National Journal of Multidisciplinary Research and Development
ISSN: 2455-9040; Impact Factor: RJIF 5.22
Received: 17-11-2018; Accepted: 19-12-2018
www.nationaljournals.com
Volume 4; Issue 1; January 2019; Page No. 30-33

Survey paper on diagnosis of breast cancer using different techniques

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Abstract
Breast cancer is the oldest type of cancer in humans. Ancient Egyptians were the first to note the disease more than 3,500 years ago. The condition was described fairly accurately in both Edwin Smith and George Ebers papyri. In 460 B.C., Hippocrates, the father of Western Medicine, described breast cancer as a humoral disease. But now a days we can find the breast cancer is one of the most common malignancies in women causing over 3000 deaths every year in the world. In the modern medical science there are plenty of newly devised methodologies and techniques for the timely detection of breast cancer. Most of the techniques used for detection of breast cancer using the image processing technology. This is the highly advanced technology which is used in many detection procedure of breast cancer. This technique provides highly affordable and reliable outputs. In spite of image processing technique, mammography or mammogram test is also effective for the purpose of breast cancer detection and now a days many techniques are developed such as an artificial neural network, digital tomosynthesis, molecular breast imaging, emerging mammography module etc.

Keywords: *Im*age processing, artificial neural network, tomosynthesis, molecular breast imaging, emerging mammography module

1. Introduction
Breast cancer is of the most common cancers in women and most of cases occurring in women over the age of 50 years. In developed country around one in eight women suffer from the breast cancer at some stages in their life. Breast begins in the breast tissues inside the breast are glands that produce and release milk after a woman has a baby. The glands that make the milk are called lobules and the tubes that connect them to the nipple are called ducts. The breast cancer itself is made up of lobules, ducts and fatty connectives and lymphatic tissues. Lymph is a clear fluid that contains immune system cells and tissue waste products. Breast cancer is the uncontrolled growth of abnormal cells in the breast. If the breast cancer is diagnosed at early stages, then there is a good chance of treatment. There are the two types of breast cancer such as first type is invasive and second is non invasive cancer. In the breast cancer five stages are taking place, in the initial stages there is a good chance of cure but in the last stage treatment is very difficult or impossible. In the modern technology for the detection of breast cancer mammography technique is used.

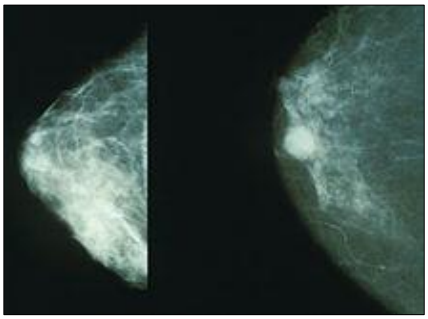

Fig 1: Image of Breast Cancer Detection

2. Different Breast Cancer Detection Techniques
2.1 Mammography
Mammography is the process of detecting the breast cancer in human breasts. Mammography is the technology in which low energy x-ray signal is used to examine the breast cancer. Mammography is used as a diagnostic and screening tool. The goal of the mammography is the early detection of breast cancer typically through the detection of characteristics massed and micro calcifications. There are two types of mammography first is digital mammography and second is film screen mammography. If we use the film screen mammography the image will be in black or white on large sheet of film on the other hand when we use digital mammography, images are recorded as directly into the computer. The image can be viewed on a computer screen and a specific area can be enlarged or highlighted. By using digital mammography the image can be transmitted from one place to another place or location. Hence digital mammography is best between both types of mammography. But disadvantage of digital mammography is more expansive and it is not widely available as film screen mammography. Digital mammography is done by using image processing technology.

Fig 2: Mammography Test

2.2 Image Processing Technology

The most common type of image processing is photography. In this process an image is captured using a camera to create digital or analog images. In the digital image processing allow the use of computer algorithm to perform the image processing or digital images. As a subcategory or a field of digital signal processing has many advantages over the analog image processing. It allows the much wider range of algorithm to be applied to input data and avoid the problem such as the buildup noise and signal distribution using process. Since the image can be defined over the two dimensions. Perhaps the digital image processing may be modeled in the form of multi dimension. Some of the fundamental steps are taking place in digital image processing.

