

# Chosen abstracts of VIII<sup>th</sup> Polish SNM Congress

## ONCOLOGY 1

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### STRONTIUM-89 AND PAMIDRONATE IN COMBINED PALLIATIVE THERAPY OF OSTEOBLASTIC-OSTEOLYTIC BREAST CANCER BONE METASTASES

Bączyk M., \*Bączyk E., Sowiński J.

Dept. of Nuclear Medicine and \*Dept. of Palliative Care

University School of Medical Sciences, Poznań, Poland

**Introduction.** The cancer bone metastases in 40% of patients with advanced breast cancer are detected; osteolysis predominates in 70% of cases, but in 30% osteoblastic component is observed, that gives the possibility for use of strontium-89.

**Aim.** The aim of this study was to evaluate the effectiveness of connected therapy using strontium-89 (osteoblastic component) and pamidronate therapy (osteolytic component) in the group of breast cancer patients with multiple osteoblastic-osteolytic (mixed) bone metastases.

**Material and methods.** 13 patients with breast cancer and multiple bone painful metastases (2 or more) detected by scintigraphy and by radiogram or CT or MRI (character of metastases) were included in the study. All patients have been treated with analgetics (NSAID + opioids). Each patient received 150 MBq of strontium-89 (Metastron, Nycomed-Amersham) combined with intravenous infusion of 60 mg pamidronate (Aredia, Novartis) and short low-dose steroid therapy. The bisphosphonate therapy was repeated every month. For assessment of therapy effectiveness, pain relief (VAS scale), a reduction in analgesic requirements and motor activity (ECOG and Karnofsky scale) were evaluated. The group of 10 patients treated with bisphosphonate only in the same time was observed.

**Results.** During follow-up after 4 weeks and 10 weeks of the end of strontium-89 therapy, we noticed pain relief effects as follows: "good" (VAS<2) in 4 patients, "moderate" (VAS<5) in 5 patients, "no effects" (VAS>5) in 4 patients. We have observed that the analgesic requirements decreased to 30% of dose on average. The motor activity of the points evaluated increased from 3 to 2 in the ECOG scale and from 40 to 60 in the Karnofsky scale. No pathological fractures, hypercalcemia and other serious side effects with clinical manifestations were observed. The results of treatment in the group with strontium 89 and bisphosphonate were better than in the group treated with bisphosphonates only (40% "good" and "moderate" response rate, one case of pathological fracture).

**Conclusions.** We conclude that combined palliative therapy using strontium-89 and bisphosphonates is effective (69% "good" and "moderate" response rate) and safe for bone pain palliation in patients with multiple osteoblastic-osteolytic bone metastases from breast cancer; it also improves the quality of life.

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### GALLIUM SCINTIGRAPHY OR 18F-FDG-PET IMAGING? CLINICAL EVALUATION IN PATIENTS WITH POST-TREATMENT LYMPHOMA

W. Cholewiński, H. Erler<sup>1</sup>, D. Kendler<sup>1</sup>, C. Decristoforo<sup>1</sup>, R. Greil<sup>2</sup>, R. Moncayo<sup>1</sup>

Dept of Nuclear Medicine, Medical University of Lublin. <sup>1</sup>Dept. of Nuclear Medicine, <sup>2</sup>Dept. of Hematology and Oncology, University of Innsbruck, Austria

**Introduction:** Gallium scan for several years has been one of the best nuclear medicine diagnostic tools in the evaluation of malignant lymphoma. The aim of this study was to assess the current clinical value of gallium scintigraphy as compared to 18FDG-PET technique in patients with malignant lymphoma after therapy.

**Material and Methods:** Both gallium and PET studies were performed in 16 patients (5F, 11M, mean age 40±16y) with histologically confirmed malignant lymphoma: 8 Hodgkin lymphoma (HL) and 8 high-grade non-HL. In all patients chemotherapy was completed within at least 4 weeks before examination. Gallium planar and SPECT images were obtained 48 h post injection of 185 MBq of 67Ga citrate using double-head gamma camera (Helix, Elscint). 18F-FDG-PET studies were performed with a double-head digital gamma camera (ADAC VERTEX), equipped with molecular coincidence detection, 60 minutes post injection of 148-185 MBq of 18F-deoxyglucose. Mean time interval between Ga and PET study was 17 ± 14 days. The sites with pathological tracer uptake were verified by CT (n=16), MRI (n=2), US (n=2), >2years follow-up (n=10) and histology (n=6).

**Results:** Gallium scan showed 17 foci with increased tracer uptake in 13 patients. 11 lesion were found above diaphragm and 6 in abdomen. PET studies revealed pathologically increased glucose uptake in 11 patients in 28 lesions. 10 lesion were found in thorax and neck, 18 in abdomen. Using gallium scan 10 patients were diagnosed properly however in the remaining 6 patients gallium scan showed 1 false negative result and in 5 false positive. With 18F-FDG all patients were diagnosed according to the presence of disease (11 true positive and 5 true negative). PET however showed 4 lesions, which during follow-up turned out to be benign.

**Conclusions:** Gallium scintigraphy has lower sensitivity and specificity than 18FDG-PET imaging in post-treatment evaluation of patients with malignant lymphoma, especially when abdominal lesions are suspected. In centers where 18FDG supply is possible PET imaging seems to be the method which could replace gallium scan in the clinical evaluation of malignant lymphoma after therapy.

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### THE POSSIBILITY OF QUALIFICATION PATIENTS SUSPECTED OF BONE METASTASES FOR SKELETAL SCINTIGRAPHY ACCORDING TO CONCENTRATION OF COLLAGEN TURNOVER MARKERS

M. Konieczna, J. Pietrzykowski, K. Chmielowski, E. Dziuk

Nuclear Medicine Center, Central Clinical Hospital Military Medical University Warsaw, Poland

**Introduction** Malignant metastases to bones develop frequently in the course of cancer. Their early detection and the possibility of monitoring of effectiveness of treatment intended to improve patient's quality of life are necessary. Finding of an adequate parameter which could make it possible would be useful for clinical practice.

**Material and methods** The study involve 187 cancer patients. They were divided into three groups according to scintigraphy results: group 0 -with normal scintigram (n=75), group 1-with single „hot” foci (n=74), group 3 - with multiple „hot” foci (n=38)

Skeletal scintigraphy was performed with gamma camera Apex SP6 after intravenous injection 925 MBq Tc-99m MDP.

In these patients two markers of bone formation were determined: amino- and carboxyterminal propeptides of I type procollagen (PINP and PICP) The third one was the marker of bone resorption and collagen degradation product: carboxyterminal telopeptide of type I collagen (ICTP).

**Results** All three markers are statistically significant increased only in group 2. According to discriminant analysis PINP is best marker for discriminating group 2 from remaining groups.

ICTP is characterised by highest sensitivity ( 86% )

ICTP and PINP have highest negative prognostic values ( 94 and 92% respectively)

**Conclusion** PINP is best correlated with scintigraphic result.

PINP and ICTP concentration within reference range may allow abandoning unnecessary bone scintigraphy during follow up of disease.

Markers of collagen turnover alone can not be used for diagnosing of bone metastases

### CARDIOLOGY 1

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#### THE VALUE OF THE LEFT VENTRICULAR EJECTION FRACTION ASSESSED BY GATED SPECT PERFUSION SCINTIGRAPHY. CORRELATION WITH CONTRAST VENTRICULOGRAPHY

M. Kobylecka<sup>1</sup>, J. Kunikowska<sup>1</sup>, A. Rak<sup>2</sup>, L. Królicki<sup>1</sup>, G. Opolski<sup>2</sup>

1. Nuclear Medicine Department, Warsaw Medical University

2. Klinik of Kardiolog and Internal Medicine Warsaw Mecical University

**Background:** LVEF is one of the most powerful predictors of prognosis in the coronary artery disease (CAD). There are several techniques providing the ejection fraction information used in clinical practice. However the concordance between them is various in different medical centers.

**Aim:** Aim of this study was the comparison between Gated 99mTc-MIBI SPECT LVEF and LVEF obtained from contrast ventriculography in our hospital.

**Material and Methods:** 51 patients with established CAD, reported for coronary angiography, were included. All patients underwent the contrast ventriculography and the MIBI-perfusion study using a standard two days stress/rest MIBI SPECT protocol with G-SPECT at rest. LVEF was calculated from G-SPECT resting perfusion images using the commercial software (QGS-SPECT). A standard technique was used for EF calculation during contrast ventriculography. The linear regression function for both GSPECT and CV LVEF values was calculated.

**Results:** LVEF obtained from G-SPECT ranged from 26 to 70% with a mean value 54 (SD 10.6). EF calculated from contrast ventriculography ranged from 50 to 93% with a mean value 73 (SD 11.6). The differences between G-SPECT EF and CV LVEF were significant ( $p < 0.05$ ). The correlation coefficient calculated for EF between both modalities was 0.81.

#### Conclusions:

1. G-SPECT tends to underestimate LVEF compared to contrast ventriculography. The difference between both values is statistically significant.
2. The approximate value of the GSPECT LVEF is 0.76 x CV LVEF.
3. It is important to use only one technique for LVEF measurement for patients follow up studies. However if comparison of various modalities LVEF data is necessary, the calculated parameter should be used.

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#### E PERFUSION THE OF THE LOWER LIMBS BY MEANS OF MIBI – – NORMAL AND PATHOLOGICAL RESLTS ACCORDING OWN DATA BASE. COMPARISON WITH OTHER NONINVASVE TPE OF DIANOSTICS

B. Małkowski, Z. Maziarz , R. W. Tryniszewski, A. R. Myśliński, W. Tomaszewski,

Zakład Medycyny Nuklearnej Katedry Diagnostyki WAM Łódź

Lack of normal results of the lower limbs' perfusion study narrows this type of diagnostics to the estimation of present state of perfusion without the conclusions about the presence and level of perfusion disturbances.

**The aim of our study was:** 1. Establish normal results of indexes of the lower limb perfusion, which can be used in our department. 2. Compare normal and pathological results with other non-invasive diagnostics to assess value of the method. 35 male patients without signs of circulatory disease and 30 with the lower limb's circulatory disturbances were entered into the study. Medium age was  $44.4 \pm 3.2$  years. Lower limbs' perfusion scintigraphy was performed in rest 5 min. after injection of 11,1MBq/kg 99mTc MIBI. The whole body and every part of lower limbs (tights, calves) acquisition were performed on ELSCINT SP6HR gamma-camera. Symmetry of the tights and calves perfusion (ST, SC.) indexes of tight (IRTP, ILTP) and calves (IRCP, ILCP) perfusion for each side of lower limbs were estimated. USG-Doppler, arm-ancle's index, blood pressure and laboratory tests were performed on every patient to exclude circulatory disturbances. Normal results: ST- $102.76\% \pm 7.6$  SC- $99.27\% \pm 9.8$  IRTP- $10.17 \pm 2.5$  ILTP- $9.9 \pm 2$  IRCP- $10.4 \pm 2.3$  ILCP- $10.46 \pm 2.5$ . Pathological results were above these values. In the group without circulatory disturbances additional examination did not show any circulatory and laboratory disturbances. In the group with circulatory disturbances of the lower limbs we found abnormalities in the perfusion studies, USG-Doppler, arm-ancle's indexes, cholesterol, and triglycerid concentration.

**Conclusions:** 1.The the lower limbs' perfusion scintigraphy indexes in patients without circulatory disturbances did not show statistical differences from estimated mean values.2.Determine normal values enable full diagnosis in patients with the pathology of the lower limbs' circulation.

### RADIOPHARMACY

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#### DEVELOPMENT OF A KIT FORMULATION FOR PREPARATION OF $^{99m}\text{Tc}$ -EDDA/HYNIC-TOC

C. Decristoforo<sup>1</sup>, R. Mikolajczak<sup>2</sup>, B. Gorska<sup>2</sup>, A. Markiewicz<sup>2</sup>, E. Guggenberg<sup>1</sup>

<sup>1</sup>University Clinic for Nuclear Medicine, A-6020 Innsbruck, Austria

<sup>2</sup>Radioisotope Centre POLATOM, 05-400 Otwock - Swierk

**Introduction:** Clinical studies have shown that  $^{99m}\text{Tc}$ -EDDA/HYNIC-TOC has promising properties as a possible replacement of  $^{111}\text{In}$ -DTPA-Octreotide for Somatostatin receptor scintigraphy. Direct  $^{99m}\text{Tc}$ -labelling of HYNIC-TOC with EDDA as coligand results in low and varying labelling yields. The aim of this project was to establish a formulation suitable for kit formulation based on a Tricine coligand-exchange reaction allowing quantitative labelling for routine clinical use.

**Materials and methods:** Parameters such as EDDA concentration, temperature, pH and  $^{99m}\text{Tc}$ -activity were tested in a wet formulation. Radiochemical purity was determined using RP-gradient HPLC and TLC. Peptide integrity was tested in radioligand binding assays. Freeze drying of various formulations was performed using a CHRIST alpha freeze dryer.

**Results:** Using the Tricine-coligand exchange labelling reaction with 1000MBq  $^{99m}\text{Tc}$ , 20 $\mu\text{g}$  HYNIC-TOC at pH6.5, 5mg/ml EDDA, 100° 10min reaction time radiochemical yields of  $95.9\% \pm 1.9$  ( $n=5$ ) were obtained with retained receptor binding of the peptide. For freeze drying modifications of the wet formulation concerning additives and pH had to be made to grant radiochemical purity and stability.

Two freeze dried formulations resulted in suitable clinical quality. Different batches at different scale were prepared. Kits with >3 months stability were prepared and have been used in clinical trials, examples of patient studies will be shown.

**Conclusion:** A formulation has been developed allowing a routine clinical preparation of  $^{99m}\text{Tc}$ -EDDA/HYNIC-TOC for further clinical evaluation.

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#### IMAGING CHARACTERISTICS AND DOSIMETRY OF $^{99m}\text{Tc}$ -EDDA/HYNIC-TOC, A PROMISING RADIOPHARMACEUTICAL FOR SOMATOSTATIN RECEPTOR SCINTIGRAPHY AND COMPARISON WITH $^{111}\text{In}$ -DTPA-OCTREOTIDE\*

W. Cholewiński, C. Decristoforo\*, M. Gabriel\*, E. Guggenberg\*, R. Moncayo\*

Dept of Nuclear Medicine Lublin, \*University Clinic for Nuclear Medicine, Innsbruck

**Introduction:** It has recently been shown that  $^{99m}\text{Tc}$ -EDDA/HYNIC-TOC (TcTOC) has promising properties as a possible replacement of  $^{111}\text{In}$ -DTPA-Octreotide (In-OCT) for somatostatin receptor scintigraphy. Its potential advantage lies in a lower radiation burden to the patient, better availability of the radionuclide and a simplified imaging protocol compared to  $^{111}\text{In}$ -DTPA-Octreotide

**Materials and methods:** Twenty six patients were studied in comparison with Octreoscan, after giving informed consent. The patients presented with thyroid adenocarcinomas ( $n=5$ ), MTC ( $n=3$ ), GEP-tumours ( $n=10$ ), carcinoid syndroms with unknown primary lesions ( $n=4$ ), paragangliomas ( $n=2$ ) and pituitary tumor ( $n=2$ ). TcTOC was given at a dose of 300-350 MBq and imaging was done at 4h p.i. including WB scan and SPECT studies. In 10 patients WB scans were performed 15 min, 1h, 4h and 24 h p.i. Final confirmation of suspected lesions was obtained by correlative inspection of matched CT or MR scans. Tracer biodistribution was evaluated using whole body images and conjugated views. Mono- and biexponential time-activity curves were fitted. These data and physical half-life of  $^{99m}\text{Tc}$  were used to calculate the residence times. For calculating self-S values for spherical tumours, the „Nodule Module” option in the MIRDose 3.1 Software was used.

