

UNIVERSITI TEKNOLOGI MARA



**OPTIMIZATION OF EXPOSURE PARAMETERS IN
DIGITAL MAMMOGRAPHY: BREAST PHANTOM
STUDY**

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AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

In the event that my dissertation be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

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ABSTRACT

This experimental study investigated the effect of kVp variation on image quality and dose. This study also identified the significance difference in image quality and dose between Mo/Mo and Mo/Rh combination, and also the significance difference in image quality and dose between different AOP. CIRS012A and PMMA breast phantom (4cm, 5cm and 6 cm thickness) were used as subject. Study was done at Pantai Hospital Kuala Lumpur using Senographe Essential FFDM and Diamond GE system. TLD chip was used as dose measurement tool. Exposures were taken using Mo/Mo combination (26kVp, 28kVp and 30kVp) and Mo/Rh combination (28kVp, 30kVp and 32kVp) in cranio-caudal projection using AEC and AOP mode. SPSS 21.0 was used as statistical tool. Criteria of image quality assessment were adapted from ACR 1999, Mammography QC. 2 experienced radiographer with at least 10 years of working experience in performing mammography scored the image independently. Kappa finds a good agreement between raters (kappa value=0.9, $p<0.01$). Correlation test has shown a significant inverse relationship between kVp and dose in all thickness of breast with excellent correlation ($p<0.01$, $r=-0.9$), except for 6cm breast in Mo/Mo combination ($p=0.27$, $r=0.7$). In Mo/Mo selection, an increased in kVp value by 1 will result in a decreased of AGD value by 0.26mGy in 4cm thickness ($p<0.01$, $b=-0.26$) and 0.57mGy in 5cm thickness ($p<0.01$, $b=-0.57$). In 6cm thickness of Mo/Mo combination, 1 kVp increased of tube voltage had caused an increased of AGD value by 0.84mGy ($p=0.027$, $b=0.84$). While for Mo/Rh selection, an increased in kVp value by 1 will result in a decreased of AGD value by 0.7mGy in 4cm thickness ($p<0.01$, $b=-0.7$), 0.15mGy in 5cm thickness ($p<0.01$, $b=-0.15$) and 0.3mGy in 6cm thickness ($p<0.01$, $b=-0.3$). Spearman correlation showed that there is no significant relationship between kVp and image quality ($p>0.05$). Independent t-test had shown a significant difference in dose value between Mo/Mo and Mo/Rh for 4cm breast thickness ($p=0.046$). However, there is no significant difference between Mo/Mo and Mo/Rh combination in image quality ($p>0.05$). One way ANOVA showed a significant difference in dose between CNT and DOSE in AOP mode ($p=0.013$). However, there is no significant difference in image quality between CNT, DOSE and STD ($p>0.05$). Study finds that 30kVp in Mo/Rh is the optimum exposure factor to be used regardless of breast thickness. STD and DOSE mode is the preferred selection in optimizing between dose and image quality.

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