- **Preprocessing:** In the preprocessing step image restoration, rectification and image enhancement is done. Image restoration and rectification aim to correct distorted and degradation image data to create faithful representation of original screen.
- **Image enhancement:** Image enhancement is another important step in image processing techniques. The underlying principle to this step is to make the image clearer. Image enhancement improves the quality of image for human viewing increasing the contrast and revealing details are important task of enhancement operations.
- **Segmentation:** In image analysis, image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

2.3 Digital Tomosynthesis

The compression also causes overlapping of the breast tissue. Due to the overlapping of the breast A newer breast imaging modality is digital breast tomosynthesis. Digital tomosynthesis approved by the U.S. Food and Drug Administration, but it is not yet considered and standard of care for breast cancer screening. Because it is relatively new, it is available at a limited number of hospitals. Digital tomosynthesis is a 3-D mammography which create a 3-D picture of the breast using x-ray and may became a more popular method of screening. According to the researcher, using a tomosynthesis dataset generally reduces detection challenges associated with overlapping structure in the breast. This is primary drawback of the conventional 2-D analog and digital mammography. Digital tomosynthesis is different from a standard mammogram in the same way a CT scan of the chest is different from the standard chest x-ray mammogram usually takes two x-rays views of each breast from the different angles, top to bottom and side to side. Mammograms are very good but they have some significant limitations.

- Compression of the breast that's required during a mammogram can be uncomfortable. Some of the women hate it.
- Tissue breast cancer can be hidden and breast cancer cannot be show in mammogram.
- Mammogram takes only one picture across the entire breast in two directions top to bottom and side to side.

But Digital tomosynthesis is a new kind of test that's trying to overcome these three big issues. It takes multiple X-ray pictures of each breast from many angles. Situation of the breast is arranged in the same way as it is in a conventional mammogram, but the difference is only a little pressure is applied — that is enough to keep the breast in a stable position during the procedure. The X-ray tube moves in an arc around the breast on the surface of breast and this x ray tube captured 11 images during a 7-second examination. Then the information is sent to a computer, where it is assembled to produce clear, highly focused 3-dimensional mages throughout the breast.

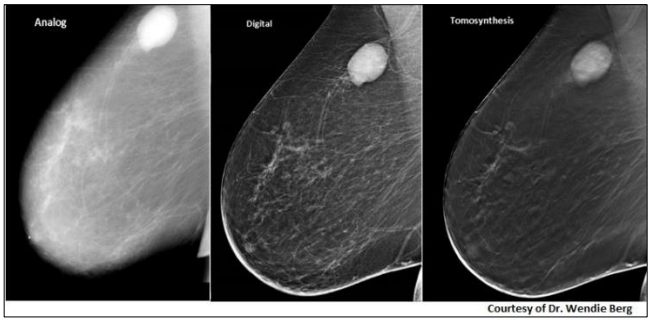

Fig 3: Comparison Image of Analog, Digital and Tomosynthesis Process.

2.4 Emerging Mammography Modalities

Hologic 3-D mammography is also a mammography technology. This technology provide combined examination of 2-D and 3-D imaging. It takes the time few seconds more than the time required in the conventional 2-D mammography. It is used to detect the increased cancer, increased invasive cancer (40 percent) and decreased call back rates (20-40 percent), localizing structure in the breast and improved lesion and margin visibility.

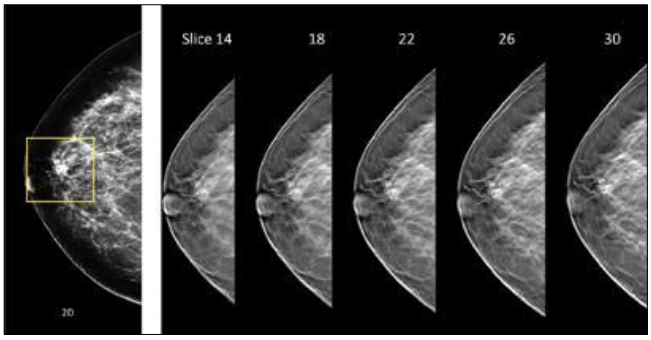

Fig 4: Emerging mammography modality.