**Results:** In 7 patients SSTR-scintigraphy was negative with both Tc-TOC and In-OCT. Matching positive scintigraphic results with both tracers were obtained in 17 out of 19 patients. In-OCT failed to detect two CT-positive thoracic lesions in two patients with thyroid cancer, whereby these lesions were seen by Tc-TOC. The biodistribution and kinetics of  $^{99m}\text{Tc}$ -EDDA/HYNIC-TOC in the source organs were used to calculate the residence times. From these values calculated absorbed doses for different organs were: spleen (0.0223 mGy/MBq), kidneys (0.0261 mGy/MBq), liver (0.0032 mGy/MBq), heart wall (0.0028 mGy/MBq), lungs (0.0063 mGy/MBq).

**Conclusion:** In this series of patients  $^{99m}\text{Tc}$ -EDDA-HYNIC-TOC imaging resulted in equivalent diagnostic information on the somatostatin receptor status, with advantages of a single acquisition, one day protocol and lower radiation dose. The excellent imaging properties resulted in improved diagnosis in 2 of 30 patients when compared to  $^{111}\text{In}$ -DTPA-Octreotide.

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### PRELIMINARY ASSESSMENT OF USEFULNESS OF $^{99m}\text{Tc}$ -HYNIC-TYR<sup>3</sup>-OCTREOTIDE OF POLISH ORIGIN FOR RECEPTOR SCINTIGRAPHY

E. Młodkowska\*, R. Mikolajczak\*\*\*, A. Markiewicz\*\*\*, B. Górska\*\*\*, J. Kunert-Radek\*\*, J. Kuśmierek\*

\* - Dept. of Nucl. Med., \*\*Inst. of Endocrinology, Medical University of Łódź

\*\*\* - Radioisotope Center POLATOM Otwock/Swierk

**Introduction:** A HYNIC-Tyr<sup>3</sup>-Octreotide conjugate, in form ready for ex promtu labeling with  $^{99m}\text{Tc}$ , had been prepared at the Research Development Center POLATOM. Studies performed in vitro and in vivo on an animal model indicate that the preparation has a high potential to serve for purposes of receptor scintigraphy in humans. Objective of the study was to assess usefulness of the new radiopharmaceutical (RPh) of Polish origin for scintigraphic detection of neoplasms with enhanced expression of somatostatin receptors as well as for formulation of indications to somatostatin (Ss) therapy.

**Materials and methods:** The study has been made on two groups of patients: A-11 patients in whom the aim consisted in detection of a possible neoplasm, B-10 patients referred for assessment of somatostatin receptor expression prior to possible therapy with Ss. The activity of the conjugate injected varied from 740 to 925 MBq. Scintigraphy (SPECT and/or whole body scan) was performed 2 hours post administration of the RPh.

**Results:** The scintigrams obtained were of high quality. As a positive result (+) a focus of evidently increased uptake of activity at the site of a verified lesion was taken. A negative sign (-) indicates lack of the focal accumulation and +/- a weak uptake, taken as uncertain diagnosis. Summary of the results in both groups are presented in tables I and II (below).

**Table I.** Search for possible neoplasm.

Clinical diagnosis	Results +	Results -	Results +/-	Overall
Pulmonary cancer	3	0	1	4
Carcinoid	2	0	0	2
Melanoma (skin)	2	1	0	3
Mammary cancer	1	0	0	1
Serotonin secreting tumor	0	0	1	1
Total	8	1	2	11

**Table II.** Selection of patients for possible sandostatin therapy

Clinical diag.	Results +	Results -	Results +/-	Overall
Hypophyseal tumor	4	0	0	4
Tu. secret. ACTH (nonoper.)	0	1	0	1
Thyroid medullary cancer	0	1	0	1
Sarcoidose (pulm.,eyes)	1	0	0	1
Diabetic retinopathy	2	1	0	3
Total	7	3	0	10

**Conclusion:** The tested new radiopharmaceutical seems to be potentially useful for detection of tumors with overexpression of somatostatin receptors. The results suggest also usefulness of the RPh for rational substantiation of sandostatin therapy in patients with various ailments in whom density of the somatostatin receptors is uncertain.

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### VALUE OF $^{99m}\text{Tc}$ -HYNIC-TYR<sup>3</sup>-OCTREOTIDE IN DIFFERENTIAL DIAGNOSTICS OF SOLITARY PULMONARY NODULES – PRELIMINARY COMMUNICATION

A. Plachcińska\*, R. Mikolajczak\*\*, A. Markiewicz\*\*, B. Górska\*\*, A. Michałski\*\*\*, K. Rzeszutek\*\*\*, J. Kozak\*\*\*\*, E. Młodkowska\*, J. Kuśmierek\*

\* Department of Nuclear Medicine, Medical University of Łódź,

\*\* POLATOM – Świerk, \*\*\* Center for Pulmonary Diseases, Łódź,

\*\*\*\* Department of Thoracic Surgery, Copernicus Hospital in Łódź.

**Introduction:** Overexpression of somatostatin receptors in various malignant tumors prompted search of somatostatin analogs, which, after radioactive labeling, could be used in oncological diagnostics. The  $^{99m}\text{Tc}$ -HYNIC-Tyr<sup>3</sup>-octreotide is a receptor bound radiopharmaceutical (RPh) developed in Poland, that now undergoes clinical trials. The purpose of the present study was the assessment of the RPh's usefulness for differential diagnostics of solitary pulmonary nodules (SPN), detected in lung radiograms, into malignant and non-malignant tumors.

**Material and methods:** The study included 25 patients with solitary pulmonary nodules of diameter between 3 ml 7 cm. In all patients a full clinical verification was secured, including bacteriological, cytologic and histologic examinations. In 18 patients pulmonary cancer was diagnosed (in 16 non-small cell and in 2 small cell). In 7 remaining patients nonmalignant tumors were found (4 tuberculomas, 3 nonspecific granulomas and 1 nonspecific infection). In all patients receptor scintigraphy was performed, using  $^{99m}\text{Tc}$ -HYNIC-Tyr<sup>3</sup>-Octreotide. The activity of the latter, administered i.v. amounted to ~ 740 Mbq. The scintigraphy was performed applying SPECT procedure 2 hours post-injection, using high resolution collimator and 128x128 images matrix. Acquisition consisted of 120 projections in full angle of rotation. Tomographic reconstruction was made applying Metz-filter (3,10). Accumulation of activity was evaluated in 3 series of cuts: transverse, coronal and sagittal, concentrating on elevation of the uptake in regions of interest corresponding to localization of the SPN, as seen in radiograms. The accumulation of activity in tumors was evaluated in a 4-grade score: 0 - lack of increased uptake, 1 - slight uptake, 2 - evident uptake and 3 - pronounced uptake (comparable to the uptake in liver).

**Results:** In all 18 malignant tumors there was a notable uptake of the RPh; in 15 - pronounced and in 3 - evident (on the average 2.8, sd-0.4). In 2 of the 7 benign lesions there was no RPh uptake, in the other 3 - slight, in 1 - evident and 1 - pronounced accumulation. Mean score in benign lesions was 1.1 (sd-1.1) and was significantly lower than in malignant tumors ( $p < 0.001$ ).

**Conclusions:**  $^{99m}\text{Tc}$ -HYNIC-Tyr<sup>3</sup>-octreotide demonstrates a potential usefulness for differentiating SPN into malignant and benign lesions. Optimal use of the differentiating properties of the RPh will require application of quantitative assessment of the uptake and derivation of quantitative criteria that will best serve the diagnostic efficacy

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### DIFFERENCE IN METASTATIC PATTERN OF DISSEMINATED CARCINOID IN PATIENTS WITH SECRETOR AND NON-SECRETOR TUMOURS USING IN-111 OCTREOTIDE

Jarosław B. Ćwikla, John R. Buscombe, Martin E. Caplin, Andrew J.W. Hilson

Department of Nuclear Medicine and NET Clinic, Royal Free Hospital; London, NW3 2QG

Functional imaging modality is standard technique to assess presence and extent of disseminated carcinoid.

**AIM OF THE STUDY** Aim of the study was to assess if there is any difference in tumour extent detected by radionuclide study in both secretor and non-secretor carcinoid.

**MATERIALS AND METHOD:** Overall 79 patients, all with histology confirmed carcinoid. Secreting tumours with carcinoid syndrome was present in 30 patients. In-111 Octreotide study was performed using standard imaging protocol. Each study was evaluated to presence of tumour extent within liver, bone, chest, lymph node and pelvis. Part of the body or organ were assessed as follows: no detected lesion, presence of single lesion, 2-lesions<5 and more than 5 lesions detected.

**RESULTS:** In non-function tumours 16 patients had foregut carcinoid, 24 patients midgut, single hindgut, 8 patients had no origin primary. Patients presented secretor carcinoid tumours had 6 foregut origin tumours, 17 midgut tumours, single hindgut tumours and 6 had no-origin. In-111 Octreotide radionuclide study was able detect disease within liver in 65% of patients, there were 29% of patients with multiple liver metastases. Secretor tumours had multiple liver metastases (more than 5 lesions) in 80% of patients, no liver deposits had 10% of patients. Those patients with non-secretor tumours had in 29% of cases multiple liver deposits. There were significant difference between both groups ( $p < 0.01$  Mann-Whitney U test). No bone involvement were detected in 87% patients with secretor tumours and 96% of patients with non-secretor tumours ( $p > 0.05$ ). Lymph node involvement was detected in 60% of secretor tumours and 35% of non-secretor tumours ( $p > 0.05$ ), but 33% of secretor tumours had multiple nodes compare to 18% of non-secretor tumours ( $p < 0.05$ ). Pelvic lesions were In-111 Octreotide positive in 40% in patients with secretor carcinoid compare to 49% in non-secretor tumours ( $p > 0.05$ ).

**CONCLUSION:** These results suggest that there is significant difference between metastatic carcinoid tumour pattern within liver and lymph nodes involvement consider secretor and non-secretor tumour.

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### SAMARIUM PLAYS MAJOR ROLE FOR THE PALLIATION OF PAINFUL BONE METASTASES

Mosa M.

Lacomed Ltd., Area on NRI plc., CZ – 250 68 REZ, Czech Republic, mosa@lacomed.cz

**Abstract:** It is known that nearly 50% of patients with breast or prostate cancer will eventually develop bone metastases. A prominent symptom of these metastases is pain. Since control of metastatic bone pain is a clinical problem, an effective agent for palliation of bone metastases has been searched.

Question is that the radiopharmaceuticals containing samarium-153, strontium-89, rhenium-186, phosphorus-32 are effective, but we do not know which of these is the most efficacious or the safest. Toxicity includes mild-to-moderate pancytopenia and an occasional brief flare of pain, and treatment of patients with disseminated intravascular coagulation must be avoided because it may predispose the patient to severe thrombocytopenia.

Post clinical study by means of Sm-153, Sr-89, Re-186 and P-32 for total 680 patients we can answer, that the earliest time interval to higher level of platelets after initial injection, shows samarium-153.

Sm-153 injection is a safe and effective agent that, due to the complex of radioactive samarium and ethylene-diamino-tetraethylene phosphonic acid (EDTMP) produced into Czech Republic via LACOMED Ltd., shows also an optimal outstanding affinity to the bone metastatic lesions. The clearance of the radiopharmaceutical is very short, the urine excretion is completed within 24 hours after administration. The elimination of drug is characterized by double-exponential curve with half times about 5 minutes and 1 hour. Two hours after administration there is only 5% of the activity applied in the blood.

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### THE EFFECTIVENESS OF STRONTIUM 89 IN PALLIATIVE THERAPY OF PAINFUL PROSTATE CANCER BONE METASTASES

Bączyk M., \*Milecki P., \*\*Bączyk E., Czepczyński R., Sowiński J.

Department of Nuclear Medicine, \*\* Department of Palliative Care University School of Medical Sciences, Poznań, Poland  
\* Great-Poland Cancer Center

**Introduction.** The cancer bone metastases in 80% of patients with advanced prostate cancer are detected.

**Aim.** The aim of this study was to evaluate the effectiveness of strontium 89 (Metastron) therapy in the group of prostate cancer patients with multiple bone metastases.

**Material and methods.** The study included 57 patients (aged 53–80) with prostate cancer and multiple bone painful metastases (2 or more) detected by scintigraphy and by radiogram or CT or MRI – character of metastases (osteoblastic – 47 patients, osteolytic-osteoblastic – 10 patients). In the all group somatic bone and neuropathic pain was detected. All patients have been treated with analgesic management (NSAID or/and opioids). Before strontium 89 therapy 24 out 57 patients have been performed local irradiation to the back bone as prevention of spinal cord compression. 52 patients received a standard dose 150 MBq of strontium 89, 5 patients a reduced dose 75 MBq (worse haematological parameters), combined with short low-dose steroid therapy. For assessment of therapy effectiveness; pain relief (VAS scale), a reduction in analgesic requirements and motor activity (ECOG and Karnofsky scale) were evaluated.

**Results.** During follow-up after 4 weeks and 10 weeks of the end of strontium 89 therapy we noticed pain relief effects as follows: "good" (VAS<2) in 30 patients (13 with additional radiotherapy), "moderate" (VAS<5) in 20 patients (7 with additional radiotherapy), "no effects" (VAS>5) in 7 patients (4 with additional radiotherapy). We have observed that the analgesic requirements decreased to 50% of dose on average. The motor activity of the points evaluated according to ECOG scale and Karnofsky scale was much better ( $p < 0.05$ ). 2 cases of pathological fractures, 6 cases of mild hypercalcemia and no serious haematological side effects with clinical manifestation were observed. The results of treatment in the group with strontium 89 were much better than in the group without therapy (8 patients with pancytopenia and osteolysis).

**Conclusion.** We conclude that palliative therapy using strontium 89 is effective (88% "good" and "moderate" response rate) and safe for bone pain palliation in patients with multiple prostate cancer bone metastases; it also improves the quality of life.

