

Purpose: Currently, there is no accepted standard for measuring breast density. Dual energy mammography, which has demonstrated accurate measurement in phantoms, has been proposed as one possible method. The purpose of this study was to assess the possibility of using chemical analysis to validate measurements of breast density made with a dual energy mammography system.

Methods: Fourteen ex-vivo bovine tissue samples composed of varying amounts of pure lean tissue and pure adipose tissue in increments of 10%, as measured by their lean percentage, were imaged using dual energy mammography. This was followed by chemical analysis of the tissue samples based on desiccation, trituration, and fat extraction with petroleum ether. Breast density, as measured from dual energy mammography, and the glandular volume percentage, as derived from chemical analysis data, were compared to the known lean percentages. Breast density was also compared to the glandular volume percentage.

Results: Breast density (BD) was related to the tissue sample's volumetric lean fraction (VLF) by $BD = 1.52 \cdot VLF + 10.0$ ($r^2 > 0.99$). Glandular volume percentage (GVP) was related to VLF by $GVP = 0.74 \cdot VLF + 26.1$ ($r^2 > 0.99$). BD was related to GVP by $BD = 2.06 \cdot GVP - 43.59$ ($r^2 > 0.99$).

Conclusions: The results of this study show strong linear relationships between different parameters and indicate that chemical analysis should be a useful technique to help validate breast density measurements. The relationship between breast density and glandular volume percentage from a bovine tissue model could help to interpret the analysis of human breast tissue samples of unknown composition.

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No conflict of interest known for this research