Role of Contrast Enhanced Mammography in Assessment of Suspicious Breast lesions

Essay

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وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ
عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

First of all I thank God who blessed me in all my steps.

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Heba Mounir

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List of Abbreviations

ACR	American College of Radiology
ADH	Atypical ductal hyperplasia
AJCC	American Joint Committee of Cancer
BI-RADS	Breast Imaging-Reporting and Data System
CC	Cranio-caudal
CEDM	Contrast Enhanced Digital Mammography
DCIS	Ductal carcinoma in situ
DE-CEDM	Dual energy Contrast Enhanced Digital Mammography
ER	Estrogen receptor
IDC	Invasive duct carcinoma
ILC	Invasive lobular carcinoma
LCIS	Lobular carcinoma in situ
LN	Lymph node
min	Minute
mL/sec	Milliliter / second
MLO	Medio-lateral oblique
MRI	Magnetic resonance imaging
TDLU	Terminal ductal lobular unit

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Introduction

The primary role of mammography is to screen asymptomatic women in the hope of detecting breast cancer at a smaller size and earlier stage than the woman's own surveillance or her doctor's routine examination might ordinarily achieve. Detecting cancers using mammography when they are at a smaller size and earlier stage has been shown to reduce or delay mortality from breast cancer ***(Kopans, 2007).***

Mammography remains a very technically demanding imaging procedure. This is partly because the breast is exclusively soft tissue and that normal and abnormal tissues have very similar radiographic properties. In addition, the appearance of ‘‘normal’’ breast tissue varies enormously from woman to woman ***(Robson, 2010).*** Also, Mammography has some limitations, such as lesions masked by normal fibroglandular tissue, lesions seen on only one view, and subtle architectural distortions. Partly because of these limitations, mammography misses about 20% of invasive breast cancers ***(Dromain et al., 2012).***

Estimates of the sensitivity of mammography vary widely, with one recent study giving a figure of 78%. Sensitivity varies with age and breast density, with figures as low as 48% being reported for the most dense breasts. However, despite these limitations, mammography remains the main modality for breast screening ***(Robson, 2010).***

Mammographic signs suspecting malignancy include:

(A) Primary signs (due to the tumor itself; most reliable signs), with 20%-30% with these findings will have breast cancer:

- Mass with spiculated or ill-fined margin,
- Malignant calcifications.

(B) Secondary signs (occur as a result of the tumor; less specific signs):

- Architectural distortion,
- Skin, nipple, trabecular changes (thickening retraction),
- Abnormal ductal patterns,
- Lymphadenopathy,
- Asymmetry of breast tissue ***(Kopans, 2011)***

Contrast agent has been used for many years in both computed tomography and magnetic resonance imaging examinations to explore angiogenesis in breast carcinoma by tracking the uptake and washout of contrast agent in tissues ***(Dromain et al., 2012).***

However, conventional CT results in a high-radiation dose to the breast and chest wall. Breast MRI using gadolinium-based contrast agents is currently considered the most sensitive imaging technique for the detection of breast carcinoma However, breast MRI has a variable specificity and positive predictive value and is more time-consuming and more expensive than mammography ***(Dromain et al., 2012).***

Contrast-enhanced digital mammography is a new breast imaging technique that aims at demonstrating breast carcinoma angiogenesis. Recent investigational clinical results on contrast enhanced digital mammography suggesting that the technique may be a useful adjunct to mammography with lesion contrast-uptake information. Two CEDM examination techniques have been investigated: temporal subtraction and dual-energy ***(Dromain et al., 2012).***

Aim of the work

To highlight the role of contrast enhanced mammography in the assessment of suspicious breast lesions.

Anatomy of the Breast

Gross Anatomy

The breast is a modified skin gland (modified sweat gland) enveloped in fibrous fascia. It is composed of three major structures: skin, subcutaneous tissue and breast tissue (parenchyma and stroma) ***(Morris and Liberman, 2005)*** **(Figure 1.1).**

