IMAGING OF PULMONARY EMBOLISM

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The aim of this review is to discuss the current opinion on the value of imaging methods for the diagnosis of pulmonary embolism (PE). The rapidly developing field of the CT pulmonary angiography (CTPA) will be pointed out. During the eight decade of the last century, large Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED) study, focused on the diagnostic value of the ventilation/perfusion scanning (V/Q, comparison with conventional pulmonary angiography — AG). Positive predictive value (PPV) of high probability V/Q results is 86%, negative predictive value of normal finding reaches 91%. However, there are roughly two thirds (1/3) of indeterminate results where the PPV ranges from 10 to 70%. Typically, this occurs in patients with preexisting cardiopulmonary disease. Pulmonary AG is still considered to be the gold standard, but it is reluctantly indicated in the clinical practice offers noninvasive alternative for the direct diagnosis of PE. The radiation burden is in lung scintigraphy several times lower comparing to CT. The reversibility of defects by evaluation of VQ scans are related to delay in performing VQ scan after the onset of symptoms, when the reperfusion already occurs and the second main problem is presence of the unresolved previous embolism (30% of cases). The radiation burden is in lung scintigraphy several times lower comparing to CT angiography and also use of the iodine contrast falls off.

PULMONARY PERFUSION SCINTIGRAPHY AT HIGH ALTITUDE (4050M)

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Aim: To assist in understanding of the pathophysiology of high-altitude pulmonary oedema (HAPE).

Material and methods: Pulmonary perfusion scintigraphy was performed in the group of 21 mountaineers (9 of them with a previous history of HAPE documented by X-ray) in basal conditions at 5500 m and 6 hours after the rapid climb to 6500 m. In 6 subjects HAPE developed 16 to 36 hours after the scintigraphy at high altitude. They were treated with NO-inhalation, the scintigraphy was repeated again before and after therapy. The area of perfusion (number of pixels) and the inhomogeneity of perfusion were calculated (determined by standard deviation — as the percentage difference from the average value).

Results and conclusions: Pulmonary perfusion area is significantly greater (35% difference in control group, 29% difference in HAPE group) at high altitudes in comparison with the results in basal conditions at low altitude. The pulmonary perfusion, especially in the apical parts, is inhomogenous at high altitudes (standard deviation increased from 31 to 35% without significant difference between control and HAPE group). The distribution of pulmonary perfusion improves and the O2 saturation increases after NO-inhalation. To our knowledge, until today we have performed scintigraphy at the highest altitude all over the world during this study.

NUCLEAR MEDICINE METHODS IN THE DIAGNOSIS OF PULMONARY EMBOLISM

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The retrospective evaluation of standard scintigraphic examination — lung perfusion scan (PSP) provided in regional nuclear medicine department — Banska Bystrica for one year — 2001 were done. Due to economic problems of our hospital we could not use ventilation pulmonary scan (VSP). The mean age was 56.6 ± 17.5 (2–88 years), 49% patients over 60 years, 301 patients (102 M, 199 F) were evaluated. Second examinations were done to 61 patients. Waiting period for the first examination was 3.6 days.

Results: About 45% PSP 100 000 inhabitants were provided in Slovakia during the year 2001. In district of Banska Bystrica it was similar — 46 and in the Czech Republic (CR) it was 15-times more — 960 pers 100 000 inhabitants. Very good correlation (R = 0.79) was found between distance (km) of ordering specialists from the department and the other problem is follow up of reperfusion of defects in known embolia. Most errors by evaluation of VQ scans are related to delay in performing VQ scan after the onset of symptoms, when the reperfusion already occurs and the second main problem is presence of the unresolved previous embolism (30% of cases). The radiation burden is in lung scintigraphy several times lower comparing to CT angiography and also use of the iodine contrast falls off.

LUNG PERFUSION SCINTIGRAPHY — INDICATIONS, AVAILABILITY AND LOGISTIC PROBLEMS OF STANDARD DIAGNOSTICS OF PULMONARY EMBOLISM

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Conclusions: PSP is useful examination in diagnostics and stratification of patients with pulmonary embolism. About a third of results (grades 2 and 2+) is necessary to reevaluate by VSP or by other examination. Probably the best one is a spiral CT. PSP is relatively rarely provided in Slovakia, about 6.4% of the level in the Czech Republic. Calculated incidence of PE in our region is about 100/100 000 inhabitants therefore real number of examinations could be about 270 PSP/100 000 and with controls to 360–400/100 000, which is near to value in CR. The result of 50% and more positive (pathological) results PSP (during the first examination) indicate very good diagnostic level of ordering clinical department. The use of diagnostic algorithm of PE with PSP is in the region of Central Slovakia is insufficient due to important logistic problems with transport of patients.
THE VALUE OF FLUORODEOXYGLUCOSE IN THE DIAGNOSTICS TODAY
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Ten years after the first synthesis of 2-fluoro-2-deoxy-D-glucose (FDG) by Josef Pacák, the atom of fluoride was replaced by its radioactive form 18F by T. Ido. It happened in USA 25 years ago. Due to imperfection of PET scanners at that time, 18FDG was used for brain research only. Later, a clinical application was recognised in seizures and in the assessment of biological behaviour of brain tumours. But the expansion of MRI considerably limited 18FDG-PET in the brain imaging. Concerning PET investigation of brain tumours, it could be expected replacement of 18FDG by labelled amino-acids like 11C-MET or 18F PET in the future. Since 1986 18FDG has been applied for studies of myocardial metabolism. Later, 18FDG PET became the gold standard in the assessment of its viability. In spite of development of other imaging modalities, 18FDG-PET partially plays this role till now. The uptake of 18FDG in the vast majority of neoplasms is high enough, that modern PET scanners enable to discover tumour foci of 5 mm in diameter, e.g. non-enlarged lymph nodes invaded by tumour, that cannot be recognised by anatomical imaging modalities (CT, MRI). An improvement of PET scanners in the last decade enabled whole body investigations. 18FDG-PET encountered great success in the localisation of unknown primary tumours, in the biological evaluation of known tumours, in the staging of solid tumours, in the assessment of the effect of therapy and in the early diagnostics of tumour recurrence.

That’s why (thanks to 18F PET) PET represents the most dynamically developing imaging modality up to date. In the Czech Republic (CZ) one of the milestones of worldwide development of PET was settled 35 years ago. It is gratifying, that two 18FDG producers operate in CZ now, and that CZ belongs to the most developed countries in the clinical usage of 18FDG-PET after 4 years of operation of PET Centre Prague. Recent installations of two state of the art PET scanners including hybrid PET/CT are promising for the future of PET in CZ.

First Experience with Positron Emision Tomography with 18F-Fluorodeoxyglucose (FDG-PET) in Pediatric Oncology
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1Department of Ped. Oncology 2nd Medical Faculty Charles University, Prague, 2Department of Radiological Techniques 2nd Medical Faculty Charles University, Prague, Czech Republic

Aim: The purpose of our study was to evaluate the role of FDG PET imaging in the management of children with cancer.

Material and methods: Twenty four children with malignant solid tumors under-went thirty-two FDG-PET studies between January 2001 and December 2002. There were 8 children with soft tissue sarcoma, 12 with bone sarcoma, two with neuro-blastoma, one with testicular germ cell tumor and one with nephroblastoma. The median age was 10.7 years (range 6.3 to 18.0). In 9 children PET was the part of primary staging, 16 PET studies were undertaken for therapy monitoring after completion of treatment and in 7 children PET was performed for suspected relapse. PET scans were compared with follow-up clinical data, results of conventional imaging methods (CIMs) and histology.

Results: In three of nine children referred for initial staging PET revealed more extensive disease than expected. These positive findings resulted in a change of the stage (from III to IV). After completion of therapy CIMs suggested residual abnormalities in 10 of 16 children, 19 of them accumulated FDG. True-positive were 7 PET studies, in two children PET was false-positive. Six of seven patients assessed for suspected relapse accumulated FDG, developed relapse was proven by biopsy or with clinical follow-up. One patient with negative PET remains in complete remission (follow-up 10 months).

