The Role of Ultrasound-Guided Vaccum-Assisted Breast Biopsy Systems in Management of Breast Lesions

Essay

Submitted for partial fulfillment of Master degree in Radiodiagnosis

Presented by

Mira Adly Mahmoud Ayoub

M.B,B.CH.

AinShamsUniversity

Supervised by

Prof. Dr. Wahid HusseinTantawy

Professor of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Dr.Gamal El-Din MohammedNiazi

Lecturer of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Faculty of Medicine,

Ain Shams University

2013

دور عينات الثدي المأخوذة بطريقة الشفط الموجهة بالموجات فوق الصوتية فى علاج امراض الثدى

رسالة

مقدمة توطئة للحصول على درجة الماجستير
فى الاشعة التشخيصية

مقدمة من

الطبيبة/ ميرا عدلي محمود ايوب
بكالوريوس الطب و الجراحة
جامعة عين شمس

تحت اشراف

الاستاذ الدكتور/ وحيد حسين طنطاوي
استاذ الاشعة التشخيصية
كلية الطب- جامعة عين شمس

د/جمال الدين محمد نيازي
مدرس الاشعة التشخيصية
كلية الطب- جامعة عين شمس

كلية الطب
جامعة عين شمس
2013

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List of Abbreviations

Abbreviation	Name
ACR	American College of Radiology
ADH	Atypical ductal hyperplasia
AP	Anterior-Posterior
BI-RADS	Breast imaging-reporting and data system
BLES	Breast Lesion Excision System
BRCA 1	BReastCAncer gene 1
BRCA 2	BReastCAncer gene 2
CNB	Core Needle Biopsy
CC	Cranio-Caudal view
DCIS	Ductal carcinoma in situ
ER	Estrogen receptor
FDA	Food and Drug Administration
FNA	Fine Needle Aspiration
HER2	Human epidermal growth factor receptor 2
IDC	Invasive ductal carcinoma
ILC	Invasive lobular carcinoma
JP	Juvenile papillomatosis
LCIS	Lobular carcinoma in situ
LG-DCIS	Low Grade Ductal Carcinoma In Situ
MLO	Mediolateral Oblique View
MRI	Magnetic resonance imaging
PASH	Pseudoangiomatous stromal hyperplasia
PR	Progesterone receptor
RF	Radiofrequency
TC	Tubular carcinoma
TDLU	terminal duct lobular unit
TNBC	Triple negative breast cancer
US	Ultrasound
USG	Ultrasonography
VABB	Vacuum-Assisted Breast Biopsy
VAM	Vacuum-Assisted Mammotomy

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Introduction

The use of screening mammography for asymptomatic women has yielded many suspicious lesions that are biopsied for final diagnosis. Some of them turn malignant while most of them are benign***(Bird et al., 2004).***

There are several advantages in definitively diagnosing these lesions with needle biopsy. For benign lesions, establishing a definitive diagnosis obviates unnecessary surgical excision or protracted follow-up, both of which are costly in psychosocial and resource terms ***(Hatmaker et al., 2006).***

Many methods of percutaneous breast biopsy are used, fine needle aspiration is relatively easy and quick technique when mass is palpable. Non palpable lesions can be aspirated under ultrasonographic or mammographic guidance. The technique of breast biopsy utilizing large core needles, automated biopsy guns and stereotactic localization device have been used for smaller lesions with better results. These methods enable radiologists to perform minimally invasive breast biopsy, obviating surgical biopsy in some cases***(Luini et al., 1999).***

The limitations of FNA have led to the introduction of large-core needle biopsy for the diagnostic workup of nonpalpable breast lesions. With large-core needle biopsy, actual tissue samples are obtained by means of a large-core needle (generally 14-gauge) and an automated biopsy gun. A minimum of four samples is needed, and for lesions containing microcalcifications, specimen radiography is essential in verifying the adequacy of sampling.

Diagnostic accuracy of large-core needle biopsy is high: miss rates of cancer vary from 1% to 7%, whereas falsepositive findings are extremely rare. However, in some cases, the severity of the disease is underestimated. In an attempt to reduce disease

underestimate rates, vacuum-assisted breast biopsy (VABB) was introduced in 1995 ***(Vlastos and Verkooijen, 2007).***

Because vacuum biopsy removes more tissue during sampling than does core biopsy, it can sometimes remove the mammographic and ultrasonographic abnormality completely ***(Jackman et al.,1998).***

In early detection of breast cancer, newly introduced techniques, such as vacuum-assisted breast biopsy is becoming increasingly common. VABB provides a minimally invasive, faster, less expensive, and less painful method for sampling non palpable abnormalities seen on mammography ***(Zagouri et al.,2007).***

The Aim of Work:

To highlight the role of ultrasound guided directional vacuum assisted breast biopsy systems as diagnostic and therapeutic procedures in the management of breast lesions.

