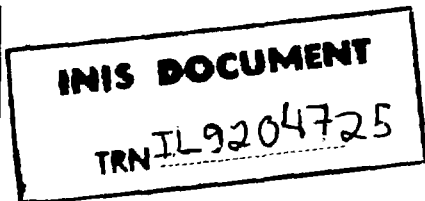
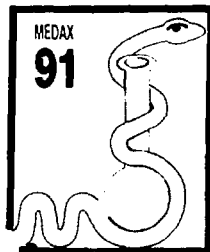


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Abstracts

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LYMPHOSCINTIGRAPHY IN BENIGN AND MALIGNANT DISEASES — UPDATE

S. Tzila Zwas, Sheba Medical Center, Tel Hashomer;
Sackler School of Medicine, Tel Aviv University

Radionuclide lymphoscintigraphy, utilizing various interstitial injection modes of radiocolloidal materials, has long been recognized as a reliable procedure for demonstrating regional lymph node involvement in malignancies. More recently, utilization of lymphatic imaging evolved to demonstrate regional dermal drainage of truncal melanoma lesions, directing elective lymphadenectomies with great efficiency. Dynamic lymphoscintigraphic studies of the extremities allowed for the investigation of lymphedema with direct visualization of the lymphatic channels. These studies have been achieved by simple non-invasive methods with no untoward effects and relatively low radiation to the patients (unlike contrast lymphangiography), with a higher sensitivity and specificity compared with CT, US and MRI imaging. Our extensive experience includes: (a) lymphoscintigraphies of the chest lymphatics in breast cancer staging; (b) regional melanoma lymphatics visualization, in addition to anti-melanoma MoAb studies; (c) cervical studies in oral carcinoma assessment using a method of submucosal injections; (d) combined dynamic lymphoscintiangiography (Tc-99m-Rhenium Sulfid Colloid) and venous scintigraphy (Tc-99m-RBC) of the extremities to evaluate obscure edemas to characterize and localize angiologic disorders; (e) dynamic lymphoscintigraphic detection of lymphoceles (lymphatic leaks) in post-kidney transplantation. All these techniques have yielded highly accurate results. Thus, lymphoscintigraphy has come a long way from regional static lymph node imaging to dynamic lymphoscintigraphic visualization of lymphatic channels and further into direct lymphangioscintigraphic visualization of lymphorrhagia and lymphocele formation.

NEW DEVELOPMENTS IN GASTROINTESTINAL
NUCLEAR MEDICINE

Leon S. Malmud, Robert S. Fisher, Benjamin Krevsky, Jean-Luc Urbain, Jeffrey Siegel. Temple University Hospital and School of Medicine, USA and University of Louvain, Belgium.

Nuclear Medicine techniques are rather unique among the diagnostic imaging disciplines in their ability to simultaneously visualize and quantitate physiologic processes. Now that effective pharmacologic agents are being introduced in rapid succession for the treatment of gastrointestinal motility disorders, these nuclear medicine procedures have assumed ever increasing importance in both the evaluation of these drugs, and most importantly in the evaluation of patients before and during therapy. Gastrointestinal nuclear medicine diagnostic methods for the upper g.i. tract, such as esophageal transit and reflux scintigraphy, gastric emptying, and quantitative hepatobiliary studies are now complemented by newer techniques for evaluating the function of the small and large intestine. These exciting physiologic diagnostic modalities are already providing gastrointestinal physiologists and clinicians new insights into the mechanisms and treatment of disorders of transit of the entire gastrointestinal tract. The prevalence of disorders of the lower g.i. tract in western populations suggests that these new diagnostic modalities will represent an increasing percent of our future clinical effort. The techniques to be reviewed include esophageal, gastric, small and large bowel transit studies and methods for evaluating acute lower gastrointestinal bleeding.

RCBF/SPECT: ITS ROLE IN DEMENTIA DIAGNOSIS

Ronald S. Tikofsky, Robert S. Hellman, Piero G. Antuono, Harold H. Harsch, Raymond G. Hoffmann

Diagnosis of dementia is a difficult task. It is typically based on information taken from the clinical examination, history, and neuropsychological findings. Anatomic imaging techniques such as CT and MRI are not particularly helpful, especially in the case of Alzheimer's disease (AD). Functional imaging of metabolism and/or cerebral blood flow with PET seems to correlate well with demented subjects' clinical status. Due to close coupling between cerebral metabolism and blood flow in demented subjects, high resolution SPECT rCBF imaging suggests that different patterns are associated with the various types of dementia such as Alzheimer's disease, multi-infarct dementia (MID), Pick's disease, and others. Examples of rCBF/SPECT findings for the various dementias will be presented. For AD, there are good correlations between global and specific measures of cognitive deficits and qualitatively and quantitatively rated areas of reduced rCBF. Language related impairment correlates with areas of reduced rCBF in the left hemisphere and cluster in the peri-Sylvian region of the left hemisphere. Visual-spatial impairment tends to correlate with areas of reduced rCBF in the right hemisphere. In demented subjects, the response to cognitive tasks that cause "activation" in normal subjects can be blunted. This could be valuable for earlier detection of dementia. Preliminary findings show that mild to moderately impaired AD patients exhibit a different activation response, which more resembles normal response, than do those with severe impairment. As research progresses rCBF/SPECT will play an increasingly significant role in the diagnosis and appreciation of the nature and diversity of dementia.