Conclusions: In this preliminary study, FDG-PET was useful in the evaluation of a variety of pediatric malignancies: for primary staging, post-therapy assessment and early detection of relapse. Approximately one third (9/24, 37%) of investigations resulted in modification of scheduled treatment. Further experience is necessary to define the precise role of FDG-PET in pediatric oncology.

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Position Emision Tomography with 18F-Fluorodeoxyglucose (FDG-PET) in Childhood Malignant Lymphomas
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1Department of Ped. Oncology 2nd Medical Faculty Charles University, Prague, 2Department of Radiological Techniques 2nd Medical Faculty Charles University, Prague, Czech Republic

Aim: Children with malignant lymphomas (ML) generally are treated according to stage and risk profile. Metabolic imaging by FDG PET offers the advantage of functional tissue characterization that is independent of morphologic criteria and contributes to more accurate primary staging and better assessment of response to therapy. The aim of our study was to assess the clinical value of FDG PET for initial staging and restaging of childhood lymphomas.

Material and methods: Fifty four children and adolescents with Hodgkin’s disease or non-Hodgkin’s lymphoma (NHL) underwent 78 FDG-PET studies between March 2001 and May 2003. The median age was 15.8 years (range 4.1 to 18.3). The indication for FDG PET examination was initial staging in 40 children and restaging after completion of first-line chemotherapy in 38 children. PET scans were compared with clinical follow-up, results of conventional imaging methods (CIMs) and histology.

Results: Thirty three of 40 children referred for initial staging had concordant FDG-PET and CIMs imaging (82%). PET correctly upstaged seven patients (18%). PET and CIMs imaging showed a normal post-treatment PET scan, all but one are in complete remission. One patient with NHL relapsed two months after a normal PET scan.

Conclusions: FDG-PET contributed to more accurate initial staging. Post-treatment PET studies were useful for detection of viable tumor. False positive results were observed due to inflammatory lesions (outside of known residual masses) or tumor “healing”. Information from FDG-PET imaging resulted in a change in clinical management in 20% of children with ML (1/5).

Supported by grant IGA M2 CR No. 7568-3, MSMF No: 113000005
NEUROLOGY

INVESTIGATION OF DAT SYSTEM USING DATSCAN. COMPARISON OF VISUAL AND SEMIQUANTITATIVE ASSESSMENT

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Aim: To compare the visual and semi quantitative assessment of the investigation of DAT system in Parkinson’s disease using DATSCAN.

Material and methods: Since year 2000 there were altogether 52 patients investigated. All procedures were done with the radiochemical preparation DATSCAN – 123I- iodoxyn (Amersham). For the study 35 patients were selected (selection criteria was the same gammacamera). All have been investigated on double head gammacamera AXIXS (Philips) connected with the Odyssey computer system.

The same system was used to determination of basic parameters with the Alderson phantom.

The patients were 19 men (average age 64 ± 8 years) and 16 women (average age 58 ± 7.6 years).

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The final assessment was done primary visual on the coloured display individual by the transversal oblique, sagittal and coronal views, finally using 3D.

Results:

Visual assessment:
0 — normal tracer uptake;
1 — asymmetric tracer uptake in putamen only;
2 — asymmetric tracer uptake both in putamen and nucleus caudatus;
3 — dramatic decrease of tracer uptake both in putamen and nucleus caudatus;
4 — putamen (P) × 0.35.

Altogether 128 images were used in the matrix 128 × 128; time per frame was 45 sec. iterative retransversal reconstruction (16 iterations) was used. Postfiltering with Butterworth filter, order 10, cut-off 0.35.

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POSSIBILITIES OF DETECTING PERFUSION DEFECTS OF LOWER LIMBS IN DIABETIC PATIENTS WITH THE AID OF TETROPHOSMIN-99m PERFUSION SCINTIGRAPHY AND LASER DOPPLER

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Aim: The diagnostics of microangiopathy and macroangiopathies of lower limbs are still difficult procedures despite the introduction of new methods of examination. For the detection of muscular perfusion in the lower limbs of diabetic patients without claudication we used 99mTc-Tetrophosmin in the performance of myocardial scintigraphy assuming that according to Cosson et al perfusion defects in the proximal parts of the lower limbs are attributed to microangiopathy, and defect distal to macrovascular disease. We compared the findings with a Laser Doppler (examination of the periphery of the lower limbs with thermal provocation).

Material and methods: We invited in the observation 11 diabetic patients, whom we divided into two groups. The first one without confirmed macrovascular complications and the second one with confirmed microvascular complications. There were 6 patients in the first group (3 women, 3 men, Type 1 DM 3, Type 2 DM 3), group age 42.2 ± 10.3 years, length of duration of DM 11.5 ± 4.6, all treated with insulin, 2 diabetics, 4 non-smokers, HbA1c 7.9 ± 0.7% 2 diabetics. In the second group 5 patients: 2 men, 3 women, Type 1 DM 4, Type 2 DM 1, group age 46 ± 6.6 years, length of duration of DM 23.6 ± 8.1 yrs, all treated with insulin, non-smokers, HbA1c 9.1 ± 1.2%, 3 diabetics. 3 patients had confirmed nonprogressive retinopathy and nephropathy, 1 autonomic neuropathy in the region of the cardiovascular system and 1 diabetic peripheral neuropathy.

Results: In the first group without macrovascular complications vascular thresholds for right LL were found to be 17.8 ± 8.9 V for left LL, 17.7 ± 8.2 V for right LL, 12.2 ± 3.1, for left LL 12.4 ± 3.3, sonographically 2 rd medialization of the crus arteries, rest Laser Doppler 13.7 ± 7.8 P (perfusion units), after thermal provocation 72.7 ± 63.8%, limited achieving maximum value of perfusion of 23.1 ± 14.7 nm/s and rest of 11.6 ± 6.5 P/mm². Sonographically after exercise 1 patient with sonographically confirmed macroangiopathy was found to have 100% reduction of the blood flow velocity. In the second group with confirmed microangiopathic complications vascular thresholds for right LL were 24.4 ± 16.9, for left LL 24.8 ± 5.3, rest Laser Doppler 30.3 ± 18.0, after thermal provocation 93.1 ± 31.9%, time for achieving maximum value of 2.4 ± 0.7 min, 0.9, 6.4 ± 2.9 P/mm² (p = 0.1). Sonographically revealed 2 defects in the region of the calves, 3 patients with perfusion defects of the thighs and one patient with borderline rates for a perfusion defect of the thighs.

Conclusions: Patients with confirmed microvascular complications manifested a lower rest perfusion of the periphery, a longer period for attaining the maximum value when examined by Laser Doppler, and these findings were correlated with proximal defects of thigh perfusion in scintigrams. The defective perfusion of calves after exercise may be a manifestation of silent macrovascular disease. In the second group with confirmed microvascular complications vascular thresholds for right LL were 24.4 ± 16.9, for left LL 24.8 ± 5.3, rest Laser Doppler 30.3 ± 18.0, after thermal provocation 93.1 ± 31.9%, time for achieving maximum value of 2.4 ± 0.7 min, 0.9, 6.4 ± 2.9 P/mm² (p = 0.1). Sonographically revealed 2 defects in the region of the calves, 3 patients with perfusion defects of the thighs and one patient with borderline rates for a perfusion defect of the thighs.

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**STRESS MYOCARDIAL PERFUSION SCINTIGRAPHY IN PATIENTS WITH IMPLANTED PACEMAKER**

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**Introduction:** Artificial heart pacing is a common therapeutic method stimulating myocardial contraction by electric pulses. Stimulating electrode is most frequently placed into the apex of the right ventricle, in dual chamber stimulation also into the right atrium. Appropriate type of stress should be applied if such a patient is referred for stress myocardial perfusion scintigraphy (SMPS) for good accuracy.

