age (Years)	Features	Diagnosis	Management
15–70	Poorly defined lumpiness; may change with menses (often bilateral)	Benign changes “fibrocystic”	Reassurance
15–30	Smooth mobile lump: usually single	Fibroadenoma	Excision if patient requests
35–55	Well-circumscribed lump(s) usually multiple, may be bilateral	Cyst(s)	Aspiration if symptomatic
20–55	Painful, red, hot lump	Abscess	Drainage/antibiotics
40–90	Ill-defined craggy lump	Cancer	Dependent on staging

Table 6.2 Presenting features of a breast lump—questions to ask

One lump or more than one lump?
Where is the lump?
How big is the lump?
Is it sore/tender/painful?
Is the lump hard or soft?
Does the lump change with the menses?
Are there any other features of the lump:
Skin changes
Nipple indrawing
Nipple discharge—one or multiple ducts;
– Axilla colour of discharge
– Axilla blood-stained or not
Is it mobile in the breast?
Is the lump fixed to the skin or chest wall?
Are there problems in the other breast?
Have you had a breast lump before?
Are there lumps elsewhere in the body?

Table 6.3 Associated features of a breast lump

Skin changes: erythema
Peau d'orange
Skin tethering/puckering
Eczematous appearance
Ulceration
Nipple discharge
Nipple retraction/flattening
Pain (on palpation, all the time)
Palpable axillary lymph nodes—axilla
– Infraclavicular
– Supraclavicular
– Cervical

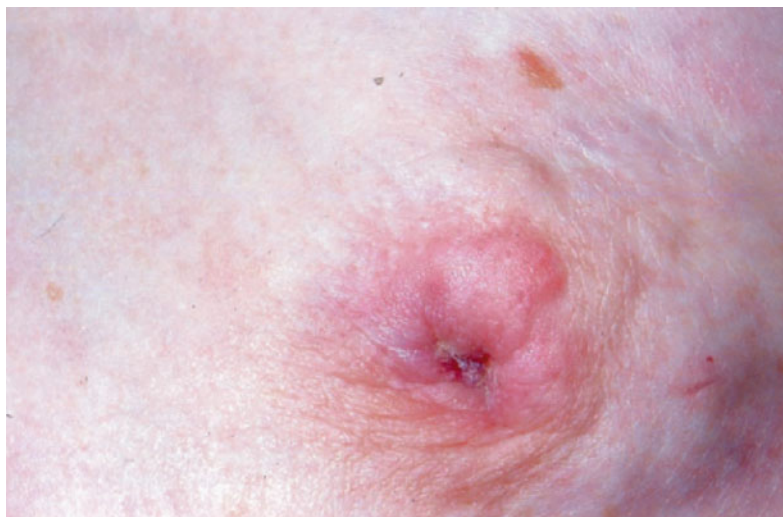
Fig. 6.1 Bleeding nipple discharge. The discharge should be examined for the number of ducts from which it emanates, and the discharge assessed for cytology or the presence of blood as appropriate

6.4 Clinical Examination

Clinical examination should aim to discern how many lumps there are, the nature of the mass and any associated features (Table 6.3). It is important for the practitioner to seek

permission from the woman to conduct a bilateral breast examination and, particularly for male practitioners, to have a female chaperone available. Breast examination is considered by some authorities to be an intimate physical examination, and each woman should be accorded due

Fig. 6.2 Nipple retraction due to cancer with areolar Paget's disease; note the small core needle biopsy scar to the right of the areolar



respect. The manner in which the breast examination is conducted is important in optimising the detection of abnormalities in the breast [3].

The patient should be naked to the waist in a warm, private, room. Breast examination should be conducted in a logical and sequential fashion so that both the patient and the practitioner are comfortable and any abnormalities will be

detected. Care must be taken to examine each breast in succession, noting differences in symmetry between the two. Usually, the normal breast is best examined first as the appearance and texture of each individual woman's breast can be quite different from other women but is quite likely to be similar to the contra-lateral side. Initial inspection to look for skin dimpling or changes in the shape of the breast may detect benign lesions such as a fibroadenoma, a cyst or a breast cancer. If no immediately apparent abnormality is detected, it may be appropriate to ask the woman to point to the mass she feels.

Initial inspection may be with the patient sitting in an upright position hands by her sides (Fig. 6.5). By asking her to raise her hands, clinical abnormalities such as indrawing of skin tethered to a cancer or nipple indrawing may be accentuated (Fig. 6.6). Next, asking the woman to place her hands on her hips and press in (contracting the pectoralis muscles) may accentuate a deeply tethered cancer and hence draw the eye to a tumour.

While obvious abnormalities (Figs. 6.2, 6.3 and 6.5) merit further inspection and palpation with the patient in the upright position, more detailed palpation may be best carried out with the patient lying flat, with one pillow for comfort, on an examination couch. The patient should be asked to raise her arm behind her head to fix the breast in a relatively static position. By palpation using a gentle rotating movement with the flat of the fingers even small lumps may be detected, using varying degrees of pressure to detect lumps that are lying at different depths in the breast tissue [4]. Using the flattened fingers of one hand and a gentle rotating movement, the whole breast on the normal side (including the retroareolar tissues) may be palpated before moving to the side with a clinical abnormality. Care should be taken to record the position, shape and calliper measurement of the size of the lesion(s) together with any other features (tender,



Fig. 6.3 Skin nodules from advanced breast cancer overlying a breast mass; a nodal mass is also visible in the axilla

BREAST CLINIC INITIAL INVESTIGATION FORM

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PERSONAL DETAILS			
Name & Address		Referring Hospital: Ninewells <input type="checkbox"/> PRI <input type="checkbox"/> Well Woman <input type="checkbox"/> Screening <input type="checkbox"/>	
CHI		Consultant Seen by	
		Referring GP/Clinician	
		Screening Patient: YES/NO Date of Referral / /	
		Date of Last Breast Screen / / Date of Clinic / /	
COMPLAINTS			
	RIGHT	LEFT	OTHER
Duration:			
Cyclical:			
Other Features:			
PREVIOUS DISEASE		FAMILY HISTORY	
Previous Breast Disease? YES / NO		Family History of Breast Cancer YES / NO	
Diagnosis		If YES, Age at onset	
Previous Breast Clinic Patient: YES / NO Date / /		MOTHER <input type="checkbox"/> <input type="checkbox"/>	MATERNAL AUNT <input type="checkbox"/> <input type="checkbox"/>
Previous Open Breast Surgery		SISTER 1 <input type="checkbox"/> <input type="checkbox"/>	MATERNAL GRAN <input type="checkbox"/> <input type="checkbox"/>
Previous Breast Aspiration		SISTER 2 <input type="checkbox"/> <input type="checkbox"/>	PATERNAL AUNT <input type="checkbox"/> <input type="checkbox"/>
NO <input type="checkbox"/> RIGHT <input type="checkbox"/> LEFT <input type="checkbox"/> BOTH <input type="checkbox"/> MULTIPLE <input type="checkbox"/>		OTHER + <input type="checkbox"/> <input type="checkbox"/> + Specify	
NO <input type="checkbox"/> RIGHT <input type="checkbox"/> LEFT <input type="checkbox"/> BOTH <input type="checkbox"/> MULTIPLE <input type="checkbox"/>		PATERNAL GRAN <input type="checkbox"/> <input type="checkbox"/>	
MENSTRUAL HISTORY			
Menopausal Status:		Pregnant <input type="checkbox"/>	
Pre-Menopausal* <input type="checkbox"/>		Oral Contraceptive Pill <input type="checkbox"/>	
Post-Menopausal* <input type="checkbox"/>		Hormone Replacement Therapy <input type="checkbox"/>	
Peri-Menopasal* <input type="checkbox"/>			
PAST MEDICAL HISTORY			
Other Cancer YES / NO Site:			
Illnesses YES / NO What:			
Current Medications YES / NO			
What:			
Drug Allergies YES / NO What			
Smoker / Ex Smoker YES / NO			
SURGERY			
Hysterectomy YES / NO Why			
Bilateral Oophorectomy YES / NO			
Unilateral Oophorectomy YES / NO			
Other Operations YES / NO What			

