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Role of Breast Ultrasound Elastography in Distinction of Benign From Malignant Tumours

Essay,

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Aim of the Work

The aim of this work is to highlight the role of ultrasound elastography in accurately differentiating benign from malignant breast tumours.

Introduction

Screening mammography is the primary imaging modality for early detection of breast cancer because it is the only method of breast imaging that consistently has been found to decrease breast cancer-related mortality. Mammography may detect cancer one and a half to four years before a cancer becomes clinically evident ***(Tabar et al., 2001).***

Diagnosis of breast cancer has been widely improved since the development of high-resolution ultrasound equipment. In the past, ultrasound was only considered useful for the diagnosis of cysts. Meanwhile, it improves the differential diagnosis of benign and malignant lesions, local preoperative staging and guided interventional diagnosis ***(Madjar, 2010).***

Ultrasound has long been used to distinguish between cysts and solid masses. However, solid masses are not always malignant. For example, both fibroadenomas and scirrhous carcinomas are solid and stiff, but only the latter are malignant ***(Selvan et al., 2010).***

The sonographic features for benign and malignant lesions have been shown to override each other substantially.In mammography, the compression of breast tissue and the repositioning of the breast for different views cause patient discomfort. It is also difficult to image dense breast tissue in mammography ***(Selvan et al., 2010).***

Limitations of mammography and sonography and the need not to miss a malignant lesion in the early stage of disease leads to invasive surgical biopsy that cause unnecessary patient discomfort, anxiety and hospitalization in addition to increasing costs to the patient. This substantial problem remains in breast cancer diagnosis ***(Selvan et al., 2010).***

There is a need for alternative non-invasive methods of detection and diagnosis of breast lesions with greater sensitivity and specificity. Mechanical measurements have shown that pathological tissue can be up to 30 times stiffer than normal tissue .Ultrasound elastography is a method for measuring the stiffness/elastic properties of tissues ***(Parkin et al., 2005).***

The basic operating principle of elastography involves the comparison of the spatial arrangement of tissue before and after compression. This scanning modality which can provide information about stiffness of the lesions is currently used for detecting and identifying lesions in the breast ***(Hall et al., 2003).***

Elastography has been used clinically to increase the accuracy of breast ultrasound for differentiating benign from malignant tumours ***(Garra et al., 1997).***

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Anatomy of the Female Breast

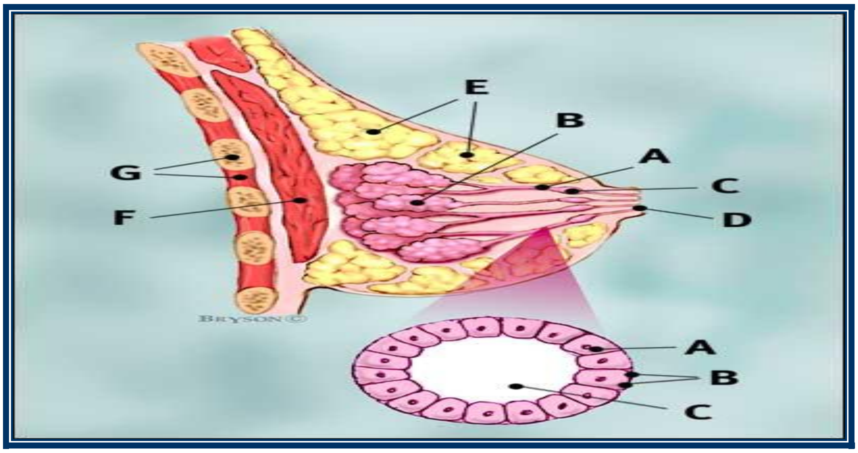
Gross Anatomy of the Female Breast:

The breast is composed of three major structures *(fig.1)*; the skin, subcutaneous tissue and the breast tissue (parenchyma and stroma). The parenchyma is divided into 15 to 20 lobes or segments that converge at the nipple in a radical arrangement ***(Morris and Liberman, 2005)***.

The ducts from the lobes converge into 6 to 10 major collecting ducts that have openings at the nipple and connect to the outside. Each of these major ducts arborizes back from the nipple and forms a lobe or segment of glandular tissue that is supported by surrounding connective or stromal tissue. The distribution of lobes is not even as there is a preponderance of glandular tissue in the upper outer quadrant of the breast ***(Morris and Liberman, 2005)***.

Beneath the nipple openings, the lactiferous sinus is visible. The lactiferous sinus is a slight dilation of the ampullary portion of the major duct. The major ducts that converge below the nipple and drain each segment are 2mm in diameter ***(Morris and Liberman, 2005)***.

Each duct drains a lobe made up of 20 to 40 lobules. Each lobule contains 10 to 100 alveoli or acini. Each lobule also consists of branching ducts that divide into subsegmental structures and terminate in the terminal duct lobular unit. The terminal duct lobular unit consists of terminal duct and acinus ***(Morris and Liberman, 2005)***.



A:	Ducts.		**Enlargement:**
B:	Lobules.	**A**:	Normal duct cells.
C:	Dilated section of duct to hold milk.	**B**:	Basement membrane.
D:	Nipple.	**C**:	Lumen of the duct.
E:	Fat.		
F:	Pectoralis major muscle.		
G:	Chest wall/rib cage.		

Fig.(1): **Female breast anatomy (side cross section).**