**Aim:** To evaluate the influence of pacemaker on myocardial perfusion by retrospective assessment of patients referred to SMPS.

**Material and methods:** 77 patients (pts) with pacemaker were enrolled into analysis. There were 44 men and 33 women with mean age of 72 years (54-83). Finally we analyzed only 56 pts without previous myocardial infarction. Single-head gamma camera with LEAP collimator was used; we employed one-day stress-rest protocol; data were processed by CEqual™. 11/14 patients stressed only by bicycle had pacemaker set on DDD mode. 5 pts were stressed only with dipyridamole, 3 with VVI and 2 with DDD mode of pacemaker. Remaining 37 pts underwent combination stress with dipyridamole and exercise. 33 pts had pacemaker set on DDD mode, 21/56 pts had ventricular arrhythmia.

**Results:** Fixed perfusion defects were detected in 42/56 (74%) pts, remaining 14 pts had homogeneous perfusion. Defects were consistently localized in the apical part of the interventricular wall and their extent was from 2% to 10% of the myocardium of the left ventricle. 10/42 pts with fixed perfusion defect underwent coronary angiography. 11/14 pts without perfusion defect revealed also normal coronary arteries (5/11) or < 50% stenoses (6/11).

**Conclusion:** 74% of patients with pacemaker and without previous myocardial infarction can reveal small fixed perfusion defect consistently localized in the apical part of the interventricular wall despite normal coronary arteries. Histological changes, mainly fibrosis, around the tip of electrode can cause these perfusion defects. We should be aware of interpreting these defects as a positive result to avoid false positive findings.

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**KIDNEY**

**DMSA SCINTIGRAPHY AND THE INFLUENCE OF APPLIED METHODOLOGY OF INVESTIGATION ON THE DIAGNOSTIC VALUE OF METHOD**

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**Aim:** According to the world standard the investigation of renal parenchyma from planar images includes the evaluation of scans at least in four projections in order of correct assessment number, shape, size and character of cortical lesions. But there are still some departments where only two projections of DMSA scan are used for the evaluation. The objective of this study was to evaluate the specificity, sensitivity and diagnostic accuracy of the method using for DMSA results interpretation only two projection and to compare variability between two above mentioned DMSA methods. The method using 4 projections in the investigation of renal parenchymal abnormality was considered as a reference one. Studies obtained from January 2000 were retrospectively interpreted. The second aim of our study was to determine an occurrence of mobile kidney (ren migrans), because this kind of renal chymal abnormality was considered as a reference one. Studies obtained from January 2000 to December 2002, whereby six types of findings were considered: without findings, there were evaluated 707 of right kidneys and 701 of left kidneys. The method using 2 projections in the investigation of renal parenchymal abnormality showed 74% sensitivity, 88% diagnostic value in left kidneys and 75% sensitivity, 87% diagnostic value in right kidneys. The finding of mobile kidney was presented in 5.5% in 2002.

**Conclusions:** Applying five planar projections in the assessment of renal parenchymal abnormalities definitely increases the diagnostic value of the planar scintigraphy. Applying only 2 projections as a method of DMSA results interpretation decreases number of positive findings specially in case of small or single lesions. We have also proved that mobile kidney appears proportionally often and it can be detected only by changing the position of patient during the investigation.

**NEW METHODS FOR EVALUATION OF DYNAMIC RENAL SCINTIGRAPHY**

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Dynamic renal scintigraphy contains more diagnostic information than it is usually extracted by traditional methods for descriptive analysis of time-activity curves. The aim of this contribution is to provide definition and description of newer parameters and procedures based on physiological models, to demonstrate principles of calculations and clinical applications.

**Aim:** The aim of this contribution is to provide definition and description of newer parameters and procedures based on physiological models, to demonstrate principles of calculations and clinical applications.

**Material and methods:** Planar anterior, posterior, right and left posterior oblique images of both kidneys were obtain in supine position for 3 min each, 2–4 hours post injection of 99mTc-DMSA. There have been used five projections for qualitative assessment of renal parenchymal abnormalities in our department since January 2000. The fifth projection presents planar posterior in standing patients and it allows the evaluation of mobile kidney. 735 studies were obtained from January 2000 to December 2002, whereby six types of findings were considered: without any presence of one, two or three renal cortical abnormalities, shrank kidney and missing kidney.

**Results:** Shrank and missing kidneys were excluded from statistic interpretation of findings, there were evaluated 707 of right kidneys and 701 of left kidneys. The method using 2 projections in the investigation of renal parenchymal abnormality showed 74% sensitivity, 88% diagnostic value in left kidneys and 75% sensitivity, 87% diagnostic value in right kidneys. The finding of mobile kidney was presented in 5.5% in 2002.

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VALUE OF DYNAMIC RENAL SCINTIGRAPHY AND INDIRECT RADIOPHARMACEUTICAL CYSTOMETRY IN EXAMINATION OF MICTURITION DISORDER IN CHILDREN

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Aim: The aim of the study was to evaluate benefit of 99mTc MAG3 dynamic renal scintigraphy (DRS) and following indirect radionuclide cystometrography (IRC) in children who were examined for micturition disorder. Furthermore, to compare our results with results of urodynamic study (UD) and ultrasound examination which were obtained at urological department of Children surgery.

Material and methods: In period — September 2000—April 2003, at Department of Nuclear medicine of IKEM were examined 12 boys of the age 10.3 ± 3.4 years, and 5 girls of the age 10.6 ± 4.9 years, mainly with diagnosis: nocturnal enuresis and neurogenic bladder.

Evaluation was performed by program MAG3 on computer system Vision 101 — General Electric.

Urodynamic study — MENUEt system — Dantec.

Evaluation was performed by program MAG3 on computer system Vision 101 — General Electric.

Results: In 7/17 patients with normal findings on UD and IRC, was found disorder in dynamic renal scintigraphy as alteration of excretory fase. In the majority of cases it was relative urine retention for hypotony of renal pelvis or ureter.

Conclusion: Advantages of indirect radionuclide cystometrography:
1. Technically is possible to obtain investigation in any child who is toilet trained — almost from the age of 2;
2. Physiological conditions of micturition (in older children there is certain influence of surrounding);
3. Radiation exposure is not increased from the preceding dynamic renal scintigraphy;
4. During the same examination we obtain complete information about condition of intra- and extrarenal urinary tract, VUR and micturition.

RADIOLOGY IN DIAGNOSIS OF INFLAMMATORY DISEASES

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This announcement is a thought on how a modern radiology can take place in the diagnosis of inflammatory diseases in the climate of a large hospital, where the opportunities of CT, MR and ultrasound imaging are available. It is aimed to demonstrate how radiology takes place in detection of severe inflammatory diseases, where imaging plays the main role. It also discusses the threats and opportunities of each method and the risk of an exaggerated diagnosis and reliance of each method and also bad clinical interpretation of a well done examination.

We point out the need of a good technical performance in examining, which plays an important role in order to determine a further imaging strategy. We also emphasise the requirement of a complex interpretation of all radiology an non-radiology examinations and the confrontation with the clinical data of a patient and his laboratory results as well. We refer to a change of findings in time and on several case we document the variation of image in a period of short time.

We discuss the benefit of relevant clinical and history data and the necessity of a cooperation between all departments. We point out the benefit of a functional data and information system, that also includes the results of all radiology examinations, now days useful for two health service institutions. (By the way we also point out on the opportunity to send the image data to a requesting physician).

The underestimated of technical and organisational requirements can lead to a severe failure of the reliability of the radiology method a examination and can thereby discredit each method in the diagnosis of inflammatory diseases in general as well. This misunderstanding can then lead to a failure tendency to replace the concrete radiology method by other non-radiology examination method, in the situation where the radiology method would be a useful and optimal way to reach the goal.

