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# Development of a collimator blurring compensation method using fine angular sampling projection data in SPECT

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Due to the collimator aperture, spatial resolution of SPECT data varies with source-to-detector distance. Since the radius of detector rotation is bigger when scanning larger patients, spatial resolution is degraded in these cases. Emitted gamma rays travel not only along the central axis of the collimator hole but also off-axis due to the collimator aperture. However, an off-axis ray at one angle would be a central-axis ray at another angle; therefore, raw projection data at one angle can be thought of as an ensemble of central-axis rays collected from a small arc equal to the collimator aperture. Thus, fine angular sampling can compensate for collimator blurring. By using a sampling pitch of less than half the collimator aperture angle, compensation was performed by subtracting the weighted sum of the projection data from the raw projection data. Collimator geometry and detector rotation radius determined the weighting function. Cylindrical phantom with four different-sized rods and torso phantom for Tl-201 cardiac SPECT simulation were used for evaluation. Aperture angle of the collimator was 7 degrees. Projection sampling pitch was 2 degrees. In both phantom studies, the proposed method showed improvement in contrast and reduction of partial volume effect, thereby indicating that the proposed method can compensate adequately for image blurring caused by the collimator aperture.

**Key words:** SPECT, collimator aperture, spatial resolution, filter, blurring