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Comparison Between Ultrasound Imaging and Mammogram Based on the Influence of Filter Materials on the Quality of Digital X Mammography

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Abstract
Diagnosis of cancer with the regular mammogram may be unreliable in nevertheless many cases since this mammogram may be unable to detect early tumors in many mammary glands. Digital mammogram is a modern technique that attempts to increase the accuracy of tumor detection. It can also be added to the magnetic resonance imaging. The digital mammogram can depict tumors in the mammary glands, which involve injection of intravenous dye while the patient is photographed with a series of mammography images that shows the flow of dye over time. It is based on the principle that fast-growing tumor's need to increase the supply of blood to support their growth. The formula accumulates in such regions, so the digital mammogram provides therefore, a method of imaging based on the distribution of dye in the breast tissue, but it is still a two-dimensional technique. Although breast magnetic resonance imaging (MRI) may be used as an additional method to digital mammography in patients with high density mammary glands or non- homogenous tissue with ultrasound waves or both, and preoperative screening for women with breast cancer, it looks like the routine use of breast magnetic resonance imaging is unnecessary.

Keywords: Breast Cancer, Ultrasound, Mammogram, Digital Mammography Quality

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Introduction

Breast cancer is one of the most common cancers in women worldwide, and early detection is crucial for successful treatment Regular mammography is a standard screening tool for breast cancer, but it may not be reliable in many cases, especially for women with high-density breast tissue in recent years, digital mammography has emerged as a potential alternative to traditional mammography for improving the accuracy of breast cancer detection. (1) Digital mammography uses a digital detector to capture and convert X-rays into digital images that can be displayed on a computer screens this technique has several advantages over traditional mammography, including better image quality, (2) the ability to manipulate images for better visualization, and the potential for reducing radiation exposure. One of the most significant advantages of digital mammography is its ability to detect early tumor's that may not be visible on traditional mammography. (3) Digital mammography can also be combined with other imaging techniques, such as magnetic resonance imaging (MRI) or ultrasound, to improve accuracy Ultrasound Imaging Ultrasound imaging uses high-frequency sound waves to create images of internal body structures, including the breast tissue. Ultrasound imaging is often used to complement mammography and can be useful in distinguishing between benign and malignant breast lesions. Ultrasound imaging and mammography are both important imaging techniques used in the diagnosis of breast cancer. (4)

However, they differ in their principles of operation and the types of images they produce. Ultrasound imaging uses sound waves to create images of internal organs and tissues in breast ultrasound, Mammography uses low-dose X-rays to create images of the breast tissue. The breast is compressed between two plates, and X-rays are used to produce images that show any abnormalities in the breast tissue, such as lumps or calcifications. Mammography is the primary screening tool for breast cancer and is used to detect abnormalities that may be missed during a physical examination.

While digital mammography with dye and breast magnetic resonance imaging have been compared and found to have similar sensitivity in detecting breast cancer, it is important to note that each imaging technique has its own advantages and limitations. Breast MRI may be more useful in detecting small lesions, particularly in women with dense breast tissue.

However, it is also more expensive and time-consuming than digital mammography. It is also important to note that breast cancer screening involves a combination of different tests, including mammography, ultrasound, and clinical breast exams. Regarding the examination of fluid from the nipple, it is important to seek medical attention if there is any abnormal discharge or if there is a lump or other unusual changes in the breast tissue.

While not all nipple discharge is a sign of breast cancer, it is important to have any abnormalities evaluated by a healthcare provider. MRI Breast MRI is a powerful imaging tool that can detect small tumor's and assess the extent of cancer spread. It is particularly useful in women with high-density breast tissue or those with a personal or family history of breast cancer. However, MRI is expensive and time-consuming, and it is not a substitute for mammography. Digital mammography is a promising technique for improving the accuracy of breast cancer detection. It can be combined with other imaging techniques, such as ultrasound and MRI, to provide a more comprehensive evaluation of breast health. The routine use of breast MRI for screening is still a matter of debate, and more research is needed to determine its optimal role in breast cancer detection and management. Ultrasound imaging and mammography are complementary imaging techniques that provide different types of information about breast tissue. While mammography is the primary screening tool, ultrasound imaging is useful in distinguishing between different types of breast lesions and in guiding biopsies.

The use of filter materials in digital X mammography can help to optimize image quality and radiation dose.