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### LYMPHOSCINTIGRAPHIC DETECTION OF SENTINEL NODE IN PATIENTS WITH CUTANEOUS MELANOMA – OWN EXPERIENCE

E. Młodkowska\*, J. Kuśmirek\*, A. Berner\*\*, D. Nejc\*\*

\* Department of Nuclear Medicine, Medical University of Łódź

\*\* Department of Oncological Surgery, Center of Oncology, Medical University of Łódź

**Introduction:** In patients with cutaneous melanoma a sentinel node (SN) for the tumor may be detected by means of lymphoscintigraphy (LS).

**Objective of the study:** Optimization and assessment of efficacy of the LS method for detection of the sentinel node.

**Materials and methods:** 74 patients (pts) with surgically removed primary lesion were studied. LS was performed on a day preceding surgical biopsy of the SN. 74 MBq of 99mTc Nanocoll were equally distributed into 4 syringes, which served for intradermal injections of the sites surrounding the scar, remaining after removal of the primary melanoma focus. The imaging was started immediately after administration of labeled Nanocoll and appearance of the focus of activity, representing the SN was noted and localized on skin surface by means of 57Co point source. In following images penetration of the radiopharmaceutical in lymph nodes of the regional and distal groups was observed, making detection of sometimes remote sentinel nodes possible.

**Results:** SN (or several nodes) were identified in all of the 74 pts (100%). Visualization occurred within 2 to 40 (mean 12 + 10) min. post injection. The time to appearance was longer for head, neck and trunk and shorter for extremities. A SN in only one regional lymph node group was observed in 57 pts (77%) and in two groups in 17 pts (23%). The latter finding was noted mainly in cases of localization of the primary neoplasm on the trunk, in close proximity to the midline of the body. In 36 patients (49%) 2 SN were observed - in nearly half of them in the same regional lymph node group. In 2 pts 3 SN and in other 2 pts 4 SN (in two groups) were localized. In 56 patients (76%) there were no technical difficulties noted in the procedure; in the remaining 18 (24%) there was insufficient contrast between count rate over the SN and the surrounding tissues; in such cases lead shielding was applied to the injection site, to eliminate the high count rate.

**Conclusions:** The preoperative SN lymphoscintigraphy is a safe procedure, in most cases easy to perform and highly efficacious in visualization of SN(s) in patients with cutaneous melanoma.

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### USEFULNESS OF SERUM TUMOUR MARKERS (CEA, CA-15.3,TPA) MEASUREMENTS IN EVALUATION OF BREAST CANCER NEOADJUVANT CHEMOTHERAPY

A. Kocharńska-Dziurowicz<sup>1</sup>, T. Jankowski<sup>2</sup>, A. Bijak<sup>1</sup>, A. Staniek<sup>1</sup>, E. Górná<sup>2</sup><sup>1</sup>Department of Radioisotope Diagnostics and Radiopharmaceuticals Medical, University Silesian; <sup>2</sup>Oncological Clinic SPZOZ in Chełm,

**Introduction:** In most countries of the world, as well as in Poland, breast cancer is the major oncological issue, as it represents 17% of malignancies in women. Early detection makes it curable. Physical examination, visual techniques and above all serum tumor markers measurements are the main tools in early diagnosis of breast cancer. The aim of the study was establishing the usefulness of serum tumor markers (CEA, CA-15.3, TPA) measurements in evaluation of breast cancer neoadjuvant chemotherapy in accordance with the CMF regimen.

**Material and methods:** The study included 30 women aged 30-68 (mean age 51.8) diagnosed with breast cancer, who were admitted to Oncological Outpatient Ward in Chełm, Poland. Breast cancer in the second clinical stage was recognized in 18 cases (60%) and 12 (40%) in the third clinical stage.

Blood samples were taken on the first day and after three courses of chemotherapy using CMF regimen, and frozen in -20°C. Concentration of markers were evaluated using IRMA method: CA-15.3 and CEA - CIS and TPA - Byc-Sangtec. The percentage of confirmed positive values prior to the treatment was 40%, 23.3% and 10% respectively for CA-15.3, TPA and CEA.

We found statistically significant differences ( $p < 0.05$ ) between arymetric mean concentration in tumor markers prior to and after neoadjuvant chemotherapy.

Geometric mean with semi-interquartile range of serum concentrations are presented in table.

Clinical stage	CEA [ng/ml]	CA-15.3 [U/ml]	TPA [U/l]
Normal range	<4.0	<30	<75
Before treatment n=30	2.29 ± 0.80	49.1 ± 29.3	28.1 ± 25.0
Before treatment with I <sup>lo</sup>	2.24 ± 0.65	45.3 ± 25.5	21.8 ± 15.2
Before treatment with II <sup>lo</sup>	2.38 ± 0.91	55.5 ± 49.0	40.9 ± 60.5
After treatment n=30	1.96 ± 1.10	22.7 ± 7.5	10.6 ± 21.9
After treatment with I <sup>lo</sup>	1.71 ± 1.10	19.7 ± 5.7	8.2 ± 17.0
After treatment with II <sup>lo</sup>	2.43 ± 0.90	28.0 ± 10.0	15.5 ± 25.7

Usage 3 of CMF at women from II<sup>lo</sup> caused lowering CA-15.3 to physiological concentrations and at women from III<sup>lo</sup> to upper limit norm. Geometric mean TPA concentrations being in range of norm submissive further to lowering, instead CEA concentrations being in range of norm submissive after treatment to lowering only at women from II<sup>lo</sup>.

**Conclusion:** Obtained results show that in chance of estimation of efficiency of treatment of breast cancer CMF greatest value diagnostic possesses CA-15.3 marker.

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### ESTIMATION OF USEFULNESS OF MONITORING TPA CONCENTRATIONS IN THE EFFECTIVENESS OF SURGICAL TREATMENT OF URINARY BLADDER CANCER

A. Kochańska-Dziurowicz<sup>1</sup>, M. Mielniczuk<sup>2</sup>, A. Bijak<sup>1</sup>, M. Jamroz<sup>1</sup>, M. Gidzior<sup>1</sup>

<sup>1</sup> Department of Radioisotope Diagnostics and Radiopharmaceuticals Medical University of Silesia, <sup>2</sup> Department Urological of District Specialistic Hospital in Bytom,

**Introduction.** Urinary bladder cancer takes the third place in all cancer tumors. Each year in Poland 4000 new cases of this disease are diagnosed. Incidences of this disease are most frequent in men above 60.

Björklund discovered tissue antigen polipeptid (TPA) in cancer tissue. At present it is considered that it is not proliferation but apoptosis marker. In the cancer cells TPA is found most abundantly on the surface of tumors, in proliferation places, that is in groups of cells attacking surrounding tissues. TPA penetrates to blood serum and its concentration exceeds 85 U/l.

**The aim** of this work was to answer the question whether TPA determination in patients after electroresection of urinary bladder cancer can be used to establish the probability of tumor reemission.

**Material and methods:** The research included 98 patients, all of whom had under-taken electroresection of urinary bladder tumor (TUR-T - transurethral resection of tumor), which enabled its removal, and then estimation of malignancy and progression stage according to international TNM scale. The mean age was 62.7. All patients had blood samples taken to determine TPA, and then underwent routine cystoscopy examination. TPA was determined using IRMA method with Byk-Sangtec kit.

**Results.** All patients were divided according to cystoscopy results into two groups: patients with tumor reemission (60 patients; mean age 64 ± 10) - group 1 and patients without reemission (38 patients; mean age 61.3 ± 11) - group 2. The geometric mean concentration of TPA in the first group was 30.2 U/l, and in the second group 26.2 U/l ( $p > 0.1$ ).

	T1	T1/2	TPA Geometric mean [U/l]	T2/3	T3	T3/4
With reemission (n = 60)	30.4 (21.7%)	10.2 (6.6%)	23.2 (41.6%)	31.5 (11.7%)	59.8 (13.3%)	161.6 (5%)
Without reemission (n = 38)	25.5 (31.5%)	32.51 (0.5%)	24.7 (50%)	17.5 (2.6%)	43.9 (5.3%)	— (0%)

In brackets the percentage of patients according to progression stage.

Taking the TPA threshold point 85 U/l as normal true-positive results were 16.3% and true-negative were 31.6%, false-positive results were 7.1% and false-negative were 44.9%. The ROC curves with calculated area under them are the measurement of diagnostic estimation of TPA concentrations in specificity and sensitivity categories. For examined group the calculated P was 0.45. If P value is under 0.5 it is considered that test should not be used in diagnosing reemission of bladder cancer.

**Conclusions.** Determination of TPA concentrations in patients after electroresection cannot be the base for estimation of cancer reemission or recovery.

## P-CARDIOLOGY

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### THE COMPARISON OF TC-99M-MIBI SPECT AND GATED SPECT (GSPECT) IN DIAGNOSIS OF CORONARY ARTERY DISEASE

J. Pietrzykowski<sup>1</sup>, M. Dziuk<sup>2</sup>, M. Zachorski<sup>3</sup>

<sup>1</sup>Centre of Nuclear Medicine, <sup>2</sup>The Institute of Internal Medicine Department of Cardiology, <sup>3</sup> Department Cardiology of Observation Central Clinical Hospital Military School of Medicine Warsaw

**Introduction:** A standard SPECT acquisition makes possible a spatial image of myocardium perfusion defect at stress and rest as well as quantification of their reversibility. GSPECT (gated SPECT) defines simultaneously perfusion and function: thickening, myocardial motion, ejection fraction value end-systolic volume and end-diastolic volume. Information on both of perfusion and function of myocardium (GSPECT) permit to determine the myocardial status.

**Aim of study:** SPECT and gated SPECT comparison and estimation of incremental GSPECT parameters value in recognition of myocardium function and perfusion defects.

**Material and methodology:** Studies were performed in 143 patients with suspected or known coronary artery disease. Studies were performed in 2-day protocol: exercise stress on first day, rest after three days. We analyzed the isotope uptake in myocardium, ejection fraction, end-systolic volume and end-diastolic volume aiming to recognize a coronary disease.

Perfusion scintigraphy was reported positive if the uptake was decreased in stress with improvement at rest. Perfusion scintigraphy was negative if no perfusion defects were found in stress and rest study, permanent perfusion defects in both of tests, proper perfusion in stress study and its decrease at rest.

**Results:** The average difference of ejection fraction ( $\Delta EF$ ) in studied patients with negative(-) and positive(+) scintigraphy was smaller than 1%. The change of end-systolic volume (ESV) in patients with positive scintigraphy reached a statistical significance of trend. There was no correlation found between perfusion reversibility and change of end diastolic volume.

**Conclusions:** ( $\Delta EF$ ) does not show to be helpful to estimate the result of treadmill exercise scintigraphy in the study group. There are no physiological changes in end systolic(ESV) and end diastolic(EDV) volumes in patients with positive scintigraphy. The changes of volume ( $\Delta ESV$ ) can be helpful in ischaemia diagnosis.

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### 99M-TC SESTAMIBI MYOCARDIAL SPECT AT REST AND AFTER DIPYRIDAMOLE IN PATIENTS WITH CARDIAC SYNDROME X

R. Czepczyński, D. Rogacka\*, I. Smolarek, R. Oleksa, H. Wysocki\*, J. Sowiński

Dept. of Endocrinology and Metabolism, \*Dept. of Intensive Cardiological Care, Univ. School of Medical Sciences, Poznań

**Introduction.** Patients with anginal chest pain, a positive result of exercise test and normal arteries in coronary angiography are classified as cardiac syndrome X. Aim of the study was to analyse the results of SPECT in patients with cardiac syndrome X and to define the role of myocardial perfusion SPECT in the diagnosis of syndrome X.

**Material and methods.** All patients qualified to the study fulfilled the criteria of syndrome X. The group consisted of 68 patients - 48 women (63.2%) and 25 men (36.7%) aged from 32 to 60 years (median 45 years). 99m-Tc-sestamibi SPECT at rest and after dipyridamole infusion (0.56 mg/kg body weight) was performed according to the two-days protocol. The perfusion of each 9 segment of left ventricle was assessed using a 4-points scoring system (from 0 to 3), where 0 meant absence of radio-tracer uptake and 3 stood for normal uptake. The summed scores of all segments at rest (S<sub>r</sub>) and after dipyridamole (S<sub>d</sub>) was analysed statistically.

**Results.** Some significant ECG abnormalities during dipyridamole infusion were detected in 24 patients (35.3%). S<sub>r</sub> was from 16 to 27 (average 22+/-2,7) and S<sub>d</sub> was from 16 to 27 (average 22.4+/-2.5). There was no significant difference between S<sub>r</sub> and S<sub>d</sub>. The individual evaluation, however, showed an impairment of myocardial perfusion by 1-6 points after dipyridamole infusion (S<sub>d</sub><S<sub>r</sub>) in 26 patients (38.2%), an improvement of perfusion by 1-7 points in 28 patients (41.2%) and no change of perfusion in 14 patients (S<sub>d</sub>=S<sub>r</sub>). In 6 patients, impairment of perfusion in some segments and improvement in other segments at the same time was found. SPECT results were independent of patients' age. The improvement of myocardial perfusion was more frequent in men (12/25 - 48%) than in women (16/43 - 37%).

**Conclusions.** 99m-Tc-sestamibi myocardial SPECT demonstrates different patterns of myocardial perfusion disturbances (decrease, increase or no change of perfusion after dipyridamole) in patients with cardiac syndrome X. Thus, in some patients with this syndrome, in whom no perfusion impairment after dipyridamole is found, coronary angiography can be avoided.

## Abstracts

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### DOES QUANTITATION OF MYOCARDIAL PERFUSION SPECT STUDY DIFFER WHILE IMAGE RECONSTRUCTION IS CARRIED OUT USING ITERATION ALGORITHM INSTEAD OF FILTERED BACKPROJECTION?

Krzysztof Kędziora, Piotr Lass

Department of Nuclear Medicine, Medical University, Gdańsk, Poland

**BACKGROUND:** The purpose of this study was to compare performance of two reconstruction algorithms: conventional filtered backprojection (FBP) and an iterative algorithm - ITW in quantitative analysis of myocardial perfusion SPECT studies. The defect size and defect severity were assessed on  $^{99m}$ Tc-MIBI images reconstructed using both methods and estimation of sensitivity in the detection of perfusion deficits and myocardial viability were performed as well.

**METHODS AND RESULTS:** The study group comprised 43 patients (38 men and 5 women) at the age of 40-73 years (mean 59 years). Heart perfusion scintigraphy has been performed following an injection of 22 to 25 mCi  $^{99m}$ Tc-MIBI for exercise and rest myocardial perfusion study. Images were reconstructed using FBP and ITW algorithms. Defect size (DS) was quantified by a threshold program and CEqual programme. Defect severity (nadir) was calculated as the ratio of minimal/maximal counts from bull's eye polar map. Coronary arteriography has been performed in all patients.