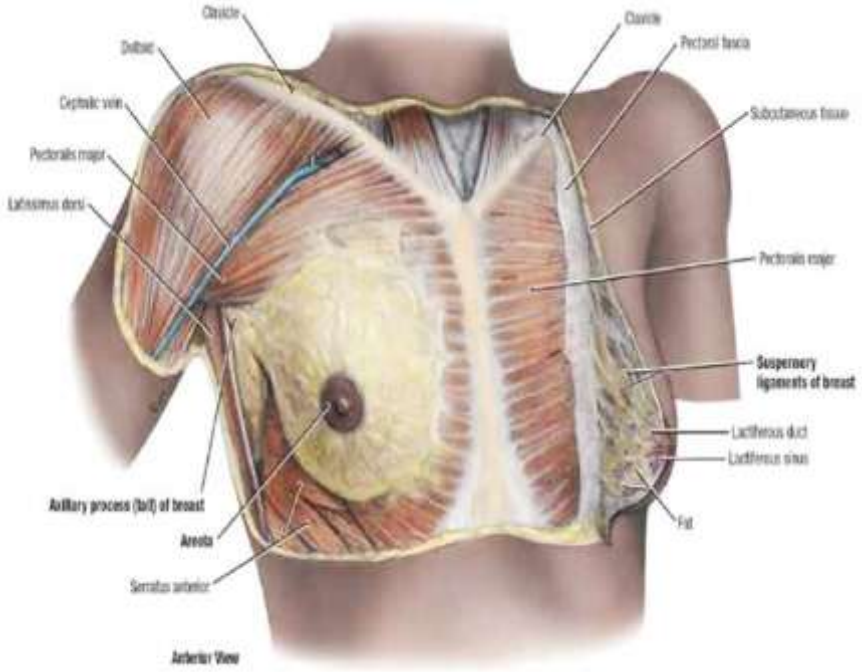

Figure 1.1: Overview of the breast ***(Quoted from Agur & Anne et al., 2009).***

The adult breast lies on the anterior chest wall between the second rib above and the sixth rib inferiorly and from the sternal edge medially to the mid-axillary line laterally. The breasts lie on the pectoral fascia covering the pectoralis major and minor muscles medially and serratus anterior and external oblique muscles laterally ***(Butler et al., 2007).***

The superficial fascia splits to contain the breast. The deep layer of the superficial fascia overlies the chest muscles, separated from them by the retromammary space. The superficial (or subcutaneous) layer lies deep to the dermis. Cords of connective tissue connect the dermis to the ducts of the gland and to the deep layer of the superficial fascia – the suspensory ligaments of Astley Cooper ***(Lagopoulos, 2007)***.

The nipple is found centrally on each breast and has abundant sensory nerve endings. The lactiferous ducts each open separately on the nipple. Surrounding the nipple is the areola which is pigmented and measures 15–60 mm **(Figure 1.2)** ***(Butler et al., 2007).***

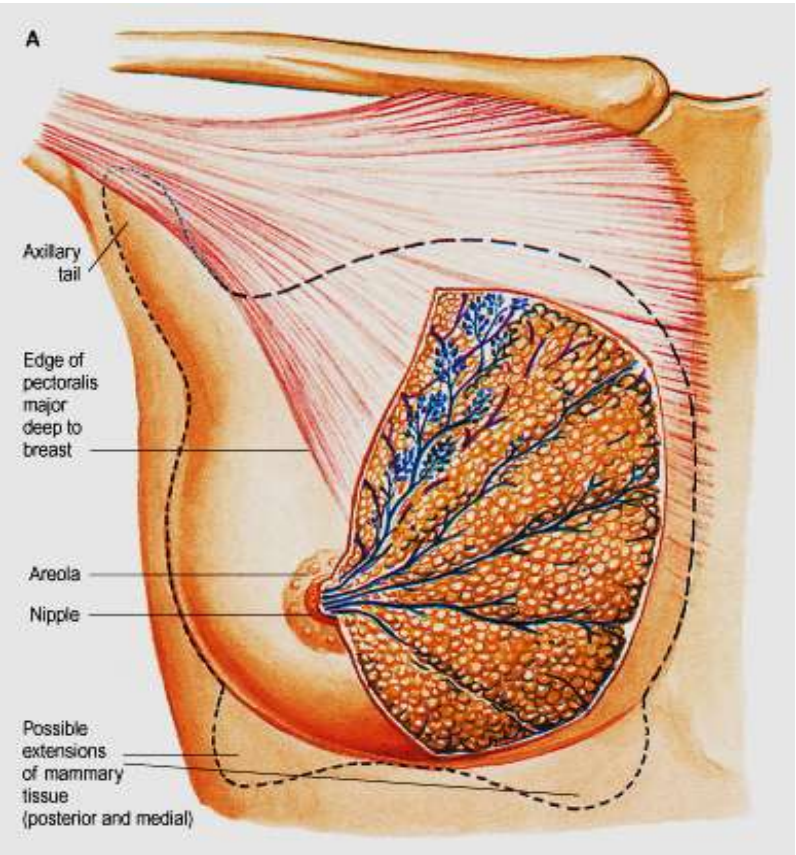

Figure 1.2: Breast extensions ***(Quoted from Standring, 2005).***