



ORIGINAL ARTICLE

Mammography: Interobserver variability in breast density assessment

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Summary Our objective was to determine the interobserver variability of breast density assessment according to the Breast Imaging Reporting and Data System (BI-RADS) and to examine potential associations between breast density and risk factors for breast cancer. Four experienced breast radiologists received instructions regarding the use of BI-RADS and they assessed 57 mammograms into BI-RADS density categories of 1–4. The weighted kappa values for breast density between pairs of observers were 0.84 (A, B) (almost perfect agreement); 0.75 (A, C), 0.74 (A, D), 0.71 (B, C), 0.77 (B, D), 0.65 (C, D) (substantial agreement). The weighted overall kappa, measured by the intraclass correlation coefficient (ICC), was 0.77 (95% CI: 0.69–0.85). Body mass index was inversely associated with high breast density. In conclusion, overall interobserver agreement in mammographic interpretation of breast density is substantial and therefore, the BI-RADS classification for breast density is useful for standardization in a multicentre study.

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Introduction

To standardize mammographic reporting, the American College of Radiology (ACR) developed the Breast Imaging Reporting and Data System (BI-RADS) lexicon.¹ This system intends to promote universal terms to describe breast density, lesion features, final assessment, and recommendations for clinical management. Furthermore, the lexicon also provides information for auditing mammography practices and facilitates research efforts, particularly towards the development of large mammography databases. Since its inception, BI-RADS has become widely used in the United States, and the system developed into a reliable method for standardization. However, BI-RADS is less widely used in Europe, in both university and general hospitals. Hence, other classifications of breast density are still in use: Wolfe's parenchymal patterns,² the Tabar classification,^{3,4} and a quantitative assessment using a computer-assisted technique of measuring percentage mammographic densities.⁵

Several studies have reported substantial inter- and intraobserver variability in mammographic interpretation when BI-RADS is used for final assessment as well as breast density assessment.^{6–11} However, it is unknown whether instructions about the use of BI-RADS can improve inter- and intraobserver agreement. One study showed that BI-RADS training resulted in improved agreement between the trainees and the consensus of experienced breast radiologists for feature analysis and final assessment. This effect was maintained over a 2–3 month period.¹² Instruction about the use of BI-RADS density categories, applying a summary of the illustrated BI-RADS lexicon, fourth edition, may be helpful in the transition from the old system to BI-RADS, and improve consistency between radiologists.

Mammographic breast density is important to estimate, because breast density is a significant risk factor for breast cancer. Women with a high mammographic breast density (>75%) have a four- to six-fold increased breast cancer risk compared with women having a very low breast density (Fig. 1).^{5,13–15} Similarly, an increase in breast density is associated with an increase in breast cancer risk.¹⁶ Furthermore, it is known that high mammographic breast density impairs the sensitivity and specificity of breast cancer screening, possibly because present (small) malignant lesions are not detectable.^{17,18}

Recently, we started a multicentre trial in which we intend to measure the effect of hormonal substitution therapy on mammographic breast

density by use of BI-RADS breast density categories. Mammographic breast density will be used as an intermediate endpoint for the incidence of breast cancer in this trial.^{15,19} To compare breast density assessments made by different observers in the participating centres, a reliable, standardized method for measurement is warranted. Therefore, we used the BI-RADS classification.

Previous epidemiological studies have identified several risk factors for breast cancer, such as family history of breast cancer, reproductive factors, early age at menarche, and late onset of menopause and hormone replacement therapy, while breastfeeding protects against breast cancer.^{20,21} The above-mentioned associations are underlying the suggestion that prolonged exposure time to endogenous and exogenous sex hormones is associated with increased breast cancer risk.²² It is not well known whether there is a relationship between these risk factors for breast cancer and high breast density.^{4,23}

The aim of this study was to determine the interobserver variability regarding the assessment of breast density after instruction to BI-RADS, using a summary of the BI-RADS lexicon. To answer this question we used a sample of consecutive mammograms from a mammography programme, made for screening as well as diagnostic indications. Secondly, we investigated the characteristics of the study participants, in particular the occurrence of the known risk factors for breast cancer according to the BI-RADS breast density categories.

Materials and methods

Fifty-seven consecutive conventional film-screen mammograms, performed during a mammography programme in one of the four participating hospitals, within a period of 7 days, were included in the study. We used all consecutive mammograms of good quality, made for screening as well as diagnostic indications. Four experienced breast radiologists, with different familiarity with BI-RADS, received oral instructions and a summary of the BI-RADS lexicon, fourth edition (Fig. 1), regarding the use of BI-RADS in the assessment of breast density.¹ The instruction was administered by a standard set of reference images of the BI-RADS breast density categories in addition to this summary. The four radiologists worked in different hospitals, two worked in tertiary referral centres for oncology, one in a university hospital, and one in a general hospital. All were trained as radiologists independently, in different hospitals, and all were experienced radiologists with respect to

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