Plenary Session

Diagnosis of Cold Thyroid Nodule with ^{201}Tl Scintigraphy

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^{201}Tl-chloride scintigraphy was performed in 45 patients with cold thyroid nodule.

^{201}Tl scintigram was positive in 17 of 18 thyroid cancer (94.4%), 8 of 20 adenoma (40.0%), 1 of 2 adenomatous goiter (50.0%) and all of 5 chronic thyroiditis (100.0%). Seventeen lesions with positive ^{201}Tl concentration in thyroid cancer were all cellular. The metastatic cervical lymphnodes in two cases and the metastatic lung lesions in one case were visualized by ^{201}Tl.

In one thyroid cancer with negative ^{201}Tl concentration the lesion was mostly occupied by degenerative cysts.

All of the eight positive lesions with adenoma were of cellular type, wheares out of 12 negative with adenoma 10 lesions were found to have either cyst formation and/or colloid degeneration.

One of two adenomatous goiter was negative with ^{201}Tl which also had cyst formation.

All of five cases with chronic thyroiditis were positive with ^{201}Tl and had not any cyst formation or degeneration.

When the cold nodule was demonstrated to be positive with ^{201}Tl, a statistical chance of the lesion being a cellular type was 100.0% and a risk of its malingnancy was 54.8%. On the other hand, the nodule with negative ^{201}Tl concentration had a 14.3% chance of cellularity and a 7.1% risk of malignancy. ^{201}Tl scintigraphy is of use in the differential diagnosis of the cold thyroid nodule.

Metabolism of Thyroxine in Various Diseases

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It has been reported that in addition to conversion of T_4 to T_3, monodeiodination of T_4 produces reverse T_3 (rT_3), and T_3 or rT_3 can be deiodinated to produce 3, 3′–T_2, 3,5–T_2, 3′, 5′–T_2. Recently we have developed sensitive radioimmunoassays for measurement of rT_3 and 3,3′–T_2 in unextracted serum using ANS to inhibit binding to serum proteins. Sensitivity, specificity and reproducibility were satisfactory in the assays. Using these assays and Tetrasorb^R and T_3–RIA kit^R of Dainabot, serum levels of T_4, T_3, rT_3 and 3,3′–T_2 were measured in various thyroidal and nonthyroidal diseases, i.e. untreated Graves' disease, Graves' disease during therapy, Graves' disease in remission, untreated hypothyroidism, T_4-treated hypothyroidism, cord blood, pregnancy, starvation, anorexia nervosa, chronic hepatitis, liver cirrhosis, diabetes mellitus, steroid therapy and other chronic nonthyroidal illness. In all of the above diseases, serum concentrations of some of the T_4-metabolites differed greatly from the normal range calculated from normal subjects (29 male, 20 female). In kinetic studies performed in starved rabbits, increase in serum rT_3 concentration was

partly due to the decrease in metabolic clearance rate of rT_3. In in vitro experiments to observe production of T_3 from T_4, production of T_3 was increased in hyperthyroid rats and decreased in starved rats indicating that changes in production rate was another important factor to regulate serum concentrations. From these results, it is suggested that metabolism of T_4 changes greatly in many diseases due to changes in metabolic clearance rate of each metabolite and to changes in metabolic pathways. Changes in T_4-metabolism may be related to the essential pathophysiology in each disease and could be employed for diagnosis.

Bone Scintigraphy in Patients with Chronic Renal Failure on Dialysis

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Early detection of alteration in mineral contents of the skeletal system has always been a difficult problem.

Here is reported the comparative study of bone scan and CT scan in the patients with chronic renal failure on maintenance dialysis. Bone scan with ^{99m}Tc-phosphate compounds was performed in 9 male and 7 female patients. The age ranged from 19 to 50 years and the duration of dialysis was 1 to 55 months. Scan was performed 3 hours after IV injection of 15mCi ^{99m}Tc-EHDP or MDP. Anterior and posterior whole body images were obtained by Toshiba 5-inch dual scanner. Then, spot scintigraphic images of anterior and lateral calvarium, and of hands were also obtained by Pho/Gamma HP camera. The bone image was classified into positive and negative scan (Positive scan: symmetrically high activity in the calvaruim, mandible, sternum, vertebrae and ribs. Negatice scan: being equal to normal uptake or decreased bone uptake but high background.) Bone scans in 6 of 16 patients were found to be positive.

Within one to 2 weeks after bone scan the calvarium of the patients was scanned with EMI CT 1000 (matrix 160×160) using 13 mm slice thickness. The plane of the scan slices was oriented 15 to 20 degrees toward feet in relation to the orbitomeatal line. The scanner was operated with 120kV, 33mA. A slice, usually 7 cm above the orbitomeatal line, was studied as a polaroid picture (window level 400, window width 100) and as a numerical print-out (160×160). The numerical print-out was analyzed in the area of the frontal bone approximately 1.5 cm from the midline, EMI number 300 being chosen as a cut-off for differentiating bone from soft tissue. Average EMI number was calculated from the numerical print-out in the study group and in the control group. EMI number of the study group was significantly low compared to that of the control group.

Subperiosteal bone resorption of the phalanges on radiogram was found in 3 of the 6 positive bone scan cases. The degree of bone scan and CT scan abnormalities correlated well with the duration of the dialysis, level of the serum alkaline phosphatase, and the PTH.

One patient was treated with α-D_3 for 3 months. Follow-up study of this patient showed no significant change in serum chemistry, bone scintigram and CT scan, compared to that of the initial study.

The usefulness of radionuclide bone scan for investigating the skeletal effects of hyperparathyroidism was first reported by Sy et al, and bone scan can detect changes of bone, particularly of the calvarium, earlier than radiography. However, it is difficult to evaluate the effect of the medical treatment on the bone disease only by bone scan, because this is not a real quantitative study. It is possible to measure bone mineral content of the calvarium quantitatively by means of CT scan. So, combination of the bone scan and CT scan is the most useful method to detect early change of the bone mineral content.