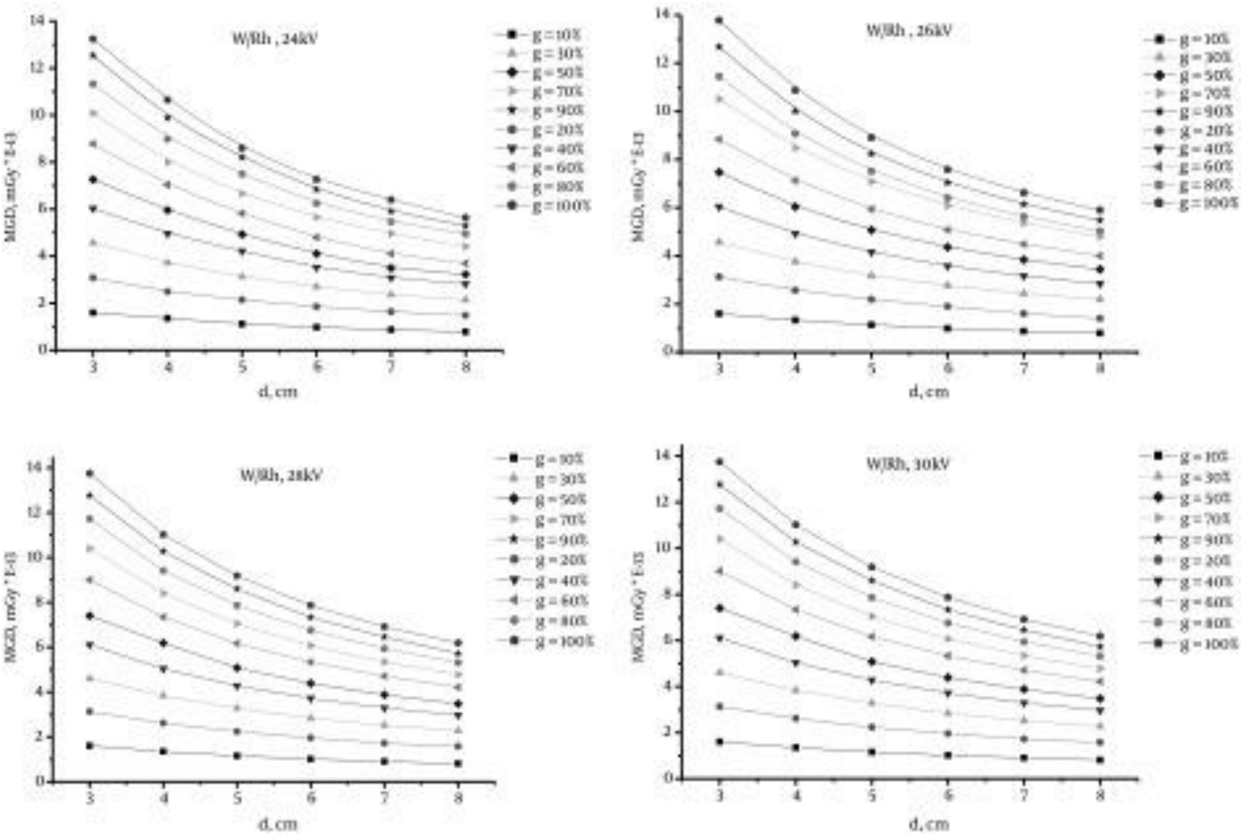

Figure 1: Mean glandular dose (MGD)values against breast phantom thickness for W/Ag in tube voltages 24 KV to 30 KV and various granularity (g)value from 10%to 100%

