

Scatter correction by two-window method standardizes cardiac I-123 MIBG uptake in various gamma camera systems

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Heart to mediastinum count ratio (H/M) has been commonly utilized as an indicator of myocardial I-123 MIBG uptake. However, normal ranges of H/M were markedly different among various gamma camera systems. The purpose of this study was to clarify whether scatter correction by two-window method standardizes H/M among various gamma camera systems. **Methods:** Scatter uncorrected and corrected MIBG imaging was acquired in phantom and human studies in combination with low energy high-resolution collimator (LEHR) and medium energy collimator (MEC). For scatter correction, energy window width of $159 \text{ keV} \pm 10\%$ was applied to main window imaging and $193 \text{ keV} \pm 9.5\%$ was applied to upper window imaging for scatter correction. **Results:** In phantom study, a significant difference was observed in uncorrected H/M among three gamma camera systems using LEHR or MEC (2.09 ± 0.06 vs. 2.58 ± 0.03 in GCA7200 camera, 2.00 ± 0.07 vs. 2.42 ± 0.06 in DS7 camera and 2.16 ± 0.04 vs. 2.67 ± 0.07 in Vertex plus camera). However, there was no significant difference in corrected H/M among the three gamma camera systems, either with LEHR or MEC (2.70 ± 0.07 vs. 2.69 ± 0.07 in GCA7200 camera, 2.66 ± 0.08 vs. 2.61 ± 0.05 in DS7 camera and 2.66 ± 0.05 vs. 2.61 ± 0.05 in Vertex plus camera). In human study, uncorrected H/M in DS7 camera with LEHC was significantly lower than that in GCA7200 camera with MEC (1.60 ± 0.37 vs. 1.85 ± 0.54 , $N = 14$). In contrast, the difference was insignificant in corrected H/M (2.12 ± 0.59 vs. 2.16 ± 0.68). There was a very excellent correlation in corrected H/M between DS7 and GCA7200 cameras ($r = 0.991$, $p < 0.001$). **Conclusion:** This study demonstrated that scatter correction by the two-window method standardizes the H/M in MIBG scintigraphy either with LEHR or MEC. Scatter corrected H/M can be applied to measure a standardized parameter of MIBG uptake in human clinical studies using various gamma camera systems.

Key words: I-123 MIBG, scatter correction, two-window method, heart to mediastinum count ratio, collimator