* for definitions, see page 4

Fig. 6.4 Proforma for recording the relevant clinical history used in everyday practice. Note the CHI (Community Health Index) is the unique patient identifier from which the patient's age can be deduced

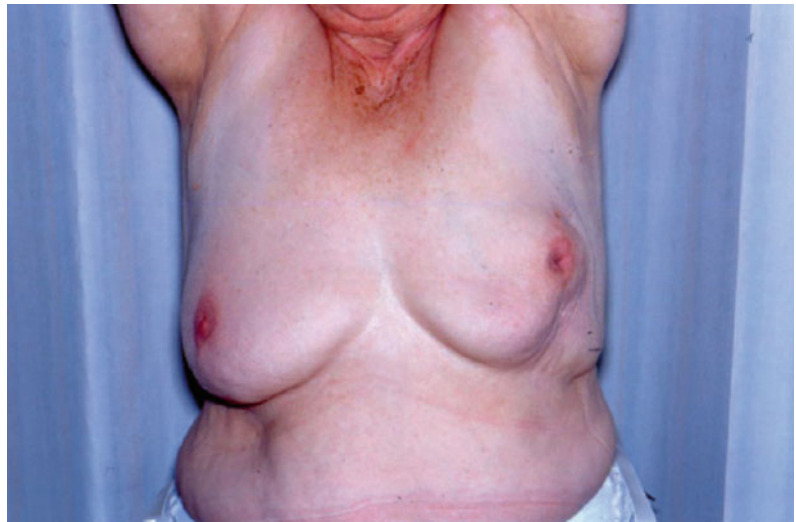
red, single or multiple). Clinical examination has a 54 % sensitivity to detect (rule out) breast cancer and a 94 % specificity to rule in breast cancer [4].

In patients with a history of nipple discharge, the patient may be asked to elicit the discharge by pressing on the nipple or areolar, thus avoiding the practitioner hurting the

Fig. 6.5 Left breast cancer: nipple retraction and skin tethering



Fig. 6.6 Left breast cancer: skin effects seen in Fig. 6.5 are more prominent as the arms are raised



patient. The number of ducts producing a discharge (single or multiple?), the colour of the discharge (is it milky?, is it obviously blood-stained? Figure 6.1) and testing for blood using urinary dip sticks can be noted.

Following breast examination, bilateral axillary examination should be performed on each side in turn. This may be most readily accomplished by asking the patient to sit up, and for the examination of the right axilla, the practitioner takes the patient's right forearm, supporting the weight of the forearm to relax the axilla. Using the fingers of the practitioner's left hand, the walls of the axilla and the apex of the axilla can be gently palpated, and any lumps and their consistency are noted. Thereafter, a similar arrangement can be used for the left axilla (the practitioner taking the patients' left forearm in his or her left hand and examining the axilla with the fingers of the right hand). Thereafter, the infraclavicular,


supraclavicular and cervical lymph nodes should be examined for lymphadenopathy often most comfortably performed (for both patient and clinician) and any findings recorded on the clinical examination sheet (Fig. 6.7).

6.5 Investigation

Investigation of a breast mass is conducted and recorded (Fig. 6.7) following clinical history and examination using imaging before core biopsy or vacuum biopsy as these latter interventions may cause bruising which, in turn, makes it more difficult to interpret the clinical and imaging appearances. For example, post-biopsy discomfort, haematoma and skin oedema can suggest an inflammatory breast cancer but may be due to post-biopsy changes.

BREAST CLINIC INITIAL INVESTIGATION FORM

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NORMAL	PAGETS	RIGHT	LEFT	NORMAL	PAGETS
DISCRETE LUMP	SINUS	12	12	DISCRETE LUMP	SINUS
THICKENING	SKIN NODULE	14	14	THICKENING	SKIN NODULE
NIPPLE INVERSION	TENDERNESS	9	3	NIPPLE INVERSION	TENDERNESS
NIPPLE DISCHARGE	GENERAL NODULARITY	13	13	NIPPLE DISCHARGE	GENERAL NODULARITY
OTHER		6	6	OTHER	

Axillary Nodes Not palpable <input type="checkbox"/> Palpable <input type="checkbox"/> Fixed <input type="checkbox"/>	Nipple Discharge YES / NO Colour _____ Single <input type="checkbox"/> Multiple <input type="checkbox"/>	Axillary Nodes Not palpable <input type="checkbox"/> Palpable <input type="checkbox"/> Fixed <input type="checkbox"/>	Nipple Discharge YES / NO Colour _____ Single <input type="checkbox"/> Multiple <input type="checkbox"/>
Supraclavicular Nodes Not palpable <input type="checkbox"/> Palpable <input type="checkbox"/>	Blood (Stick Testing) POS / NEG	Supraclavicular Nodes Not palpable <input type="checkbox"/> Palpable <input type="checkbox"/>	Blood (Stick Testing) POS / NEG

FNA				FNA			
#	SIZE	SITE	VOLUME/FEATURES	#	SIZE	SITE	VOLUME/FEATURES
1				1			
2				2			

CYTOLOGY*		CYTOLOGY*	
C1 <input type="checkbox"/>	REPORT:	C1 <input type="checkbox"/>	REPORT:
C2 <input type="checkbox"/>		C2 <input type="checkbox"/>	
C3 <input type="checkbox"/>		C3 <input type="checkbox"/>	
C4 <input type="checkbox"/>		C4 <input type="checkbox"/>	
C5 <input type="checkbox"/>		C5 <input type="checkbox"/>	

MAMMOGRAMS*				MAMMOGRAMS*			
NORMAL <input type="checkbox"/>		BENIGN <input type="checkbox"/>		MALIGNANT <input type="checkbox"/>		NORMAL <input type="checkbox"/>	
R1 <input type="checkbox"/>	N1 <input type="checkbox"/>	REPORT:	R1 <input type="checkbox"/>	N1 <input type="checkbox"/>	REPORT:	R2 <input type="checkbox"/>	P1 <input type="checkbox"/>
R2 <input type="checkbox"/>	P1 <input type="checkbox"/>		R3 <input type="checkbox"/>	P2 <input type="checkbox"/>			
R3 <input type="checkbox"/>	P2 <input type="checkbox"/>		R4 <input type="checkbox"/>	PDY <input type="checkbox"/>			
R4 <input type="checkbox"/>	PDY <input type="checkbox"/>		R5 <input type="checkbox"/>	DY <input type="checkbox"/>			
R5 <input type="checkbox"/>	DY <input type="checkbox"/>						

ULTRASOUND		ULTRASOUND	
U1 <input type="checkbox"/>	REPORT:	U1 <input type="checkbox"/>	REPORT:
U2 <input type="checkbox"/>		U2 <input type="checkbox"/>	
U3 <input type="checkbox"/>		U3 <input type="checkbox"/>	
U4 <input type="checkbox"/>		U4 <input type="checkbox"/>	
U5 <input type="checkbox"/>		U5 <input type="checkbox"/>	
U6 <input type="checkbox"/>		U6 <input type="checkbox"/>	

* for definitions, see page 4

Fig. 6.7 Proforma for recording the relevant examination findings and investigations (continuation of the proforma shown in Fig. 6.4)

6.6 Imaging

Standard initial imaging is to use bilateral two-view digital mammography (craniocaudal (Fig. 6.8) and medio-lateral oblique (Fig. 6.9) views), with additional coned or

magnified views (Fig. 6.10) of abnormalities as appropriate, for women aged 35 years and older and ultrasound as the primary imaging modality for women younger than 35 years. This somewhat arbitrary cut-off (some health care systems use 40 years) is based on the higher breast density