POSITION OF RADIUM/NUCLEIDE IMAGING METHODS IN THE DIAGNOSIS OF OSTEOARTHRITIS IN PATIENTS WITH DIABETIC FOOT SYNDROME

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Introduction: Ulcerations of foot in diabetics are frequent but virtually serious complication. Ulcers commonly cause poly-microbial infection of soft tissue but it can involve a bone. Osteomyelitis especially together with ischemia frequently lead to lower extremity amputation.

Aim: To introduce a review of available radionuclide methods and their position in the diagnostic process.

Material and methods: Many different imaging methods can be used for osteomyelitis imaging. This review is focused on radionuclide methods mainly on bone and leukocyte scans. Polyclonal human immunoglobulin G scan, gallium scan and new methods are also briefly reported.

Results: Diagnostic efficacy of particular method depends on patient population examined, localization of inflammation, clinical course of the disease and other factors. Moreover there is no gold standard which could be used as a reference method currently. Bone scan sensitivity between 83% and 100% and specificity 50% to 75% is referred in the literature. Labeled white blood cells sensitivity is referred between 86% and 94%, specificity 90% to 100%. Combined sensitivity is referred 77% to 95% and specificity 83% to 100%. No method can be used alone for diagnosis of osteomyelitis.

Conclusion: Plain radiograph is a first choice method in the diagnostic process of osteomyelitis in patients with diabetic foot syndrome. Bone scan or magnetic resonance imaging follows. In the case of neuropathic osteoarthropathy white blood cells scan is usually essential — see diagram.

Diagnostic diagram (OM — osteomyelitis; MRI — magnetic resonance imaging).
The scintigraphic imaging of infection has become a well established part of routine clinical practice, though for 40 years the dynamic bone scan has been used for osteomyelitis and the HIDA scan for nearly 50 years in cholecystitis. It was the advent of Ga-67 which in 1969 ushered in the era of more specific infection imaging. Ga-67 is still useful in disease such as TB, spinal osteomyelitis but its use is hampered by the non-specific uptake into a variety of normal tissues and non-infected pathology. Therefore the search for more specific tracers has continued with In-111 labelled leukocytes in 1977 and Tc-99m HMPAO labelled cells 10 years later. These are often considered the gold standards of infection imaging but the cell labelling requires skill and time. Therefore the search for an easy to use Tc-99m labelled radiopharmaceutical continues. The early 1990’s saw the production of Tc-99m antigranulocyte antibodies and Tc-99m HIG. These agents still have their enthusiasts but have not been widely accepted. The last 5 years has seen the launch of Tc-99m selsasamab, a radiolabelled Fab, with the ability to image soft tissue and bone infections. More specific infection imaging was also promised by Tc-99m Ciproflaxacin but recent reports suggest this may also be a non-specific marker.

Recent developments have also concentrated on PET, however the most commonly used agent F-18 FDG is very non-specific and may not be ideal for use in infection, though new infection specific tracers for PET await development.

PET/CT — the new modality (nuclear medicine point of view)

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Aim of this presentation is to discuss the first experience with hybrid PET/CT investigation from the nuclear medicine point of view.

Material and methods: The scanner used Siemens Biograph duo LSO is equipped by LSO detectors. It operates in 3D mode exclusively. So it is possible to shorten the data acquisition by factor of 2 and administer lower amount of activity at the same time in comparison to the standard 2D mode at BGO scanners. CT data serve as well for attenuation correction.

Results: 400 PET/CT investigations were carried out during the first 3 months of operation. The image quality in 3D mode is fully comparable to up to now used BGO PET scanner ECAT EXACT in 2D mode. Moreover exact anatomical localisation of hypermetabolic lesions is enabled. Some typical findings and image patterns will be presented to illustrate capability of the new PET/CT modality.

Conclusion: PET/CT imaging should be considered as the substantial milestone in the development of PET. It brings complex and rapid (one stop shop) investigation of the patients, but on the other hand it requires to solve plenty of new questions arising by fusion of nuclear medicine and radiodiagnosis. This work was supported by the grant NC/7066 — 3 of IGA MZ ČR.

VALUE OF BONE SCINTIGRAPHY AFTER THE TREATMENT OF THE BONE CYST

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Aim: To assess the role of the bone scintigraphy after the treatment of unicameral and aneurysmal bone cysts. The cause of the lesions is unknown. Pathologic fractures are common. As a bone substitute bioactive glass ceramics, bone allograft and autograft can be used. Fresh autogenous bone is the best grafting material, but its supply is limited especially in children. Bioactive glass ceramics were reported to have the character of osteoconduction and capability for binding directly with the living bone tissue. In orthopedic surgery material BAS-O Lasak, Praha in granules is used.

Material and methods: In our study 13 patients (pts) were treated by curettage and filling of the bone defect with bioactive glass ceramic. Patients were in age range 8–23 years. Aneurysmal bone cyst was present in 3 pts, in 10 pts unicameral bone cyst was proved. Involvement of femur was in 8 pts., humerus in 3 pts and tibia in 2 pts. Clinical examination, plain radiography and 3-phase bone scintigraphy and SPET were performed to follow up the patients 3–11 years after the operation. Scintigraphic data were acquired with dual head gamma camera after intravenous injection of 99mTc-methylendiphosphonate. Regions of interest (ROI) were selected bilaterally within 4 consecutive coronal tomograms and each ROI was compared to equivalent reference ROI.

Results: In all patients were no significant changes in perfusion and blood pool. Normal osteoblastic activity in implanted area was in six cases, slightly increased in 4 and high in 3 cases (these pts suffered pain). No signs of glass ceramic loosening and no pericellular reaction were observed on plain radiographs. Clinical examination proved no inflammatory changes of the soft tissues in all cases.

Conclusions: This small study suggests that 3-phase bone scintigraphy and quantitative SPET analysis are sensitive methods to follow up patients for monitoring bony repair after aneurysmal or unicameral bone cyst operation. The next step will be comparison between similar groups of patients where bioactive glass ceramic, allogeneous and autogeneous bone grafts were used for filling. This study was supported by the Czech Ministry of Health Grant Agency, No. 6853–3/2001.
UNDOGRADUATE TEACHING OF NUCLEAR MEDICINE TECHNOLOGISTS IN EUROPEAN COUNTRIES

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This article overviews the training of nuclear medicine technologists in chosen European countries, Australia, the USA and Canada. There are basically two types of this training: either at medical schools following secondary school, without any university degree, usually on a two- or three-year basis, or else as a university course, leading to a BSc degree after three years, in some countries an MSc degree after an additional two years. In the USA/AU/CA/SCAN both systems coexist, in Europe it varies from country to country. Also the number of hours devoted to nuclear medicine varies in particular curricula — from 2,500–4,400 hrs BSc, 4,500—6,200 MSc. Some efforts are being made to unify this system by transition to the university model of education in many European countries (BG, CH, CZ, I, PL and others).

There are following questions facing the future of nuclear medicine technologists training:

— professional schools or university-based training?
— radiology, radiography and nuclear medicine technology — together or separated?
— role of MSc of NM technology.
— radiology, radiotherapy and nuclear medicine technology — together or separated?
— role of MSc of NM technology.

Those questions are the challenge for the community of technologists and educators.

INTO THE FUTURE OF NUCLEAR MEDICINE

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Any attempt to predict the future of any medical specialty is fraught with problems. Personal preference will play a part as will wishful thinking and possibly the ravings of a mad or alcohol soaked mind. Therefore this vision of the future will be very personal.

There are three main areas where Nuclear Medicine will develop in the next 10 years and all have in common the fact that it is important to exploit the differences between functional imaging and radiology and not to compete head on. The first of these is PET, clearly this technology will be the area of greatest investment in machines, however if PET is to truly succeed then new tracers must be found, if we allow PET to be a CT contrast agent we will have failed to deliver the range of knowledge possible in nuclear medicine.