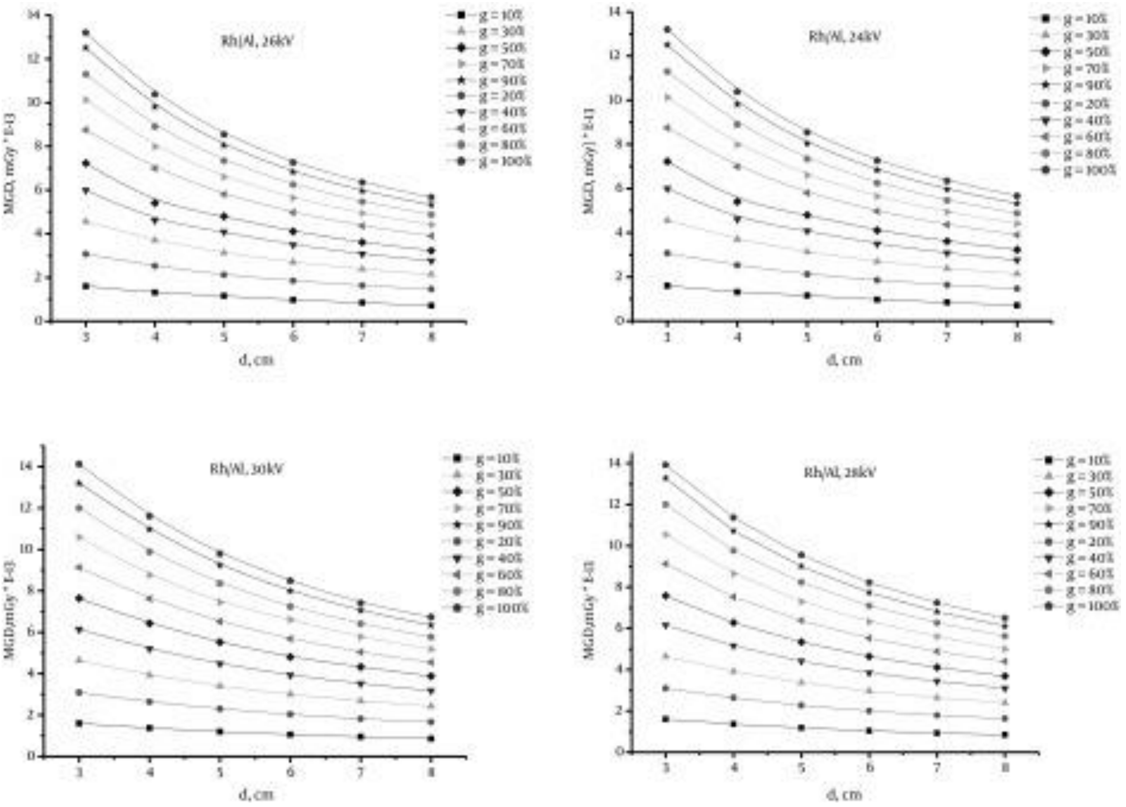

Figure 2: Mean glandular dose (MGD)values against breast phantom thickness for W/Ag in tube voltages 24 KV to 30 KV and various granularity (g)value from 10%to 100%

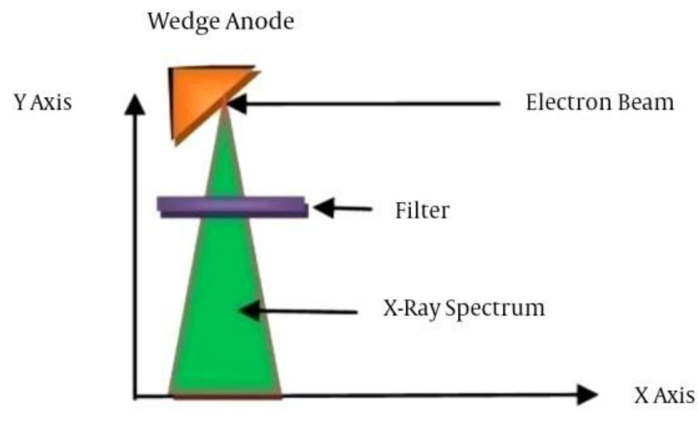

Figure 3: The simple geometry of X-ray tube in mammography for input of MCNP Code

The graph likely shows how the MGD values change with increasing breast phantom thickness and granularity, which can affect the attenuation of X-rays passing through the breast tissue and hence the amount of radiation absorbed by the glandular tissue. (3) The results can be useful for optimizing mammography protocols to minimize the radiation dose while maintaining image quality. Conclusion In this study investigated the factors that affect MGD. during mammography examinations with X-ray radiation in the glandular tissue of the breast. Using MCNPX Monte Carlo simulation code, we calculated MGDs for different (1) anode/filters and tube voltage range, our results showed that MGD decreases with increasing breast thickness and increases with increasing granularity. also found that different anode/filter combinations have different effects (1) on MGD. Consequently, suggests that the study aimed to investigate the effect of different factors on the MGD values in mammography, including tissue composition, breast size, anode/filter combination, and tube voltage (3). Through the study only consisted of three anode/filter combinations and did not investigate the effect of filter thickness on different mammography regimens. The results are consistent with currently published work and they show that the W/Rh anode/filter combination delivered the lowest dose of the three new anode/filter combinations tested. (3).

Conclusion

1- Wherefore, shows a graph of mean glandular dose (MGD) values versus breast phantom thickness for W/Rh in tube voltages shows a graph of mean glandular dose (MGD) values versus breast) values versus breast phantom thickness for W/Rh in tube voltages 24 kV to 30 kV and various granularity (g) values from 10% to 100%. The MGD values are expressed in units of mg. The graph shows that the MGD values increase with increasing breast phantom thickness and tube voltage. At a given breast phantom thickness, the MGD values decrease with decreasing granularity. This is because the glandular tissue absorbs more radiation than the adipose tissue, and a higher granularity means a higher proportion of glandular tissue in the breast phantom.

2- Wherefore, shows Based on the information provided, Figure 39 appears to show a graph of the mean glandular dose (MGD) values against breast phantom thickness for W/Ag in tube voltages ranging from 24 kV to 30 kV, and various granularity (g) values ranging from 10% to 100%. The MGD is a measure of the average radiation dose delivered to the glandular tissue of the breast during mammography, and is an important parameter in assessing the potential risk of radiation-induced breast cancer. The W/Ag combination refers to the type of X- ray tube target material used in mammography machines, and the tube voltage is an important parameter that affects the penetration and energy of the X-rays used to produce the image.

The results of this study can help improve mammography protocols and reduce radiation dose to breast tissue while maintaining image quality. Overall, the conclusion suggests that the study provides valuable insights into the factors that affect MGD values in mammography.
received by the breast tissue during mammography, and can help optimize mammographic techniques to minimize patient dose while maintaining image quality

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