**RESULTS:** Defect size calculated by threshold method on resting images did not differ between reconstruction methods ( $p=0.61$  for cut-off 50% and  $p=0.24$  for cut-off 60%); defect severity was higher on images reconstructed with ITW ( $Cl_{0.95} = 2.4\% \div 5.2\%$  of maximal counts).

**CONCLUSIONS:** Sensitivity for detection of heart perfusion defects and estimation of myocardial viability were similar on images reconstructed by both algorithms.

## P-ENDOCRINOLOGY

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### APPLICATION OF RADIOGUIDED OCULT LESION LOCALISATION METHOD IN SUBCLINICAL RECURRENCES OF DIFFERENTIATED THYROID CANCER

M. Turska<sup>1</sup>, B. Maćka<sup>1</sup>, A. Sacher<sup>1</sup>, J. Krajewska<sup>2</sup>

<sup>1</sup> Clinic of Oncological Surgery, Center of Oncology, Maria Skłodowska-Curie Memorial Institute, Gliwice Branch, <sup>2</sup> Dept. of Nuclear Medicine and Endocrine Oncology Maria Skłodowska-Curie Memorial Institute, Gliwice Branch.

Clinically occult loco-regional recurrences in thyroid cancer patients can be operated by applying ROLL method (Radioguided Occult Lesion Localisation). In this method we use  $^{99m}$ Tc - albumin (ALBU-RES, 100  $\mu$ Ci in 0.1 ml) into cytologically diagnosed lesions using ultrasound-guided technique. Afterwards, we are able to localize precisely these small tumors by means of intraoperative gamma-rays detector.

Our material consists of eight thyroid cancer patients who have been operated many times and treated by iodine  $^{131}$ I. Six of them had local recurrence, in two – neck lymph node metastases were diagnosed. We were able to localize all the lesions (5 to 20 mm in diameter) described in ultrasound examination. All of them where pathologically proved, afterwards.

**Conclusions:** Application of ROLL method in subclinical recurrence of differentiated thyroid cancer allows to:

- shrink the operation field
- shorten the operation time
- minimize the frequency of complications

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### EFFECT OF LITHIUM CARBONATE ON $^{131}$ I UPTAKE IN THE THYROID GLAND.

Plazińska M.T., Królicki L., Jędrzejowski M.

Department of Nuclear Medicine, Medical School of Warsaw.

The iodine kinetic in thyroid tissue is significantly affected by lithium salts. They block the release of organic iodine from the thyroid gland. This effect suggests that lithium may be useful as an adjunct to radioiodine therapy in thyrotoxicosis.

The aim of this work was to evaluate the influence of lithium carbonate pretreatment in the group of hyperthyroid patients with low and normal iodine uptake. We evaluated the iodide uptake before and after lithium carbonate intake in 10 patients with RAIU<30% and RAIU>40%. Both groups were discriminated according of disease, age, sex and duration of disease as a possible factors influencing the results. Kinetic examinations of iodine uptake were repeated after lithium carbonate was included in the dose of 0.5g per day. The retention of iodine in the first group at the 6 and 24 hours amounted 13 +/- 4%, and 25 +/- 6%, respectively and in the second group 32 +/- 5% and 51 +/- 9%, respectively.

**No effect of lithium carbonate on the  $^{131}$ I uptake was noted in all patients with baseline RAIU>40%.** The uptake of iodine after 6 and 24 hours were 34 +/- 4% and 55 +/- 6%, respectively. Despite the lack of effect on the radioiodine uptake a significant prolongation of the biological and effective half live time were observed. The biological half live time increased from 24 to 240 days and effective half live time increased from 6 to the 7.8 days ( $p < 0.005$ ).

**A significant increase of iodine retention was noted in patients with baseline RAIU<30%.** During lithium carbonate treatment T6 increased to the 21 +/- 5% ( $p < 0.01$ ) and T24 to the 38 +/- 7% ( $p < 0.001$ ). The biological half live time in this group increased from 5.8 to 267 days ( $p < 0.001$ ) and effective half live time amounted 7.8 days ( $p < 0.001$ ).

The results indicate that the response of iodine uptake on the lithium carbonate depends on the baseline RAIU but the response on the biological and effective half live times are uniform.

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## THE COMPARISON OF DUAL-PHASE TC-99M MIBI SCINTIGRAPHY VERSUS TC-99M/TC-99M MIBI SUBTRACTION SCINTIGRAPHY IN PATIENTS WITH PRIMARY HYPERPARATHYROIDISM

M. Kobylecka, J. Miśkiewicz, M. Jędrzejowski, L. Królicki

Nuclear Medicine Department, Warsaw Medical University

**Background:** Technetium-99m MIBI scintigraphy is one of the basic modalities of preoperative diagnosis of primary hyperparathyroidism. The preoperative parathyroid scintigraphy is routinely performed by using 201Tl/99mTc subtraction technique or dual-phase 99mTc MIBI scintigraphy. Dual-phase 99mTc MIBI scintigraphy is based on the delayed washout of MIBI from parathyroid tissue compared to thyroid tissue. In patients with concomitant goitre or focal thyroid lesions dual-phase scan results may not be evident. In these cases, additionally, subtraction MIBI scans are performed.

**Aim:** The aim of this study was to compare the diagnostic value of dual-phase 99mTc MIBI versus 99mTc/99mTc MIBI subtraction scintigraphy in patients with primary hyperparathyroidism from endemic thyroid goitre area.

**Material and Methods:** Scintigraphic scans of 67 patients with primary hyperparathyroidism confirmed by laboratory tests were analysed. In 40 patients (59%) the goitre or focal thyroid lesions were observed. In all cases the dual-phase MIBI scintigraphy was performed. Additionally, in 27 patients, the 99mTc/99mTc subtraction scintigraphy was acquired. At least one focus of abnormal MIBI accumulation was considered positive.

**Results:** 34/67 (51%) focal pathological lesions of increased MIBI accumulation were observed. In this group 16/40 (40%) patients had concomitant goitre or focal thyroid lesions and 18/27 (66%) patients had no pathological thyroid changes. The subtraction scans showed additionally 17 pathological changes that were not visualised in dual-phase scans. In this group 12 patients had concomitant goitre or focal thyroid lesions and 5 patients had no pathological thyroid changes.

### Conclusions:

- Sensitivity of dual-phase MIBI scintigraphy and 99mTc/99mTc-MIBI subtraction scans in patients with primary hyperparathyroidism without pathological thyroid changes is comparable.
- Subtraction scans in comparison with dual-phase scintigraphy allows to visualise more pathological parathyroid glands, especially in patients with goitre or focal thyroid lesions.

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## THE USEFULNESS OF 99M-TC- MIBI SCINTIGRAPHY IN THE DIAGNOSIS AND LOCALIZATION OF HYPERFUNCTIONING PARATHYROID GLANDS, IN SECONDARY AND TERTIARY HYPERPARATHYROIDISM

Kobylecka M<sup>1</sup>, Jędrzejowski M<sup>1</sup>, Chudziński W<sup>2</sup>, Królicki L<sup>1</sup>

<sup>1</sup>Nuclear Medicine Department, Warsaw Medical University

<sup>2</sup>Klinik of General, Vascular and Transplant Surgery Warsaw Medical University

**Background:** Technetium-99m MIBI scintigraphy is useful in the diagnosis of primary hyperparathyroidism.

**Aim:** The aim of the work was to study the diagnostic value of Tc-99m MIBI scintigraphy to localize anomalous parathyroid glands in patients with secondary and tertiary hyperparathyroid disease.

**Material and Methods:** We studied 73 patients with secondary and tertiary hyperparathyroid disease. Each patient was injected with 555 to 740 MBq (15 to 20 mCi) Tc-99m MIBI. The radionuclide images were acquired 20 and 120 minutes after injection using a low-energy, all-purpose, parallel-hole collimator. In 48 cases pertechnetate thyroid scintigraphy was obtained prior to MIBI scintigraphy, subsequently 99mTc/99mTc-MIBI subtraction was performed. The pathological focal uptake in the neck /mediastinum region was considered positive.

**Results:** At least one focus of abnormal MIBI accumulation in dual phase MIBI scintigraphy as found in 16 cases (22%). An ectopic gland was found in four cases. The subtraction showed focal uptake with no retention in 14 cases. The overall MIBI sensitivity was 41%. After parathyroidectomy the abnormal gland was found in all operated cases.

### Conclusions:

- The sensitivity of 99mTc- MIBI scintigraphy in secondary and tertiary hyperparathyroidism is low, but comparable to the reported results at various institutions.
- The subtraction may improve the results of MIBI scintigraphy, when routinely used.
- The reason of the difference between dual phase and subtraction MIBI scintigraphy might be the high rate of thyroid goiter and focal thyroid lesion and presence of parathyroids with atypical washout.

## P-NEUROLOGY

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### REGIONAL CEREBRAL BLOOD FLOW IN POSTMENOPAUSAL WOMEN ON HORMONAL REPLACEMENT THERAPY

R. Junik\*, R. Stopień, \*\*J. Sowiński, A. Warenik-Szymankiewicz

\*Department of Endocrinology and Diabetology of L. Rydygier Medical University, Bydgoszcz, \*\*Department of Endocrinology and Metabolic Diseases, Department of Gynecological Endocrinology, K. Marcinkowskiego University of Medical Sciences, Poznań

**The aim of this study** was evaluation of the influence of hormonal replacement therapy (HRT) on the regional cerebral blood flow in postmenopausal women.

**Material and methods:** Twenty postmenopausal women were studied, mean age  $48.7 \pm 4.9$  years. The study was repeated after 1 year of HRT. The severity of climacteric syndrome was measured with the use of Kupperman index and serum FSH and 17 $\beta$ -estradiol levels. rCBF was measured using SPECT. Tracer's uptake was estimated in cerebellar, thalamic, and ventricular slices. Brain SPECT was repeated in 10 women with an impairment in the rCBF at the beginning of the study.

**Results:** Before HRT mean value of the Kupperman index in the study group was  $29.8 \pm 7.1$  points and after one year of HRT the value of the index was  $13.2 \pm 2.1$  points ( $p < 0.05$ ), serum concentration of FSH decreased from  $56 \pm 49$  U/l to  $36 \pm 57$  U/l, and level of 17 $\beta$ -estradiol increased from  $27 \pm 2$  pg/ml to  $44 \pm 25$  pg/ml. Increasing of rCBF of 7.5% was observed in ventricular right slice and of 6.7% in the left one. rCBF increase was stated in thalamic and cerebellar slices 3.3-5.2% (NS).

**Conclusion:** Hormonal replacement therapy increases regional cerebral blood flow.

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### CEREBRAL BLOOD FLOW SPECT MAY BE HELPFUL IN ESTABLISHING THE DIAGNOSIS OF PROGRESSIVE SUPRANUCLEAR PALSY AND CORTICOBASAL DEGENERATION

Jarosław Ślawek, Piotr Lass, Mirosława Derejko, Mirosława Dubaniewicz, Justyna Scheffler

Department of Neurology and Outpatient Department of Extrapyramidal Disorders, St. Adalbert Hospital, Gdańsk, Poland

Department of Nuclear Medicine, Department of Radiology, Medical University, Gdańsk, Poland

**BACKGROUND:** We present 5 cases, which illustrate the usefulness of neuroimaging studies in atypical forms of parkinsonism. Progressive Supranuclear Palsy (PSP) and Corticobasal Degeneration (CBD) are rare neurodegenerative progressive disorders of central nervous system of unknown cause. Those diseases have similarity to Idiopathic Parkinson's Disease (IPD) but more differentiated clinical symptoms and signs are classified in a group of s.c. parkinsonism-plus. The clinical accuracy in this diagnosis is not very high even in the centres specialised in movement disorders, with usual initial diagnosis of IPD. Functional imaging can be helpful in diagnosing of PSP and CBD, as rCBF SPECT changes may precede CT/MRI changes.

**METHODS:** We present the results of cerebral blood flow (CBF) SPECT scanning in 2 patients with PSP and 2 patients with CBD. This was performed using a triple-head gammacam and  $^{99m}\text{Tc}$ -HMPAO

**RESULTS:** In PSP patients a diffuse frontal perfusion deficit was seen, eventually with striatal and occipital hypoperfusion. CT/MRI was either normal or showed a diffuse cortical-subcortical atrophy. In CBD patients left fronto-parieto-temporal cortex as well as striatal hypoperfusion was shown. CT scanning was normal in one case either normal or showed an asymmetrical temporo-parietal atrophy. In 2 patients rCBF SPECT changes preceded CT/MRI changes.

**CONCLUSIONS:** The pattern of diffuse frontal perfusions deficit in PSP and asymmetrical, subcortical hypoperfusion contralateral to initially unilateral symptoms of CBD cortico- may be helpful in establishing the correct diagnosis. It may enable early diagnosis and early medication slowing down the progression of disease. rCBF SPECT scanning is also less expensive than one with the use of specific ligands, although also less specific.

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**THE USEFULNESS OF CBF BRAIN SPECT IN FORENSIC MEDICINE**

Piotr Lass, Maciej Piskunowicz, Maciej Krzyżanowski, Michał Studniarek

Departments of Nuclear Medicine, Forensic Medicine and Radiology,  
Medical University of Gdańsk

**INTRODUCTION:** The aim of this study was to show the application of cerebral blood flow SPECT scanning in forensic medicine expertise.

**MATERIAL AND METHODS:** CBF SPECT scanning has been performed in 12 persons: suspects, victims of crime and the subjects of civil court cases, using a triple-head gammacamera MS-3 (Siemens) and  $^{99m}\text{Tc}$ -HMPAO (Amersham) or  $^{99m}\text{Tc}$ -ECD (FAM, Łódź). Qualitative and quantitative analysis was performed, utilising an asymmetry index for unilateral perfusion deficits and a comparison to cerebellar perfusion for assessing the regional cerebral perfusion. For assessing the normal values two control groups: 30 patients studied utilising  $^{99m}\text{Tc}$ -HMPAO (Amersham) and 18 patients studied utilising  $^{99m}\text{Tc}$ -ECD was studied.

**RESULTS:** At least in part of these cases CBF SPECT scanning proved its usefulness in medico-legal arguing and played a role in formulating the final forensic expert's opinion.

**CONCLUSIONS:** CBF SPECT scanning may play a role in forensic medicine, where this method is mostly under-utilised at present. Its under-utilisation may be due to the unsatisfactory co-operation of forensic and nuclear medicine specialists as well as, at a high sensitivity, low to moderate specificity of CBF SPECT scanning.

**P-GASTROINTESTINAL**

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**COMPARATIVE ASSESSMENT OF CLINICAL USEFULNESS OF TOTAL PLASMA AND SPECIFIC HEPATIC CLEARANCE OF  $^{99m}\text{Tc}$ -HEPIDA**I. Frieske\*, J. Bialkowska\*\*, J. Kuśmierek\*, J. Liniecki\*, J. Kuydowicz\*\*,  
M.J. Surma\*

\* Department of Nuclear Medicine, Medical University of Łódź

\*\* Chair and Clinical Department of Infectious Diseases, Medical University of Łódź

**Introduction:** Total plasma clearance of  $^{99m}\text{Tc}$ -HEPIDA ( $\text{Cl}_{\text{p}}$ ) is one of noninvasive tests, used in diagnostics of liver parenchyma disease. Its magnitude reflects functional condition of the organ. Disadvantage of  $^{99m}\text{Tc}$ -HEPIDA complex is its partial elimination from the body via urinary system.

