Scatter and cross-talk correction for one-day acquisition of ^{123}I-BMIPP and ^{99m}Tc-tetrofosmin myocardial SPECT

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Objective: ^{123}I-15-(*p*-iodophenyl)-3-(*R*,*S*)-methylpentadecanoic acid (BMIPP) and ^{99m}Tc-tetrofosmin (TET) are widely used for evaluation of myocardial fatty acid metabolism and perfusion, respectively. ECG-gated TET SPECT is also used for evaluation of myocardial wall motion. These tests are often performed on the same day to minimize both the time required and inconvenience to patients and medical staff. However, as ^{123}I and ^{99m}Tc have similar emission energies (159 keV and 140 keV, respectively), it is necessary to consider not only scattered photons, but also primary photons of each radionuclide detected in the wrong window (cross-talk). In this study, we developed and evaluated the effectiveness of a new scatter and cross-talk correction imaging protocol. ***Methods:*** Fourteen patients with ischemic heart disease or heart failure (8 men and 6 women with a mean age of 69.4 yr, ranging from 45 to 94 yr) were enrolled in this study. In the routine one-day acquisition protocol, BMIPP SPECT was performed in the morning, with TET SPECT performed 4 h later. An additional SPECT was performed just before injection of TET with the energy window for ^{99m}Tc. These data correspond to the scatter and cross-talk factor of the next TET SPECT. The correction was performed by subtraction of the scatter and cross-talk factor from TET SPECT. Data are presented as means ± S.E. Statistical analyses were performed using Wilcoxon's matched-pairs signed-ranks test, and $p < 0.05$ was considered significant. ***Results:*** The percentage of scatter and cross-talk relative to the corrected total count was 26.0 ± 5.3%. EDV and ESV after correction were significantly greater than those before correction ($p = 0.019$ and 0.016, respectively). After correction, EF was smaller than that before correction, but the difference was not significant. Perfusion scores (17 segments per heart) were significantly lower after as compared with those before correction ($p < 0.001$). ***Conclusions:*** Scatter and cross-talk correction revealed significant differences in EDV, ESV, and perfusion scores. These observations indicate that scatter and cross-talk correction is required for one-day acquisition of ^{123}I-BMIPP and ^{99m}Tc-tetrofosmin SPECT.

Key words: fatty acid metabolism, myocardial perfusion, one-day acquisition, scatter, cross-talk