The second area is the development of single photon agents which will allow in-vivo monitoring of highly specific and important physiological processes. These will be linked to our growing knowledge of the genomics and proteomics of diseases such as cancer. Therefore Tc-99m MIBI is a known substrate for MDR1 expression and Tc-99m Annexin V can be used to identify apoptosis. Soon it may be possible to use nuclear medicine to identify manipulations of the patient’s genome.

The third area is therapy, the advance of 177Lu-Zevalin for non-Hodgkins lymphoma is showing the way and underdevelopment is a whole raft of new antibodies and peptides. These treatments will not be cheap but will provide highly efficacious treat-ment with reduced toxicity and will need to thought of as a cancer therapy and not a nuclear medicine imaging agent.

Therefore the next 10 years in nuclear medicine may the most exciting since the 1960s and the first use of Tc-99m we are in for a revolution — I hope we enjoy it.
ONCOLOGY

In cases of benign lesions should be verified.

Institute of Oncology, Department of Nuclear Medicine, Sremska Kamenica, J. Mihailovic, Lj. Stefanovic, G. Tomin, M. Malesevic

Material: In 31 women scintimammography was made, age of 19–70, average age 51.06 years. By the breast changes were divided into 3 groups. Group I (n = 13) were patients with clinical and scintimammography findings suggesting benign malignancy, with PH verification. Group II (n = 13) patients with earlier PH certified benign malignancy and later developed recurrence. Group III (n = 5) was made of women who had clinical and ultrasonography signs for fibroadenoma and dysplasia.

Methods: Scintimammography was made with 99mTc-MIBI with an activity of 555 MBq, 10 minutes after intravenous application in the cubital vein on the contralateral side where the breast changes were detected. Gamma camera Ortler 4G Siemens was used, with matrix 128 x 128 in breast and anterior position of both breasts. Only the sensitivity and accuracy of the method could be determined.

Results: Group I: in 69.2% (9/13) a breast amputation was made and in 30.8% (4/13) breast quadrantectomy. All the scintimammography findings were true positive (TP) regarding the PH results, so this method had SE = 100% and A = 100%. Group II were patients with proven malignancy and later developed recurrence: in 53.8% (7/13) the scintimammographic findings were negative and three were positive. None of the women from this group had PH verification of the scintimammographic findings. In 19.2% (3/16), in whom the malignancy was PH verified, the Scintimammography was detected in and in 11.5% (2/13) multifocally of the changes in both breasts were detected.

Conclusion: Scintimammographic findings can help a surgeon make a decision if a breast amputation or quadrantectomy is to be made, in cases of recurrence it can help make a decision about further therapy, a positive scintimammographic finding in a case of benign lesions should be verified.

FREQUENCY OF METASTASES AND LETHAL OUTCOME IN PATIENTS WITH LOCALLY INVASIVE DIFFERENTIATED THYROID CANCER (DTC)

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Aim: To analyze the frequency of metastases and lethal outcome in DTC pts staged pT4, related to the DTC pts staged pT1–pT3.

Material and methods: We treated 367 pts whose primary tumor status was exactly staged (pT1–pT4) in a period of 1977–2000. They were followed up until the end of 2002. In 55 (14.1%) of them the primary tumor was pT0 (4 pts) or pT1 (51 pts). They were divided into groups: A — 25 (45.5%) pts with regional metastases (N1) — 3 of them had distant metastases (M1) too, B — 30 (54.5%) pts without regional and distant metastases (N0M0).

Results: Results: Results: Results: Results: In pT4 stage we found regional metastases in 68 pts, distant metastases in 21 pts and lethal outcome in 10 pts (58.1%, 17.9% and 8.3%, respectively). In pT1 stage we found regional metastases in 21 pts, distant metastases in 2 pts and lethal outcome in 2 pts (91.9%, 93.1% and 8.7%, respectively). In pT2 stage we found regional metastases in 37 pts, distant metastases in 8 pts and lethal outcome in 5 pts (47.4%, 10.3% and 6.4%, respectively). In pT3 stage we found regional metastases in 14 pts, distant metastases in 11 pts and lethal outcome in 5 pts (28.6%, 22.4% and 10.2%, respectively). Regional metastases were significantly more frequent in pT4 stage than in pT1 and pT2 (p < 0.05, p < 0.01, respectively). In pT1 stage without regional metastases were significantly more frequent in DTC pts staged pT4, related to the pts in pT1 and pT2 stage (p < 0.005, p < 0.005, respectively). There were no significant statistical difference related to the pts staged pT3 (p > 0.2). We didn’t find any statistical differences between the pts staged pT1, pT2 and pT3 stage (p > 0.9, p > 0.4, p > 0.5, respectively).

Conclusions: Patients with DTC staged pT4 have significantly more frequent regional and distant metastases than DTC pts staged pT2–pT3, with exception of pts staged pT1 stage who were detected because of the presence of regional metastases. DTC pts staged pT4 had no influence to the lethal outcome, related to pts staged pT1, pT2 and pT3 stage.

TREATMENT AND OUTCOME OF SMALL (pT0 AND pT1) AND LARGE (pT2–pT4) DIFFERENTIATED THYROID CANCER

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Aim: The analysis of treatment and outcome of differentiated thyroid carcinoma (DTC) patients (pts) whose primary tumor was in diameter to one centimeter (pT0 and pT1).

Material and methods: 391 DTC pts were treated from 1977 to the end of 2000, followed to the end of 2002. In 65 (14.1%) of them the primary tumor was pT0 (4 pts) or pT1 (51 pts). They were divided into groups: A — 25 (45.5%) pts with regional metastases (N1) — 3 of them had distant metastases (M1) too; B — 30 (54.5%) pts without regional and distant metastases (N0M0).

Results: The frequency of N1 in pT0–pT1 pts was not significantly different comparing to other DTC pts (p > 0.1), but M1 were significantly less frequent (p < 0.05). Papillary carcinomas (94.5%) were significantly more frequent than follicular (5.5%) comparing to other DTC pts (p < 0.05). The probability of 20-years survival was 0.94 ± 0.04. In the group A — nearly total or total thyroidectomy was done in all 25 pts, nodal dissection in 24 pts, radioiodine therapy was applied in 24 pts, hormonal therapy in all 25 pts, external beam therapy in 2 pts and chemotherapy in one patient; complete remissions were achieved in 15 (60%) pts, 7 (28%) pts had relapses, and 2 (8%) pts died from disease related deaths. In the group B — nearly total or total thyroidectomy was done in 10 pts, in 7 pts subtotal thyroidectomy, partial lobectomy, partial lobectomy, partial lobectomy, partial lobectomy, hormonal therapy in all pts and one patient was treated by external beam therapy; complete remissions were achieved in 24 (80%) pts, 2 (6.7%) pts had relapses, while disease related deaths were not registered.

Conclusion: The small (pT0 and pT1) DTC were papillary in most pts. Nearly half of them had N1, but rarely M1. The probability of 20-years survival was very high. In pts with N1 complete remissions were less frequent, relapses more frequent, and there were a few disease related deaths comparing to N0 pts; in our opinion in N1 pts radical surgery and radioiodine therapy are mandatory, followed by life-long hormonal treatment. In TNM0 pts acceptable is less capacious surgery and life-long hormonal therapy, while RAI treatment in most of them is not necessary.

FLUORINE–18-FDG COINCIDENCE IMAGING IN PATIENTS WITH LYMPHOMA

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The continued improvement in chemotherapy and radiation therapy strategies has resulted in high overall survival rates in patients with Hodgkin’s disease (HD) and non-Hodgkin’s lymphoma (NHL). Computed tomography is still the principal imaging modality for monitoring of lymphoma, but it is unable to differentiate residual disease from fibrosis. The aim of this study was to compare FDG coincidence imaging with CT and other conventional diagnostic method.

