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# IMAGE QUALITY AND DOSIMETRIC EVALUATION OF A DIGITAL MAMOGRAPHY SYSTEM IN 2D AND 3D ACQUISITION MODES

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**Introduction**: The quality controls are necessary to make sure an optimal compromise between image quality and the dose received by the patient in each study. In this work, the mean glandular dose (AGD) has been obtained in the 2D and 3D acquisition modes for a Digital Breast Tomosynthesis system (DBT), for each available dose mode, using different thicknesses of polymethyl-methacrylate (PMMA) phantoms. In addition, AGD values are presented from a sample of 900 patients. Image quality was evaluated trough the contrast to noise ratio (CNR) on each acquisition mode and testing the visualization of structures in the image using the mammography phantom of the American College of Radiology (ACR).

**Material and method:** AGD values were obtained based on different thicknesses (2, 3, 4, 4.5, 5, 6, 6.5 cm) of triangular PMMA phantoms, in high (AOP +), low (AOP-) and standard (AOP STD) dose mode in 2D and 3D acquisitions using a General Electric (GE) Senographe Pristina DBT system, based on the 'Protocolo Español de Control de Calidad de Sistemas de Tomosíntesis de Mama'. In addition, these values have been compared with those provided by the system.

The CNR has been evaluated for each PMMA thickness in 2D and 3D acquisition modes and for each dose mode, following the same quality control protocol. In 3D mode, CNR has been characterized for projections, slabs and reconstructed volumes. In addition, two operators have studied the visibility of different structures through the accreditation phantom in mammography proposed by the ACR.

**Results:** AGD values as a function of the different PMMA thicknesses were adjusted by linear fits, with $R^2 > 0.97$ in all cases. Furthermore, the achievable levels proposed by the EUREF were never exceeded, for each dose mode using 2D and 3D acquisitions. These results have been verified for the AGD data taken from patients undergoing 2D studies in AOP STD mode. This data was obtained using the openREM software wich is connected to the PACS system in real time for dosimetric evaluations.

Regarding the AGD values obtained from the machine, there are not differences greater than 10% with respect to the experimental ones, ensuring the reliability of the doses reported by the system. AGD values for 2D were 5 to 20% higher than those obtained in the 3D acquisitions, depending on the thickness used.

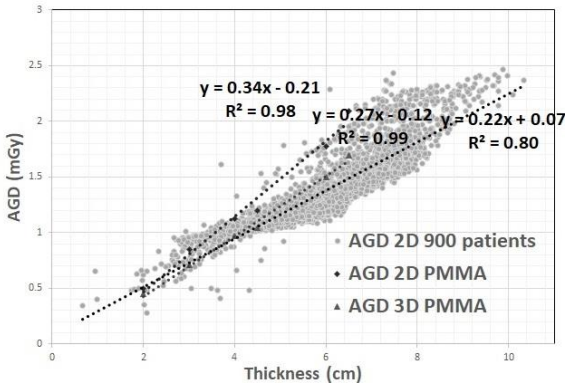


Figure 1. AGD in 2D and 3D acquisitions in phantoms and a sample of 900 patients.

CNR values have shown a directly proportional dependence with the dose. These values have been higher for the AOP + mode and lower in the AOP - mode. This was verified through the use of the ACR phantom, where more structures were visualized in the high dose mode, followed by the standard dose mode in both 2D and 3D acquisitions.

In General, CNR values have decreased increasing thickness of the simulated breast. In 3D mode, for both AOP + and AOP STD modes, it is observed that CNR values are higher for the projections, followed by the reconstructed volumes. For planes these values were lower. Between acquisition modes, CNR values were always higher for 2D mode than for 3D.

**Conclusions:** Image quality and dose assessement was done for the GE Senographe Pristina DBT system. Results have shown a good relationship between these two variables ensuring satisfactory mammography studies.