2.5 Molecular Breast Imaging

Molecular breast imaging technique is a highly effective secondary diagnostic tool that is used particularly for those women with the dense breast tissue. In this technology Gama Medica's Lema GEM technology measures and images the distribution of radionuclide's by means of photon detection in order to aid in the evaluation of lesion in the breast tissue. Molecular breast imaging utilizes a radioactive tracer that "lights up" any areas of cancer inside the breast. This radioactive tracer is injected into the body by using a vein in the arm. As compare to the normal cells Breast cancer cells tend to take up the much more radioactive substance. A nuclear medicine scanner is also called a special camera that scans the breast, focusing on any areas where the radioactive substance is concentrated.

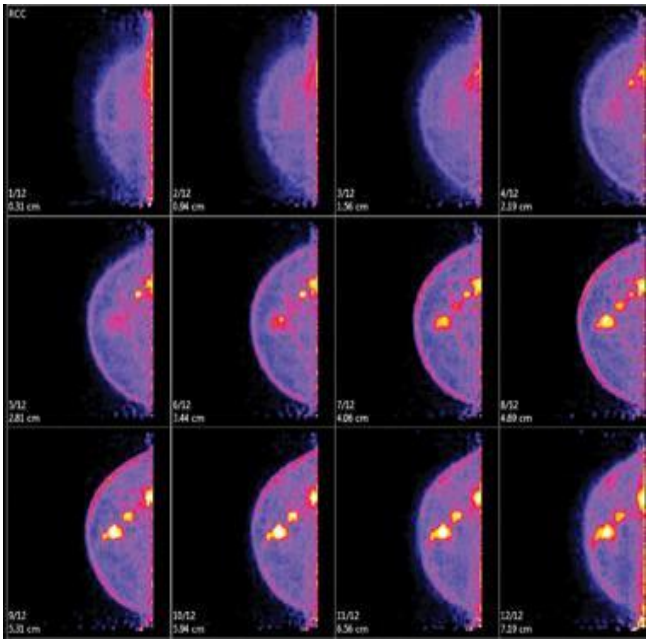

Fig 5: Molecular Breast Imaging.

2.6 Breast Cancer Diagnosis Using Artificial Intelligence

Mammogram detection is the most commonly used method of them. But despite the development of medical diagnostic techniques maximum of the breast cancer cases (about >90%) are diagnosed in advance stages i.e. stage II, III and stage IV. This delay in diagnosis not only increases the cost of treatment but also decreases the chances of survival of the patients. As a result, the problem of Breast Cancer Diagnosis (BCD) has attracted many researchers in the area of computational intelligence, data mining and statistical fields. Recently, Artificial Neural Networks (ANNs) has emerged as an effective method for pattern recognition, machine learning and data mining. It is inspired from the biological neural network of mammalian brain, capable of complex decision making and pattern recognition. Neural networks are used to increase the accuracy and objectivity of medical diagnosis as they allow physicians to distinguish benign breast tumors from malignant ones. Therefore, several research groups are working world wide on the development of neural networks in medical diagnosis.

3. Artificial Natural Network: A New Diagnostic Approach

Artificial Neural Network (ANN) is an ingenious system which is exhilarated by the biological nervous systems which embraces and processes information. The information processing system which largely comprises of highly interconnected processing neurons working in unison is described as the key element of this prototype. Neural Network (NN), a parasite of Biological Neural Network and it is a highly interconnected neuron system and is processed using parallel distributed processing system. This system therefore acquires the ability to learn and thereby access knowledge and make it available for use. Simplified versions of our central nervous system known as Neural Networks are hence provoked by the functions performed by a human brain. Neural Networks (NN) are just simplified models of human nervous system which performs functions such as logical inference, cognition, pattern recognition, etc. Neurons are hence the structural entities of a human brain. Hence this simplified imitation of neurons is known as to be Artificial Neural Networks (ANN). It is also termed as Artificial Neural system (ANS) Different Neural network architectures like Feed forward Network, Recurrent Network, and Multilayer Feed forward Network are broadly specified in the literature.

4. Conclusion

In this review paper different techniques were reviewed and we conclude that so many techniques are being used to detect the breast tumor from mammogram. The evaluation of all techniques shows that we can detect the tumor efficiently by using it and provide accurate results like detection of mass and microcalcification using Artificial Neural Network.

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