

**No. 265**

**IN VIVO MAPPING OF CHOLINERGIC NEURONS IN AGING AND ALZHEIMER'S DISEASE USING SPECT AND (-)-5-[I-123] IODOBENZOVESAMICOL (IBVM).** D.E. Kuhl, J.A. Fessler, S. Minoshima, K. Cho, K.A. Frey, D.M. Wieland and R.A. Koeppe. The University of Michigan, Ann Arbor, MI

To determine the in vivo distribution of cholinergic neuronal integrity in aging and in Alzheimer's disease, we performed cerebral SPECT using [I-123]IBVM, an analog of vesamicol which binds to the acetylcholine transporter on presynaptic vesicles. Postmortem measures of choline acetyltransferase are reduced in aging hippocampus and are markedly reduced (50-80%) in AD cerebral cortex.

We studied 34 normal subjects (ages: 20-90 years) and 8 patients with probable Alzheimer's disease (AD) (ages: 58-68 years; dementia: 4 mild, 1 moderate, 3 severe). Brain images were collected sequentially over the first 4.5 hours following injection, data were realigned and transformed to stereotaxic coordinates, and localized activities were extracted for tracer kinetic analysis. The cerebral tracer input function was determined from metabolite-corrected radial arterial blood samples. Fitted parameters reflecting transport (K1) and binding site density index (k3) were determined using a three compartment model including terms reflecting cerebral blood volume, exchange of free tracer between plasma and brain, and specific binding.

In normal subjects, K1 correlated negatively with age (p<0.05) in all gray matter sites except occipital cortex, pons and cerebellum, but k3 did not correlate with age at any site. In AD subjects, mean k3 was reduced (p<0.05) in cortex (24%) and striatum (24%), most reduced in posterior cingulate cortex (29%) and hippocampus (29%, p <0.005); and least reduced in pons (8%) and cerebellum (10%). In AD subjects, K1 and k3 decreases were similar in some zones, e.g., posterior cingulate and parietal cortex (30-33%), but differed in others; e.g., visual cortex, striatum, and hippocampus K1 values were less reduced (13-18%) than k3 values (24-29%).

We conclude that [I-123]IBVM imaging is useful for determining patterns of cholinergic neuron loss, which may differ from patterns of decline in cholinergic enzyme activity.

The difference in diagnostic sensitivities of 43% and 86%, respectively, for sestamibi SPECT and FDG PET, is statistically significant (Sign test, two-tailed exact p-value=0.004). This study demonstrates that FDG PET is more sensitive than double-phase sestamibi SPECT in the preoperative localization of parathyroid adenomas in patients with primary hyperparathyroidism.

**No. 267**

**THE ROLE OF PREOPERATIVE SPECT-99mTc-SESTAMIBI IMAGING AND INTRAOPERATIVE PTH MEASUREMENT IN PARA-THYROIDECTOMY.** G. Sfakianakis, J. Foss, M. Georgiou, G. Irvin, III, S. Levis-Dusseau, S.K.C. Chandraratny. Departments of Radiology and Division of Surgery. University of Miami, School of Medicine, Miami, FL.

In patients with hypercalcemic (primary) hyperparathyroidism, localization and excision of all hyperfunctioning tissue can be a difficult and lengthy operation. Thirty five patients (36 studies) had preoperative SPECT-SESTAMIBI imaging for localization of adenomas. Following a 20-25 mCi iv injection planar and tomographic (SPECT) scintigrams were acquired immediately and approximately 3 hours after injection. Interpretation of planar images was performed as usual and the tomographic studies were reviewed on a standard "reprojection" mode off a computer monitor allowing either static presentation of the 34 images or a three-dimensional reprojection rotating image of the neck and upper chest of the patients. The early images helped define the exact location of the parathyroid tumor in depth and position relative to the thyroid gland and other anatomical landmarks and the delayed images confirmed the lesions demonstrating the preferential retention of the radiopharmaceutical.

By SPECT/reprojection 32/36 studies were clearly positive, one confusing, and 3 negative, whereas by planar, 23 positive, 8 questionable and 3 negative.