REGIONAL CEREBRAL PERFUSION IMAGING - RECENT EXPERIENCE

Stanley J. Goldsmith, M.D.
Mt. Sinai Medical Center
New York, NY

Regional Cerebral Perfusion Imaging is feasible as a result of progress in instrumentation (SPECT) and radiopharmaceutical development (lipophilic compounds which traverse the blood brain barrier). Currently SPECT is possible using either single headed gamma cameras or a variety of dedicated neurospect devices which significantly improve resolution and decrease imaging time. Two radiopharmaceuticals (^{123}I -iodoamphetamine, SPECTAMINE and $^{99\text{m}}\text{Tc}$ -HMPAO, CERETEC) are widely available. Several other $^{99\text{m}}\text{Tc}$ -labeled compounds are under clinical evaluation. We have evaluated both ^{123}I -iodoamphetamine and $^{99\text{m}}\text{Tc}$ -HMPAO utilizing both a rotating gamma camera and a dedicated brain imaging device, the Tomomatic 564 from Medimatic (Copenhagen). Single camera imaging was optimized by compounding slices to a thickness approximating spatial (axial) resolution. Gamma camera slices (1 voxel thick ~ 3 mm) were stacked three deep (~ 0.91 cm) with basal ganglia as a reference point. Using this rotating gamma camera technique, images with quality approaching dedicated devices were achieved. Because of the speed of acquisition, recent studies have used the dedicated Tomomatic 564. imaging data was transferred to Siemens Microdelta image processors (VAX) for further processing and quantitation. In psychiatric disorders, neurospect techniques are currently under evaluation utilizing activation techniques; that is psychological stimuli which activate or utilize specific areas of the cerebral cortex involved or impaired in specific disorders. Since activation techniques depend upon repetitive imaging and the identification of changes in regional cerebral perfusion, it is necessary to evaluate reproducibility of regional cerebral perfusion measurements. Volunteers were imaged on multiple occasions with and without specific intellectual or motor tasks. Using quantitative and image subtraction techniques, regional cerebral perfusion was reproducible within 10-12%. Specific psychological stimuli (Wisconsin Card Sort, number matching, continuous performance testing) demonstrated activation of dominant hemisphere prefrontal cortex in normals. In a small group of schizophrenics studied to date, failure to activate this area was observed. Regional cerebral perfusion imaging is a reproducible noninvasive radionuclide technique which is challenging to the nuclear medical physician but opens a new frontier for the assessment of disorders of the brain.

HIGH DOSE/LOW VOLUME RADIOEMBOLIZATION OF HEPATIC MALIGNANCIES

Rösler H., Triller J., Baer H.U., Geiger L.
Dept. Nuclear Medicine, Inst. Diagnostic Radiology, Clinic Visceral Surgery:
Inselspital/University Berne, CH-3010 Berne, Switzerland.

Beta emitting **Y-90**, fixed to **resin particles** > 45 μ , can be deposited in tumors via trans-arterial embolization (TAE). Modern angiography techniques allows this TAE to be performed superselectively. The aim was to eradicate liver malignancies with absorbed doses of 200-300 Gy, (i.e. with doses which successfully ablate thyroid tumors after metabolical concentration of radioiodine). The **procedure** starts with a diagnostic X-ray angiography. ^{99m}Tc-labelled macroaggregates are selectively delivered via the catheter under continuous fluoroscopic monitoring; their dispersal is documented scintigraphically. The tumor volume, the %-dose distribution and the shunt to the lung are quantified. Using these data, the amount of Y-90 - equivalent to an energy dose of 200 to 300 Gy to the target - is calculated and applied some days later via the newly catheterized artery. Verification scans rely on additionally applied Tc-aggregates and on a Tc-Colloid (to quantify Kupfer cell mass, i.e. hepatic functional reserve, necessary in regard to repeated TAE's). Thirteen patients with primary and 11 with secondary liver tumors, all of them non-operable, were treated. Lung complications (individual shunt rates 0-14 %) were not seen. **1)** A direct tumor embolization (via its own artery/ -ies) could be done in only 4 liver primaries and 1 metastasis. **2)** In 9 livers with carcinomas and 6 with metastases, multiplicity required a segmental or multi-segmental particle deposition. The high grade of tumor vascularization enabled sufficiently high energy absorption even with doses <50 Gy to the involved liver segments. **3)** Most of the colo-rectal carcinoma secondaries were "cold" with the embolization scan; here the segmental embolization succeeded in tumor destruction with regional liver doses >40 Gy in 6 (of 8) patients, and in another one with a "cold" hepatic cancer. **Results:** Median reduction in tumor size was 40 % (10-100 %), 3 pts. died due to disseminated disease. 7 survivors - 5 of them meanwhile over >18 months - have an excellent quality of life. Post treatment symptoms were minimal (fever: 9; severe pain, caught: 1; non-progressive thrombocytopenia: 1) with no mortality. Liver enzymes rose in some pts. transiently, but bilirubin remained normal. **Conclusions:** **1)** "High Dose-to-Low-Volume"- TAE allows an application of tumor destroying doses of beta energy to the majority of liver primaries with the least radiation to normal tissue. **2)** High vascularisation allows a nearly as high selective application to most of multifocal hepatic cancers and some selected liver secondaries. **3)** Even the "medium-dose-to-limited-volume"-embolization of liver segments which encase tumors with poor vascularization resulted in remarkable palliation. There is little risk as long as the mentioned precautions are observed.

