

Abstract

Objectives: Resolution recovery algorithms (IR-RR) were recently proposed as tools to improve quality of SPECT images through better resolution. The aim of the presented study was to investigate the effect of IR-RR on myocardial perfusion SPECT studies.

Methods: Phantom and clinical studies were performed using SPECT-CT Infinia/Hawkeye (GE Healthcare). NEMA triple line phantom was scanned according to NEMA procedures. Cold sphere and cardiac phantom were scanned under clinical conditions (90⁰-angled detectors, 60 views and circular orbit) and reconstructed via IR-RR (Evolution for Cardiac, GE, 12 iterations and 10 subsets), OSEM (ordered subset expectation maximization, 2 iterations and 10 subsets) and FBP (filtered back projection). IR-RR and OSEM reconstructions were used with/without attenuation and scatter correction (ACSC). The effect of post-reconstruction filtering was evaluated. In clinical studies two data-sets were used (half-time and full-time). Conventional scan using full-time (20 sec per stress projection and 25 sec per rest projection) was reconstructed via FBP and IR-RR; half-time scan (10 sec stress, 12 sec rest studies) was reconstructed via IR-RR. End-diastolic volume (EDV), end-systolic volume (ESV) and left ventricular ejection fraction (EF) were calculated using two software methods.

Results: In phantom study, IR-RR provided better (up to 40%) spatial resolution than OSEM. The cold sphere phantom studies demonstrated that IR-RR had slightly improved contrast compared to OSEM, but comparable to that of FBP. IR-RR (and OSEM) with AC or ACSC showed lower contrast of cold sphere compared to reconstruction without AC or ACSC. The best results were obtained by Butterworth post-filter of order 10 with cutoff frequency 0,4 cycles/cm. In the clinical studies, highly significant correlation was observed between IR-RR (full-time and half-time) and FBP, however, statistically significant differences were measured in the mean values of EDV and ESV. No statistically significant differences were reported for EF.

Conclusions: IR-RR produced better image quality compared to that of OSEM and is thus recommended for myocardial perfusion SPECT studies. However, in order to get high image quality, the full-time has to be maintained.

Key words: Myocardial perfusion scintigraphy, Resolution recovery, Image quality, Quantification