35 studies were performed in 31 patients (14 female, 17 male; median age 35 years, range 16–66 years; 21 with HD, 10 with NHL; 15 patients — stage III–IV, 16 patients — stage I–II) following chemotherapy, radiotherapy and in a few cases after or before bone marrow transplantation. In almost all patients FDG study was done for clarification of residual post-therapy abnormalities that fall under the category of unconfirmed/uncertain complete remission. All patients were injected with 296–370 MBq of FDG after one night fasting. Acquisition, consisting of whole-body scan and tomographic studies of the thorax and abdomen, was started one-hour p.i. The system used was triple-head Philips IRIX, Inc, Cleveland, OH. Reconstruction was performed by an iterative method. In 19 studies FDG scan was negative, in 16 positive. In 11 studies FDG scans found out more lesions than CT and other methods. In many patients unsuspected lesions were detected. The modality of treatment was changed in 10 patients (29%). All FDG-negative patients remained in remission one year after the study. Our preliminary data indicate that this non-invasive metabolic imaging performed with “hybrid” coincidence technology is superior to CT and other conventional diagnostic method in the post-therapy staging of lymphoma. More patient studies and longer period of time are needed to assess the prognostic value of this method in follow-up.
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**RADIOGUIDED INTRAOPERATIVE LOCALIZATION OF SMALL COLORECTAL LESIONS**

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**Aim:** Accurate intraoperative localisation of small non-palpable colorectal lesions is often difficult. Based on our previous experience with radioguided occult lesion localisation (ROLL) in the breast, we have recently introduced similar ROLL method for the detection of small colorectal lesions with 99mTc-labelled macroaggregates (99mTc-MAA).

**Material and methods:** Five patients (4 males and 1 female, age 55–73 years) were candidates for surgery of small colorectal lesions (3/5 located in the rectum, 2/5 in the colon sigmoidum) that were expected to be identified with difficulties during open surgery. During colonoscopy performed 18–24 hours before operation, 99mTc-MAA (74–111 MBq in 0.5 ml volume) was injected into the base of the lesion using sclerotherapy needle. All the patients underwent planar scintigraphy of abdomen with simultaneous emission-transmission scanning using a 57Co flood source, 1–2 hours before surgery. The location of injected radiopharmaceutical was intraoperatively detected with gamma-probe.

**Results:** In 4/5 patients scintigraphy revealed intensive focal uptake, in 1/5 patients the focal uptake was only faintly seen, probably because of intraluminal leakage of radiopharmaceutical. Intraoperatively, all the marked lesions were easily detected with gamma-probe and later confirmed by histopathological examination.

**Conclusions:** Our work suggests that intraoperative radioguided detection of small non-palpable colorectal lesions after preoperative endoscopic injection of 99mTc-MAA is simple and accurate method.

6

**THE VALUE OF SCINTIGRAPHY BY RADIOLABELLED CIPROFLOXACIN IN THE DETECTION OF ORTHOPEDIC INFECTIONS**


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The aim is detection of the infective foci in orthopedic patients using 99mTc-ciprofloxacin (Laboratory for radioactive isotopes, Vinča).

Total of 35 patients with clinical suspicion on orthopedic infection was investigated. In all the patients, whole body skeletal scintigraphy was performed. Ciprofloxacin chloride (3.5 mg) was mixed with 555 MBq of 99mTc in 3 ml of physiological solution and incubated for 20 min. After slow i.v. injection in a cubital vein, dynamic acquisition (1 min/mm) was performed during first 60 min in the position of interest, followed by static acquisition (500,000 imp) of the whole body, anterior and posterior view after 1 h and 4 h in all patients. When necessary, additional scintigrams were acquired after 24 h. In all the patients with negative or equivocal findings of planar scintigraphy, emission computerized tomography (SPECT) was performed (80 positions, 6 degrees). Interpretation was made by three independent observers. Additional data were provided using clinical finding, ultrasonography, radiography, computed tomography and magnetic resonance imaging, laboratory analyses, and surgical or microbiological confirmation of infection.

In our study, the highest uptake of radiopharmaceutical was present in liver and urinary bladder, while there was no free perchentrate in a thyroid gland. There were 18 TP findings (4 with septic arthritis, 5 with osteomyelitis of femur, after fracture and osteosynthesis, 4 with flegmona of cranial region and the foot caused by diabetes, and 5 with infection of the hip prosthesis), 12 TN (5 with osteoporosis, 5 with hip luxation and 2 with femoral fracture and osteomyelitis without infection), three FP (femoral osteomyelitis without infection and loosening of hip prosthesis without infection), while two FN (one due to TBC vertebral osteomyelitis, and the other with resistance to antibiotic therapy). The smallest lesion found was 15 × 20 mm. Scintigraphy after 4h reduced the number of FP findings from 7 to three, and increased the number of TP from 14 to 18, while scintigrams taken after 24 h did not influence the results of the study. Sensitivity was 90%, specificity 80%, positive predictive value 86%, negative predictive value 86% and accuracy 86%. In all 18 patients infection was caused by Staphylococcus aureus, in three associated with Staphylococcus alpha haemolyticus, Pseudomonas and Acino bacter. In one patient with FN finding, infection was caused by Microbacterium tuberculosae, and in the other resistant to antibiotic.

According to our results, scintigraphy with radiolabeled ciprofloxacin is a useful method for detection and assessment of exact localisation of orthopedic infections.
LOW DOSE DOPAMINE AND LOW DOSE DIPYRIDAMOLE RADIONUCLIDE VENTRICULOGRAPHY IN DETECTION OF MYOCARDIAL CONTRACTILE RESERVE IN PATIENTS AFTER MYOCARDIAL INFARCTION

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Aim: To evaluate the ability of low dose dobutamine and low dose dipyridamole radionuclide ventriculography to detect contractile reserve in patients after myocardial infarction and functional recovery after coronary angioplasty.

Material and methods: The study group consisted of 20 consecutive patients (52 ± 10 years, 17 male) with previous myocardial infarction and testing regional dysynergy, in whom diagnostic cardiac catheterization revealed significant one-vessel coronary artery stenosis suitable for angioplasty. Each patient underwent equilibrium 99m-Tc radionuclide ventriculography which was performed at rest and during low dose dobutamine (0.28 mcg/kg/minute) and low dose dipyridamole infusion (up to 10 mcg/kg/minute). Left ventricular global and regional ejection fraction were determined. Increase of regional ejection fraction for > 5% (interapolical and posterolateral regions) or > 10% (anteroseptal regions) during low dose dobutamine and dipyridamole in infarcted regions, as well as in the follow-up period, was considered as index of contractile reserve. After 8 weeks of successful angioplasty, resting radionuclide ventriculography was repeated in all patients in order to identify functional recovery of the infarct zone.

Results: Out of the 180 analyzed segments (20 × 9), 90 regional ejection fractions have shown depressed contractility. The mean of the regional ejection fractions showing depressed contractility increased from the resting value of 43 ± 12% to 42. ± 14% in the follow-up period (p = 0.06). Of the 50 with baseline dysynergy, 46 were responders during low-dose dobutamine (51%), whereas 30 segments were responders (36%; p = 0.05 vs. dobutamine) during low dose dipyridamole. Positive predictive value of dobutamine and dipyridamole for predicting functional recovery was 72% and 76% (p = 0.05), respectively. Negative predictive value of dobutamine and dipyridamole was 48% and 69% (p = 0.05), respectively. In the group of patients with moderate/severe dysynergia, positive predictive value of dobutamine and dipyridamole increased to 88% and 93%, while negative predictive value of dobutamine and low dose dipyridamole respectively (p = NS).

Conclusions: Although low dose dobutamine induced higher rate of positive responses during radionuclide ventriculography imaging, dipyridamole radionuclide ventriculography has shown superior, particularly negative, prognostic value for predicting functional recovery of infarcted regions.