In-111 PHOTOFRIN-II: A NEW TUMOR IMAGING AGENT FOR INTRACRANIAL NEOPLASMS.

S.M. Karesh, T.C. Origitano, J.R. Halama, O.H. Reichmann, and R.E. Henkin. Loyola University Medical Center, Maywood, IL, USA.

Photofrin-II is a photosensitizer used in laser photodynamic therapy (PDT) as an adjunct to neurological surgery for therapy of intracranial neoplasms. We have shown In-111 Photofrin-II, a mixture of porphyrins, to be an effective agent in depicting the location of brain tumors. Synthesis of the In-111 complex in greater than 96% yield is achieved by a simple, rapid radiolabeling method using In-111 oxine as the starting material. To date, 17 patients with malignant gliomas and metastatic brain lesions have been evaluated. Prior to human investigation, this material was evaluated in a canine glioma model. Human studies were carried out using both static imaging and SPECT studies employing 3-D volume rendered displays. Excellent anatomical spatial correlation was demonstrated between SPECT imaging, contrast-enhanced CT, and contrast-enhanced MRI. Regions of intense focal uptake correlated with neoplasia as determined by surgical histopathology. The target to non-target ratio (tumor to surrounding brain), calculated from computer-generated SPECT data, averaged 5:1. This agent has potential for identification and volumetric analysis of intracranial lesions, permitting individualization of PDT planning by calculation of the optimal time window for photoactivation of the residual brain tumor.

Tl-201 SPECT IN DETERMINING RESIDUAL MALIGNANT BRAIN TUMOR BURDEN.

M. Lorberboym,* A. Hercberg,+ J. Baram,+ and L. Lieberman*
* Department of Nuclear Medicine and + Department of Oncology
Sheba Medical Center, Tel Hashomer.

High grade astocytoma and glioblastoma multiforme are the most common primary malignant brain tumors in adults. The use of combined radiation and chemotherapy have been shown to improve the survival time of these patients. However, identification of tumor residual or tumor recurrence has been unreliable with computerized tomography (CT) and magnetic resonance imaging (MRI) because of brain and tumor necrosis following treatment. Recent studies with Thallium-201 suggest that brain imaging with this radionuclide may correlate better with the presence of residual tumor tissue than CT or MRI. Several mechanisms have been suggested for the improved accuracy of Tl-201 imaging for residual or recurrent brain tumor after therapy. We have studied 29 patients with malignant brain tumors using single photon emission computerized tomography (SPECT) and iv Tl-201. Patients were referred from the Department of Oncology for identification of residual tumor tissue after chemotherapy and/or radiation therapy. 21 males and 8 females aged 21-67 years were studied after iv injection of 4 mCi Tl-201. Results of the SPECT findings were compared with CT and/or MRI studies that were done within a week to 10 days of the SPECT. In 23 of the 29 patients the SPECT studies were positive. 2 patients with tumor grade 1-2, and 21 patients with tumor grade 3-4. Six patients had negative SPECT studies; 2 patients with tumor grade 1-2 and 4 patients with tumor grade 3-4. SPECT scans generally showed lesions that were more discrete than those seen on CT or MRI suggesting that cerebral edema, fibrosis, and necrosis are not imaged by Tl-201 SPECT in the same manner as CT or MRI. A number of patients were noted to have additional lesions on SPECT that were not noted on CT or MRI. Compared with other available imaging modalities Tl-201 provides the most accurate representation of tumor burden following chemotherapy and/or radiation therapy. It offers an excellent complimentary technique to the anatomic results obtained with CT and MRI.

IMPROVEMENT OF INITIAL PERFUSION IN ACUTE MYOCARDIAL INFARCTION : ASSESSMENT BY ISONITRILE TOMOGRAPHY (MIBI-SPECT) AFTER PRE-HOSPITAL OR HOSPITAL THROMBOLYSIS.