Of the 35 patients, 21 underwent cervical exploration, and in 20 of them SPECT studies were diagnostic and confirmed, and one positive but confusing, whereas planar studies had one FN and 5 questionable cases.

In 18 of 21 cases with adenomas in the neck, the hormone level dropped significantly in the five-minute post-excision sample (by quick PTH assay) intraoperative and the patient was awakened and returned to the recovery room, whereas in 3 cases (2 mediastinal) PTH levels remained high and further surgery was necessary. The size of the excised parathyroid tissue was between 0.9 and 3.5 cm (maximum dimension).

Compared to patients undergoing parathyroidectomy without SPECT localization and hormone monitoring, the average operative time was shortened from 90 to 36 minutes, (minimum 13 min) and 3 patients were operated on as out-patients.

**Endocrinology II: Parathyroid, Adrenal, Etcetera**

3:30-5:00 Session 44 Room: 13C-D

Moderator: Jerry Glowniak, MD  
Comoderator: Loraine Fig, MD

**No. 266**

**COMPARISON OF FDG PET AND DOUBLE-PHASE SESTAMIBI SPECT IN THE PREOPERATIVE EVALUATION OF PRIMARY HYPERPARATHYROIDISM.** D.R. Neumann, C.B. Esselstyn, W.J. MacIntyre, R.T. Go, N. Obuchowski, E.Q. Chen, L.M. Kohse, A.A. Licata. The Cleveland Clinic Foundation, Cleveland, Ohio.

Preoperative noninvasive localization of hyperfunctioning parathyroid tissue in patients with primary hyperparathyroidism has been a longstanding diagnostic challenge. The purpose of this study was to directly compare, in the same patients, FDG PET and double-phase sestamibi SPECT for the preoperative detection and localization of abnormal parathyroid tissue.

Twenty-one consecutive patients with biochemical evidence for primary hyperparathyroidism were studied prospectively prior to surgical neck exploration. Double-phase SPECT imaging of the neck and chest was done at 15 minutes and at 2 hours after 20 mCi Tc-99m sestamibi was given I.V. Regional body PET imaging of the neck and upper chest was also done on each patient 45 minutes after 5-10 mCi F-18 FDG was given I.V. Surgery revealed a solitary parathyroid adenoma in all 21 patients. The comparative imaging results are tabulated (TP = true positive, FN = false negative):

		FDG PET		Total
		TP	FN	
Sestamibi SPECT	TP	9	0	9 (43%)
	FN	9	3	12
	Total	18 (86%)	3	21

**No. 268**

**SCINTIGRAPHIC ASSESSMENT OF DEACTIVATION OF ALDOSTERONOMA TREATED BY TRANSCATHETER ADRENAL ARTERIAL EMBOLIZATION WITH ABSOLUTE ETHANOL (TAAE).** M. Nakajo, Y. Nakabeppu, N. Miyazono, H. Inoue, T. Miki, and Y. Baba. Kagoshima University Hospital, Kagoshima, Japan.

We investigated the efficacy of adrenocortical scintigraphy with I-131-6-beta-iodomethyl-19-norcholesterol (I-131-NCL-6) to assess the degree of deactivation of aldosteronoma treated by TAAE which was developed at our institution to nonsurgically deactivate an aldosteronoma by an interventional angiographic procedure of infusion of absolute ethanol into the arteries feeding the adenoma. TAAE was performed in a total of 7 patients with unilateral aldosteronoma; once in 3, twice in 3 and three times in one. Finally, 5 were completely deactivated by this method and 2 were surgically removed. Scintigraphy was performed 7 days after i.v. injection of 37 MBq of I-131-NCL-6 using a pinhole collimator, before and after TAAE. Before TAAE, the aldosteronoma was visualized as a hot nodule in 6 and a warm nodule in one. After TAAE, a hot or residual nodule with decreased activity was observed on 6 occasions of 5 patients in whom TAAE was unsuccessful. The hot nodule disappeared on 5 occasions of 5 patients in whom TAAE was successful and no hypersecretion of aldosterone was observed during 5-16 months. Thus adrenocortical scintigraphy is useful to estimate the viability of aldosteronoma treated by TAAE and decide the indication of further TAAE or operation.