

## ESTIMATED RADIATION RISKS, CLINICAL FACTORS AND PATIENT DOSE IN MAMMOGRAPHY

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**Abstract.** Mammography is a non-invasive technique that helps physicians diagnose. A mammogram is basically an X-ray picture of the breast. A mammography unit is a specific type of X-ray for breast imaging. Mammography uses low radiation dose X-rays to detect breast cancer early, before women experience symptoms. Like all X-ray units, mammograms use doses of low ionizing radiation to generate images. However, sometimes low doses of ionizing radiation can increase the risk of longer term effects, such as cancer. In this paper, our purpose was to compare patient radiation doses and patient lifetime attributable risks. We measured patient doses and background radiation in two different mammography units (digital, analogue).

**Key words:** Digital mammography, conventional mammography, radiation

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### 1. INTRODUCTION

Mammography is a specific method of breast imaging in diagnostic radiology clinics. Mammography unit uses x-rays to detect cancer early, before women experience symptoms. A mammography procedure, called mammogram, is used for an early detection and diagnosis of breast diseases, especially in women. X-rays involve exposing a part of the body (breast) to a small dose kVp (25-35) of ionizing radiation to produce an image of the body. Digital and conventional mammography both use X-rays to produce an image of the breast. Conventional mammography is an old method for breast imaging. Recent advances in mammography include digital mammography, computer-aided detection and breast tomosynthesis. In conventional mammography, the image is stored directly on film, whereas, in digital mammography, an electronic image of the breast is stored as a computer file. The risks and benefits of screening mammography should always be calculated. An obvious risk, and a barrier to some women undergoing screening mammography, is the risk of radiation-induced breast cancer [1]. Recently, the increased use of imaging modalities such as computed tomography (CT) has raised concerns about potential cancer induction [2–3]. This aim of this paper is to assess patient and technician cancer risks from ionizing radiation, in imaging with mammography.

### 2. MATERIALS AND METHODS

At the Hospital Department of Diagnostic Radiology, patients were selected for this study for one month. These patients were divided into 2 groups. Patients in the first group were exposed to

conventional mammography, whereas the patients in the second group were exposed to digital mammography (Digital-Conventional). The relevant data are shown data in Table 1 and Table 2. Groups consisted of 141 patients who had the mammography, 59 patients under conventional mammography, 82 patients under digital mammography. A correlation analysis was performed to reveal the direction and functional status of the relationship of different types of mammography (Digital-Conventional). We measured patient and technicians' radiation dose ourselves (Fig. 1). Firstly we measured patient doses in one month, we were given a personal dosimeter near on breast. In addition, we were measured technician radiation doses with behind the shielding glass in mammography unit by personal radiation dosimeter. We were made same application like patient. We were measured with dosimeter in their breast latitude. We repeated the measurements for one month and worked with Polimaster PM-1621 radiation personal dosimeter in two mammographies (Table 3).

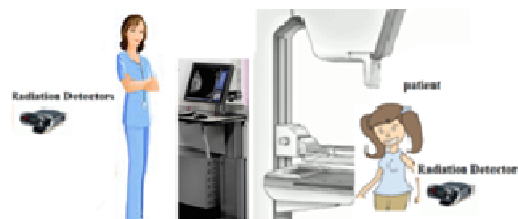


Figure 1. The measurement of the doses

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### 3. RESULTS AND DISCUSSION

Table 1. Patient conventional mammography data

Number of patients	59
Average of kVp	Average of mAs
26.5	130.3
Average Background Doses (1 month)	0.021 mSv
Average Shielding Background Doses (Technician/1 month)	0.00091 mSv

Table 2. Patient digital mammography data

Compressed breast thickness (mm)	Number of patients	Percentage (%)
64≤	None	0
65-130	78	95
130-195	4	5
Average Background Doses (1 month)	0.018 mSv	
Average Shielding Background Doses (Technician/1 month)	0.00078 mSv	

Table 3. Features of personal dosimeter PM-1621

Detector	GM tube
DER Measurement Range	0.01 μSv/h - 0.2 Sv/h (1 μR/h - 20 R/h), Hp(10)
Dose Rate Accuracy	±(15+0.0015/H+0.01H)% (in range 0.1 μSv/h - 0.1 Sv/h, where H = dose rate in mSv/h)
DE Measurement Range	0.01 μSv - 9.99 Sv (1 μR - 999 R)
Dose Accuracy	± 15% (in range 1 μSv - 9.99 Sv (100 μR - 999 R))
Energy range	10.0 KeV - 20.0 MeV
Energy response relative to 0.662 MeV ( <sup>137</sup> Cs)	±30%
Survive after momentary influence of maximum permissible gamma radiation within 5 min:	1 Sv/h (100 R/h)

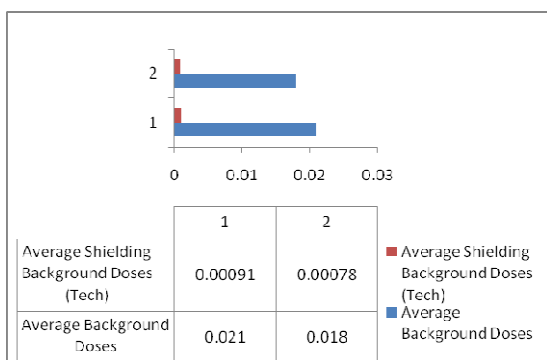


Figure 2. Conventional/digital mammography comparison graphics

This study compared the sensitivity of conventional and digital mammography in my city hospital. There are limited data comparing the results of women who had screening with conventional mammography to those who had screening with digital mammography. Fig. 2 shows the correlation rate for conventional and digital mammography, respectively. There is a percentage change between Table 1 and Table 2. These results changed for approximately 20%. This work showed that the average radiation exposure with digital mammography was lower than with conventional mammography. [4].

### 4. CONCLUSION

This work was organised with the aim of providing our diagnostic radiology clinic with the possibility of testing the performance of analytical methods on patients. Considering the measurements, an expected variety between the two unit obtained by our clinic has been ascertained. Several new studies are underway and additional studies may be needed. Studies of other mammography units exposed at different doses may provide important information on interactions.

### REFERENCES

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