Chapter 4
Breast Cancer:
A Technological Review

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ABSTRACT

Breast cancer is the second leading cause of cancer deaths in women and occurs in one out of eight women worldwide. Early detection is an effective way to diagnose and manage breast cancer. Currently there are three methods used in breast cancer treatment: mammography, FNA (fine needle aspirate) and surgical biopsy. The diagnose accuracy of mammography is from 68% to 79%, the accuracy of FNA is inconsistent with varying from 65% to 98% and the accuracy of a surgical biopsy is nearly 100%. The procedure of a surgical biopsy is both unpleasant and costly. In this paper we found that three techniques are mostly seen in the literature of breast cancer. Some of the specific existing approaches are specifically described for breast cancer and the obtained results are evaluated and noted carefully in order to give a clear view of the topic to the reader.

1 INTRODUCTION

Cancer is a general term that refers to cells that grow larger than 2mm and multiply out of control and possibly spread to other parts of the body. Breast cancer is the second leading cause of cancer deaths in women worldwide and occurs in nearly one out of eight women. Breast cancer occurs mostly in women but does occur rarely in men. Among men, breast cancer is the most common cancer and the second leading cause of cancer deaths behind lung cancer.

The American Cancer Society has predicted that about 192,370 women in the United States will be diagnosed with Invasive breast cancer and 40,170 women will die in 2009. It also reported that over 2 million women residing in the United States have been treated for breast cancer. This number shows a great decrement in the mortality rates caused by breast cancer and it can increase with earlier detection and treatment. Early detection is an effective

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way to diagnose and manage breast cancer. The etiologies of breast cancer remain unclear and no single dominant cause has emerged. Preventive way is still a mystery and the only way to help patients to survive is by early detection. If the cancerous cells are detected before spreading to other organs, the survival rate for patient are more than 97%.

Breast Self-Examination (BSE)

Breast Self-Examination (BSE) is recommended for all women and should begin when women are in their 20's. BSE is an approach to examining the breast for monthly basis in order for women to be aware of any changes on their breast. BSE can be one of the first screening tools to help women to find anomaly in their breast tissues. There is evidence that a substantial proportion by (71 percent) of breast cancer may be initially detected during BSE.

Mammography

Mammography is currently the most effective imaging technique for detection of breast cancer. mammography-based breast cancer diagnose system, studies to improve the data extracting technique by merging computer aided systems in extracting lesions and microcalcification images have been progressing. It is known that it is difficult to reliably differentiate between benign and malignant lesions seen on mammograms. All cancers of the breast cannot be seen on mammography, even if a magnified viewing also may miss 25% of the malignant cancer. The doctors' face difficulty in determining whether they are benign or malignant, particular in micro-calcifications clusters. The average size of those tumors undetected by mammography or infrared imaging was 1.66 cm and 1.28 cm respectively, while the false positive rate of infrared imaging is 19% which leads to unnecessary biopsies. The diagnose accuracy of mammography is from 68% to 79%.

Biopsy

Biopsy is a second most common technique used for detection and diagnosis of breast cancer. The breast cancer biopsy is classified into several ways like: surgical/open biopsy, vacuum assisted biopsy, large scale biopsy, Fine needle aspiration biopsy (FNA), Core needle biopsy, and Breast cyst aspiration. The accuracy of a surgical biopsy is nearly 100% but the surgical biopsy is unpleasant as well as costly. An alternative diagnostic method to mammography is using fine needle aspiration (FNA) technique. FNA smear slides are viewed under the microscope to determine malignancy. The diagnosis process takes a long time and it is costly. The accuracy of FNA is inconsistent with varying from 65% to 98%.

Clinical Follow-Up

The prediction of clinical outcome of patients after breast cancer surgery plays an important role in medical tasks like diagnosis and treatment planning. These kinds of estimations are currently performed by clinicians using non-numerical techniques. Soft computing based CAD system are a powerful tool for analyses data sets where there are complicated non-linear interactions between the input data and the information to be predicted and perform decision making in real life problems.

Computer-Aided Detection, Diagnosis and Medical Expert System

The user has the ability to examine digitized mammograms and biopsy. Every selected image may be processed with the help of a digital lens, which leads to the effective investigation of small structures and suspicious regions on the mammogram. The user is also able to apply several techniques such as histogram equalization, zoom, edge detection, differentiation of contrast and brightness. Some of them are very effective vi-