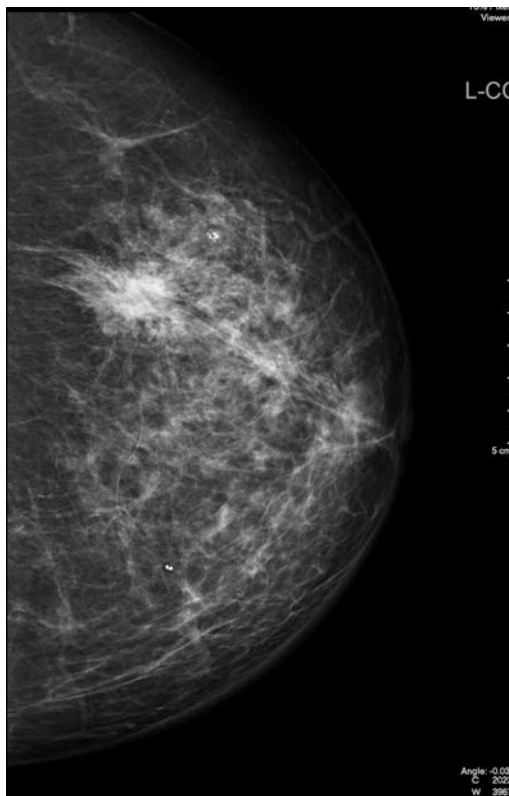


Fig. 6.8 Craniocaudal mammograms showing a left breast cancer as a stellate lesion which was clinically palpable. The horizontal guideline allows ready comparison between the two breasts

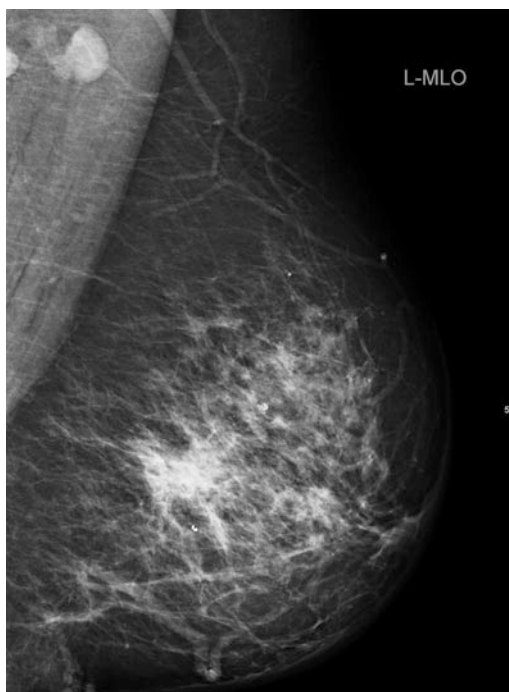


Fig. 6.9 Medio-lateral oblique views of the same patient as in Fig. 6.8

in younger women which may make it difficult to detect even quite a large cancer. With increasing age, the breast parenchyma is replaced by fatty tissue and breast cancer becomes easier to detect in the older breast. Premenopausal women should confirm they are not pregnant before undergoing mammography, although the likelihood to cause harm to a foetus is low. Ultrasound should always be used in addition to mammography in the older age group and, similarly, if ultrasound detects what appears to be a malignant lesion in a younger women, or clinical suspicion persists, then mammography should be performed. On average, ultrasound is more likely to definitively characterise a palpable mass than mammography. Mammography has the advantage of picking up associated DCIS in women with breast cancer. It is important that the clinician marks on the skin, the site of the palpable abnormality to enable the sonographer to be sure that that any ultrasound lesion spatially correlates with the palpable abnormality.

6.7 Breast Ultrasound

Ultrasound is performed using warmed gel to ensure contact and good transmission between the probe and the patient's breast and may accurately measure a breast mass in multiple dimensions. Ultrasound can identify whether a breast mass is cystic (Fig. 6.11) or solid (Fig. 6.12), may identify multiple pathologies (e.g. an intracystic cancer, Fig. 6.13) and can also be used to demonstrate blood flow (using Doppler) and stiffness (using elastography) in and around a breast mass (Fig. 6.14). The ultrasound appearances can be categorised for reporting (Table 6.4).

Ultrasound is particularly useful to delineate cysts (Fig. 6.11) and to subsequently direct and confirm drainage of a cyst. Ultrasound is also extremely useful to delineate a fibroadenoma (Fig. 6.15). The typical picture of a carcinoma with an irregular border and casting an acoustic shadow (Fig. 6.12) is usually quite different to a fibroadenoma (Fig. 6.15) and cysts (Fig. 6.11), and makes ultrasound particularly useful in the clinic to indicate the likely pathology of a lump. However, distinguishing between a carcinoma and a fibroadenoma usually requires needle sampling of such lesions.

Ultrasound is routinely used to examine the axilla and regional nodal basins in women with a suspicious breast mass (Fig. 6.16), and in combination with fine needle aspiration cytology or core biopsy (see below) can diagnose axillary metastases in up to 90 % of positive nodes and most patients with a high axillary disease burden [5]. Women with markedly abnormal nodes in their axilla should have the infraclavicular and supraclavicular nodes examined and biopsied if required.

Fig. 6.10 Magnification views of a breast mass showing the fine microcalcifications associated with ductal carcinoma in situ; an additional coarse calcified area is non-malignant

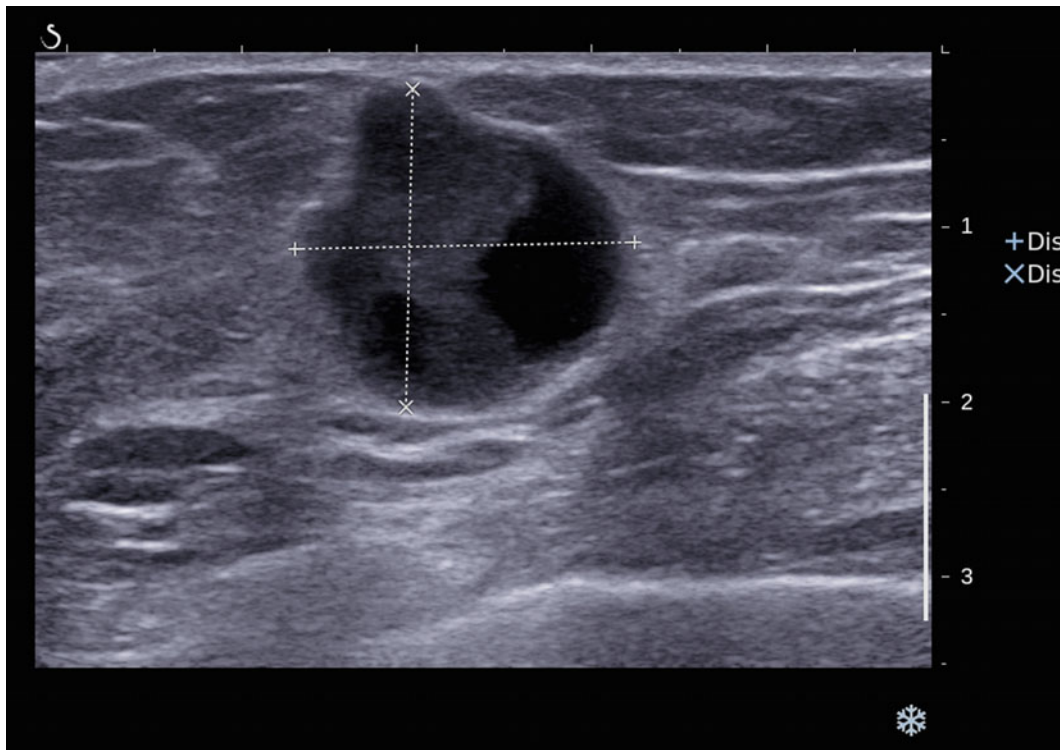
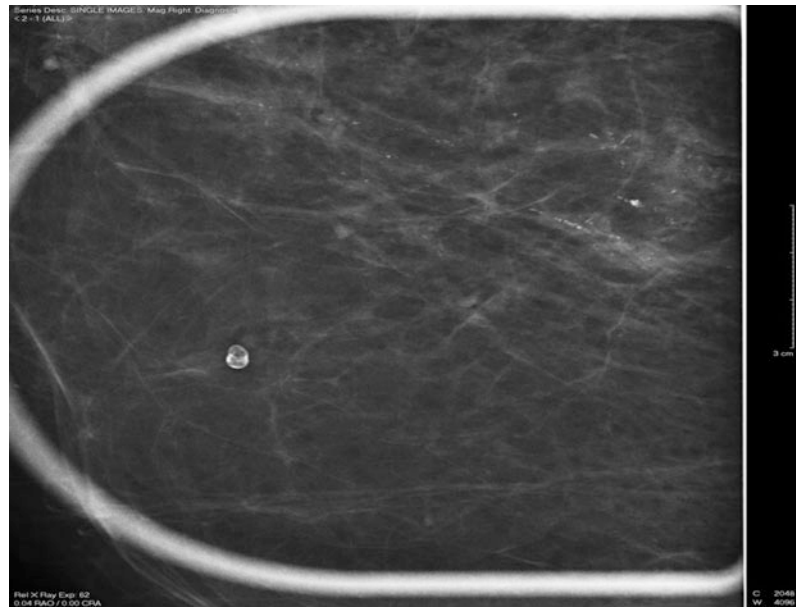