FREQUENCY AND PROGNOSTIC VALUE OF REPORTED SIDE EFFECTS DURING DIPYRIDAMOLE STRESS TEST IN MYOCARDIAL PERFUSION SCINTIGRAPHY

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Aim: To evaluate occurrence and prognostic value of side effects of pharmacological vasodilatation induced by dipyridamol on the outcome of myocardial perfusion scintigraphy.

Material and methods: Study group comprised 95 patients (M 58, F 37, mean age 58 years, range 38–76 years). Gated or non-gated SPECT 199m-Tc-DTPA myocardial perfusion scintigraphy (99m-Tc-MIBI or 99m-Tc-Tetrofosmin) was performed according to stress-rest two days protocol. Average dose of intravenous dipyridamol was 0.56 mcg/kg, infused over 4 minutes (maximal vasodilatory effect achieved in average 5.5 minutes). Subjective symptoms and clinical cardiac (chest pain, ST-T segment change in ECG, hypotension, Ventricular ectopics, AV block) and non-cardiac side effects (headache, nausea, dyspnea, fatigue, bronchospasm, non-specific pain, flushing, sweating) were registered during test.

Results: 66 patients (69.5%) had subjective symptoms or clinical signs during pharmacological stress test. The most frequent cardiac sign was chest pain reported in 23 patients (24.2%) (associated with ST-T segment changes in 4 patients and hypotension in 1 patient). One patient had transient AV block grade I. Headache (52.8%), fatigue (36.3%), nausea (25.1%) and flushing (15.4%) were the most frequent non-cardiac symptoms. 14 patients received Aminophyllin treatment for substantial side effects. Neither fatal nor nonfatal myocardial infarction, or endangering arrhythmias were registered. Myocardial perfusion test findings were positive in 63% of the patients with severe side effects (3 or more symptoms or signs). 44% of the patients with moderate side effects (1-2 symptoms or signs) and 48% of the patients with no side effects (statistically insignificant).

Conclusion: Dipyridamol stress test performed during myocardial perfusion scintigraphy presents safe diagnostic procedure. Subjective symptoms and clinical signs registered during pharmacological vasodilatation had no prognostic value for the outcome of myocardial perfusion scintigraphy.

ACCURACY OF 99mTc-MIBI MYOCARDIAL SCINTIGRAPHY IN THE EVALUATION OF CORONARY ARTERY DISEASE

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Aim: To assess the accuracy of myocardial 99mTc-MIBI scintigraphy for tomographic imaging (SPECT) comparing to coronary angiography in the evaluation of coronary artery disease.

Material and methods: Sixty-six patients (40 males — 60.6%, 26 females — 39.4%; mean age 51.13 ± 5.3 years) who presented with findings of normal or nonsignificant coronary artery disease were included in the study. Significant disease was defined by ≥ 75% luminal coronary artery stenosis in one or more coronary artery or major branch or in a saphenous vein graft or arterial mammary graft.

Results: Overall results are shown in the Table:

<table>
<thead>
<tr>
<th></th>
<th>Myocardial 99mTc-MIBI</th>
<th>Coronary angiography (pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal finding</td>
<td>24 (36.4%)</td>
<td>42 (63.6%)</td>
</tr>
<tr>
<td>One- vessel disease</td>
<td>26 (39.4%)</td>
<td>10 (22.7%)</td>
</tr>
<tr>
<td>Multi- vessel disease</td>
<td>16 (24.3%)</td>
<td>9 (13.6%)</td>
</tr>
</tbody>
</table>

According to our results, we found the myocardial 99mTc-MIBI scintigraphy overall sensitivity of 92%, specificity of 55% and accuracy of 50% with positive predictive value of 39% and negative predictive accuracy of 96%.

Conclusion: On the basis of its high sensitivity and high negative predictive value myocardial 99mTc-MIBI scintigraphy appear to be an useful diagnostic tool for coronary artery disease, with especially high value in predicting the low-likelihood of future cardiac events.

ANALYSIS OF 99mTc-MIBI MYOCARDIAL PERFUSION SCANS IN PATIENTS WITH NORMAL OR NON-SIGNIFICANT FINDINGS ON CORONARY ANGIOGRAPHY

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Aim: To analyze Tc-99m-MIBI myocardial perfusion scans (MPS) in patients (pts) with normal, or findings of non-significant stenoses on coronary angiography (CA).

Material and methods: We retrospectively analyzed 41 patients (22 males, 19 females; mean age 51.13 ± 5.3 years) who presented with findings of normal or non-significant stenosis on CA in the past two years. Findings of MPS and CA were analyzed comparatively in each patient. Positive MPS findings were divided according to the vessels involved compared to CA findings, into 3 categories: A — same vessels involved as in CA, B — same vessels plus additional vessels, C — different vessels.

Results: In 41 pts with normal/non-significant findings on CA, we found 16 (39%) with negative MPS (true negatives) and 25 (61%) with positive MPS findings (false positives). Out of those 25, there were 6 in category A, 6 in category B, and 13 in category C (5 of those could be characterized as unrecognized attenuation). Since the same vessels were involved in both CA and MPS, category A and B pts could also be accounted for true positives, rendering only the patients in category C as false positives. Having in mind the 5 unrecognized attenuation pts, there would be only 8 pts (20% of all) as false positives.

Conclusions: Coronary angiography is often considered golden standard for myocardial perfusion imaging. However, these results show that in some pts the significance of stenoses on CA could be underestimated. Also, it is essential to recognize artifacts in order to achieve more accurate results of myocardial perfusion imaging.
11 KIDNEY

THE ROLE OF DYNAMIC SCINTIGRAPHY WITH TC-99M DMSA IN THE QUANTIFICATION OF RENAL BLOOD FLOW

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Aim: To evaluate whether blood flow to kidney (RBF) could be estimated by the analysis of the vascular transit of DMSA and to determine the sensitivity of this parameter in assessing perfusion of native and transplanted kidney.

Material and methods: Investigation was carried out in 58 subjects, who were divided into four groups. The first two groups consisted of healthy individuals: group A of 23 potential kidney donors and group B of 18 children in remission after first urinary tract infection. Group C consisted of 10 pts. with well-functioning transplant and group D of 7 pts. with suspected acute rejection. Dynamic scintigraphy was done 14 min after bolus of 370 MBq DMSA. For the first 40 seconds two frames per second were recorded. The blood flow to kidney is estimated from a derived first pass activity plateau in renal region of interest as the difference between the maximal slopes of renal and arterial TA-curves.

Results: Mean values of RBF in group A were 18.28±0.0°C and of one kidney BF of 9.14. In group B values were 20.83 for both kidneys and 10.96 for one kidney. Transplant blood flow (TBF) in group C was 13.99 and in group D 6.73. Values of RBF in group C were 53% higher than one kidney RBF in group A and 23% lower than global RBF in group A. In group D, RBF was 66% lower than global RBF in group A and 56% lower than RBF in group C. Statistical difference was significant. The BF was no overlapping between group D and C, as well as between group D and A. Correlation between RBF and biochemical parameters of renal function was significant: RBF/Cr = -0.30, RBF/Cr 7 = 0.73 and RBF/BUN = 0.79.

Conclusions: Fractional renal blood flow, derived from the first-pass activity plateau, and the upslope ratio of kidney curve and arterial curve is sensitive method for quantifying renal perfusion. Flow is generated in physiological units of percentage cardiac output. Method is independent of time interval between the arterial and organ blood activity curves; many other techniques require this to be simultaneous. Method gives physiological values of blood flow in healthy adults and infants. Well functioning transplants could receive a fraction of CO similar to that delivered to two normal kidneys. Flow to the rejecting allograft is markedly reduced.