Unpredictable and pronounced variability of the fraction of  $^{99m}\text{Tc}$ -HEPIDA that leaves the body by urinary route may render assessment of liver's excretory function – via total plasma clearance determination – quite uncertain. For this reason a method has been elaborated for determination of the specific hepatic clearance of  $^{99m}\text{Tc}$ -HEPIDA. The aim of the study was therefore a comparative evaluation of  $\text{Cl}_{\text{p}}$  and  $\text{Cl}_{\text{hp}}$  (specific hepatic clearance) for assessment of liver's excretory function.

**Materials and methods:** The study was made on 96 patients with chronic disease of the liver: hepatitis B and C, autoimmune hepatitis, parenchymal disorder of the organ in course of alcoholic disease, and with hepatic cirrhosis. In addition, the clearances in 31 healthy volunteers, in two age brackets: a/ 20-25 and b/ 50-55 years of age were also determined. In all subjects the measured values were standardized to the surface of the body = 1.73 m<sup>2</sup>.

The values of  $\text{Cl}_{\text{p}}$  varied from 65 to 312 ml (min 1.73 m<sup>2</sup>)<sup>-1</sup>. Values of the specific hepatic clearance ( $\text{Cl}_{\text{hp}}$ ), expressed as a fraction of  $\text{Cl}_{\text{p}}$ , varied from 29 to 98 %. For values of both clearances four ranges were selected of equal span, and scores were attributed to these ranges from 0 for the lowest to 3 for the highest.

Liver's parenchyma performance was assessed on basis of five laboratory biochemical tests applied commonly in hepatology (AspAT, ALT, GGT, bilirubin pl. conc, proteinogram). Again for each test a range of equal span has been selected, attributing zero score to a physiological (normal) range and up to 3 for most pathological values. In turn, codependance was looked for between a sum of these scores and those attributed to values of the clearances: a/ by means of covariance (Spearman correlation) and b/ applying a  $\chi^2$  test for independence of the measures.

**Results:** There are strong negative correlations between sums of biochemical scores and  $\text{Cl}_{\text{hp}}$  ( $r = 0.66$ ) and  $\text{Cl}_{\text{p}}$  ( $r = -0.6$ ). Values of  $\chi^2$  test for  $\text{Cl}_{\text{hp}}$  and  $\text{Cl}_{\text{p}}$  amounted to 67 and 44, respectively; they indicate again that accord between biochemical indices of hepatic damage and  $^{99m}\text{Tc}$ -HEPIDA clearance is better for  $\text{Cl}_{\text{hp}}$  than for  $\text{Cl}_{\text{p}}$ .

**Conclusion:** The specific hepatic clearance  $\text{Cl}_{\text{p}}$  reflects more adequately liver's parenchyma performance than the total plasma clearance ( $\text{Cl}_{\text{p}}$ ) of  $^{99m}\text{Tc}$ -HEPIDA.

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**DETERMINATION OF HEPATIC  $^{99m}\text{Tc}$ -HEPIDA CLEARANCE BY MEANS OF A SIMPLIFIED, SINGLE BLOOD SAMPLE METHOD**

M.J. Surma

Department of Nuclear Medicine, Medical University of Łódź

**Introduction:** Hepatic clearance of  $^{99m}\text{Tc}$ -HEPIDA is one of parameters for assessment of liver's excretory function, useful in diagnosis and monitoring of conditions impairing integrity of the organ. However, there is no need to determine always the clearance with high precision by means of serial blood sampling over the first 90 min. post injection of the radiopharmaceutical (RPh).

A less laborious, simplified procedure has been developed for determination of the total plasma clearance ( $\text{Cl}_{\text{p}}$ ) and of specific hepatic clearance ( $\text{Cl}_{\text{hp}}$ ). The latter is a difference between the  $\text{Cl}_{\text{p}}$  and urinary (kidney) clearance  $\text{Cl}_{\text{ur}}$  of  $^{99m}\text{Tc}$ -HEPIDA.

**Materials and methods:** The study was made on a set of 165 clearance determinations of  $^{99m}\text{Tc}$ -HEPIDA in patients with varying degree of liver parenchyma damage, using a multisample reference method.

**Results:** Based on the data from the determinations, several relationships were derived enabling:

- determination of  $\text{Cl}_{\text{p}}$  on basis of plasma concentration of the RPh, measured in one sample of blood, drawn between 70 and 80 min post-administration;
- determination of  $\text{Cl}_{\text{ur}}$  utilising plasma concentration of  $^{99m}\text{Tc}$ -HEPIDA measured in one sample of blood, and activity of the RPh, contained in a sample of urine representing excretion over time from zero to 90–100 min post injection;
- calculation of  $\text{Cl}_{\text{hp}}$  as a difference  $\text{Cl}_{\text{p}} - \text{Cl}_{\text{ur}}$ ,
- assessment of precision of  $^{99m}\text{Tc}$ -HEPIDA clearances.

The value of  $\text{Cl}_{\text{p}}$  and  $\text{Cl}_{\text{hp}}$  obtained from these simplified determinations correlate very strongly with the values obtained by means of the multisample reference method ( $r = 0.96$  for both  $\text{Cl}_{\text{p}}$  and  $\text{Cl}_{\text{hp}}$ ).

A dedicated computer program has been developed for calculations involved in simplified clearance determinations.

**Conclusions:**

1. The developed simplified method for  $\text{Cl}_{\text{hp}}$  determination is simple and easy to perform in every nuclear medicine lab. However, precision of the results is inferior to that achievable by means of a multisample reference method, particularly when the clearance to be measured has a value substantially below the normal range.
2. The method, nevertheless, is suitable for screening of patients for presence of liver parenchyma damage

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## PROPOSAL OF ALGORITHM THAT MAKE POSSIBLE QUANTITATIVE ESTIMATION OF HEMODYNAMIC INDICATOR OF BLOOD SUPPLY IN LIVER AND CALCULATION OF OXYGEN SUPPLY

Eugeniusz Zmuda

Szpital Specjalistyczny w Pile, Zakład Medycyny Nuklearnej,

**Introduction:** Despite a huge number of various laboratory examinations in liver diagnostics quantitative information is still not easy available. Those examinations inform about processes taking place in organ. They appear in a miscellaneous phases of disease providing to deep damages of organs. It has to be underlined that inflammation processes or toxins effects on liver first of all disturb hemodynamics of an organ. Those examinations most of all are the only one indicator of liver pathology when sharp period of disease lefts serious damage of an organ which is not possible to detect by other examinations.

The purpose of this work is to introduce an easy way of estimation of quantitative estimation of circulation index via Arteria hepatis, portal vein, total blood circulation via liver and oxygen supply indexes or both of catchment areas.

**Materials:** Examinations were applied to patients sent to ZMN with purpose of appreciation after WZW. For examination was used sulfid colloid marked with Tc. Dynamic activation was processed according to user protocol. After completing of examination it was registered with a right side projection which is used for estimation of liver capacity.

**Method:** After statistic verification of repeatability of section inclination indicator which belongs to liver artery as well as portal vein we stated the following way of proceeding:

1. Generation of dynamic curves from left heart ventricle, liver, right liver area
2. Estimation of maximum activity time on liver curve
3. Estimation of correction of deep indicator for organ location WKGN, indicators of inclination of ascending part of left heart ventricle, liver artery, portal vein which are useful for estimation of blood circulation indicators via Ah IVp, as well as oxygen supply indicator.
4. Generally this algorithm is estimated with a help of 14 easy formulas. Function of natural algorithm was used only in one formula.

Calculation of proper values:

- total blood circulation via liver indicator = 0,25 of circulating blood
- via liver artery = 0,05 o 0,075
- via portal vein = 0,2 to 0,175
- liver oxygen supply indicator = 20,5 to 20,75 (incl. Via liver artery = 4,5 to 6,75) via portal vein from 16 to 14

Standard deviation is expressed in % of average value for lever artery parameters = 6,4% for portal vein = 4,9%.

**Conclusions:** Described algorithm extends range of diagnostics of liver diseases with calculation of chosen hemodynamic parameters and provides its quantitative estimation when other parameters are in the normal range.

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## HEPATOBILIARY SCANNING IN THE DIAGNOSIS OF BILIARY ATRESIA

A. Kamińska, J. Pawłowska, I. Jankowska, E. Świątek-Rawa, P. Socha, A. Kamiński, M. Teisseyre, P. Czubkowski, K. Toth

The Children's Memorial Health Institute, Warsaw

**Objectives:** In the neonatal cholestasis the early diagnosis is vital. Therefor it is essential to find the most sensitive and specific methods. Still, in most Polish paediatric centres the standard is to perform hepatobiliary scanning. The aim of the work is to assess the usefulness of hepatobiliary scanning in the diagnosis of biliary atresia in our patients.

**Material and methods:** 33 hepatobiliary scannings done in 30 children with cholestasis over the last two years were analysed. The mean age was 6,6 weeks. The investigation was done with Multispect camera using intravenous infusion of  $^{99m}\text{Tc-MBIDA}$ .

**Result:** In 23 patients there was scanning done twice in the interval of two weeks. The biliary atresia was proven during the operation and Kasai procedure was done. In 2 children the second scanning showed bile drainage. In 3 children, apart from the failing passage, the intrahepatic cholestasis was diagnosed.

### Conclusions:

1. Hepatobiliary scanning in the diagnosis of neonatal cholestasis showed high sensitivity (100%) but less specificity (74%).
2. In difficult cases the final diagnosis should be made from complex clinical, biochemical and radiological techniques and, eventually, be verified by intraoperative cholangiography.

## P-MISCELLANEA

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### IS THE POLICLONAL IgG SPECIFIC TRACER FOR IMAGING INFLAMMATION?

Z. Grabowski

Department of Nuclear Medicine County Hospital in Siedlce

**INTRODUCTION** In imaging of inflammation, especially of bones, the polyclonal IgG is useful and reliable tracer. It is thought to be specific for inflammation, but not only for infection (for example inflammation of joints). Authors did not find any information about concentration of IgG in bone metastases.

**MATERIAL AND METHODS** During routine investigation of women with pelvic pain, who 15 years before underwent mastectomy for carcinoma, we found intensive uptake of MDP-Tc  $^{99m}$  in right iliac bone. In suspicion of inflammation, we made an examination with IgG. We found typical, intensive uptake of the tracer in this area, and finally diagnosis was osteomyelitis. Because it was clinical doubtful, biopsy was made. Histopathology showed metastasis of carcinoma, probably from carcinoma of the breast. That unexpected results inspired us to make another 3 examinations, both with MDP and IgG in patients, who showed typical multiple metastases to the bones (2 with ca of the prostate, 1 with ca of the breast).

**RESULTS** Scintigraphy with IgG already after 30 min. showed in all patients less or more intensive uptake in metastases to the bones. It was almost impossible to differentiate that uptake of typical uptake in sites of inflammation.

**CONCLUSIONS** Therefore, instead of very limited number of patients, we made preliminary conclusions. Uptake of polyclonal IgG in metastases to the bones from carcinoma of prostate and breast is often. Probable mechanism of that uptake is the same as in the sites of inflammation – polymerisation of IgG in extra vascular space through proteolytic enzymes, which are present in high concentration in carcinoma of prostate and breast, as in the sites of inflammations. Therefore during imaging of inflammation with IgG, that phenomenon should be taken into account.

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### DYNAMIC IMMUNOGLOBULIN G IN INFLAMMATORY LESIONS BONE-JOINT SYSTEM IMAGING BY SCINTIGRAPHY $^{99m}\text{Tc-IgG}$

A. Stepien, J. Pawlus

Department of Nuclear Medicine, 5<sup>th</sup> Clinical Military Hospital, Krakow, Poland

**Introduction:** Usage radiofarnaceuticals which selective accumulation in the site of the inflammatory allowed discovering pathology that cannot diagnosis by others image methods. Scintigraphy  $^{99m}\text{Tc-IgG}$  let distinguish between inflammatory lesions with and without active inflammation. Accumulation of IgG in the site of the inflammation is non-specific and its mechanism is not clear. It is suggested that increase vessels permeability plays the major role in localize IgG in the inflammatory lesions.

**The purpose** of this study was to estimation dynamic IgG in the inflammatory lesion bone-joint system.

**Material and methods:** Scintigraphy IgG performed in 25 patients (110 inflammatory lesions) with clinical confirmed active inflammatory process bone-joint system. Study carried out with  $^{99m}\text{Tc}$  labelled non-specific, polyclonal immunoglobulin G (IgG) (according to Bialobrzeskie). Imaging gamma camera Nucline<sup>TM</sup> TH/AP performed after 1, 4 and 22 hours since administration of the radiotracer.

**Results:** Kinetic IgG estimation on the basis of measurement activity lesions in manual selected regions of interest (ROI) in the function time. Received value activity/cm<sup>2</sup> amended about background around inflammatory lesion and introduced amendment on the radioactive disintegration  $^{99m}\text{Tc}$ . In the all cases observed long-lasting retention of the tracer in the inflammatory lesion with variable in time dynamic. In analyzed group of patients stated 4 false positive lesions (3 changes post-traumatic, 1 bone cancer). We did not observe differences in kinetic IgG between false positive and false negative lesions.

### Conclusions:

1. Presence the tracer in inflammation bone-joint system is long-lasting and characterize slow remove IgG from lesion
  2. Dynamic accumulation of IgG between 4 and 22 hour after administration of the tracer is lesser in compare with the phase between 1 and 4 hour study
- Conclusion, dynamic accumulation of IgG between 4 and 22 hours after injection the radiotracer suggest that imaging in this time is optimal for visible inflammatory changes in bones and joints.

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### INFLUENCE OF INSULIN THERAPY METHOD ON THE INCIDENCE AND PROGRESSION OF URINARY EXCRETION DYSFUNCTION IN TYPE 1 DIABETIC CHILDREN AND ADOLESCENTS

A. Szadkowska<sup>1</sup>, M.J. Surma<sup>2</sup>, E. Młodkowska<sup>2</sup>, J. Bodalski<sup>1</sup>

<sup>1</sup> Institute of Pediatrics, Medical University of Łódź

<sup>2</sup> Nuclear Medicine Department, Medical University of Łódź

**Introduction:** The aim of the study was to estimate the influence of the method of insulin therapy on the incidence and progression of urinary excretion dysfunction.

