Aims and objectives

In Norway, the most common cancer among women is breast cancer, with about 3,300 new cases per year.

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. At the screening centre, approximately 97% of the women will only meet radiographers. Therefore, the radiographers work is of great importance, not only for the attending women's experience, but also of great importance for the images quality. High quality images are essential for correct interpretation of the mammograms by the radiologists.

A widely used tool within Europe for quality evaluating and classifying mammograms is the PGMI classification system. PGMI is not a diagnostic classification tool, but a quality evaluation of each mammogram 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. NBCSP has developed a quality assurance manual (QAM) (1). In the radiographer's chapter, there are specific recommendations and classifications criteria for classifying mammograms. Dedicated radiographers 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 (2) have shown that the MLO images have a potential for improvement. We therefore decided to evaluate the MLO screening images.

The aim of this study is to evaluate the quality of the mammography screening images prior to the interval cancer diagnosis and to compare the result with a control group of normal cases.
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 was 29 in 2007 (IC rate 20.4) and 39 in 2009 (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. In the IC group there were a total of 24 cancers in the right breast (n = 13 in 2007 and n = 11 in 2009) and a total of 44 cancers in the left breast (n = 16 in 2007 and n = 28 in 2009).

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 130 MLO images (n = 66 R-MLO, n = 64 L-MLO) in the IC group. The corresponding numbers of randomly selected exams from same periods with normal/negative diagnostic findings were PGMI defined as a control group (n = 130).

PGMI

Two experienced PGMI radiographers independently assessed and classified baseline mammograms prior to the IC cancer diagnosis. Each image was classified in one of the four categories: perfect, good, moderately good, or inadequate. The classification of 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) of NBCSP 2003 edition (1). The criteria in this edition were valid for exams taken in 2007 and 2009.

Statistical analyses

We used Chi-square statistic to compare differences in the PGMI scores between the IC group and the control group.
Results

The overall PGMI results for all MLO images in both the IC group (n = 130) and in the control group (n = 130) showed no significant difference (p = 0.842).

In the IC group, 49.2% (n = 64) of the images were classified as P+G; 29.2% (n = 38) as M; 21.5% (n = 28) were classified as I (Fig. 1).

In the control group, 52.3% (n = 68) of the images were classified as P+G, 26.2% (n = 34) were classified as M, 21.5% (n = 28) of the images were classified as I (Fig. 2).

When analyzing PGMI scores separately for the right and left breast, in both groups, the results showed no significant difference (p = 0.978 for right breast and p = 0.589 for left breast) (Fig. 3 - 4).

The result between IC and control group of the L-MLO showed that the control group had a slightly better P+G score than the IC group, but not significant.
**Fig. 1:** PGMI results for all MLO images in the IC group.

© Department of Radiology, Breast Imaging Center, Oslo University Hospital - Oslo/NO
Fig. 2: PGMI results for all MLO images in the control group.

© Department of Radiology, Breast Imaging Center, Oslo University Hospital - Oslo/NO
Fig. 3: PGMI results for RMLO images for both IC and control group.

© Department of Radiology, Breast Imaging Center, Oslo University Hospital - Oslo/NO
Fig. 4: PGMI results for LMLO images for both IC and control group.

© Department of Radiology, Breast Imaging Center, Oslo University Hospital - Oslo/NO
Conclusion

Study limitation

There are some limitations in our study. First, the numbers of images are small in both 2007 and 2009. Second, randomly selected cases for the control group might not be representative as the numbers of cases are small. Third, the classifications system has a subjective factor despite recommendations, criteria and guidelines. Strength of our study is that there were consensus meetings for images classified with divergent results. 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, PGMI classification showed no differences of images quality between the IC group and the control group.
References

1. http://www.kreftregisteret.no/no/Generelt/Publikasjoner/Mammografi_programmet/Kvalitet/

2. Gullien, Randi; Andersen, Jack Gunnar; Haakull, Anne Emilie. Identifying the most common deviations in mediolateral-oblique (MLO) mammograms classified as "moderate" before and after implementation of improvement initiatives. European Congress of Radiology; 2010.