I- Anatomy of the Breast

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).***

The adult (female) breast lies on the anterior thoracic wall. Its base extends from the 2nd to the 6th rib. It lies from the edge of the sternum to almost the mid-axillary line. Part of the superior lateral quadrant is sometimes extended towards the axilla. This is the axillary tail of the breast ***(Lagopoulos, 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. Contraction of these cords leads to indentation of the skin associated with some tumours ***(Lagopoulos, 2007)***.

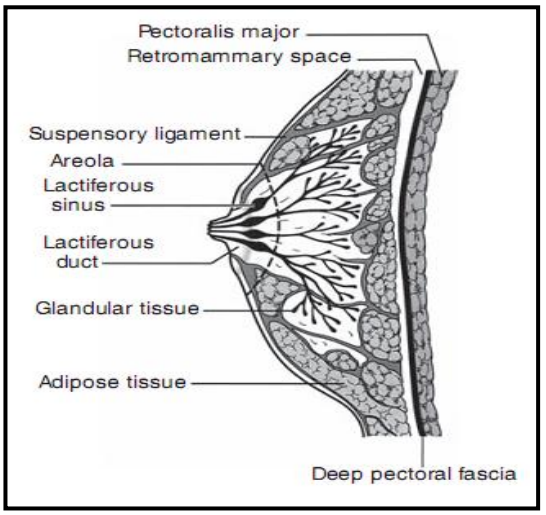

Fig. (1.1): The suspensory ligaments ***(Dudek, 2002).***

The tissue of the breast is composed of about 10–20 lobes separated by connective and adipose tissue. Each lobe opens independently at the nipple. A lobe is made of several lobules. A lobule consists of clusters of milk secreting sacs, the alveoli. Myoepithelial cells lie around the alveoli. Their contraction helps the release of milk. When milk is produced it passes from the alveoli into a complex system of tubules and eventually reaches the intralobular duct. Outside the lobule, the intralobular duct becomes the extralobular duct ***(Sinnatamby, 2001)***.

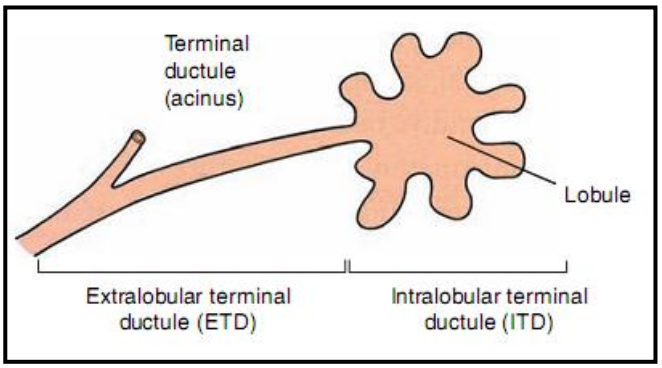

Fig. (1.2): The intra- and extralobular ducts ***(Morris and Wood, 2000).***

The lactiferous (mammary) duct drains each lobe. Near the nipple it dilates to form the lactiferous sinus. The ducts drain at the nipple, near the tip. The nipple is a raised pigmented area.

The areola surrounds the nipple. Near the surface, the lactiferous ducts are lined with squamous stratified epithelium ***(Morris and Wood, 2000).***

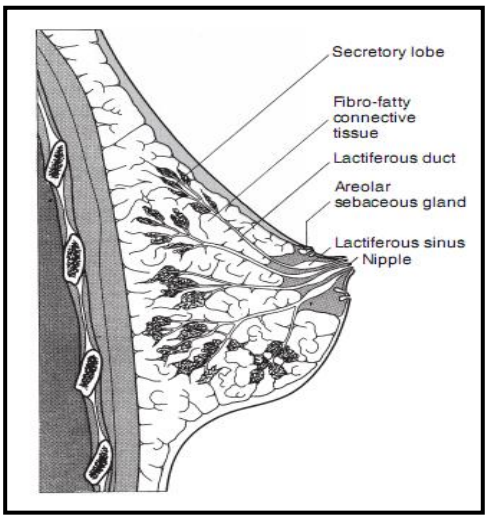

Fig. (1.3): The ductal system of the breast (***Burkitt et al., 1993).***

The axilla:

It is a wedge shaped fat filled space***(Agur and Dalley, 2009).***

It lies between the arm and the thorax, and communicates with the posterior triangle of the neck. It contains vessels, nerves and lymph nodes. It has an apex and a base (floor), and four walls, anterior, posterior, medial and lateral. The axillary fascia forms the floor. The anterior wall consists of three muscles, pectoralis major and minor, and subclavius. The fascia extends between the clavicle and pectoralis minor muscle. It is pierced by lymphatics, the cephalic vein, the lateral pectoral nerve and branches of the thoraco-acromial axis (a branch of the axillary artery). The posterior wall is formed by the subscapularis and teres major muscles, and the tendon of latissimus dorsi. The medial wall is the chest wall with the upper portion of serratus anterior. The lateral wall is the humerus. It contains the axillary artery and vein, the brachial plexus and lymph nodes ***(Lagopoulos, 2007).***