Fig. 6.11 Ultrasound of a breast cyst: note the smooth outline, fluid-filled lesion

Fig. 6.12 Ultrasound of a breast cancer: note the irregular margin and dense acoustic shadow in contrast to Fig. 6.11 and Fig. 6.15

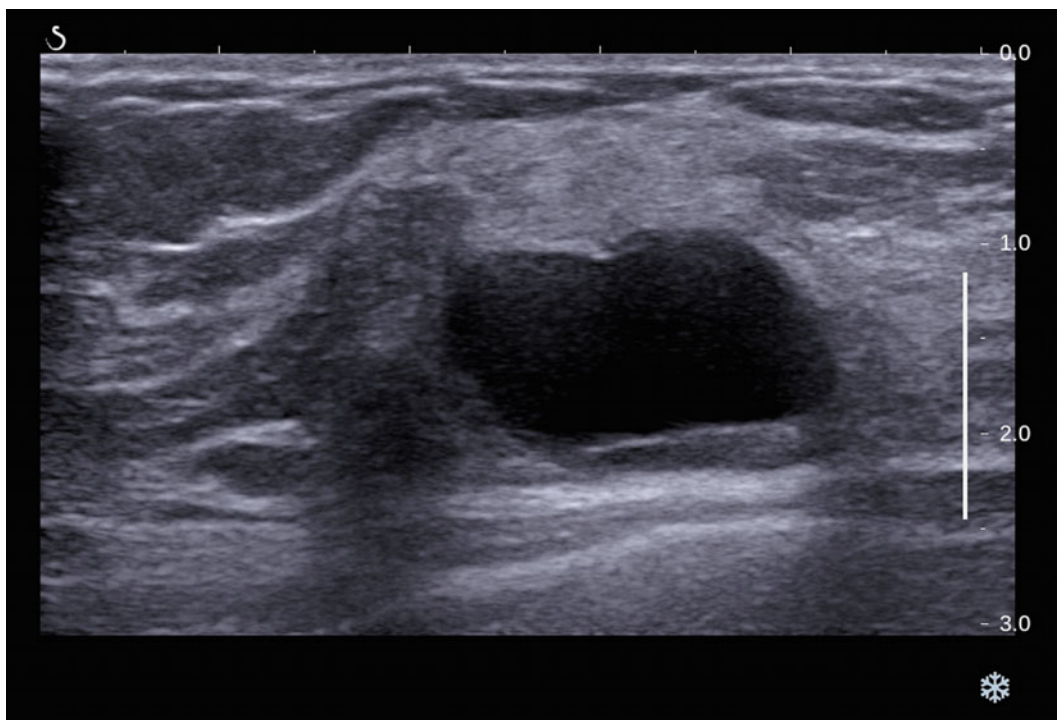
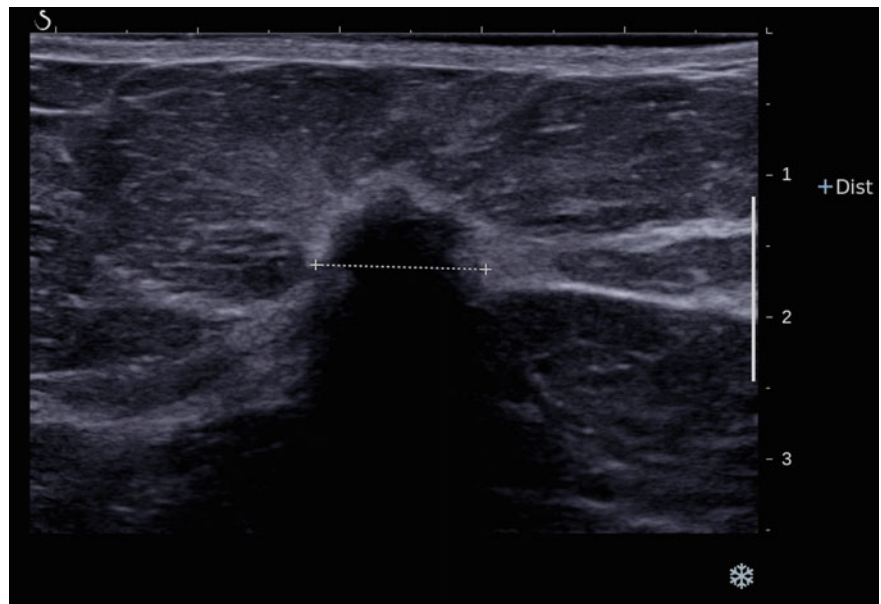


Fig. 6.13 Ultrasound of a breast cyst within which there is an intracystic tumour

6.8 Mammography

Mammography may suggest the nature of a breast mass as benign (e.g. breast cysts: smooth outlines with multiple masses visible; Fig. 6.17) or malignant (stellate mass with

irregular outline; Figs. 6.8 and 6.9). Mammography is more sensitive with increasing age as the breast density declines and breast adipose tissue increases.

An abnormality on the mammograms is often visible on two-view mammography (Figs. 6.8 and 6.9), but finer

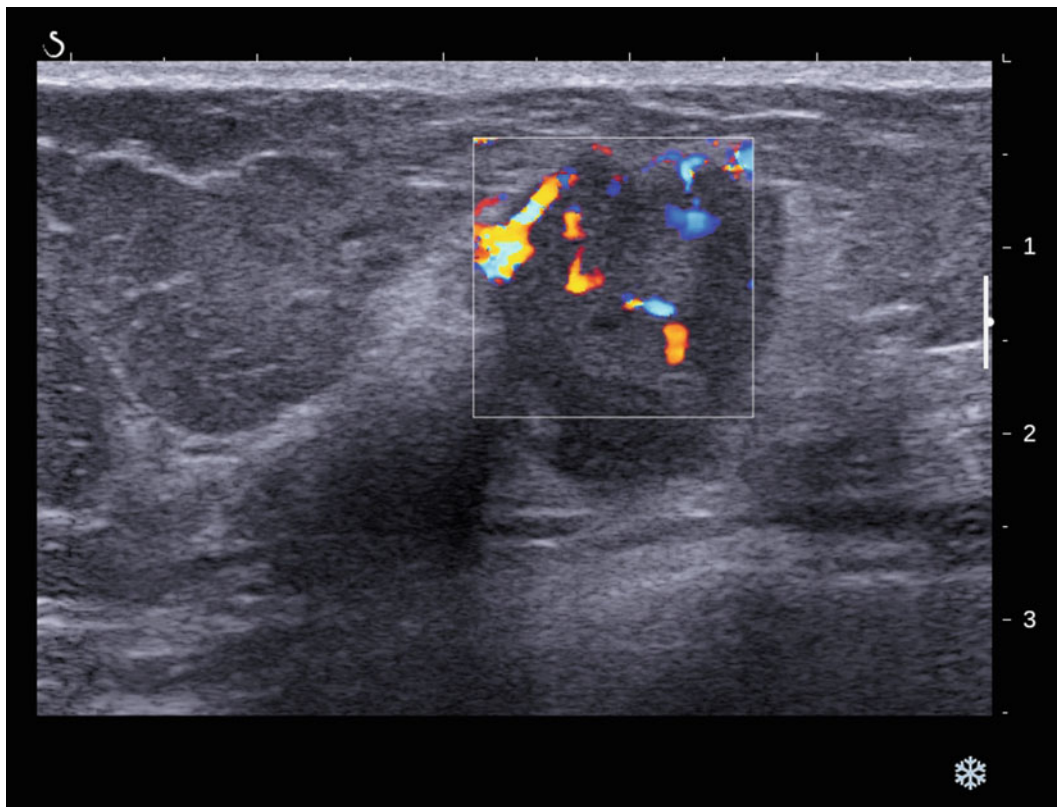


Fig. 6.14 Ultrasound of a breast cancer demonstrating the vascularity of the cancer