B. BOU and M. FARAGGI, Hospital Beaujon (Clichy).

Early spect with a pre thrombolysis injection of Tc 99m labeled MIBI has been used to assess initial area at risk in acute myocardial infarction (AMI). Because there is no significant redistribution of MIBI after myocardial uptake, delayed imaging still shows the initial perfusion. Status individual gain is evaluated by comparison with a control MIBI SPECT (72H).

MIBI was injected on arrival in intensive care unit (ICU) to the suspected AMI of less than 6 hours during 10 months. Furthermore, in a multicentric trial and in order to be able to perform MIBI injection at patient's home (if a pre hospital thrombolysis is decided), MIBI was prepared on a 24H/24H duty basis and dispatched in 4 medicalized ambulances during 1 month.

We investigated 32 suspected AMI (19 injections at home). 26 AMI were confirmed and 19 thrombolyses were performed either at home or in ICU (from 1H to 4H50 after the onset of chest pain).

Initial SPECT was constantly abnormal in confirmed AMI (sometimes before Pardee's wave), but was normal in non coronary syndroms. MIBI uptake improved significantly after thrombolysis only ($p < 0.01$) with individual variations. Extent of early (36H) LV angiographic akinesis or vessel patency were not predictive of SPECT improvement.

Home administration of MIBI is feasible and might help in comparing at home versus ICU thrombolysis. More generally, Tc 99m MIBI SPECT may help the assessment of comparative therapeutic protocols in AMI

EVALUATION OF RENAL TRANSPLANTS WITH Tc-99m-DTPA RENOGRAPHY

Manfred AKERMAN

Serious medical and surgical complications can occur after renal transplantation that threaten graft survival and sometimes recipient survival.

Nuclear medicine tests, due to their non invasive nature and capability to quantitate renal function, are used routinely in the monitoring of the posttransplant course.

In FOCH Hospital (Paris, France) we performed 276 examinations following 42 transplants. The first examination was done within 24 hours after operation and, afterwards, routinely 2 or 3 times a week until stabilization of the clinical situation. After a bolus injection of 260 MBq of Tc-99m-DTPA, 1 sec frames during 1 min and 20 sec frames during 20 min were acquired. The processing provides three indices: (1) a perfusion index based on the KIRSCHNER K/A ratio of initial slopes; (2) a GFR index based on GATES method; (3) a washout time calculated on the decreasing part of the renogram. In 6 transplants MAG3 and DTPA were compared.

Initial ATN was diagnosed in 14 patients. rejection was present in 11 cases, 9 developed renal stenosis, 3 superimposed cyclosporine nephrotoxicity, and urologic complications were diagnosed in 6 patients.

Tc-99m-DTPA renography is a simple, reproducible and valuable method for diagnosing the main complications occurring after renal transplantation and assessing response to therapy. The impact of the procedure is improved with the use of baseline and serial examinations, and by the integration of radionuclide findings with clinical parameters.

SIMULTANEOUS EVALUATION OF MYOCARDIAL PERFUSION
AND LV WALL MOTION USING 99mTc MIBI SPECT GATED
MYOCARDIAL STUDY

A. Kuczkowska, M. Wypych, B. Bogdanek, J. Szarek, B.
P. Kowalczyk, A. Gawlik, S. Jankowski
Department of Nuclear Medicine, Medical Academy
in Lublin, Poland

After myocardial administration of 99mTc MIBI, the
ECG gated activity measurements were performed
over the heart area in the LAO 45° position. In
this method, the count rate was maximum in the
systole and minimum in end-diastole. In order to
the procedure adopted for the radioisotope veno-
culography, analysis of count rate variations on
pixel basis of the gated myocardial study was
performed. The Fourier amplitude (FA) and systolic
diastolic index (SDI, maximum counts minus minimum
counts, divided by average counts in given pixel)
were calculated for the time activity curve in
each pixel of the LV area and displayed in color
coded images. The distribution of these indices
within the left ventricle was assessed in normal
subjects and in patients with CAD using the refer-
ence circle method and compared with the normal-
ized distribution of activity in LV myocardium.
The results obtained suggest that the ECG gated
myocardial study may be useful in assessing the
effect of myocardial perfusion abnormality on the
regional wall motion of the LV.

ROLE OF 99M-TC-FIBRINOGEN SCINTIGRAPHY IN DETECTION OF DEEP VEIN THROMBOSIS.

Y. Krausz (1), M. Liebergall (2), E. Lavie (3), P. Lebensart (4), R. Marciano (1), H. Atlan (1). Nucl. Med. (1), Orthop. Surg.(2) and Radiol.(4), Hadassah Hosp., Jerusalem, and NRC, Soreq, Yavne(3), ISRAEL.

Noninvasive imaging has become a major step in diagnosis and treatment of patients with deep vein thrombosis.