The most common site of regional involvement of breast cancer is within the axillary lymph nodes ***(Morris and Liberman, 2005).***

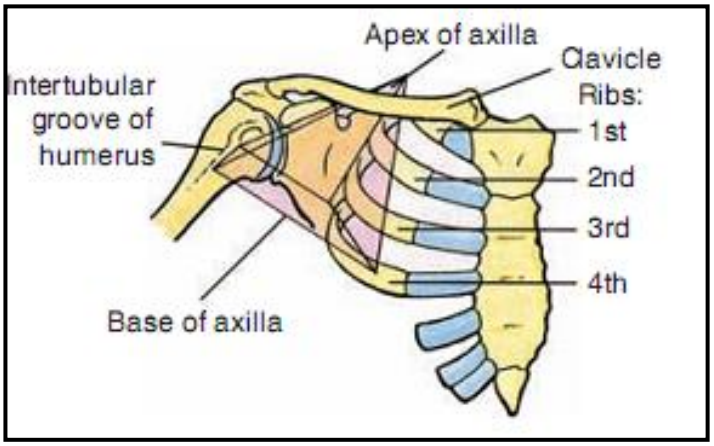

Fig. (1.4): The boundaries of the axilla ***(Moore and Agur, 2002).***

Blood supply of the breast:

The main vessels are the internal thoracic artery, the axillary artery and intercostal arteries. The lateral thoracic artery supplies the upper and lateral borders of the breast. The internal thoracic artery sends branches through the 1st to 4th intercostal spaces. The 2nd and 3rd branches are the largest. They supply the medial aspect of the breast. The posterior intercostal arteries also send small branches. There are variations in the distributions of these vessels ***(Lagopoulos, 2007).***

Venous drainage of the breast:

There is a circular venous plexus around the areola. Blood drains in the veins which accompany the corresponding arteries that supply the breast, which is drained to the axillary, internal thoracic and intercostal veins ***(Standring et al., 2005).***

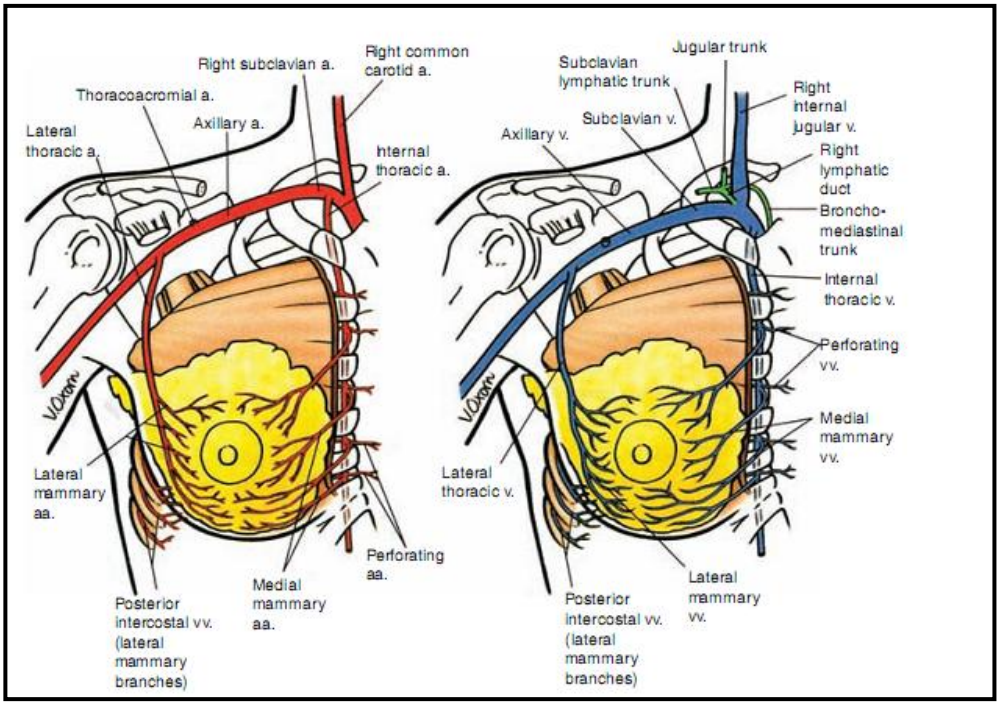

Fig. (1.5): The blood supply and venous drainage of the breast***(Moore and Agur, 2002*).**

Nerve supply of the breast:

The sensory supply of the breast is from branches of the 4th, 5th and 6th intercostals nerves. These nerves also carry afferent sympathetic fibers. The secretory activity of the breast is mainly controlled by the ovarian and pituitary hormones ***(Standring, 2005).***

Lymphatic drainage of the breast:

This is of considerable importance in the spread of breast tumours. The lymph drainage of the breast, as with any other organ, follows the pathway of its blood supply and therefore travels: