Assessing Relationships between Glandularity and Gray Level by Using Breast Phantoms

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Abstract : Breast cancer is predominant of malignant tumors in females. The increase in the glandular density increases the risk of breast cancer. BI-RADS is a frequently used density indicator in mammography; however, it significantly overestimates the glandularity. Therefore, it is very important to accurately and quantitatively assess the glandularity by mammography. In this study, 20%, 30% and 50% glandularity phantoms were exposed using a mammography machine at 28, 30 and 31 kVp, and 30, 55, 80 and 105 mAs, respectively. The regions of interest (ROIs) were drawn to assess the gray level. The relationship between the glandularity and gray level under various compression thicknesses, kVp, and mAs was established by the multivariable linear regression. A phantom verification was performed with automatic exposure control (AEC). The regression equation was obtained with an R-square value of 0.928. The average gray levels of the verification phantom were 8708, 8660 and 8434 for 0.952, 0.963 and 0.985 g/cm3, respectively. The percent differences of glandularity to the regression equation were 3.24%, 2.75% and 13.7%. We concluded that the proposed method could be clinically applied in mammography to improve the glandularity estimation and further increase the importance of breast cancer screening.

Keywords : mammography, glandularity, gray value, BI-RADS

Conference Title : ICNRE 2017 : International Conference on Nuclear and Radiation Engineering

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2017