The role of 99m-Tc-fibrinogen scintigraphy was evaluated in 17 patients with clinically suggested deep venous thrombosis after orthopedic surgery. Duplex ultrasound was obtained in 11 patients and contrast venography in 5 patients. Informed consent was obtained from all patients.

Scintigraphy was performed after intravenous injection of 30 mCi of 99m-Tc-fibrinogen with images obtained over pelvis and lower limbs 5 min., 3h and 24h post injection. Abnormal uptake at 3h which persisted through 24h was considered as positive, in the absence of blood pool activity.

Five out of the 17 studies were interpreted as positive, with confirmation by either duplex ultrasound or venography or both. The active process was detected only in the 24h images in these studies, while the 3h images were still negative. In 12 negative scans, 8 were confirmed by negative duplex studies, 2 were confirmed by negative venography and in 2 patients no further studies were performed.

The delayed detection of deep vein thrombosis for 24h by the 99m-Tc-fibrinogen scintigraphy and the need to withhold heparin therapy until after the study, limit the use of this technique to screening of patients at risk, rather than to clinical use in the acute stage. When the study is equivocal, it should be followed by duplex ultrasound or contrast venography.

LUNG PERFUSION SCANS IN PATIENTS WITH CONGENITAL HEART DEFECTS

M.M. Melloul¹, A. Tamir², M. Jorant², G. HOFER³, E. Lubin¹, L.C. Gliden¹, S. Zeevi², Institutes of Nuclear Medicine¹, Pediatric Cardiology², and Pediatric Radiology³, Beilinson Medical Center, Petan Tikva and the Tel Aviv University Sackler School of Medicine, Israel.

Lung perfusion was evaluated in 63 patients with various congenital heart defects using technetium Tc99m macroaggregated albumin. Abnormalities of right lung perfusion were documented in 34 patients (54%). A particularly high incidence occurred in patients who had undergone a systemic pulmonary artery shunt operation as initial palliation or following right ventricular outflow reconstruction and in patients with bilateral pulmonary artery stenoses. Serial studies were helpful in evaluating functional results of different transcatheter interventions for optimizing pulmonary blood flow. The radionuclide quantitative relative perfusion method was proved to be a sensitive means of detecting cases of abnormal lung perfusion.

THE VALUE OF ULTRASONOGRAPHY AND SCINTIGRAPHY FOR
THE DIAGNOSIS AND CONTROL OF NON SURGERY TREATMENT
OF THE THYROID GLAND CYSTS

GEMBICKI Maciej and PIETZ Leszek

Radioisotopic scintigraphy created the basis for the first classification of the thyroid nodules determining them as "hot" and "cold". According to this classification the thyroid gland cysts were within the group of "cold" nodules. The important progress in the diagnosis of the thyroid gland cysts is connected with the introduction of ultrasonography. Both methods become much more efficient in the diagnosis and classification of the thyroid gland cysts when combined with fine needle biopsy and aspiration biopsy. The wide use of these techniques brought also some therapeutic possibilities of non surgery treatment of the cysts.

We selected 49 patients with true cysts from the group of 341 persons investigated because of the presence of the thyroid gland nodules. All of them were investigated by radioisotopic scintigraphy and ultrasonography combined with fine needle biopsy. In the group of these 49 cases the cysts disappeared after aspiration biopsy and were divided to two subgroups according to the kind of fluid detected. One with the cysts containing serum like fluid / 31 cases/ and the second containing blood /18 cases/. In all of them after careful examinations, scintigraphy and ultrasonography including as well as the control of thyroid gland function, a solution of Doxycyclin was injected to the cyst after second aspiration biopsy. The results controlled after 1,2, 3,6, and 12 months after Doxycyclin injection were quite satisfactory because in 12 cases the cysts disappeared completely, in other 30 cases the production of fluid was reduced or stopped and in the place of former cysts a small hard nodule appeared and in 7 cases the calcification of the cysts were observed.

Better results were observed in the cysts containing serum like fluid than in the cysts containing blood.

THYROID DISORDERS INDUCED BY RECOMBINANT ALPHA-INTERFERON THERAPY IN PATIENTS WITH CHRONIC C HEPATITIS.

B.BOK*, M.POUTEAU*, E.BAUDIN*, P.MARCELLIN-, N.COLAS
LINHART*, J.P. BENHAMOU* , Depts of Nuclear Medicine (*) and
Hepatology (-) - Hosp. Beaujon, CLICHY FRANCE.

In about 40 % of the patients with chronic C Hepatitis (CCH), normalisation of the alanin-aminotransferase (ALT) is obtained after recombinant alpha Interferon (RAI) therapy. This treatment is usually well tolerated, but some thyroid dysfunctions have been reported. The study was then aimed at establishing the prevalence of hyper or hypothyroidism after RAI in CCH patients.

