AbstractID: 11042 Title: Evaluation and comparison of image quality figures for digital mammography

Purpose: To survey the image quality of digital mammographic units in Taiwan using a mammographic contrast-detail phantom and an ACR accreditation phantom, and to compare image quality figures from those two phantoms.

Method and Materials: The scope of the survey covered most digital mammographic units in Taiwan. On-site measurements included phantom image acquisitions and entrance surface doses (ESD). Image acquisitions of an ACR accreditation phantom (Victoreen N-566 18-220) and ESD measurements were following the protocols of the ACR Mammography Quality Control Manual. A mammographic contrast-detail phantom (CDMAM type 3.4, Artinis) with 1-cm PMMA-equivalent thickness was placed on the PMMA of 3 cm. The CDMAM assembling was exposed using the same technical factors as the ACR accreditation phantom. Signal-difference-to-noise Ratios (SDNR) of the largest mass inside the ACR phantom were calculated by the equation,
$$\text{SDNR} = (Mean_{background} - Mean_{mass}) / \sqrt{\left(SD_{background}^{2} + SD_{mass}^{2}\right)}.$$
Inverse Image quality figures (IQF_{inv}) were calculated according to the threshold diameter ($D_{i,min}$) at each contrast-column (C_i), $IQF_{inv} = n / \Sigma(D_{i,min} \cdot C_i)$.

Results: Fifty-seven digital units were surveyed, including 44 DR units and 13 CR units. The tube voltage, tube current-time product, and ESD range from 23 to 29 kV, 36 to 182 mAs, and 3.22 to 12.4 mGy for imaging the ACR phantom. The mean values and standard deviation of SDNR are 1.97±0.31 for GE 2000D, 1.50±0.91 for GE DS, and 1.76±0.20 for Hologic Lorad Selenia. The mean values and standard deviation of IQF_{inv} are 127±10 for GE 2000D, 120±11for GE DS, 135±28 for Hologic Lorad Selenia, and 101±0 for Siemens Novation DR. The correlation between SNDR and IQF are mild (R^2=0.414 for GE 2000D; 0.520, GE DS; 0.446, Hologic Lorad Selenia).

Conclusion: The SNDR obtained from the ACR phantom mildly correlates with the IQF_{inv} evaluated from the CDMAM phantom.