PGMI classification of screening mammograms prior to interval cancer. Comparison with radiologists' consensus classification.

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Aims and objectives

Breast cancer is one of the most common cancers in women worldwide with 1.7 million new incidents every year and 3.300 new cases every year in Norway. Early detection and reliable diagnosis have proven to be the key to survival, but imaging results can be unclear (1).

To decrease the breast cancer mortality, the Norwegian Breast Cancer Screening Program (NBCSP) has been implemented. This population-based program invites women aged 50-69 years biannually for a two-view (cranio-caudal, CC, and mediolateral-oblique, MLO) mammography.

A widely used tool within Europe for quality evaluation and classifying mammograms is the PGMI classification system. PGMI are not a diagnostic classification tool, but a quality evaluation of each the mammograms with reference to a gold standard. The PGMI is an acronym, where P = perfect image, G = good image, M = moderately good images and I = inadequate images. Dedicated radiographers at our hospital perform the PGMI classification of the screening images. The purpose of the PGMI assessment is to monitor, achieve and maintain high-quality mammography images.

Interval cancers (IC) are diagnosed in the time between two screening examinations, after a normal/negative screening mammogram and before the next invitation. We refer to baseline screening images as those carried out prior to the diagnosis of an IC.

Previous studies of screening mammograms have shown that the MLO images have potentials for improvements. We therefore decided to evaluate the MLO screening images (2, 3).

The radiological assessment of mammograms might be challenge. Despite independent interpretation/double reading with consensus meetings before a final management decision, some cancers might be overlooked (3, 4).

The aim of this study is to compare the radiologist’s assessment of baseline screening mammograms prior to the interval cancer diagnose with the PGMI classification score of the MLO mammograms.
**Methods and materials**

*Patient Selection*

All digital mammograms (DM) in this study were performed in the same county. The numbers of screened women in 2007 were 14,329 and 15,612 in 2009. The number of women with IC in 2007 was 29 (IC rate 20.4) and in 2009 the number of IC was 39 (IC rate 25.1). Two women had bilateral cancers, one in 2007 and one in 2009. Two women (one in 2007 and one in 2009) had only one breast, due to previous mastectomy.

*Exclusion criteria*

Two women with implants were excluded, one in each year, due to unclear PGMI criteria for images with implants. Women opted out of the NBCSP are excluded.

This gives a total of 66 women, and 68 MLO images with IC (n = 24 R-MLO; n = 44 L-MLO).

*Radiographers score*

Two experienced PGMI radiographer retrospective and independently PGMI classified baseline mammograms prior to the cancer diagnosis. Each image was classified in one of the four categories: P, G, M or I. The classification categories P+G were pooled. Images with divergent results were discussed in a consensus meeting. The PGMI radiographers used the images criteria from the quality assurance manual (QAM) for the NBCSP 2003 edition (1). The criteria in this edition were valid for exams performed in 2007 and 2009.

*Radiological score*

Three experienced radiologist's retrospective and independently classified the baseline screening mammograms prior to the cancer diagnose. Each exam was classified in one of the four categories. The classification categories were: 1 = negative/normal: no suspicious abnormalities; 2 = nonspecific minimal sign: subtle findings, not requiring workup; 3 = significant minimal sign: minor findings that in which recall might be considered and 4 = overlooked/missed cancer: findings should have been recalled for workup. Exams with divergent results were discussed in a consensus meeting. The radiological assessment categories 1+2 and 3+4 were pooled.
Statistical analyses

For analysis, we selected only those 68 MLO images of women that later presented with interval cancers. We used Chi-Square statistic to compare differences between the radiographers PGMI score and the radiologist's classification.
Results

The number of exams in category 1+2 were \( n = 50 \) (73.5 %) and \( n=18 \) (26.5 %) in category 3 + 4.

For MLO images with radiological score 1+2 the PGMI results were: 52% P+G (\( n = 26 \)), 28% M (\( n = 14 \)), 20 % I (\( n = 10 \)) (Fig. 1).

For MLO images with radiological score 3+4 the PGMI results were: 44.4 % P+G (\( n=8 \)), 39.9 % M (\( n=7 \)), 16.7 % I (\( n = 3 \)) (Fig. 2).

There were no significant differences between group 1+2 and 3+4 regarding PGMI score (\( p = 0.692 \)) (Fig.3).
**Fig. 1:** PGMI results for images in radiologist's classification group 1+2.

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Fig. 2: PGMI results for images in radiologist's classification group 3+4.

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**Fig. 3:** PGMI results for images in radiologist’s classification group 1+2 and group 3+4.

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Conclusion

Study limitation

There are some limitations in our study. First, the numbers of images with IC are small in both 2007 and 2009. Second, the PGMI classifications system has a subjective factor despite recommendations, criteria and guidelines. Third, the radiologists were biased because they knew they were reviewing cases in which there later on became an interval cancer diagnosis. Strength of our study is that there was a consensus meeting for images with divergent results both for the radiographers and for the radiologists. In spite these limitations; this is one of few studies to investigate the image quality of mammograms prior to an IC diagnosis.

Conclusion

In conclusion, there were no significant differences in the PGMI result for radiologist's score in group negative/normal nonspecific minimal sign and in the group significant minimal sign overlooked/missed cancer.
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