74 CCH patients were included in a therapeutic trial. They then received during 24 weeks, 3 to 10 MU three times a week of RAI. A Thyreostimuline (TSH) IRMA assay was performed every 3 months. In case of abnormal finding free T4 (fT4), free T3 (fT3), antithyroglobulin (Tg Ab) and antimicrosome (MAb) antibodies were also controlled. In 4 patients the treatment was interrupted for non-thyroid reasons and one patient escaped the survey.

Before treatment, TSH levels were normal in 60 patients. In 8 patients (11%), thyroid abnormalities were noted during (5 cases) or at the end of the treatment (3 cases)

5 patients became hypothyroid, 1 of them with clinical symptoms. One of them, although euthyroid when starting RAI had a family history of thyroid disorders. In 3 patients, the presence of Tg Ab and Mab was noted. In 2 patients, a short phase of purely biological hyperthyroidism was noted before hypothyroidism appeared. In all but one patient, substitutive hormonotherapy was considered necessary and the abnormalities disappeared after withdrawal of RAI.

Hyperthyroidism was noted in 5 patients. In two of them already mentioned, it was only transient and followed by hypothyroidism. In two other patients purely biological hyperthyroidism was noted at the end of the treatment and disappeared spontaneously within weeks. In one patient clinical hyperthyroidism appeared after two months RAI. This patient however had received previously Amiodaron. Hypothyroidism developed later on in this patient and required substitutive hormonotherapy.

In conclusion, the prevalence of thyroid abnormalities occurring during RAI therapy of CCH is high (11%). Therefore, thyroid status should be checked before starting and surveyed all along the duration of Interferon therapy.

QUALITATIVE AND QUANTITATIVE BONE SCINTIGRAPHY IN
TRAUMATOLOGY

J. Spitz, H. Weigand, K. Tittel

Since Subramanian described the Tc-99m-labeling of phosphate compounds in 1971, bone scintigraphy has become one of the most important tasks in nuclear medicine. But there are almost no quantitative data about bone remodeling in man after trauma.

So over 2000 bone scans after trauma were screened retrospectively and allow to describe the following rules of bone remodeling after fracture in man:

1. Within 24 hours after a fracture there is a diffuse increase of the tracer due to the reactively increased perfusion.
 2. Lesions in the neighbourhood of joints show up intensively and early whereas lesions of the body stem and the shafts of long bones sometimes need up to 10 days to become obvious.
 3. In the next 2-3 weeks the focal lesions show an increasing accumulation of the tracer. The scale of this increase is significantly different for different fracture sites.
 4. The highest tracer accumulation was found between 2-5 weeks after the trauma, apparently depending on the extent of the fracture callus of different fracture sites.
 5. During the 24-hours after injection different fracture sites show a different initial intensity and different extent of increase in accumulation.
 6. The estimation of the ratio 24 hours to 4 hours allows the differentiation of fractures from soft tissue lesions.
 7. The appearance time of a fracture does not depend of the age of the patient but on the fracture site in the skeletal system.
 8. It is possible to estimate the relative fracture age.
- The knowledge of the qualitative and quantitative data leads the way to a standardized application of bone scanning and with that to an improvement in specificity in traumatology.

"COLD-KIT" PREPARATION OF I-131 mIBG.

S.M. Karesh, Ph.D. and R.E. Henkin, M.D.
Loyola University Medical Center, Maywood, IL, USA.

In an effort to simplify in-house labeling of I-131 mIBG, "cold kits" were prepared consisting of 1 ml of a sterile, pyrogen-free aqueous solution of mIBG (2 mg/ml) and ammonium sulfate (12 mg/ml). The kits were stored at 4°C prior to use. Preparation of the I-131 mIBG was accomplished by injecting the contents of the "cold kit" into a vial containing 1-10 mCi of I-131 sodium iodide (NaI) and then subjecting the reaction mixture to two 30 min heating cycles at 155°C with addition of 1 ml of water for injection between the heating cycles. To facilitate the solid state reaction, water in the reaction mixture was removed by distillation and collection in a sterile vented glass tube through butterfly tubing. The dried reaction mixture was then reconstituted in bacteriostatic water for injection and terminally filtered. Average radiochemical purity obtained for 75 lots of I-131 mIBG prepared by this method was 97%; the overall yield based on mCi of I-131 NaI in the reaction mixture was 88%. Stability studies indicate that the product maintains its label throughout the first 7 days post labeling. Both clinical and chromatographic comparisons indicate essentially identical performance for this product and commercially available I-131 mIBG. For those laboratories holding approved IND Exemptions for I-131 mIBG, this method represents a simple, rapid and inexpensive procedure for preparing this valuable radiopharmaceutical.

TISSUE CHARACTERIZATION BY MRI AND NUCLEAR MEDICINE IN OSTEO-MUSCULAR PATHOLOGIES : COMPETITION OR COMPLEMENTARITY ?

