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Quality assurance in mammography - screen-film characteristic and nationwide survey of radiation dose and image quality-.

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INTRODUCTION

During the past 20 years there have been many significant technological improvements in mammographic equipment and in screen-film recording systems. Today mammography is radiographed with dedicated mammographic x-ray equipment. These units have specially designed x-ray tubes targets and filter materials. Therefore, it is possible to obtain mammograms with higher resolution images and lower radiation dose compared to mammograms obtained old decade.

This report describes the results of first nationwide survey of glandular tissue dose and image quality for establishment of breast cancer screening system using mammography. We also report the image characteristics of modern screen-film systems, and the influence of processing conditions on image characteristic of films used in screen-film mammography.

METHOD

RMI-156 phantom and glass dosimeters were sent to 104 mammography sites. Glass dosimeters were exposed together with a phantom by a method based on the protocols described in the mammography Quality Control Manual . The returned dosemeters of 100 mammography sites were analyzed, and the beam qualities and the entrance surface exposures were determined. By used of these values, the average glandular doses were estimated with a $\pm 8\%$ accuracy.

The reading of phantom images were performed by means of ACR method. All phantom images were read by 4 radiological technologists who have special experience in mammography.

Physical imaging properties of screen-film systems were evaluated by measuring their basic imaging parameters, namely relative speed, H & D curves, MTFs, and Wiener spectra. The influence of processing conditions on image characteristic was analyzed in terms of relative speeds, average gradients and film fogs.

RESULTS

In 91 facilities, the doses were less than 2mGy. The mean dose and the standard deviation were 1.48mGy and 0.52mGy, respectively (Fig.1). In 77 facilities,the phantom image (mass, speck, and calcification) showed exellent image quality (Fig.2).

Modern mammographic screen-film systems can improve image characteristic over that obtainable with old syste. Mammograpic films showed optimal image contrast without

increasing of film fog within the range of 90 sec to 120 sec of processing cycle time at 34℃ of developer temperature.

DISCUSSION & CONCLUSION

The results of the nationwide survey indicate that QC practices for mammography in Japan have improved markedly during the past decade with statistically significant improvement. Regarding the technical factors of facilities which presented doses of 2mGy or over, it seemed that doses could be easily reduced to less than 2mGy, if the setting of the auto exposure controller (AEC), anti-scatter grid and/or the film-screen system were optimized. Modern mammographic screen-film systems showed improved basic imaging properties compared with that of old system. Optimal average gradient and speed could be achieved without extension of processing cycle time in recently developed, high contrast mammographic films.

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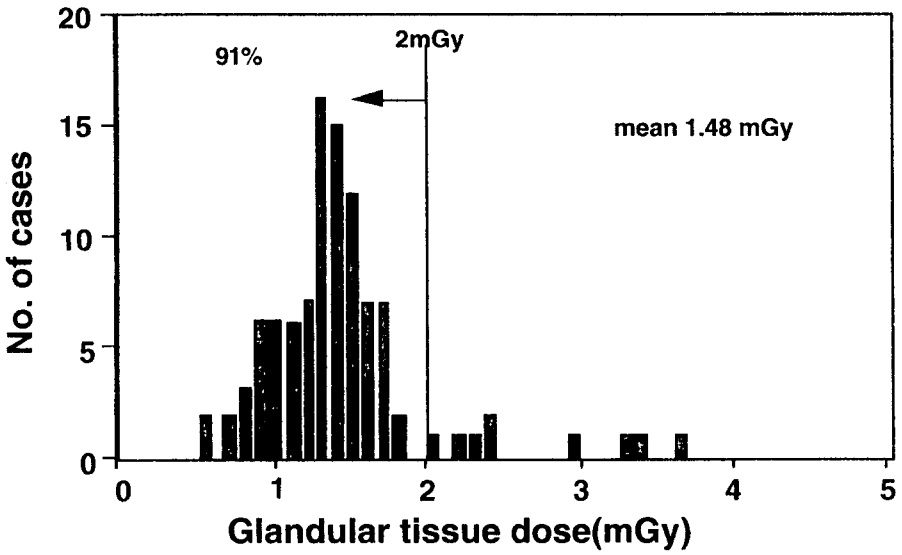

Figure 1. Histogram of glandular tissue dose obtained from nationwide survey. In 91 facilities, the doses were less than 2mGy and mean dosewere 1.48mGy, respectively.

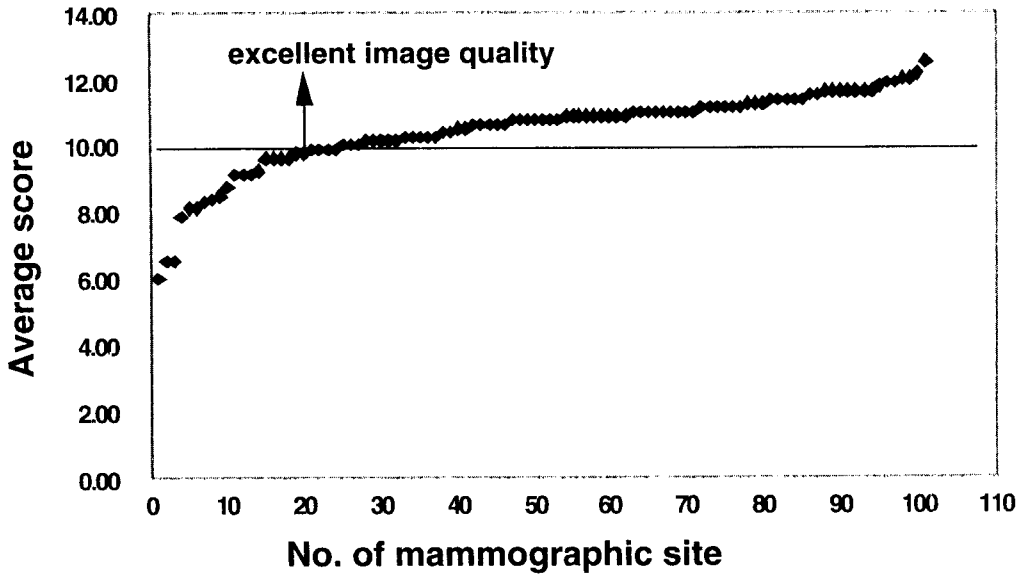

Figure 2. Graph shows the distribution of the visual evaluation of phantom images. Each point shows the average score of 4 radiological technologists.
Average score above the 10.00 shows the excellent image quality.