Optimized tube voltage setting for contrast of the mammogram films

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Introduction
In analogue mammography, single-side emulsion mammographic films (s-s film) had been used. However, double-sided emulsion mammographic films (d-s film) were developed in 2010. The contrast of d-s films is higher than s-s films (Fig. 1). Therefore, to optimized image contrast in the breast of the d-s films, the tube voltage is intended to increase to adjust image contrast. ¹, ² The image contrasts in the breast among the s-s film, the d-s film, and d-s film with tube voltage adjusted were analyzed. The image contrast in the breast was adjusted between s-s film and d-s film with increase tube voltage.

Methods
Thirty series of mammograms were evaluated among three groups. To determine of contrast, the density between mammary gland areas and fat areas were measured films (Fig. 2). One-way analysis of variance (ANOVA) among three kinds of images was carried out and post hoc test was performed (SPSS Ver.2, IBM). Statistical significant level was set at 5 %. The study was conducted with the permission of the ethical review board of facilities.

Results
The contrasts in the breast between the s-s films (0.87 ± 0.29) and d-s film with adjusted tube voltage (0.96 ± 0.28) were no statistical significant (p > 0.05). However, the contrast in the breast between the s-s films (0.87 ± 0.29) and d-s films (1.17 ± 0.35) were statistically significant (p < 0.01). In addition, the contrast in the breast between the d-s films (1.17 ± 0.35) and d-s films with adjusted tube voltage (0.96 ± 0.28) were also statistically significant (p < 0.01) (Fig. 3). The tube voltage for s-s film and d-s film with adjusted tube voltage was increased from 26.3 ± 0.15 kV to 27.2 kV ± 0.16 kV. to adjusted optimized tube voltage (Fig. 4).

Conclusions
To adjust contrast in the breast of the d-s film was same as s-s film, tube voltage should be increased 1 kV. Therefore, the similar contrast image in the breast was obtained by using d-s film.

References
2) ACR (AMERICAN COLLEGE OF RADIOLOGY) ; Mammography Quality Control Manual