

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.

REFERENCES

1. Woods SW, Hegeman IM, Zubal IG, et al. Visual stimulation increases technetium-99m-HMPAO distribution in human visual cortex. *J Nucl Med* 1991;32:210-215.
2. Le Scao Y, Baulieu JL, Robier A, Pourcelot L, Beutter P. Increment of brain temporal perfusion during auditory stimulation: preliminary study with technetium-99m-HMPAO SPECT. *Eur J Nucl Med* 1991;18:981-983.
3. Talairach J, Szlika G. *Atlas d'anatomie stéréotaxique du télencéphale*. Paris: Masson; 1967.

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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,