

Role of Radio Frequency Ablation in the Treatment of Breast Cancer

An Essay

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Radiodiagnosis*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ
الْحَكِيمُ

صدق الله العظيم

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Introduction

Breast cancer is the most common female cancer and is a leading cause of cancer related deaths among women worldwide ^[1].

The treatment of breast cancer through the majority of the twentieth century was radical mastectomy, modified radical mastectomy, simple or total mastectomy and lumpectomy. Surgical treatment may be combined with chemotherapy, radiation therapy or immunotherapy ^[2].

Advances in imaging, such as digital mammography, ultrasound and magnetic resonance imaging (MRI) have improved our ability to both visualize smaller breast tumors and biopsy them without the need for surgery ^[3].

In breast cancer management, there has been a major shift toward less invasive and non-surgical treatment methods for patients with small breast cancer. Radiofrequency ablation (RFA) is one of the most

promising among non-surgical ablation techniques in the treatment of breast cancer ^[4].

Interventional radiologists use imaging to guide a small needle through the skin into the tumor. From the tip of the needle, radiofrequency energy is transmitted into the target tissue, where it produces heat and kills the tumor. Following the RFA, the dead tumor tissue shrinks and slowly forms an internal scar ^[9].

RFA has been used successfully for the treatment of primary or metastatic tumors of numerous organs, such as liver, lungs, bones, central nervous system, pancreas, kidneys and prostate. Several studies evaluated the use of RFA in the treatment of breast cancer ^[1].

RFA may offer complete breast cancer ablation with low complication rate, less psychological morbidity, better cosmetic results, and reduced inpatient care compared with traditional surgery ^[10].

Aim of The Work

The aim of this work is to evaluate the role of radio frequency ablation in the treatment of breast cancer.

Anatomy of the Female Breast

The breast is a modified, differentiated apocrine sweat gland with a functional purpose of secreting milk during lactation. It is located in the superficial tissues of the anterior chest wall. The surface of the breast is dominated by the nipple and the surrounding areola ^[^].

The mature breast has an eccentric configuration, with the long axis diagonally placed on the chest wall largely over the pectoralis major muscle and extending into the axilla. The peripheral anatomic boundaries of the breast are not precisely defined, except at the deep surface where the gland overlies the pectoralis fascia. Superficially, the breast extends over portions of the serratus anterior muscle, laterally, inferiorly over the external oblique muscle and superior rectus sheath, and medially to sternum ^[^].

The protuberant part of the human breast is generally described as overlying the 2nd to the 4th ribs, and extending from the lateral border of the sternum to the anterior axillary line ^[^].

Two-thirds of the breast rests on the deep membranous layer of the superficial fascia of the pectoral fascia overlying the

pectoralis major, the other one third rests on the fascia covering the serratus anterior muscle. Between the breast and these fasciae is a potential space, the retro-mammary or sub-mammary space (bursa), which contains a loose adipose and connective tissue allowing the breast some degree of movement on the pectoral fascia. Extensions of the membranous superficial fascia that traverse the retro-mammary space act as posterior suspensory ligaments ^[^].

The axillary tail:

The axillary tail of the breast (tail of Spence) is a breast extension towards the lateral margin of the chest and into the axilla. It has a duct which drains into the ductal system of the major gland. In some normal cases it is palpable, and in a few it can be seen premenstrually or during lactation ^[^].

The internal structure of the mammary gland:

The normal adult female breast (fig. 1) is composed of an admixture of epithelial and stromal elements with variable adipose tissue typically present in the interlobular stroma, and not amongst the lobules. The epithelial elements are glandular tissue or tubulo-alveolar type consisting of a series of branching ducts which connects the structural and functional units of the breast,

the lobules, to the nipple. The stroma is composed of variable amounts of adipose tissue and fibrous tissue, and comprise the majority of the breast volume in the non lactational state [1].

The relative abundance of parenchyma and stroma varies according to age, parity and other factors [1].

The mammary gland consists of 15-20 lobes or segments, separated by adipose tissue. The amount of adipose tissue, not the amount of milk produced, determines the size of the breast [1].

Each lobe is drained by one lactiferous duct. Lactiferous ducts run dorsally in long axis of the nipple, enveloped in an areolar cuff, and then spread radially. Each two or three lactiferous ducts unite to form a total of five to eight lactiferous sinuses which exit at the nipple [1].

The lobule is the basic structural unit of the mammary gland. Each lobe contains hundreds of lobules, composed of grape like clusters of milk-secreting glands termed alveoli embedded in connective tissue. Surrounding the alveoli are spindle shaped cells called myoepithelial cells, whose contraction helps to propel milk toward the nipple [1].

Terminal ductal lobular unit (TDLU) is the basic histological unit. It consists of extra- and intralobular terminal ducts and the blind ending acinar ductules. The lobule consists of 20-30 acini [1].

The acini are (milk producing) the glandular component of the breast lobules [1].

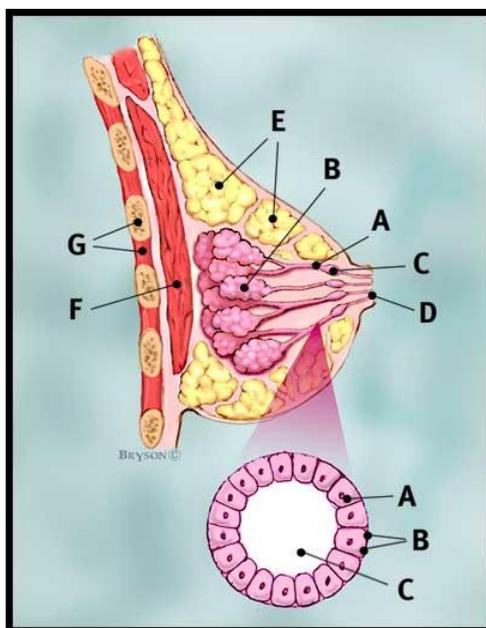


Fig. (1): Sagittal section of the breast and anterior thoracic wall showing the basic anatomy of the breast. **Breast profile:** A ducts, B lobules, C dilated section of duct to hold milk, D nipple, E fat, F pectoralis major muscle, G chest wall/rib cage. **Enlargement:** A normal duct cells, B basement membrane, C lumen. Quoted from [17].