

Methodological Features for Neurostimulation Studies with Technetium-99m-HMPAO SPECT

TO THE EDITOR: The development of neurostimulation studies associated with single-photon emission computed tomography (SPECT) raises some methodological problems related to quantification of results (1,2). We have developed a technique associating ^{99m}Tc-HMPAO SPECT with tests of auditory stimulation. The clinical protocol consists of two brain SPECT images affected before and after auditory stimulation. The canthomeatal plane and its perpendicular passing through the auditory meatus are marked with ⁵⁷Co lines. A double-isotope acquisition is performed using an Elscint SP6 gamma camera and a low-energy, high-resolution collimator. Data are collected in 64 × 64 matrices using 90 angular increments over 360° with an acquisition time of 20 sec/view.

Presently, images are processed in a standardized manner which comprises calculation of a perfusion index, R, normalized to cerebellar activity concerning temporal and parietal regions (internal control) for each of three preselected coronal slices of 1 cm passing through auditory areas. Localization of the regions is semi-automatic; their position in respect to the median line and the cantho-meatal plane is defined by a stereotaxic atlas (3). Variation in activity is calculated by using the ratio (Rpoststimulation – Rprestimulation)-to-Rprestimulation for the three sections. Maximum variation represents the auditory areas' response to stimulation. This appears permissible in view of the uncertainty related to the head's repositioning in each examination.

More than 15 individuals with normal hearing were thus tested during tonal auditory stimulation (30 to 40 dB above threshold) with high-pitched as well as low-pitched frequencies. Results show an increase in temporal cortex activity of 20% on the right side and 21% on the left. This is significantly higher than increases observed in parietal regions used as internal controls on the same slices (paired t-test, $p < 0.005$). Eight patients were tested for reproducibility, which showed activity variation as well as asymmetry (seven of eight patients). Despite methodological difficulties related to quantification of results and to repositioning problems, it appears feasible to show localized cerebral activations. Standardization in image processing, in particular, allows performance of multicentric tests, such as those currently performed.

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Differential Renal Uptake of Technetium-99m-DMSA and Technetium-99m-DTPA

TO THE EDITOR: Quinn and Elder described a patient demonstrating poor renal uptake of ^{99m}Tc-DMSA and normal handling of ^{99m}Tc-DTPA, owing to tubulointerstitial renal disease (1). We would like to report a similar difference of renal uptake of DMSA and DTPA due to another cause.

A 13-yr-old girl was hospitalized for evaluation of failure to thrive, vomiting and dehydration. Her weight had dropped by 1 kg over a few weeks. At physical examination, a rachitic rosary was found as well as thickening of the wrists. Serum sodium was 133 meq/liter, potassium 2.9 meq/liter, calcium 4.7 meq/liter, phosphorus 2.7 meq/liter, chloride 104 meq/liter and bicarbonate 8 meq/liter. Creatinine was 0.071 mM/liter (0.8 mg/dl), ureum 7.138 mM/liter (43 mg/dl). Blood gases revealed a pH within the normal range, but the pCO₂ was at 20.4 mmHg and the base excess at -16.7, indicating compensated metabolic acidosis. Alkaline phosphatases were 729 mU/ml (normal values in adults less than 115 mU/ml). Glycosuria was present despite normal glycemia. Generalized aminoaciduria was found. Parathormone levels were 193 pg/ml (normal values 10-55), whereas 25 OH-Vitamin D was 27.5 ng/ml (normal values 16-74). Split lamp examination of the eye revealed crystals in the subepithelial layer of the cornea on both sides, whereas the conjunctiva was normal bilaterally. Bone marrow disclosed crystal deposits as well. Therefore, a final diagnosis of cystinosis with secondary Fanconi syndrome was made.

Early in the work-up, ^{99m}Tc-DMSA scintigraphy had been performed to uncover possible renal scarring. Kidney depth was measured on lateral views of the abdomen. Tracer uptake was quantified as a percentage of the injected dose. Only 2.7% and 1.1% of the injected dose were taken up by the right and left kidneys, respectively. Concomitant ^{99m}Tc-DTPA nephrography on the other hand was qualitatively normal.