**Material and methods:** 112 patients (59 male, 53 female) at the age 13±3 years, with duration of diabetes 5±3 years were included into the study. The individuals were divided in to two groups. 63 patients were included into group I, treated by conventional insulin therapy (CIT) and group II (59) for which the therapy was intensified (IIT). The first renal scintigraphy (<sup>99m</sup>Tc-EC) was performed in all patients when they were treated conventionally. The second examination was made after four years in group I, while continuing the CIT, and in the group II treated intensively (IIT). For characterization of the urinary excretion dysfunction we used a 3 grade classification (type Z – normal result, type O1 – modest dysfunction, type O2 – severe dysfunction). Metabolic control of diabetes was evaluated by means of glycated haemoglobin (HbA1c) determined by high pressure liquid chromatography (HPLC) four times annually.

**Results:** In the first renal scintigraphy the incidence of urinary excretion disturbances in both groups was similar. In group I the disturbances were found in 38,1% children (in 18 - type O1 and in 6 - type O2), and in group II in 44,9% individuals (in 16 type O1 and in 6 - type O2). In the second examination we observed more frequent incidence of urinary excretion dysfunction in group I (group I – II: 64,5% vs 28,6%, p<0,001). In that examination in 22 patients of group I the urinary excretion disturbances or their progression were found, and only in one individual an improvement was observed. In group II in 13 children the improvement, and only in 6 persons a deterioration was noticed. During first renal scintigraphy the level of metabolic control in both groups was similar (group I-II: - 9,8 vs 9,5%; ns). During four years of observation in the group with intensified method of treatment (group II) the metabolic control significantly improved in comparison to group I (group I-II: 9,2 vs. 8,1 p<0,001).

**Conclusion:** The intensification of the method of the insulin therapy in type 1 diabetic patients - by improvement of metabolic control - may lead to reduction of the incidence of urinary excretion disturbances.

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### <sup>11</sup>C TRACER IN STUDIES OF NEW MATERIALS FOR SEMICONDUCTOR DETECTORS OF IONIZING RADIATION

B. Petelenz, B. Rajchel, M. Bartyzel, R. Misiak, A. Adamski

The Henryk Niewodniczański Institute of Nuclear Physics, Kraków, Poland

**Introduction.** Ionic methods of surface modification can be used in forming super-hard layers on working parts of endoprostheses or cutting (e.g. surgical) tools as well as in semiconductor technology.

**The aim** of this work was investigation of boron-implanted diamonds as potential materials for miniature thermoluminescence detectors of ionizing radiation, being developed in our Institute for dosimetry in oncological radiotherapy.

**Materials and methods.** Polycrystalline diamond samples were implanted with <sup>11</sup>B boron ions of 25 KeV energy. Surface density of the implanted boron was calculated from the measured charge deposited on the samples, and measured as the activity of the positron emitter <sup>11</sup>C ( $t_{1/2} = 20,38$  min), produced in the samples in the <sup>11</sup>B(p,n)<sup>11</sup>C nuclear reaction. The activations with the 14 MeV internal proton beam were performed in the AIC-144 cyclotron. The intensity of the 511 keV annihilation peak of <sup>11</sup>C was measured by gamma spectrometry.

**Results.** Proton activation is a very sensitive method of detecting isotopically stable <sup>11</sup>B. Gamma-spectrometric measurements of <sup>11</sup>C confirmed semi-quantitatively the estimated density of implanted boron (ca.  $10^{17}$  of <sup>11</sup>B atoms cm<sup>-2</sup>). The accurate analysis was difficult because of large errors in proton energy determination, but these errors will be significantly reduced when the extracted beam becomes available.

**Conclusions.** Ionic implantation of boron into diamonds and diamond-like structures is a promising method of preparation of miniature semiconductor or thermoluminescence detectors.

Proton activation allows one to determine surface concentrations of <sup>11</sup>B in materials in which boron cannot be detected otherwise. It can be expected that deuteron activation will be suitable for determining another stable isotope, <sup>10</sup>B, e.g. in detectors developed for boron neutron capture therapy.

Thick target yields of <sup>11</sup>C produced in the <sup>11</sup>B(p,n) reaction are high enough to consider its application in preclinical research aimed at nuclear medicine (the target material,  $\text{B}_2\text{O}_3$ , is relatively cheap).

## ONCOLOGY 2

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### THE ROLE OF LYMPHOSCINTIGRAPHY IN THE DIAGNOSIS OF MALIGNANT TUMORS OF THE MOUTH, PHARYNX AND LARYNX

J. Manasterski\*, R. Czepczyński, D. Kędzia\*, W. Szyfter\*, J. Sowiński, A. Gracz\*\*

Dept. of Endocrinology and Metabolism

\*Dept. of Otolaryngology, Univ. School of Medical Sciences, Poznań

\*\*1st Dept. of Oncological Surgery, Great Poland Cancer Center, Poznań

**Introduction.** Evaluation of the lymphatic system of the neck is substantial for proper choice of treatment in malignant tumors of the head and neck in  $N_0$  stage, i.e. when regional lymph nodes are not palpable or by absence of lymph nodes greater than 1 cm or sonographically heterogenous. Aim of this study was to evaluate the usefulness of lymphoscintigraphy in the detection of the sentinel node in patients with tumors located in oral, pharyngeal and laryngeal regions.

**Material and methods.** 7 patients (6 men, 1 woman; aged 42-66 years) treated for lingual cancer (3 cases), palliative cancer (1), tonsillary cancer (2) and laryngeal cancer (2) in stage  $T_{1-3} M_0 N_0$  were studied. Lymphoscintigraphy was performed with <sup>99m</sup>Tc-nanocolloid (Nanocol) with activity of 1 mCi (37 MBq). The radiotracer was injected submucosally, directly to the tumor. 15, 30, 60 and 120 min. p.i. acquisition of images of the neck were performed using Nucline gamma camera (Mediso). The visualised lymph nodes were excised and examined histopathologically.

**Results.** In all the patients one to four sentinel lymph nodes in the neck were visualized. Pathological examination revealed metastatic cells only in one of the patients – in this case metastases were found not only in this lymph node but also in other nodes that were not visualised by this method. In the remaining patients no malignant cells in the sentinel nodes were found. During follow-up (4 – 1 months after surgery) a local recurrence was found only in one patient in whom the removed lymph nodes were not metastatic.

**Conclusion.** Lymphoscintigraphy is an efficient method for localization of sentinel lymph nodes in case of the tumors of oral, pharyngeal and laryngeal region in stage  $N_0$ . The obtained results are encouraging, so that the studies will be continued in a larger group and the presented method probably will be introduced to the routine clinical practice.

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### EVALUATION OF THE LYMPHATIC DRAINAGE OF THE THYROID TUMORS USING LYMPHOSCINTIGRAPHY

R. Czepczyński, M. Ruchala, M. Bączyk, J. Sowiński

Dept. of Endocrinology and Metabolism, Univ. School of Medical Sciences, Poznań, Poland

**Introduction.** Evaluation of the lymphatic drainage of a tumor is of great importance while planning the extent of a surgical treatment. Lymphoscintigraphy is one of the methods used for the assessment of the lymphatic drainage. In this study, we assessed the usefulness of lymphoscintigraphy in the preoperative evaluation of patients with thyroid tumors suspected of malignancy.

**Material and methods.** 11 patients in whom a solitary thyroid nodule was found by the means of ultrasound examination and in whom the fine needle biopsy revealed papillary thyroid carcinoma (5 patients) or follicular nodule (6 patients). Before thyroidectomy a lymphoscintigraphy was performed. An activity of ca. 1 mCi (37 MBq) of Tc-labelled nanocolloid (Nanocol®) was injected into the thyroid nodule with the use of a fine needle (0,35 mm diameter). The injection was supervised by the ultrasound imaging. Scintigraphy of the neck was then performed in four phases: phase 1 - 2 min. p.i., phase 2 - 1 h p.i., phase 3 - 2 h p.i., phase 4 - 3 h p.i. The images obtained were analysed for focal activity around the tumor, i.e. outside the injection site.

**Results.** In 2 patients (18,2%) no focal activity outside the tumor was found in any phase of imaging. In the remaining 9 patients (87,8%) altogether 54 extratumoral foci accumulating the tracer were found. In 8 out of 9 patients the first focus (the sentinel node) was observed already in the early images of phase 1. In each next phase of the imaging new foci (lymphnodes) were visualised. In all the study group, the images in phase 1 revealed 20 lymphnodes, in phase 2 - 29 lymphnodes, in phase 3 - 50 and in phase 4 - 54 lymphnodes.

**Conclusion.** In the majority of patients lymphoscintigraphy is able to localise the sentinel node as soon as in several minutes after injection of the tracer into the thyroid tumor. This method can be successfully used in the evaluation of the lymphatic drainage in patients operated for diagnosed or suspected thyroid carcinoma.

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### DYNAMIC LYMPHOSCINTIGRAPHY IN DIAGNOSTIC AND MANAGEMENT OF POSTMASTECTOMY LYMPHOEDEMA

Bączyk M., \*Biela J., Wyszomirska A., Czepczyński R., Sowiński J.

Dept. of Nuclear Medicine and \*Lymphoedema Out-patients Clinic  
University School of Medical Sciences Poznań, Poland

**Introduction.** Postmastectomy lymphoedema develops in 20-36% of women after breast cancer surgery with axillary clearance. In many cases lymphoedema delays full recovery and influence physical and psychosocial well-being.

**Objective.** The aims of the study were:

- to evaluate dynamics of the lymph outflow in patients after axillary clearance for breast cancer with subsequent lymphoedema
- to define the level of lymphatic insufficiency and its influence on effects of complex decongestive therapy (CDT)

**Materials and methods.** The group of patient consisted of 16 women. The age of patients varied from 37 to 65 years. Dynamic lymphoscintigraphy was taken with Varicam gamma camera by Elscint, 0.5 ml of the radiotracer (Nanocoll labelled with 99m Tc) was injected subcutaneously between II and III metacarpal bone at the back of the hand. Subsequent acquisitions were taken every 60 sec., radioactivity over axillary, sub- and supraclavicular lymph nodes area was evaluated. Registered parameters:

- arrival time - the time from radiotracer injection to revealing regional lymph nodes.
- lymph nodes uptake - storage capacity of the radiotracer in the regional lymph nodes in %.
- During examination patient was doing movements of flexion and extension in the wrist to activate muscle pump. The examination was ended by final scintigraphy after 2 hours or if necessary after 5 hours by scintigraphy evaluating dermal back flow. Lymphatic insufficiency was measured in 4 steps scale by Weissleder and compared with clinical grading and effects of CDT.

**Results.** There were three types of images registered:

- no axillary lymph nodes revealed and flat radioactivity curve. This correlated with severe lymphoedema in clinical grading and poor results of CDT.
- a few lymph nodes revealed in the axilla with marked outflow to the subclavicular lymph nodes and delayed transport of the radioactive material. It correlated with moderate lymphoedema in clinical grading and slightly better effects of CDT.
- direct although delayed lymph outflow to the supraclavicular lymph nodes. Those patients had clinically mild lymphoedema and achieved the best results in CDT.

**Conclusions.** Dynamic lymphoscintigraphy helps not only to evaluate the level of lymphatic insufficiency but also to estimate remaining transport capacity and the role of muscle pump in accelerating lymph outflow. Those factors are strong predictors in the treatment efficacy. Lymphoscintigraphy should be done immediately when the first symptoms of lymphoedema occurs. The delay in proper treatment results in massive fibrosis in subcutis that compromises the lymph outflow in remain intact lymphatics.

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### EVALUATION OF THE RADIOTRACER FLOW BY LYMPHOSCINTIGRAPHY IN PATIENTS WITH SECONDARY LYMPHOEDEMA

A. Stępień, J. Pawlus

Department of Nuclear Medicine, 5<sup>th</sup> Clinical Military Hospital, Krakow, Poland

**Introduction:** Lymphoedema is clinical after-effect functional and anatomical insufficiency of lymphatic vessels. Disturbance balance between capillary filtration (production lymph) and its outflow, cause accumulation of the fluid in tissues and migration cells. Untreated lymphatic oedema lead to deepen dysfunction of the limbs, skin ulceration and in extreme cases even cancers (lymphangiosarcoma). In the Europe the major reason lymphoedema are chronic insufficiency veins in the lower limbs, concern about 25-33% women and 10-20% men, cancer diseases and surgical treatment. Efficacy and a relatively non-invasive diagnostic method allow to evaluate of lymph transit is lymphoscintigraphy.

**The purpose** of this study was to estimation of rate and size of the radiofarmaceutical flow in cases secondary lymphoedema by lymphoscintigraphy.

**Material and methods:** Retrospective analysis included 21 patients with unilateral oedema the upper limb after lymphoedema. After subcutaneous injection of 99mTc labelled albumin (Nanoalbumon) into second interdigital space each hand, study was performed. All subjects underwent an initial dynamic acquisition (gamma camera Nucline<sup>TM</sup> TH/AP) of the upper limbs for 30 min, with further images obtained after 2 hours. We selected regions of interest (ROI) and drew curves activity in function time. The diagrams normalized about administration of the radiotracer.

**Results:** The lymphatic transport of the tracer was compared between hand with lymphatic oedema and hand without (normal), according differences in time of injection and activity. The rate and size the tracer transports in that group of patients was differentiated. Accelerated flow was observed in 14,3%, slowed in 38,1% and symmetric in 46,6% cases. The features block of the lymph outflow in dynamic phase of the study was visible only in the regions, which showed retention of the tracer in delay phase of the study. In 74% cases size of oedema in clinical study did not correlate with region retention of the tracer in static analysis.

#### Conclusions:

1. The rate and greatness transit of the tracer in patients with secondary oedema in dynamic phase was differentiated.
2. Accelerated and symmetric of the tracer flow did not exclude lymphatic ground of the oedema.
3. The block in the outflow obtained for regions, which demonstrated prolong retention of the radiotracer.
4. We have not observed connection between spread of the oedema in clinical examination and region retention of the tracer.

## ENDOCRINOLOGY

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### INFLUENCE OF THE ACQUISITION TIME ON THE RESULTS OF DIAGNOSTIC STUDIES WITH <sup>131</sup>I IN PATIENTS WITH DIFFERENTIATED THYROID CANCER

W. Mielcarek<sup>1</sup>, Z. Stembrowicz-Nowakowska<sup>1</sup>, E. Dziuk<sup>1</sup>, A. Kowalczyk<sup>2</sup>, M. Siekierzyński<sup>2</sup>

<sup>1</sup>Centre of Nuclear Medicine and <sup>2</sup>Endocrinology and Radioisotope Therapy Clinic, Central Clinical Hospital WAM, Warsaw

**Introduction.** Detection of the thyroid remnants or metastases in patients with differentiated thyroid cancer may be dependent on various factors (e.g. sufficient level of the TSH stimulation, radioiodine dose, period after radioiodine administration and imaging time, proper procedure to avoid artifacts, equipment). The aim of this work was to assess the utility of an additional, 15 minutes long anterior and posterior scan of the neck and thorax region.

**Material.** The group of patients with finally positive results of the diagnostic scintigraphy consisted of 24 persons (M-3, F-21) aged 27 - 77 yrs (mean 50,9), 22 of them with papillary cancer, 2 follicular cancer.

**Methods.** Whole-body scans (WBS) were performed using dual headed gamma camera Varicam equipped with high-energy collimators. Acquisition time was up to 30 minutes which corresponds with 5 minutes scan of the neck region. Doses ranged from 3 to 5,5 mCi of 131-I (mean 3,8 mCi 131-I). Additionally, 15 minutes long planar studies of the neck and thorax were performed.

**Results.** The foci of increased activity were detected in 18 out of 24 WBS. The remaining 6 patients had changes visible only in 15 minutes long additional study (in 2 evident, in 4 faintly seen) so that additional, longer scans detected remnants not seen on WBS alone in 25 % patients in this investigated group.

**Conclusion.** Taking into consideration also lower doses of radioiodine used in diagnostic scintigraphy WBS without additional, longer scan may underestimate the presence of thyroid remnants.

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### COMPARISON OF TC-99M DUAL-PHASE MIBI SCINTIGRAPHY VERSUS TC-99M/TC-99M-MIBI SUBTRACTION SCINTIGRAPHY IN THE DIAGNOSIS AND LOCALIZATION OF HYPERFUNCTIONING PARATHYROID GLANDS IN SECONDARY AND TERTIARY HYPERPARATHYROIDISM

M. Kobylecka<sup>1</sup>, J. Miśkiewicz<sup>1</sup>, A. Zdrodowski<sup>1</sup>, W. Chudziński<sup>2</sup>, L. Królicki<sup>1</sup>

<sup>1</sup>Nuclear Medicine Department, Warsaw Medical University

<sup>2</sup>Klinik of General, Vascular and Transplant Surgery Warsaw Medical University.

**Background:** The MIBI perfusion scintigraphy is reported to be more sensitive than other diagnostic modalities in the preoperative parathyroid localization studies. The double-phase scintigraphy with Tc-99m-MIBI is the preferred protocol for the diseased glands localization, however the optimal procedure for parathyroid scanning has not been defined. Dual phase MIBI scintigraphy, based on the difference in 99mTc-MIBI clearance rates between the thyroid and diseased parathyroid glands, is the most sensitive in primary adenoma localization (65-83%). On the contrary, there is a high rate of false negative results in patients with secondary hyperplasia. The subtraction technique might be helpful in these cases.

**Aim:** The study compared the relative sensitivity of these two techniques of parathyroid diseased gland localization.

**Material and methods:** We examined 76 patients with secondary and tertiary hyperparathyroidism. The double-phase 99mTc-MIBI perfusion scintigraphy was performed in all 76 patients. The subtraction 99mTc/99mTc-MIBI scintigraphy was performed in 46 patients.

**Results:** The dual phase 99mTc-MIBI scan and the 99mTc/99mTc-MIBI subtraction scan was positive in 16 (22%) of 73, and 28 (61%) of 46 cases, respectively. The lesions, which were evaluated in the subtraction scan only, showed no prolonged retention of the tracer in comparison to thyroid tissue.

#### Conclusions:

1. The subtraction imaging was more sensitive than the double-phase technique in our group of patients.
2. The subtraction allows the evaluation of the pathological parathyroid glands with atypical washout, which do not show the prolonged retention of the tracer.
3. The delayed images of double-phase protocol do not provide any additional information in comparison to early MIBI image and thyroid pertechnetate subtraction.

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**CONNECTION BETWEEN PRESENCE OF THYROID LESIONS AND RESULT OF 99m-Tc MIBI SCINTIGRAPHY IN PATIENTS WITH SECONDARY AND TERTIARY HYPERPARATHYROIDISM**

M. Kobylecka<sup>1</sup>, J. Kuniowska<sup>1</sup>, J. Miśkiewicz<sup>1</sup>, W. Chudziński<sup>2</sup>, L.Królicki<sup>1</sup>

<sup>1</sup> Nuclear Medicine Department, Warsaw Medical University

<sup>2</sup> Clinic of General, Vascular and Transplant Surgery, Warsaw Medical University.

**Background:** The low sensitivity of 99m-Tc MIBI scintigraphy in patients with secondary and tertiary hyperparathyroidism may be connected with common occurrence of thyroid abnormalities in goiter endemic area and with thyroid hormone disturbances present in dialyzed patients.

**Aim:** The study compared the sensitivity of the double-phase and subtraction MIBI perfusion scintigraphy in patients with and without thyroid abnormalities. Material and methods: 48 patients with secondary and tertiary hyperparathyroidism were examined. 17/48 patients had goiter or focal thyroid lesions. The double-phase 99mTc-MIBI perfusion scintigraphy and the subtraction were performed in all patients. At least one focus of abnormal MIBI accumulation was considered positive. We analyzed the results of each scintigraphical protocol in both groups of patients: with and without thyroid abnormalities.

**Results:**

	Dual phase scintigraphy		Subtraction	
	Positive	Negative	Positive	Negative
Goiter and/or thyroid focal lesions (17)	2/17 (12%)	15/17 (88%)	9/17 (53%)	8/17 (47%)
Normal thyroid (31)	11/31 (35%)	20/31 (65%)	21/31 (68%)	10/31 (32%)

The dual phase 99mTc-MIBI scan and the 99mTc/99mTc-MIBI subtraction scan was positive in 13/48, and 28/48 cases respectively. In the group of patients with thyroid lesions the sensitivity of dual-phase and subtraction scintigraphy was lower than in the group without thyroid lesions. For dual phase scintigraphy the difference between this two groups was statistically significant.

**Conclusions:**

1. The subtraction imaging should be routinely performed in patients with secondary and tertiary hyperparathyroidism due to common occurrence of thyroid abnormalities.
2. The subtraction improves the results in both groups of patients.
3. Thyroid abnormalities are important, but not the only reason of false negative results of scintigraphical examinations.

## ONCOLOGY 3

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**DIAGNOSTIC ACCURACY MAMMOGRAPHY AND SCINTIMAMMOGRAPHY IN DETECTION OF PRIMARY BREAST CANCER RELATED TO SIZE OF THE TUMOUR**

Agnieszka D. Kolasinska, John R. Buscombe, Sławomir Chaberek, Jarosław B. Ćwikla, Brian Holloway, Tim Davidson, Santilal Parbhoo, July Cowe, Andrew J.W. Hilson

Department of Nuclear Medicine, Radiology and Surgery; Royal Free Hospital; London, NW3 2QG; UK

**INTRODUCTION:** The detection of breast cancer relies on physical examination performed by trained oncologists and mammography (XMM). The sensitivity of mammography is often without typical microcalcification lesions-size dependent. The use of scintimammography (SMM) may be helpful in this situation.

**THE AIM OF THE STUDY:** is to compare the diagnostic accuracy of mammography and scintimammography in patients with suspected breast cancer across all groups with different size lesions.

**MATERIALS AND METHODS:** There were 304 patients with suspected breast lesions recruited from Symptomatic Breast Clinic Royal Free Hospital. Standard XMM and SMM (Tc-99m sestamibi) were performed in every patients. Analysis of images were performed by trained specialists in their fields. Each imaging study was graded using five grades of certainty, as follows: 1- normal or benign, 2- probably normal or benign, 3 equivocal, 4- probably cancer and 5- cancer. All lesions were surgically removed and final histology and pathological size of the tumours were reviewed. Three groups of lesions were analysed: below 2cm, between 2-4cm and above 4cm.

**RESULTS:** There were 230 patients with breast cancer and 74 patients with benign lesions. First group consists of: 86 patients (69 cancers), second group consists of 147 patients (107 cancers) and third group had 71 patients (54 cancers). Sensitivity of SMM was consistently high across all size groups of the lesions; overall sensitivity for SMM was 87% compared to 69% for XMM. Sensitivity of SMM consider first group of patients provides results as follows: SMM 77% and XMM 54%; second group of patients SMM 88% and XMM 68% and third SMM 100% and XMM 91%. Using ROC analysis the results were as follows. In first group there was no significant difference between diagnostic accuracy of SMM and XMM (Wilcoxon matched pairs test  $p>0.05$ ). In second group of patients SMM had higher diagnostic accuracy than XMM  $p<0.05$  with 90% of probability and third group had no significant difference between SMM and XMM ( $p>0.05$ ).

**CONCLUSION:** SMM seems to be a sensitive and reliable diagnostic test for breast cancer independent of the size of the tumour, particular in group of patients presented tumour size between 2 and 4cm.

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**COMPARISON OF STANDARD TRIPLE ASSESSMENT AND SCINTIMAMMOGRAPHY IN DETECTION OF PRIMARY BREAST CANCER**

Agnieszka D. Kolasinska, John R. Buscombe, Jarosław B. Ćwikla, Brian Holloway, Tim Davidson, Santilal Parbhoo, July Cowe, Andrew J.W. Hilson

Department of Nuclear Medicine, Radiology, Surgery and Pathology, Royal Free Hospital; London, NW3 2QG; UK

**INTRODUCTION:** Although triple assessment is currently the gold standard for diagnosis of primary breast cancer, still open biopsies are required in many cases to confirm diagnosis. Scintimammography (SMM) could be an alternative imaging technique for inadequate fine needle aspiration cytology (FNAB).

**AIM OF THE STUDY:** To compare the sensitivity of the traditional triple assessment of symptomatic breast lesion with scintimammography and to evaluate the accuracy of SMM in cases of inadequate fine needle aspiration cytology.

**MATERIALS AND METHODS:** There were 320 patients with suspected breast lesions recruited from symptomatic breast clinic. Mean age of women was 51 year (SD 12). Scintimammography was performed in each patients followed by standard X-ray mammography (XMM). There were 402 fine needle biopsy performed in all patients. Core biopsy or excision of suspected lesion were performed if any of modalities suggested malignancy or there were still clinical suspicious of malignancy.

**RESULTS:** Histopathology verified cancer in 199 patients and benign lesions in 121 patients. FNAB was truly positive in 171 of 199 primary malignant breast cancers (86%) and false negative in 28 cases. There were 25 false positive cases of fine needle biopsy. XMM was truly positive in 140 of 199 cancers (70%). SMM was correct in 181 of 199 cancers (91%). The overall sensitivity of standard triple assessment was 93%. The specificity of each modality was as follows: FNAB 70%; XMM 68%; SMM 65%, and triple assessment only 54%. In those patients with false negative results of FNAB, scintimammography confirmed malignancy in 22 of 28 cases (79%). Also in group with false positive fine needle biopsy SMM excluded cancer in 18 of 25 cases (72%).

**CONCLUSION:** Scintimammography seems to be sensitive and more specific than the combined traditional triple assessment for diagnosis of malignant breast cancer and especially it is very useful in evaluation of those lesions in whom triple assessment and FNAB are equivocal, doubtful or incorrect.

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### COMPARISON OF DIAGNOSTIC ACCURACY BETWEEN MAMMOGRAPHY AND SCINTIMAMMOGRAPHY IN PATIENTS WITH PRIMARY BREAST CANCER RELATED TO THEIR AGE

Jaroslaw B. Ćwikla, John R. Buscombe, Slawomir Chaberek, Agnieszka D. Kolasinska, Brian Holloway, Tim Davidson, Santilal Parbhoo, July Cowe, Andrew J.W. Hilson

Department of Nuclear Medicine, Radiology and Surgery; Royal Free Hospital; London, NW3 2QG; UK

**INTRODUCTION:** Detection of breast cancer relies on clinical examination, mammography (XMM) and histopathology. However, where mammography has reduced sensitivity, such as in younger women, with dense breasts or receiving HRT, the inclusion of scintimammography (SMM) may aid diagnosis.

**AIM OF THE STUDY:** We compared the diagnostic accuracy of the combination of XMM and SMM with either test alone, across all age groups.

**MATERIALS AND METHODS:** Data for 458 patients (above 50 year old 247 patients), imaged for suspected breast cancer. In all cases, further information had been required due to inconclusive mammography results and/or discrepancies between mammography and breast examination. All patients had core or surgical biopsy to confirmed pathology. All images were graded using five grades of certainty. SMM images were reviewed by an independent specialist blinded to clinical presentation and XMM. Diagnostic accuracy of each test, overall and by each age subgroup, was compared using ROC curve analysis.

**RESULTS:** The sensitivity of the combination of SMM and XMM in all patients was higher than mammography or SMM alone, respectively 92%, 67%, 87%. In the group of patients below 50 yo the sensitivity were as follows: 95%, 68%, 90% and in group above 50 were respectively: 91%, 65%, 84%. The specificity for combination of SMM and XMM in all patients were 60%, for XMM alone 73%, for SMM alone 72%. In the group of patients below 50 the specificity were respectively: 66%, 73%, 65%, in the second group of patients above 50 yo: 61%, 72%, 77%. Analysis of the area under the ROC curves showed that the combination resulted in improved diagnostic accuracy compared with XMM alone, in all patients ( $p < 0.05$  with 90% certainty), and in group of patients below 50 yo ( $p < 0.05$  with 90% certainty). In the group of patients above 50 yo there was significance difference between the combination of SMM and XMM and XMM alone ( $p = 0.05$  with 80% certainty). There was no difference in the diagnostic accuracy between XMM and SMM alone in both groups of patients. However, there was significance difference analyzing all patients ( $p = 0.05$  with 90% certainty).

**CONCLUSION:** This study shows that the combination of both imaging modalities improves diagnostic accuracy than each technique alone in detecting primary breast cancer in all patients as well as in two groups above 50 and below 50 years old patients.

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### UPTAKE OF RADIOLABELED ALPHA-FETOPROTEIN (AFP) AND ITS PEPTIDE FRAGMENT BY EXPERIMENTAL BREAST CANCER

R. Wiercioch<sup>1</sup>, G. Birnbaum<sup>2</sup>, E. Byszewska<sup>2</sup>, M. Mirowski<sup>1,2</sup>

<sup>1</sup> Department of Pharmaceutical Biochemistry, Medical University of Lodz, <sup>2</sup> Radioisotope Centre, POLATOM, Otwock, Swierk, Poland

**Introduction.** The presence of alpha-fetoprotein receptor (r-AFP) is observed in tumor cells which can be characterized by high grade of proliferation. This fact is the basis of the study in which human AFP as a vector for anticancer drug targeting (bleomycine, doxorubicine, cis-platine, methotrexat and others) is used. Conjugates all of this compounds with AFP demonstrate high selectivity in drug delivery to tumor cells. Therapeutical effect of this conjugates comparison with free drugs was significantly better. The aim of this study was to check the usefulness of AFP in scintigraphy of breast cancer and selection of its peptide fragment responsible for binding with r-AFP.

**Materials and methods.** Synthetic, 34 amino acid AFP peptide fragment (EEDKL-LACGEGAA DIIGHLCIRHEMTPVNPVGQY-COOH) was synthesized at The National Research Centre for Biotechnology in Braunschweig, Germany. Labeling of investigated molecules by iodine 131 was carried out in Radioisotope Centre POLATOM. Mice (C3H/Bi) with transplantable mammary tumors were used in biodistribution studies.

