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Quarter-time Wide Beam Reconstruction: Evaluation of SPECT Myocardial Perfusion and Function

Author Block: E. Gordon DePuey, Srinivas Bommireddipalli, John Clark, Anna Leykehman, Linda Thompson, Marvin I. Friedman, Haim Kermany, St. Luke's-Roosevelt Hospital, New York, NY, UltraSPECT, Ltd., Haifa, Israel

Abstract:

Background: Previously we reported that compared to iterative reconstruction with OSEM, wide beam reconstruction (WBR), which incorporates resolution recovery and models noise during reconstruction without applying a post-processing filter, allows half-time SPECT acquisition with preserved diagnostic quality. We now postulate that with further Poisson noise modeling quarter-time acquisition is possible.

Methods: The half-time WBR algorithm was optimized for quarter-time acquisition based upon anthropomorphic cardiac phantom data and a pilot group of 48 patients (pts). Then using the modified algorithm, 208 pts (91 men, 117 women, mean chest circumference = 41 in.) were imaged at rest (R) and stress (S) (9/32 mCi ^{99m}Tc-sestamibi) full-time with OSEM, and again quarter-time with the modified WBR algorithm. 180-degree, 64-stop, full-time single-day rest (R) (25 second-per-stop (sps)) and 8-frame per cardiac cycle post-stress (S) (20sps) gated SPECT, and then quarter-time R (6sps) and post-S (4 sps) gated SPECT were acquired. Blinded observers graded scan quality (1=poor to 5=excellent) based on myocardial uniformity, endocardial/epicardial edge definition, and background noise. Perfusion defects were scored using a 17-segment model. Using Myometrix® software, EDV, ESV, and LVEF were calculated.

Results: For the 208 prospective pts mean image quality for R full-time OSEM and quarter-time WBR were similar (3.6 vs. 3.5, p NS). For S, quarter-time WBR quality (4.3) was superior to full-time OSEM (3.9) (p=1.8E-17). Of 48 pts with abnormal scans (SSS's >2 by OSEM) mean SSS's, SRS's, and SDS's were not significantly different with quarter-time WBR vs. full-time OSEM (11.2 vs. 10.9), (9.2 vs. 9.0), (2.0 vs. 1.9) (p's NS). There was a good correlation of LVEF, EDV, and ESV determined by WBR vs. OSEM (r's = 0.92, 0.97, and 0.98). ESV's were higher with WBR (52cc vs. 46cc, p=2.6E-23) primarily due to better delineation of the valve plane at end-systole, whereas EDV's were similar (94cc vs. 96cc, p NS). Thus, EF's were lower with WBR (49.1 vs. 57.6, p=1.6E-48).

Conclusions: For perfusion SPECT quarter-time WBR affords image quality, defect characterization, and functional assessment equivalent to full-time OSEM.

Category (Complete): Nuclear Cardiology/PET

Keyword (Complete): SPECT ; reconstruction software ; wide beam reconstruction

Institution Information (Complete):

***Responsible Institution 1:** : St. Luke's-Roosevelt Hospital

***City:** : New York

State: New York

***Country:** United States

Responsible Institution 2: : UltraSPECT, Ltd.

City: : Haifa

Country: Israel

Learning Objective (Complete):

***Learning Objective 1:** : USE WBR to shorten SPECT acquisition time

Presentation Preference (Complete): Oral or Poster Presentation

Payment (Complete): Your credit card order has been processed on Tuesday 30 September 2008 at 2:57 PM.

Status: Complete