Table 6.4 Ultrasound classification for breast masses

Code	Description
U1	Normal diffuse benign
U2	Single cyst
U3	Solid benign
U4	Suspicious of malignancy
U5	Malignant
U6	Multiple cysts

details such as microcalcification may require magnification views (Fig. 6.10) and may or may not correspond to a palpable abnormality. While such fine details may indicate a benign or malignant (DCIS) (Fig. 6.10) pathology, further localisation and investigation will be required. Calcifications are best biopsied using a vacuum-assisted biopsy device. Whatever the findings, they can be annotated for future reference and reporting (Table 6.5). Digital breast tomosynthesis offers a computer-generated 3-D reconstruction of the breast and may have a particular role in detecting small low-grade spiculated cancers otherwise obscured on two-view mammography in a dense breast. The value of such detection with regard to breast cancer mortality is unknown.

Breast ultrasound and mammography are the mainstays of radiological evaluation of a breast mass and may be conducted at the time of clinical history and examination to allow progress to needle biopsy of a lesion as part of a one-stop diagnostic breast clinic.

6.9 Magnetic Resonance Imaging (MRI)

Magnetic resonance imaging (MRI) has been increasingly adopted [6] particularly to image the breast in the presence of silicone implants, screening women with a strong family history or genetic-tested high risk of breast cancer and monitoring women receiving neo-adjuvant chemotherapy.

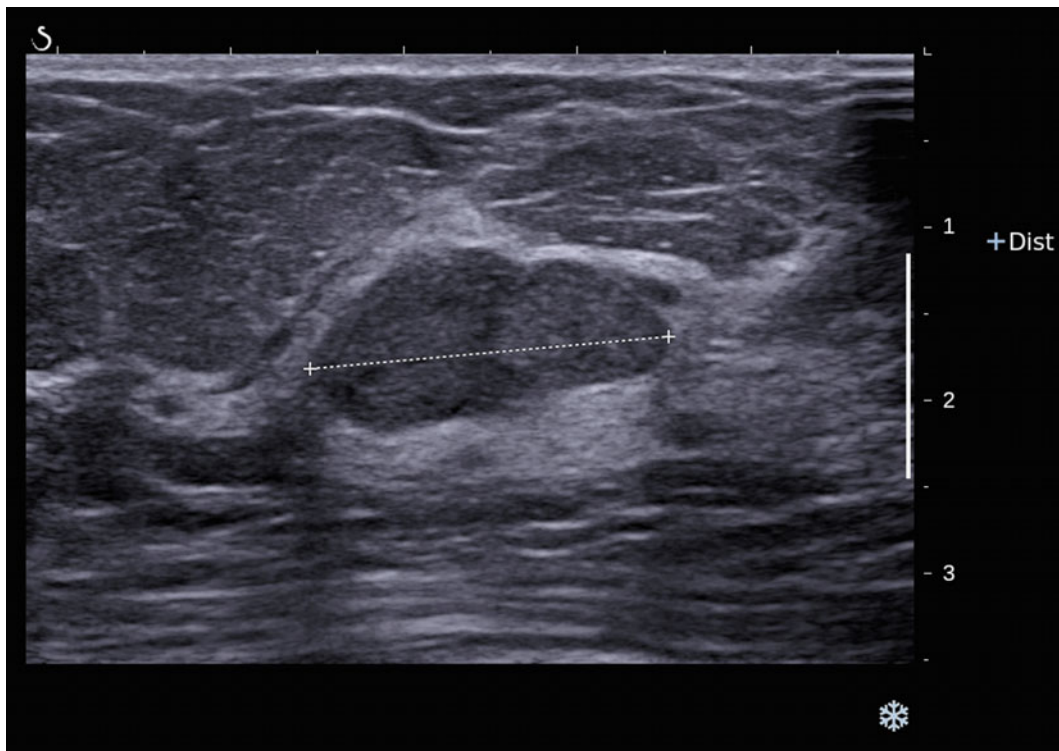
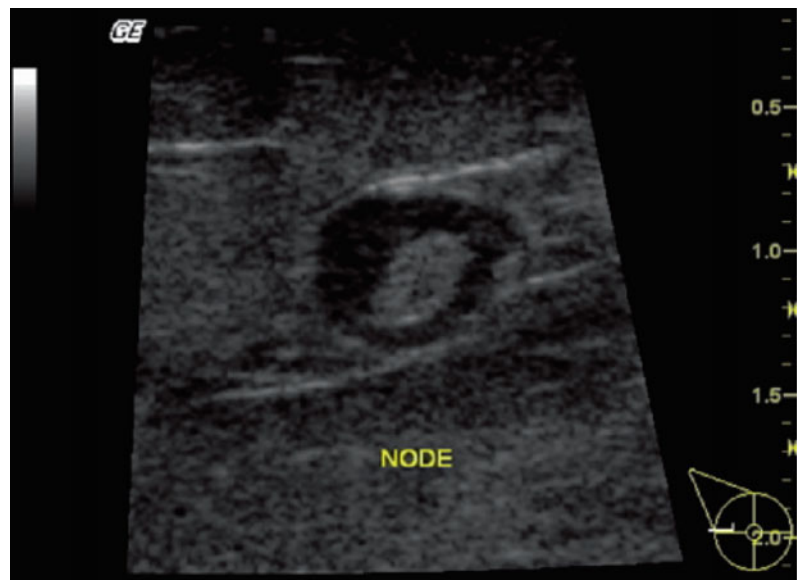


Fig. 6.15 Ultrasound of a fibroadenoma; note the ovoid appearance with the long axis parallel to the skin surface and the well-defined edges of the lesion. Contrast the appearances to those of Fig. 6.12

Fig. 6.16 Ultrasound of a malignant axillary lymph node



MRI can also be used to assess size and focality in women with breast cancer looking towards breast conservation particularly in women with a lobular cancer; MRI can also detect DCIS not visible on mammography (Figures 6.18, 6.19 and 6.20).