**Results.** The percentage of accumulation (% of dose / gram of tissue) of <sup>131</sup>I-AFP in tumor tissue in *in vivo* experiments at time intervals (0.5, 2, 24 and 48 hours after injection) was 4.02, 5.43, 0.28 and 0.15 respectively. Tumor to muscle (T/M) radioactivity ratio was estimated as 5.7, 3.4, 1.7 and 23.4. The content of <sup>131</sup>I-AFP peptide fragment in tumor tissue after 0.5, 2 and 24 hours was 2.29, 5.56 and 0.21%. T/M ratio was the highest (47.5) after 30 minutes, later decrease tendency was observed (5.6 after 2 hours, and 3.2 after 24 hours).

**Conclusions.** Percentage of <sup>131</sup>I-AFP and its 34 amino acid peptide fragment accumulation in tumor tissue was nearly the same. However, T/M radioactivity ratio was higher for peptide fragment of AFP. Our data suggest, that selected peptide fragment is responsible for binding with r-AFP.

## NEUROLOGY AND MISCELLANEA

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### PROGRESSIVE FACIAL HEMIATROPHY: CENTRAL NERVOUS SYSTEM INVOLVEMENT IN HM-PAO-SPECT AND MRI IMAGES

Królicki L., Blaszczyk I., Krasuń M., Butkiewicz O.

Dep. of Nuclear Medicine and Dep. of Dermatology, Medical School, Warsaw.

**Background.** The atrophies in progressive facial hemiatrophy (PFH) show such clinical similarity to involuntary deep morphea, that the relationship of these two conditions is not clear and not infrequently controversial.

**Objective.** The aim of the study was to find out relationship of PFH and scleroderma en coup de sabre by establishing the presence and type of central nervous system (CNS) involvement in both diseases.

**Material.** The study was performed in 19 cases of PFH classified into two groups: group 1 in which atrophies were preceded by cutaneous indurations (ten cases) and group 2 (nine cases) with no preceded indurations. The third group consisted of seven cases of scleroderma en coup de sabre.

**Methods.** Besides the neurological examination following techniques were applied: electroencephalography (EEG), magnetic resonance imaging (MRI) before and after contrast injection to evaluate the integrity of blood-brain barrier, angio-MR to evaluate intracranial blood vessels anomalies and 99mTc-HM-PAO-SPECT to evaluate regional cerebral blood flow (CBF).

**Results.** The studies with the use of different techniques disclosed similar anomalies in all three groups. MRI did not show abnormality in 2 of 9 PFH cases preceded by indurations, in 5 of 9 cases not preceded by indurations and in all 7 cases of scleroderma en coup de sabre, in majority of which SPECT showed regions of diminished cerebral blood flow. However in some cases SPECT was normal and MRI abnormal. Angio-MR was not contributory disclosing the same type of abnormalities of Willis circle in controls. The blood-brain barrier was damaged in single cases of PFH, as disclosed by MRI with contrast.

**Conclusion.** The study showed a very frequent CNS involvement in PFH cases, both preceded and not preceded by cutaneous indurations, and with or without coexistent plaques of localized scleroderma elsewhere on the body, as well, as in s. en coup de sabre. The results of CNS studies with the use various techniques speak in favor of close relationship between PFH and scleroderma. Of practically importance is detection of abnormal SPECT by normal MRI in some cases of PFH and in s.en coup de sabre, which indicates the usefulness of SPECT in the study of these conditions.

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### BRAIN SPECT IMAGING AND HEMISPATIAL NEGLECT IN RIGHT HEMISPHERE-DAMAGED PATIENTS

Piotr Lass, Krzysztof Jodzio, Walenty Nyka, Dariusz Gałecki, Justyna Scheffler

Department of Nuclear Medicine, Department of Neurology, Medical University of Gdańsk, Department of Psychology, University of Gdańsk

**BACKGROUND:** Hemispatial neglect, characterised as failure to attend to contralateral space, is hypothesised by recent neuroanatomical models to result from damage to a network involving the frontal, parietal, and cingulated cortices, basal ganglia, and thalamus.

**METHODS:** The aim of this preliminary study was to verify this model of neglect in twenty two right hemisphere-damaged acute stroke patients using single photon emission-computed tomography (SPECT). Presence of a single right-sided vascular brain lesion was confirmed on CT and/or MRI. Neglect, assessed with a battery of drawings, line bisection, and line and shape cancellation tests, was observed in 12 cases.

**RESULTS:** Patients with neglect (compared with those without neglect) had more extensive hypoperfusion in the frontal and parietal cortex, as well as striatum and thalamus. Left-sided dysfunction in the parietal cortex and the thalamus also emerged as significantly associated with neglect on SPECT imaging. Moreover, performance on three out of five tasks (the drawing tests and line bisection test) commonly used to detect the presence of hemispatial neglect was exclusively sensitive to damage to the parietal cortex of the right hemisphere, while the line cancellation test might be attributable to the lesion of the right striatum.

**CONCLUSIONS:** This findings support the model attributing neglect to a unilateral defect in a cortico-striato-thalamo-cortical loop. It can be concluded that the brain SPECT imaging provides a reliable description of the brain pathology associated with hemispatial neglect.

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**CBF  $^{99m}$ Tc-HMPAO BRAIN SPECT IN ANTIHOSPHOLIPID SYNDROME**

Piotr Lass, Grzegorz Romanowicz, Miroslawa Kosedz-Dragan, Roman Nowicki, Jarosława Lauer, Justyna Scheffler

Department of Nuclear Medicine, Medical University, Gdańsk, Poland

**BACKGROUND:** Antiphospholipid syndrome (APS) is defined as the presence of repeated episodes of arterial and venous thrombosis, recurrent spontaneous abortions and thrombocytopenia with elevated antiphospholipid antibodies. An important feature of APS are cerebrovascular disorders of thrombotic origin. The aim of the study was to assess cerebral blood flow changes utilising brain SPECT scanning.

**METHODS:** CBF SPECT scanning was performed using  $^{99m}$ Tc-HMPAO (Amersham, UK) and a triple head gamma-camera MS-3 (Siemens, Erlangen, Germany) in 21 patients with APS: 12 with systemic lupus erythematosus, 4 with Sjögren's syndrome, 2 with Sjögren's syndrome, 2 with primary APS, 1 with HELLP syndrome. 30 healthy volunteers served as a control group.

**RESULTS:** 20 studies were abnormal, 1 normal. Abnormalities comprised multifocal perfusion deficits and diffuse regional CBF defects. The average number of focal perfusion deficits per patient was  $4.8 \pm 1.7$ . In 7 patients multifocal frontal perfusion deficit was accompanied by diffuse frontal hypoperfusion (bilateral hypofrontality), in 1 by temporal and occipital hypoperfusion. Analysing the group as a whole, a decreased perfusion in frontal lobes, thalamus and basal ganglia has been found. A significantly higher was the number of focal perfusion deficits was higher in patients with cognitive impairment ( $8.7 \pm 2.2$ ), as well as in patients with stubborn migraine headaches ( $6.7 \pm 2.6$ ).

**CONCLUSIONS:** These results indicate the high utility of brain SPECT CBF studies in patients with antiphospholipid syndrome.

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**EFFICACY OF  $^{99m}$ Tc-Igg SCINTIGRAPHY IN DETECTION OF ACUTE NEONATE OSTEOMYELITIS**

E. Młodkowska\*, A. Midel\*\*, T. Biegański\*\*

\* Department of Nuclear Medicine, Medical University of Łódź

\*\* Department of Radiology, Center of Mothers Health of Łódź

**Introduction:** The acute neonate osteomyelitis starts in epiphysis of a long bone, from where it diffuses into the neighbouring joint. The disease is frequently of a multifocal character, occupying simultaneously or spreading to several bones and joints. Detection of inflammatory foci presents a difficult diagnostic problem with which ultrasonography, classic radiology, nuclear medicine, magnetic resonance imaging and computerized tomography try to deal with.

Objective of the study was to assess the efficacy of scintigraphy using a  $^{99m}$ Tc labeled immunoglobulin G ( $^{99m}$ Tc-IgG) complex for detection of the inflammatory foci in the skeleton in neonates and infants.

**Materials and methods:** 29 children were studied, of the age ranging from 5 to 30 days (mean  $\sim 15$  d), on the average in the second week of the disease. Whole body scintigraphy (anterior and posterior) was performed at 4 and 24 hours post administration of 40-80 MBq of the radiopharmaceutical.

**Results:** Out of 44 foci verified positively by means of above mentioned imaging modalities, and/or by means of surgery, microbiology and histology, 37 were diagnosed correctly by  $^{99m}$ Tc-IgG scintigraphy. The resulting sensitivity and positive predictive value of the test amounted to 84 and 90 per cent, respectively. In 3 neonates it was only the scintigraphy that yielded clinically "silent" inflammatory skeletal foci. There were 4 false positive results of which one resulted from presence of a verified suppurative focus of soft tissues.

**Conclusion:**

1. The results of the study indicate that the whole body  $^{99m}$ Tc-IgG scintigraphy is an efficacious method for detection of acute osteomyelitis in neonates and infants.
2. The test provides diagnostic informations regarding the stage of the disease, additional to those obtainable by other means.

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**COMPARISON OF THE USEFULNESS OF LUNG PERFUSION SCINTIGRAPHY AND HIGH RESOLUTION CT IN THE DIAGNOSIS OF PULMONARY EMBOLISM — PRELIMINARY REPORT**

J. Kuniowska, L.Królicki, M.Kobylecka

Nuclear Medicine Department, Warsaw Medical University

**Background:** Despite technical progress, the diagnosis of pulmonary embolism (PE) remains challenging. Even pulmonary angiography does not guarantee perfect diagnosis accuracy, as 5-10 % of studies are false negative. The aim of study was to compare perfusion scintigraphy using planar and single photon emission computed tomography (SPECT) techniques and spiral computer tomography (CT) in clinically suspected PE.

**Material and methods:** 34 patients with clinical suspicion of pulmonary embolism were investigated. Following scintigraphy 9 patients were given antithrombotic treatment and CT was performed within a week. Both lung scan and CT were available for final analysis in 25 patients (16 women, 9 men, avg. age  $72.72 \pm 8.9$  years). Investigations using planar and SPECT methods were made with two-head Elscint gammacamera, using  $^{99m}$ Tc labelled human albumin microspheres, with 300-400 MBq activity. Data were acquired in 72x20s mode. Lung scans were evaluated using PIOPED criteria.

Spiral CT scans were performed using radiologic contrast (Picker PQ 2000)

**Results:**

CT	PE probability of perfusion scintigraphy	Number of patients	Clinical diagnosis of PE
Massive thrombi	high	4	4
	intermediate	0	0
	Low	1	1
Inocclusive thrombi	high	1	1
	intermediate	3	1
	Low	6	0
No thrombus	high	4	1
	intermediate	2	0
	Low	4	0

**Conclusions:**

1. Perfusion scintigraphy allows highly accurate diagnosis of pulmonary embolism, is cheaper than CT and results in fewer side effects.
2. Results of both methods were most discordant when CT scan showed inocclusive thrombi or no thrombi above subsegmental level.

**CARDIOLOGY 2****50****SCINTIGRAPHIC ASSESSMENT OF MYOCARDIAL PERfusion IN CHILDREN AFTER ANATOMICAL CORRECTION OF TGA**

Bogdan Mąkowski, Zbigniew Maziarz, Wiesław Tryniszewski, Anna Dedećjus-Sysa, Jadwiga Moll

Dep. of Nuclear Medicine Military Medical University Łódź  
Clinic of cardiology ICZMP Łódź

Anatomical correction in treatment of complete transposition of great arteries (TGA) is a method of choice. Because the transfer of coronary arteries to neoaorta is the most crucial and difficult problem during this operation we investigate the long term myocardial perfusion in this group of children.

310 children were operated between 1991 and 2000 and among them 29 (9%) underwent MIBI SPECT at 4–9 years after the operation.

In 21 (75%) myocardial perfusion was normal but in 6 cases several defects of perfusion occurred, whereas in 3 patients there was no perfusion in basal segment of myocardial septum because of large path.

In the course of scintigraphic examination USG Doppler were also performed showing normal results of total contractility.

Based upon long-term assessment it may be assumed that most patients after anatomical correction of great arteries have no myocardial perfusion disorders. However, these local perfusion defects are an indication to further observation and coronary angiography because of possibility of gradual aggravation of myocardial perfusion defects.

**51****EFFICACY OF THE DIRECT MYOCARDIAL REVASCULARIZATION PERFORMED ON THE BEATING HEART AND PERFORMED WITH THE USE OF EXTRACORPORAL CIRCULATION - COMPARISON BY THE MEANS OF MYOCARDIAL PERfusion SPECT**

P. Kwieciński\*, R. Czepczyński, M. Jemielity\*, W. Dyszkiewicz\*, J. Sowiński

Dept. of Endocrinology and Metabolism, Univ. School of Med.Sciences, Poznań  
\* Dept. of Cardiac Surgery, Univ. School of Med.Sciences, Poznań

**Introduction.** In the recent years, new techniques of direct myocardial revascularization: OPCAB – off pump coronary artery bypass and MIDCAB – minimal invasive coronary artery bypass were developed. Aim of this study was to compare the efficacy of these methods with that of CABG performed with the use of extracorporeal circulation.

**Material and methods.** 20 patients operated on the beating heart (group 1; 16 men and 4 women; aged 40 to 65 years; mean  $53.0 \pm 8.6$  years) and 36 patients operated in the extracorporeal circulation (group 2; 33 men and 3 women; aged 34 to 69 years, mean  $52.5 \pm 8.6$  years). In all the patients myocardial SPECT using  $^{99m}\text{Tc}$ -MIBI at rest and after stimulation with dipyridamole (0.56 mg/kg) was performed twice: before and 4 – 7 months after revascularization. Myocardial perfusion was evaluated in 9 segments using following scale: from 1 (normal) to 5 points (no uptake). The average score in all nine segments constituted a perfusion index (PI). The differences of PI before and after operation, both at rest and after dipyridamole were compared.

**Results.** In none of the patients of group 1 a perioperative ischemia was found by ECG or enzymatic (CK-MB) measurements. In a part of group 2 signs of transient ischemia were found. Global evaluation of perfusion in SPECT is presented in the table:

	Group 1	Group 2	p
DPI – rest	$3.68 \pm 3.72$	$2.76 \pm 2.97$	ns
DPI – dipyridamole	$7.95 \pm 6.25$	$5.82 \pm 5.40$	ns

ΔPI were similar in both groups, both at rest and after dipyridamole.

**Conclusion.** Efficacy of the direct myocardial revascularization performed on the beating heart is similar to that of the CABG operations performed with the use of extracorporeal circulation. The OPCAB and MIDCAB operations are less traumatizing.