SCHNEIDER Christian, CHAMBRON Jacques
INSTITUT DE PHYSIQUE BIOLOGIQUE - 4 rue Kirschleger
67085 STRASBOURG CEDEX - FRANCE

Bone and joints NM investigations are widely used owing to their higher sensitivity than conventional radiology (CR) in early detection of fast evolving pathological processes. Bone metastasis screening still represents the main clinical demand, rheumatology and sport's traumatology being new fields in growing stage. Although specific tracers are now available for detecting tumor or infection and associated inflammation, ^{99m}Tc -phosphate compounds (PYP or MDP) are still the main tracers used for dynamic and/or static bone scintigraphy.

With reference to CR, Magnetic Resonance Imaging (MRI) provides a better contrast in soft-tissues and in medullar bone related to content and mobility of water and fat. T1, T2 and diffusion weighted images of high spatial resolution are obtained allowing characterization of changes in the tissular water dynamical structures which are associated with most of the osteo-articular pathologies. This high sensitivity explains the rapid development of MRI indications.

Three topics will be discussed:

1. The superiority of NM as the first procedure in the diagnosis and follow-up of bone multiple lesions without focal clinical symptoms.
2. In opposite, the predominant role of MRI in the investigation of the large joints.
3. The complementarity of both modality, better assessed by using superimposition techniques, MRI improves localization of an increased phosphate turn-over as early detected by NM.

These trends, already mentioned in the literature, are supported by our own work based on a 200 MRI serie using a 0.28T Bruker resistive system at the IBP. As example we would like to present partial data regarding to sympathetic reflex syndrome and osteonecrosis of the hip. The results have shown a higher score for MRI/MN for both affections leading to indicate MRI as the procedure of choice in front of a painful hip without clinical signs of arthritis and a normal CR appearance.

Although less specific than NM, MRI is of high performance in the diagnostic of osteomuscular pathologies. In a large number of clinical indications competition will appear, being a stimulating challenge for NM and encouraging the development and utilization of more specific tracers. Complementarity is to be considered 1/ in view of localization i.e. metastasis screening for NM followed by MRI but also 2/ for tissue characterization. To achieve these goal the superimposition of NM/MRI images will be helpful.

METABOLISM OF RADIOCESIUM IN HUMANS

M. R. Quastel

Institute of Nuclear Medicine, Soroka Medical Center and Faculty of Health Sciences
Ben Gurion University of the Negev, Beer Sheva, Israel, and

Health Protection Branch, Health and Welfare Canada, Ottawa, Ont., Canada

Exposure of residents of the USSR living in regions near the Chernobyl accident has reawakened interest in the problem of human radiocesium exposure. Data on the normal absorption and excretion of Cs-137 in relation to body burden as measured by whole body counting are reported. The urinary excretion of radiocesium was found to show a marked diurnal variation, falling to about a half during the night, and was most clearly seen when expressed in terms of concurrent creatinine excretion. Caribou meat containing relatively high levels of radiocesium was fed to 9 volunteers. There was almost complete absorption of the isotope (>99%) during the initial phase; urinary excretion was prominent (10% in the first 24 hrs). Urine:fecal ratios were generally about 3-5 and the biological half life corresponded to reported values of 90-120 days. Prussian blue accelerated radiocesium excretion in the feces by about twice without effect on urinary concentration. Cs-137 showed differences in biological handling compared to potassium. The Cs-137:K ratio in the red cells was 1/6 that in the muscle mass and that in the urine was 1/3 that seen in the muscle mass indicating substantial differences in renal mechanisms and in transmembrane transport in red cells. Substantial amounts of Cs-137 appeared in the sweat increasing during exercise to rates of excretion equal to that appearing in the urine.

CORRELATIVE IMAGING OF THE HEAD AND NECK

R. Chisin

The extracranial head and neck together comprise a region of complex anatomy that challenges imaging techniques. Because of the variety of anatomic regions of the extracranial head and neck, the imaging strategy will be discussed by anatomic areas. MR and CT are complementary imaging modalities for orbital pathology.

CT remains the study of choice for inflammatory disease and cholesteatoma of the middle ear and mastoid cavities. MRI with Gd-DTPA is the modality of choice for evaluating neoplasms of the cerebellopontine angle and of the internal acoustic meatus.

MRI had replaced CT for the evaluation of the majority of tumors in the major salivary glands. contrast CT is a more reasonable choice for demonstrating stones, inflammatory masses, and abscesses. However, Tc-99m-pertechnetate scan with sialogogue stimulation by lemon, the only functional imaging test of salivary tissue, should be more utilized. MRI is the examination of choice for the evaluation of the parapharyngeal space, the nasopharynx and the oropharynx and oral cavity. If mandibular invasion is suspected, CT and last but not the least Tc-99m-MDP bone scan should be performed.

In the neck, radionuclide techniques have retained their prominence for thyroid diseases; as for preoperative detection of parathyroid adenoma, Thallium/technetium - pertechnetate subtraction imaging has proven equal to US, CT or MRI. MRI challenges CT in laryngeal and hypopharyngeal imaging as well as for cervical lymph node detection.