6.10 Other Imaging Techniques

Positron emission tomography combined with computerised tomography (PET/CT) or MRI (PET/MRI) may be performed as an investigation for breast cancer either to obtain

Fig. 6.17 Bilateral cysts on craniocaudal mammograms

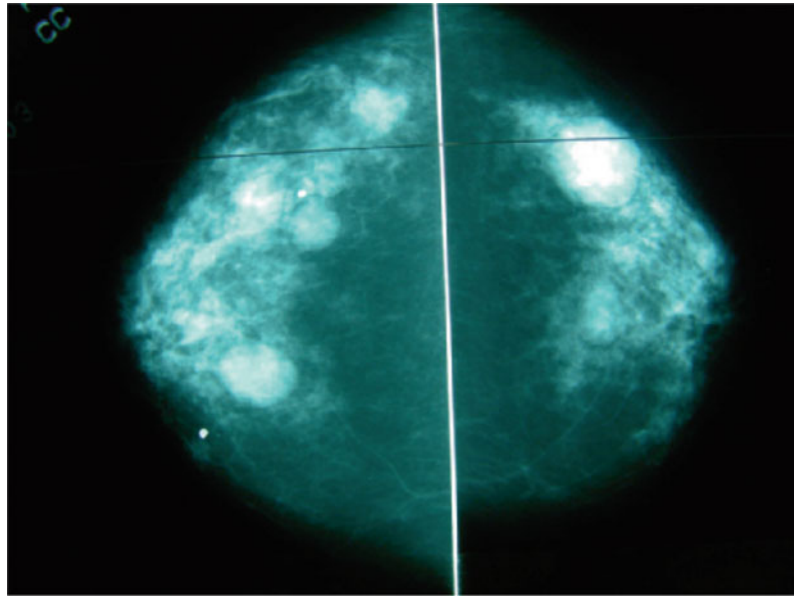


Table 6.5 Mammographic appearances of the breast

Code	Description
R1	Normal
R2	Benign
R3	Indeterminate
R4	Probably malignant
R5	Malignant

Fig. 6.18 MRI demonstrating mass secondary to DCIS (*left* half of figure)

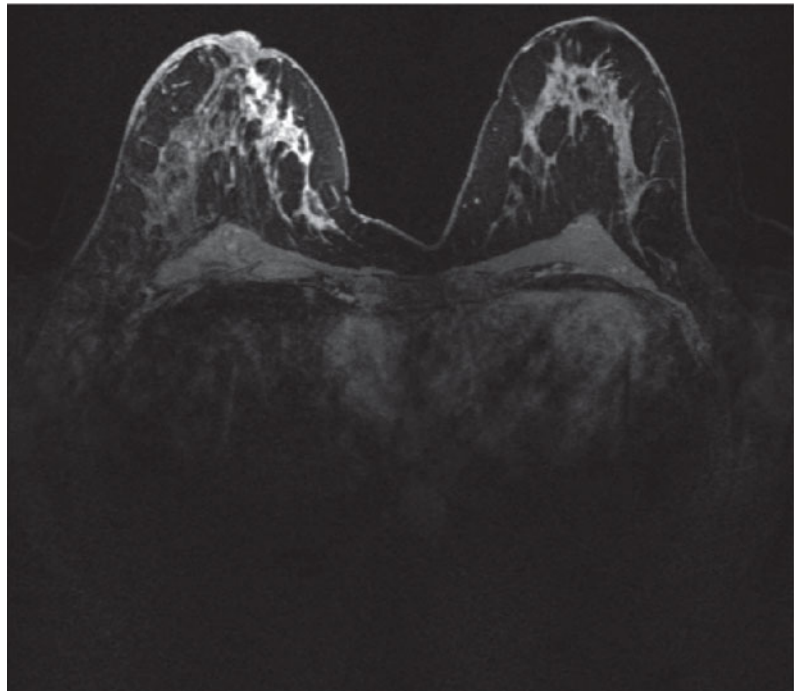


Fig. 6.19 MRI of invasive breast cancer (*left half of figure*)

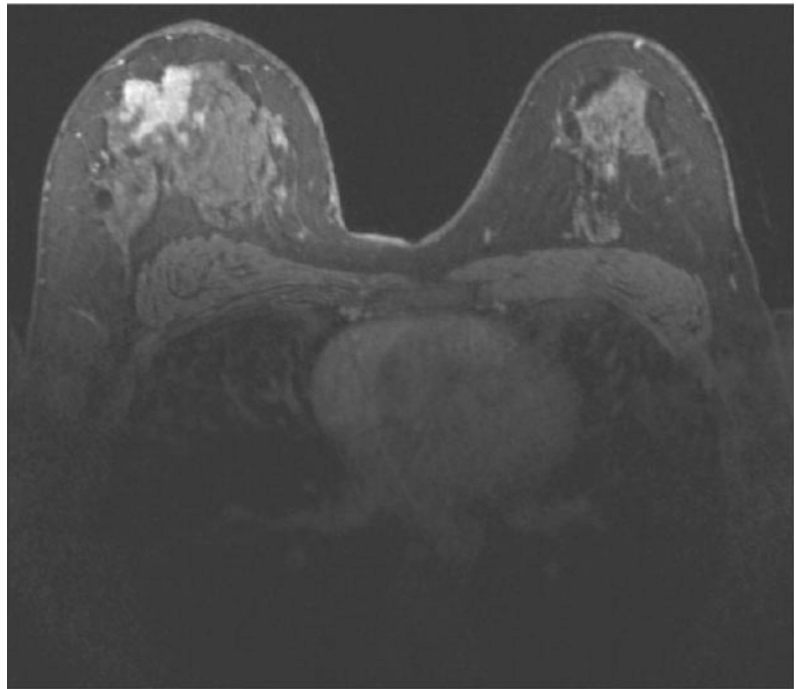
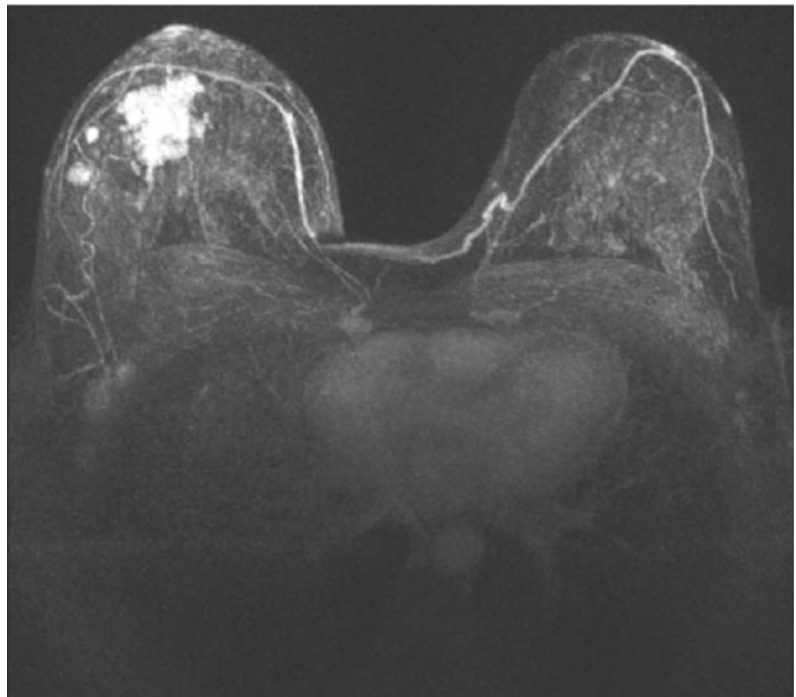


Fig. 6.20 Early enhancement of MRI of patient in Fig. 6.19 demonstrating multifocality



functional imaging as a baseline for subsequent therapy or as part of whole body imaging for metastatic disease. Although the radiation dosages (for PET) or access to such facilities at present may limit their use, PET may play a role in future in the evaluation of locally advanced breast cancer or in the evaluation of regional lymph nodes (including internal mammary and mediastinal nodes) for metastatic disease.

6.11 Pathology Diagnosis

The third component of triple assessment after clinical history/examination and imaging is histopathological diagnosis. Cytology is inferior to core biopsy in the diagnosis of breast lesions and should not be used. Until recently, it was used widely in the assessment of abnormal axillary nodes,

but recent comparisons with core biopsy have confirmed the superiority of core biopsy in this clinical setting also [5].

While a palpable solid mass may be core biopsied “free hand,” ultrasound guidance is preferable as accuracy is greater. Biopsy using a 14-gauge needle following infiltration with local anaesthetic should be used to confirm the diagnosis of a benign lesion such as a fibroadenoma (Fig. 6.21) in women over 25 years and thus prevents the need for excisional biopsy. Stereotactically guided core biopsies can take an extremely accurate core sample from lesions with radiological features such as microcalcification,

and subsequent specimen X-rays can confirm that the microcalcification has been adequately sampled (Fig. 6.22). Core biopsy also has the virtue of demonstrating tissue architecture and thus distinguishing between DCIS and invasive breast cancer.

More recently, vacuum-assisted biopsies (VAB) taken under radiological guidance have the advantage of multiple relatively large cores of tissue from the same small area and may, under some circumstances, actually be able to excise a lesion completely. Eleven- or nine-gauge VAB is the method of choice for diagnosing microcalcification. Seven- or

Fig. 6.21 Core needle inserted under ultrasound guidance into a fibroadenoma for histological confirmation of the diagnosis

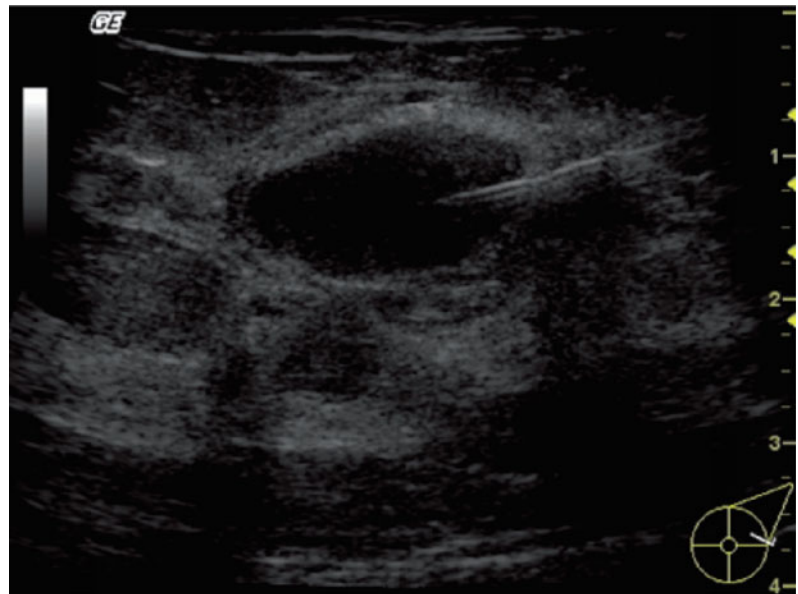


Fig. 6.22 X-ray image of cores from a core biopsy confirming the calcification present in the targeted mass is represented in the cores

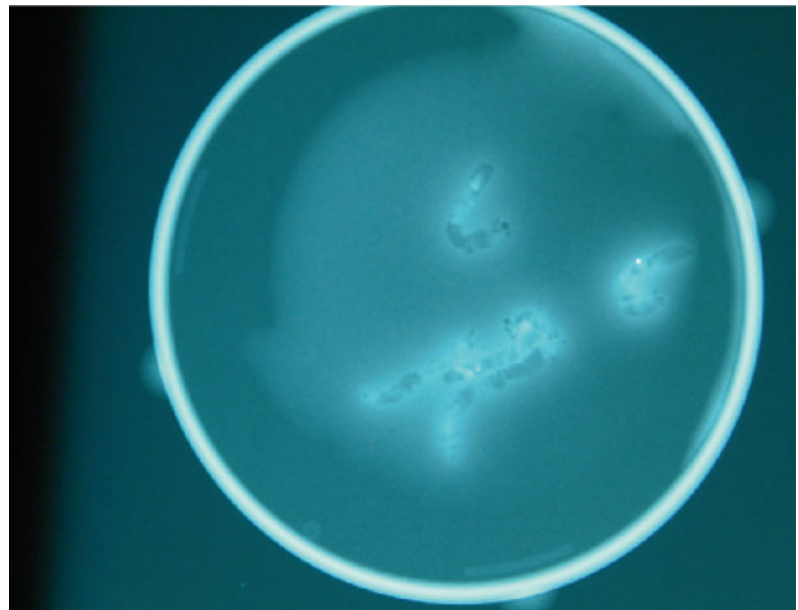
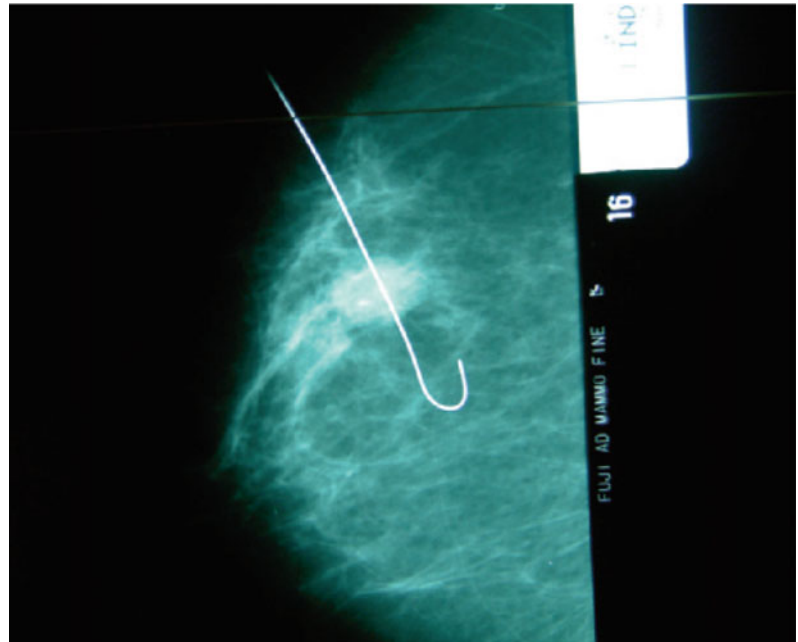


Fig. 6.23 Needle localisation of a breast mass to ensure the correct mass is excised at the time of surgery



nine-gauge VAB, usually under US control, should be used for the percutaneous excision of papillomas, radial scars and fibroadenomas if the patient requests removal. A marker clip is often deployed to allow localisation if malignant pathology is found.

Very rarely, it is impossible to establish a diagnosis even with repeated core biopsy or VAB. In such circumstances, a diagnostic excisional biopsy of the lump may be considered. This will require image-guided localisation, particularly on the background of a lumpy breast, to ensure that the correct breast mass is excised (Fig. 6.23) so that the diagnosis can be established. However, routine use of excisional (and often incomplete) surgical open biopsy of a palpable mass should no longer be standard practice.

Fig. 6.24 Needle aspiration of a breast cyst yielding typical breast cyst fluid



6.12 Patient Plan

Following triple assessment, it is thereafter important to discuss with the patient whether any lump can be left alone, should be excised or whether—if a diagnosis of cancer has been made—staging tests should be performed prior to definitive treatment. These decisions should be formally recorded in the case record (Fig. 6.24).

6.13 Benign Breast Masses

The focus of this chapter on malignant breast masses reflects the concerns of patients to exclude cancer and that of clinicians not to miss diagnosis of cancer. However, benign

breast changes and lumps are more common than breast cancer. Only approximately one in twenty women attending a symptomatic breast clinic will have a mass that turns out to be malignant, and the management of benign breast masses is thus an important component of clinical practice.

The same principles of triple assessment apply to all benign breast masses as apply to a lump which turns out to be malignant. The features of a benign breast lump can also be described in a similar fashion with associated features noted (Tables 6.1, 6.2 and 6.3). Following the diagnosis of a benign breast mass, if no further intervention is required, a written information booklet describing the benign findings in the breast may be helpful to reinforce verbal reassurance. Women should still be encouraged to seek re-evaluation if any new mass or breast symptom appears in future—it is not unknown for a woman to have sought and obtained appropriate reassurance for benign breast changes then at a later date to find a new mass which turns out to be malignant.

6.13.1 Benign Nodularity

Many women notice changes in their breasts on a monthly cycle, but may become worried if lumpiness or a breast mass persists beyond 2 menstrual cycles (6–8 weeks), particularly if associated with asymmetry between the two sides, even if there is some cyclical change. The history and clinical examination will often point to this variation in normal breast which is in accordance with the expected responses to endocrine fluctuations on a monthly basis in premenopausal women. Premenstrual discomfort or pain may also highlight the “normality” of this change. However, even with a low clinical concern on history and examination, imaging (ultrasound or mammography as first line, dependent on the age of the patient), if necessary, supplemented by core biopsy may be required for reassurance of the patient and clinician. This may be particularly useful if there is a family history of breast cancer or if the patient is anxious about the changes she has noted.

