Impact of Reduced Mammographic Compression on Craniocaudal (CC) Image Quality and Average Glandular Dose (AGD): A Paired Retrospective Study

Ye Rim Lee[1], Dong Jin Choi[1]
[1]SMG-SNU Boramae Medical Center

BACKGROUND

- Breast compression reduces tissue overlap and helps optimize both image quality and AGD
- However, it is associated with pain and discomfort
- Lower compression may improve comfort, but may impair image quality and increase AGD

"To assess the impact of reduced compression force (10-14 daN) on CC image quality and AGD compared with standard compression force (15-19 daN) in a paired retrospective cohort."

METHODS

- **Retrospective paired same-patient study** of **20 women** examined in 2024-2025
- **CC-view mammograms only**; **dense breasts** predominant (BI-RADS C/D, 95%)
- Standard compression (15-19 daN) vs Reduced compression (10-14 daN)
- Quantitative assessment: fixed 8-mm circular ROIs placed with a **clock-face reference system**; SNR, CNR, and GVI
- Qualitative assessment: 3 readers, 3-point scale
- Statistics: Shapiro-Wilk test, paired t-test; Inter-rater reliability was evaluated using ICC (2,1) with 95% CI

Characteristic	SCF condition	RCF condition
Breast thickness (mm)	42.1 ± 11.8	49.6 ± 11.3
△ Thickness (%)	+ 17.8%	
AGD (mGy)	1.8 ± 0.5	2.1 ± 0.6
△ AGD (%)	+ 16.7%	

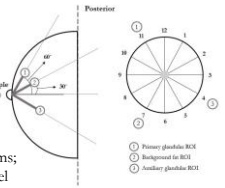

Fig 1. Clock-reference ROIs on CC mammograms; thickness and AGD changes by compression level

RESULTS

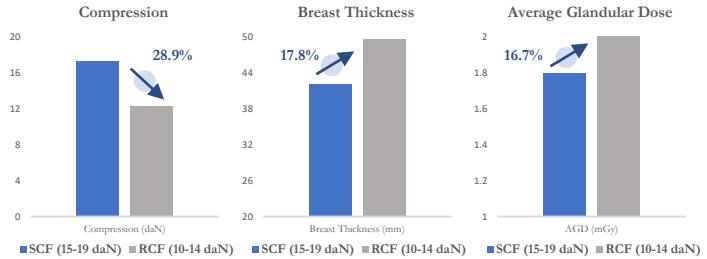

Fig 2. Comparison of compression force, breast thickness, and AGD between SCF (15-19 daN) and RCF (10-14 daN). Under reduced compression, breast thickness and AGD increased as compression force decreased.

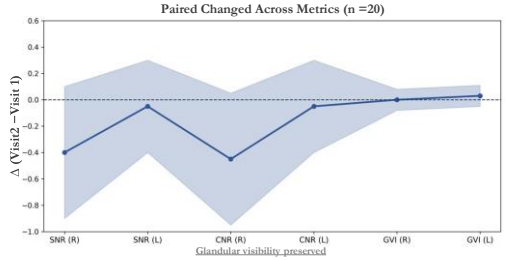

Fig 3. Paired changes in SNR, CNR, and GVI by breast side (n=20) with Cohen's d_z effect sizes. Solid lines indicate mean △; shaded bands denote 95% CIs.

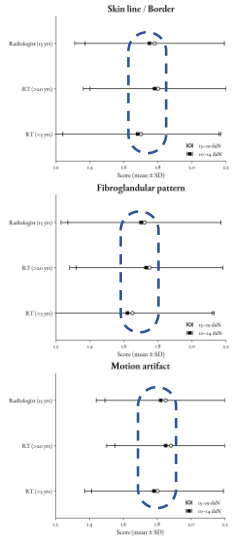

Fig 4. Qualitative image scores by observer and compression force.
Mean ± SD scores are shown for each observer under standard (15-19 daN) and reduced (10-14 daN) compression.

- Reduced compression **decreased compression force** by **29%**, with corresponding **increases** of **18%** in **breast thickness** and **17%** in **AGD** (Fig2).
- Signal changes were modest in the primary glandular ROI (approximately -5% in mean signal; +2-3% in signal SD) but larger in the fat ROI (+7% and approximately +17%, respectively). In contrast, the auxiliary glandular ROI remained stable (<3% change). This pattern suggests that the observed variability may reflect ROI positioning or local tissue heterogeneity rather than compression force alone.
- Although SNR and CNR tended to be lower under RCF than under SCF, **no significant bilateral differences were observed in SNR, CNR, or GVI** (all **$p > 0.05$**); effect sizes were generally small, and GVI remained stable in both breasts (Cohen's d_z, -0.22 to 0.12) (Fig 3).
- **Qualitative image quality was preserved** across all categories, with **mean score differences below 0.1**. Interobserver agreement was good (**ICC, 0.80**; 95% CI, 0.68–0.88) (Fig 4).

DISCUSSION

(a) (b)

Fig 5. Within-patient comparison of CC mammograms under (a) standard and (b) reduced compression.

- **Reduced compression maintained CC image quality** in paired same-patient mammograms, with **no significant differences** in quantitative parameters and **only minimal qualitative changes**.
- Breast thickness and AGD increased, likely due to AEC compensation.
- These findings support prior evidence that **lower compression does not necessarily compromise image quality**.
- Limitations include the small sample size, predominance of dense breasts, and CC-only evaluation. Further multicenter prospective studies including MLO and DBT are needed.

CONCLUSION

"In this paired same-patient comparison, there was no meaningful difference in CC image quality under reduced compression of 10-14 daN."

- In clinical practice, breast thickness and AGD should be monitored concurrently.
- Image quality should also be assessed in parallel to ensure an appropriate balance between diagnostic image quality and radiation dose.

REFERENCES

1. Cho JH, Lee HY, IM IC. Monitoring on Dose Index Analyzed in the Mammography. J. Korean soc. Radiology 2016: 10(7): 477-482.
2. Lau S, Abdul Aziz YF, Ng KH. Mammographic compression in Asian women. PLoS One 2017: 12(4): e0175781.
3. Chida K, Komatsu Y, Sai M, et al. Reduced compression mammography to reduce breast pain. Clin Imaging 2009: 33(1): 7-10.
4. Jo HM, Lee EH, Ko K, et al. Prevalence of women with dense breasts in Korea. Cancer Research Treatment 2019: 51(4): 1295-1301.
5. Korhonen KE, Conant EF, Cohen EA, et al. Beast Cancer Conspicuity on Simultaneously Acquired Digital Mammographic Images versus Digital Breast Tomosynthesis Images. Radiology 2019: 292(1): 69-76.1.