Special attention should be given to imaging of osteomyelitis which can involve the paranasal sinuses, the mandible, the temporal bone and the base of skull. Tri-phase bone scan is here very helpful.

CORRELATIVE PEDIATRIC IMAGING

Itzak Garty and Martin P. Sandler, Central Emek Hospital, Afula, Israel and Vanderbilt University Medical Center, Department of Radiology, Nashville, Tennessee, U. S. A.

Nuclear medicine, ultrasound, and magnetic resonance imaging (MRI) are considered ideal imaging modalities for pediatric patients. The future is even more promising for pediatric imaging with the development of newer and improved radiopharmaceuticals, instrumentation and diagnostic modalities such as positron emission tomography, labeled monoclonal antibodies, and faster dynamic and contrast enhanced MRI methods. However correlation of more conventional imaging modalities with nuclear medicine, ultrasound and MRI remain essential for optimal patient care.

The recent technological advances in nuclear medicine, the introduction of new short-lived radiopharmaceuticals, and improved detector systems have considerably minimized the radiation exposure to pediatric patients. This has led to the dramatic development of nuclear medicine as a pediatric imaging modality over the last decade.

Magnetic resonance imaging (MRI) in children is a promising modality, due to the lack of radiation exposure, superior anatomic resolution, and exquisite soft-tissue contrast capability. In some disease categories, MRI is complementary to other imaging modalities such as computed tomography (CT), ultrasonography (US) and nuclear medicine. However, MRI is rapidly replacing CT as the study of choice in the evaluation of neurological disease.

A survey of correlative imaging in the pediatric age group organized by anatomic regions will be presented.

UPTAKE AND DISTRIBUTION OF ^{99m}Tc -MDP AND ^{99m}Tc -MD32P,
DURING RAT TIBIAL BONE REPAIR

Shani, J., Schwartz, Z., Soskolne, W.A., Touma, H., Amir, D. and Sela, J. - Departments of Pharmacology, Oral Pathology, Orthopedic Surgery and Periodontology, The Hebrew University - Hadassah Medical center, Jerusalem 91120, Israel

^{99m}Tc -phosphates are extensively used for detection of bone formation and resorption. Uptake of ^{99m}Tc -labeled phosphates was studied in an animal model of primary osteogenesis following tibial marrow injury in a rat, and incorporation of the radionuclide was correlated with that of ^{47}Ca and ^3H - ^{32}P , and with matrix vesicle calcification. ^{99m}Tc -MDP uptake on day 6 after injury in the whole tibial bone was increased compared to controls, and on that day an increase in vesicular diameter and distance from the calcified front was observed. ^{99m}Tc -phosphate was detected only in the organic phase, while ^3H - ^{32}P and ^{47}Ca were detected in both the organic and the inorganic phases, suggesting that ^{99m}Tc may serve as a specific marker for the anabolic phase of remodeling, and that increased incorporation of ^{99m}Tc during bone healing indicates enhanced organic matrix formation, but not necessarily calcification (JNM 31:2011,1990). In a dual isotope labeling of MDP, MD32P was synthesized at the Nuclear Research Center - Negev, by isotopic exchange of ^{32}P during the reaction of triisopropylphosphate with methylene dibromide, in the presence of ^3H - ^{32}P . ^{99m}Tc -MD32P was injected to one group of injured rats, and MD32P to another. ^{99m}Tc and ^{99m}Tc -MDP were used as controls. While ^{99m}Tc did not show any adsorption to the healing leg or to the control leg, MD32P was significantly taken up by the healing leg, both in the whole bone and the inorganic phase. Similar results were obtained when ^{32}P was counted after the SC administration of ^{99m}Tc -MD32P or ^{99m}Tc -MD32P. When ^{99m}Tc was counted after administration of ^{99m}Tc -MD32P or ^{99m}Tc -MDP, no preferential uptake was detected in the inorganic phase of the injured leg, and enhanced uptake was noticed in the whole bone and the organic phase. The lack of uptake of ^{99m}Tc by the inorganic phase of bone suggests that although it is a reliable marker for bone matrix formation, it is not an indicator of bone mineralization activity.

BRAIN RECEPTOR IMAGING WITH SPECT : PRINCIPLE AND INDICATIONS

Prof. S. ASKIENAZY

Neuroreceptors have been widely studied by PET. Many ligands of various neuroreceptors have been described in different cases.

Many groups are working on the development of such ligands, suitable for SPECT, using ¹²³Iodine. Some of these ligands are already commercially available.

Before using those neurotracers, one should understand the mechanisms involved and define the indications for such studies and try to answer some questions : should this technique be kept for research only or is it useful in daily practice ? Can it be performed with standard (rotating gamma-cameras) equipment or does it necessitate dedicated machines ? What about quantitation in order to evaluate target to non-target ratios.

many of those problems have still to be solved.