6.13.2 Changes Associated with Pregnancy and Lactation

The breasts undergo enormous physiological and morphological changes during the early stages of pregnancy (and indeed are one of the first symptoms a woman may note when pregnant) which develop as pregnancy continues and evolve during the post-partum period into the lactating breast. Benign lumpiness is a common feature of the breasts in pregnant women and when breast feeding. However,

pathological changes can occur, and breast cancer, which may present as inflammatory breast cancer mimicking an abscess (see below) while rare, should be considered and new, focal breast lumps investigated by triple assessment (using ultrasound rather than mammography due to the pregnancy). Lactational cysts are not uncommon; aspiration should lead to resolution though may need to be repeated if the cyst refills.

6.13.3 Fibroadenoma

An aberration of normal development and involution (ANDI), this smooth, non-tender mobile lump may be single, lobulated or occasionally multiple. Ultrasound as part of triple assessment may identify a typical appearance (Fig. 6.15). Under the age of 25, typical ultrasound appearances may provide sufficient reassurance that some practices do not require needle sampling. In women over 25 years, core biopsy is the preferred diagnostic method and avoids the need for excision. Excision (by surgery or vacuum device) or cryoablation may be performed if the patient wishes.

6.13.4 Phyllodes Tumour

Phyllodes tumour (a biphasic stromal and epithelial lesion) may appear on clinical and imaging evidence to be very similar to a fibroadenoma. However, histology (core biopsy) will demonstrate features (number of mitoses per high powered field; morphological appearances) ranging from benign, through borderline histology, to frankly sarcomatous (hence the former term cystosarcoma phyllodes) or alternatively classed as high- or low-grade variants. Excision with a margin of normal tissue and follow-up for local recurrence for 5 years thereafter is required.

6.13.5 Cysts

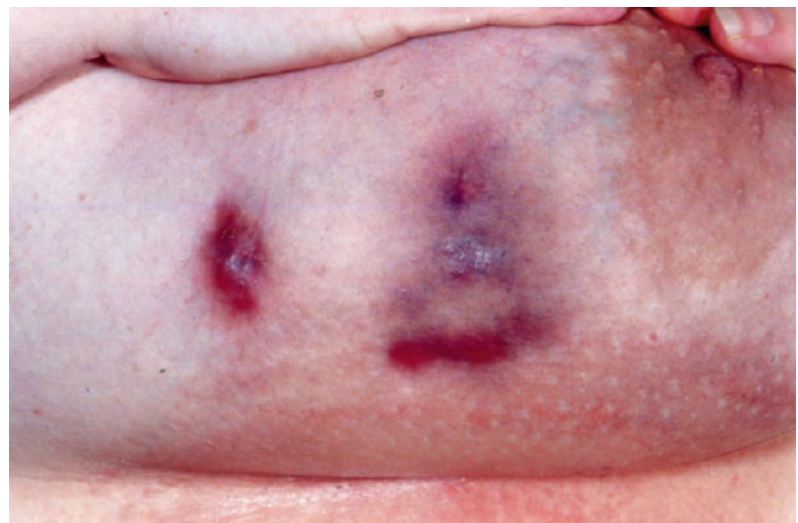
One in twelve women develops a symptomatic cyst in their lifetime. A cyst may be single or multiple, and both mammography (Fig. 6.17) and ultrasound (Fig. 6.11) are diagnostically useful. Aspiration both establishes the diagnosis and treats the cyst. However, blood in the cyst aspirates or a residual mass may be due to an intracystic cancer (Fig. 6.13), so the remaining lesion requires core biopsy. Cysts may refill, particularly if not completely aspirated, and require repeated aspiration or, rarely, if large and recurring after repeated aspiration, excision.

6.13.6 Breast Sepsis

A breast abscess develops from tender, erythematous cellulitis (mastitis) to present as a painful red, mass warm to the touch which may occupy part or the entire breast. An abscess occurs in two groups of women. In young, breast-feeding mothers, *Staphylococcus aureus* is the usual organism; the abscess usually sits adjacent to the areolar, and early intervention with amoxicillin (or erythromycin if penicillin allergic) at the cellulitic stage may prevent the formation of an abscess. The differential diagnosis includes inflammatory breast cancer, and so ultrasound evaluation is useful to identify focal pus. Once formed, an abscess may be drained under local anaesthesia using aspiration through a wide-bore needle under ultrasound guidance and antibiotic cover or, more rarely, by formal incision and drainage particularly if loculated. A subsequent mammary duct fistula may emerge at the junction of the areolar and breast skin and requires surgical excision. If possible, the mother should be encouraged to continue breast feeding to reduce breast engorgement.

In women aged 35–55, often smokers, multiple abscess formation may occur throughout both breasts (Fig. 6.25) and may not be confined to the nipple areolar area. The process of duct ectasia with enlarged ectatic ducts surrounded by an inflammatory infiltrate may lead to a slit-like nipple retraction (in contrast to the retraction seen with a cancer) and creamy nipple discharge which may be blood-stained. Subsequent inflammatory episodes with periductal mastitis may progress to abscess formation. While the anaerobic bacteria may respond to amoxicillin (or erythromycin and metronidazole) if treatment is commenced early, the repeated development of abscesses which may require formal drainage leaves a scarred, often discoloured breast (Fig. 6.25)

Fig. 6.25 Multiple abscesses and scars in a 50-year-old smoker with periductal mastitis for 5 years



6.13.7 Intraduct Papilloma

Intraduct papilloma may imitate breast cancer by presenting as a blood-stained nipple discharge from a single duct (Fig. 6.1). Triple assessment should exclude other pathologies, and the papilloma may be visible on ultrasound. If so, this should undergo core biopsy. If core biopsy shows a papilloma with no atypia, VAB biopsy is a good alternative to surgical excision and usually results in cure of the discharge. Cytology of the nipple discharge may reveal papillary clusters of epithelial cells, and although ductoscopy has some advocates, excision of the relevant duct under general anaesthesia is advocated to establish the diagnosis and exclude any evidence of malignancy which may be focal within a papilloma.

6.13.8 Skin Lesions

Skin lesions may occur on the breast as elsewhere in the body. An epidermoid cyst (formerly referred to as sebaceous cyst) may give the impression of a small (usually < 1 cm) breast mass; it is usually possible to demonstrate the intradermal location, a visible punctum and may produce creamy material. Epidermoid cysts are usually located adjacent to the sternum or in the inframammary fold. In contrast, a lipoma is usually 1–4 cm in size, deep to the skin and may require triple assessment to distinguish it from other breast masses. Additional breast tissue in the form of an accessory breast tissue can present as a mass in the axilla or subcutaneous mass just inferior to the breast in the midclavicular line. Assessment with ultrasound may establish the diagnosis. Accessory breast tissue rarely requires intervention unless symptomatic.

6.13.9 Fat Necrosis

A woman presenting with a breast mass secondary to fat necrosis is usually suggested by a history of trauma and bruising post-injury with a palpable lump which takes several weeks to resolve. On mammography, fat necrosis, if it is longstanding, may have similar features to a breast cancer with a stellate appearance. Most women with fat necrosis have normal mammography. Ultrasound often shows characteristic subcutaneous hyperechogenicity with central oil cysts. Aspiration of oil from an oil cyst confirms the diagnosis and, if required, core biopsy can also be performed.

6.13.10 Other Lesions

Other breast lesions, usually detected by breast screening, such as sclerosing adenosis or a radial scar, may mimic small breast cancers on imaging but rarely present as a palpable breast mass.

In general, surgical excision of benign lumps, if required, should try to use approaches which minimise scarring to the breast, whether conducted under local anaesthetic or general anaesthesia. This includes using a circumareolar incision (with tunnelling to the lesion if required), submammary or

axillary approaches. In a larger breast, it may be necessary to cut directly into the breast skin overlying a breast mass, and then the skin tension lines of the breast should be used to ensure scars heal with minimal cosmetic deficit.

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