The patient described here thus represents yet another example of disparate renal handling of DMSA and DTPA. In this patient, this disparity is caused by the proximal tubulopathy of Fanconi's syndrome.

It is still unsettled how much of DMSA is filtered glomerularly and how much is taken up from peritubular blood (2,3). It is clear, however, that normal tubular function is critical to the uptake of DMSA into the proximal tubular cell. In proximal tubulopathy,

divergence between the uptake of DMSA and the glomerular filtration rate has been documented (4). This further supports the notion that DMSA uptake reflects "functioning tubular mass" as opposed to "global renal function."

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Reversible Thallium-201 Perfusion Defects in Right Bundle Branch Block and Normal Coronary Angiogram

TO THE EDITOR: In a recent paper published in *The Journal of Nuclear Medicine* (1), Dr. Wei-Jen Shih and colleagues describe a case of reversible ²⁰¹Tl perfusion defect of the septal and inferoapical segments in a patient with incomplete right bundle branch block (IRBBB) and normal coronary angiogram.

From the above paper, it seems that the authors have linked IRBBB with the finding of ²⁰¹Tl perfusion defect during exercise testing. We would like to express our doubts concerning the linkage suggested between IRBBB and the ²⁰¹Tl stress test.

It is well known that 1%-3% of all myocardial infarctions occur without demonstrable evidence of significant coronary atherosclerosis (2,3). This percentage may be as high as 17% in patients less than 36 yr old (4). The etiology is probably vasospasm with a higher incidence of coronary spasm related to acute myocardial injury in the inferior wall when compared to anterior wall infarction (5-7). Indeed, the case we refer to shows a perfusion defect in the inferior wall.

It is well accepted that isolated RBBB in a young and apparently healthy individual cannot, of itself, be taken to indicate prima facie evidence of organic heart disease and shows no increased incidence of coronary ischemic heart disease (8).

In the light of the above facts together with the relatively young age (34 yr) of the patient described by Shih et al., it is more logical to say that what the authors have described is a case of a coronary spasm event in a relatively young patient and that there is no connection between the IRBBB found in this patient and the perfusion defect shown during the stress thallium scan.

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REPLY: We thank Drs. Margulis and Golan for reading and commenting on our recent paper (1). Although our patient was relatively young (34 yr) with incomplete right bundle branch block (IRBBB), his clinical manifestations and coronary risk factors (heavy smoking for 22 yr and family history of heart disease) justified proceeding with ²⁰¹Tl myocardial imaging, which yielded reversible defects and subsequently led to a coronary angiogram. We could not ignore these factors just because of the individual's relative youth.

We agree that isolated right bundle branch block may occur in normal patients (2-4). We also agree that myocardial infarction can occur in young patients without demonstrable evidence of significant coronary atherosclerosis. There are multiple suggested mechanisms by which patients with normal epicardial coronary arteries can have myocardial ischemia, including vasospasm, as Drs. Margulis and Golan suggest, as well as embolic events, small vessel disease (5-7) and myocardial injury involving the inferior wall more often than the anterior wall. Reversible redistribution of our patient's ²⁰¹Tl images mainly involves the septal wall and the inferoapical wall. Actually, those references (5-7) regarding coronary artery spasm relating to myocardial infarction or ischemia indicate preferable involvement of the septal wall.

In rare instances, exercise can induce coronary spasm, resulting in reversible ²⁰¹Tl perfusion defects without significant coronary stenosis. In the previous reports, the patients with exercise-induced reversible perfusion defects are almost always accompanied by typical exertional angina and ST-segment elevation on ECG (8-12). Our patient did not have angina nor ST-segment elevation during his treadmill exercise test. Thus, our patient's reversible defects are not likely due to exercise-induced coronary spasm. As a matter of fact, exercise ²⁰¹Tl SPECT in patients with various types of intraventricular conduction disturbance may result in a false-positive scan in the septal wall (13). In that report, patients with transient septal defect included two patients with RBBB and 11 patients with RBBB and left-axis deviation. Our results agree with their findings (13).

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