Validation of HMPAO-Tc-99m as a myocardial perfusion radiotracer: preliminary results

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Background/Introduction – We have previously reported the possibility of imaging the heart with HMPAO-Tc-99m (HMPAO). Being a brain perfusion radiotracer, mapping of myocardial perfusion seemed also probable, permitting the use of a single radiotracer on patients with epilepsy with less radioactive exposure.

Purpose – To compare myocardial gated SPECT images made with both HMPAO and Tetrofosmin-Tc-99m (Tetrofosmin).

Methods – In three patients who had myocardial perfusion scintigraphy (MPS) as part of their clinical evaluation [Tetrofosmin, 370 MBq (stress)/1110 MBq (rest), one-day protocol], we acquired myocardial stress and rest SPECT images after injecting 555 MBq of HMPAO (two-day protocol). Both studies were acquired in gated mode, 40 min after the i. v. injections.

We selected another two patients who had ictal brain perfusion SPECT and needed to perform a MPS as well (Tetrofosmin, stress). In these cases, we acquired an ictal myocardial SPECT after the brain SPECT (HMPAO).

All studies were processed with a cardiac dedicated software.

Algorithms were developed in MATLAB R2016 to compare the Tetrofosmin and HMPAO images of each reconstructed plane (short axis - SA -, vertical long axis - VLA -, and horizontal long axis - HLA -). After applying a median filter, each slice pair was aligned and the area of interest was defined. A pixel-wise correlation was calculated for every slice, using Pearson’s Correlation Coefficient.

Reversibility of the defects was also evaluated (correlation of the rest-stress subtraction with each radiotracer), as were the polar maps.

The study was approved by our Institution Ethics Committee and all patients gave their informed consent.

Results – In the five patients evaluated, we obtained high correlations for perfusion images [better in the VLA, (0.88-0.94, stress), (0.88-0.90, rest)]. Reversibility correlations varied between 0.45 and 0.8 (3 axes). Gated images correlations between each slice of each gate were also better in VLA [mean values: 0.78-0.89 (stress), 0.78-0.84 (rest)]. The polar maps correlations were 0.93-0.96 (stress), 0.93-0.95 (rest) and 0.6-0.9
(reversibility).

Patient 2 had poorer correlations due to lung HMPAO uptake, interfering with image processing. That patient has smoking habits (a known cause of HMPAO lung uptake).

Conclusion – We obtained high correlations for cardiac studies between Tetrofosmin and HMPAO, especially in VLA.

Myocardial SPECT with HMPAO may be a screening method for myocardial ischemia in non-smoking patients who already need to perform a HMPAO brain perfusion SPECT. In a subset of patients with epilepsy who are prone to have heart changes (e.g. those with rises in ictal Troponin I) it could serve as a gateway to MPS.