12 GASTRIC EMPTYING AND HORMONE LEVEL CHANGES AFTER GASTRIC BULAR SUTURE

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The aim was to examine influence of peptic ulcer surgery on the gastric emptying (GE) and serum levels of the gut hormones. Seven healthy volunteers (C), 7 patients after Bilroth I (B), 11 after Bilroth II (II), 7 after BI with selective vagotomy — Harkins 1 (H1) and 10 after BI with selective vagotomy Harkins 2 (H2) were examined. After ingestion of the high density test meal dynamic scintigraphy of the gastric region was performed during 120 min. From the gastric emptying curve the lag phase duration (min) and emptying rates (%) after 30, 60, 90 and 120 min were analysed. The serum levels of gastrin, motilin, somatostatin and neurotensin were determined by RIA techniques just before the test meal, at the beginning and every 10 min of GE study. The lag phase duration was reversely related to GE rates, and the GE pattern was linear in both controls and operated patients, except in BI group in which the GE pattern was exponential. In relation to C group, GE was slower in BI (p = 0.05), H1 and H2 groups (p = 0.01), and faster in BI group (p = 0.01). Slower GE in operated patients except BI group, could be explained by massive gastric motility disorders (H1, H2) and by decreased anastomotic patency (BI, H1). Faster GE in BI group could be a consequence of increased anastomotic patency (large stoma) and lack of the duodenal inhibitory activity. Lower serum gastrin values obtained in all patients, in relation to C group (p < 0.01), were explained by an absence of the secretory active antal mucosa. The serum motilin values showed peaks during the first 60 min in all groups. Higher values of this gastric motility activator obtained in patients after the selective vagotomy (p < 0.01) could be explained by its attempt to normalize marked GE retardation (H1, H2). Since somatostatin also stimulates the gastric motility, its higher serum values recorded in BI and H1 groups (p < 0.01) might be explained as a compensation of decreased anastomotic patency, while such an effect was not necessary in other operated patients. The highest serum values of neurotensin obtained in BI group (p < 0.01) might be a result of an attempt of this GE inhibitor to retard the most rapid GE in those patients, while increased values obtained in H1 and H2 groups could not be explained by this effect.

13 EVALUATION OF LIVER TRANSPLANT FUNCTION BY NUCLEAR MEDICINE METHODS

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The aim was to evaluation the perfusion, morphology and the biliary three patency of the liver transplants by the two scintigraphy methods successively performed. The study was performed in 10 controls and 18 patients after orthotopic transplantation (up to two years). "First pass" acquisition was performed with scintillation camera, after bolus injection of 360 MBq 99mTc-dextran (DA, 60 frames/60s), con- tinued by 59 minutes (1 frame/min) slower dynamic study. From the liver and kidney activity during "first pass" study, hepatic perfusion index (HPI) was calculated using slope-analysis. Hepatobiliary scans obtained during second phase of the study were analysed for morphology, and parenchymal and hepatobiliary TA curves were generated and analysed according to the time to maximal activity (Tmax) and the time to half of maximum activity (T1/2).

In comparison to the controls (HPI = 0.64 ± 0.05%) portal perfusion was slightly (0.68 ± 0.04%), but not significantly (p > 0.05) increased. In 3 patients, bilary phase of hepatobiliary scintigraphy showed increased accumulation of radiopharmaceuti- cal in the left (n = 1) or right (n = 2) hepatic duct. Uptake of the radiopharmaceuti- cal (Tmax = 18.5 ± 2.9 min) was slightly, but not significantly (p > 0.05) delayed in comparison to the controls (14.2 ± 3.4 min), while excretion was significantly (p < 0.05) prolonged (31.3 ± 3.7 min) in comparison to the controls (25.7 ± 3.5 min), while especially one is high significantly (p < 0.01) prolonged (89.0 ± 14.3 min) than physiological (45.0 ± 7.2 min).

The single injection hepatic radionuclide angiography and hepatobiliary scintigraphy are noninvasive, sensitive and valuable for the follow up of the liver transplants.
MEMBRANE BASED EXTRACTION OF 177Lu (III) WITH DI(2-ETHYLHEXYL) PHOSPHORIC ACID

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Metallo-radiopharmaceuticals are pharmaceuticals composed of a metallic radionuclide, e.g. 111In, 177Lu, 99mTc, 186Re, 188Re, etc., and a bioactive targeting molecule, e.g. antibodies, peptides or receptor ligands [1]. Metallo-radiopharmaceuticals can be used for diagnosis or endoradiotherapy depending on the radiophysical characteristics of the incorporated radionuclide. Uranium(III) radiotopes are of particular interest for endoradiotherapy as they are readily forming stable complexes with linking chelators [2]. Lu(III) is a lanthanide radionuclide with good characteristics (t1/2 = 6.7 days and Eβ = 0.499 MeV) for application in endoradiotherapy. The labelling of a bioactive molecule with metal-luorocides involves several steps. The most important phase is the separation of the labelled compound from the free radionuclide [1, 2].

The aim of this study was to investigate the feasibility of membrane extraction of 177Lu(III) for the separation of free 177Lu(III) from the bioactive compound labeled with 177Lu(III). This was achieved by dilution with 0.05 mol·dm−3 ammonium citrate buffer of pH = 5.3. Supported liquid membrane based extraction of 177Lu(III) has been performed in a small membrane module with a microporous flat polypropylene membrane. The membrane was impregnated by spaying in a solution of 40% di(2-ethylhexyl) phosphate (DEHPA) in Kerosene for 30 min. The extraction of 177Lu(III) was performed from a donor phase consisting of 36.9 mg·dm−3 Lu in 0.05 mol·dm−3 ammonium citrate buffer, pH = 5.3 into the acceptor phase, which was 1 mol·dm−3 HNO3, pH = 0.5. The donor phase was pumped continuously through the membrane and the permeation was monitored by the change of the initial 177Lu concentration in the donor phase. The efficiency of the extraction was 99%. The purity of the products was 99.1%.

Results: Results: Results: Results: Results: Ciprofloxacin was labeled with 99mTc-pertechnetate using SnCl2 as reducing agent. The reaction volume of 3 ml has shown minimum content of impurities. For determination TcO2 species (free 99mTc-pertechnetate, Rf = 1) SG strips (MEK or saline) and silica gel 60 F254 plates (Merck, Darmstadt) (Rf = 2) were used. The concentration of TcO2 species (reduced-hydrolyzed 99mTc-pertechnetate, Rf = 0) was determined with CuO (butfal/acetic acid/water 2:2:1). The results obtained with these chromatographic methods in a good agreement. In the bacterial binding assay, Tc-99m was prepared by formulation No. 1 gave highest binding to bacteria, formulation No. 2 gave lower values, while No. 4 showed significantly lower binding.

Conclusion: Radiopharmaceutical 99mTc-ciprofloxacin has been developed for detection of bacterial infection. This technique is simple and the product is easy for handling. After reconstitution of the inactive kit with sodium pertechnetate, no additional manipulations are necessary before i.v. application.

CHEMICAL AND BIOLOGICAL EVALUATION OF TECHNETIUM (I)-DPD COMPLEXES WITH EHDIA AND DPD


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The first results on synthesis of [99mTc(CO)3(H2O)3]+, the air and water stable organometallic [99mTc(CO)3(H2O)3]+ precursor, were presented 1998 [5]. This complex is reduced by SnCl2, synthesized in the presence of metal ions under an air atmosphere and used in the clinical practice. In our work we studied the influence of different ligands on the chemical and biological activity of [99mTc(CO)3(H2O)3]+ complexes.

The results confirmed that hydrophilic organometallic [99mTc(CO)3(H2O)3]+ complexes, were presented.

Biological evaluation of [99mTc(CO)3(H2O)3]+ and [99mTc-IDA] complexes involve the bio distribution examination on Wistar rats. The animals were sacrificed sixy and 3.5 min after application of 0.1 ml of [99mTc-carbonyl tagged DPD and EHIDA (74 kBq)] respectively. The radioactivity in the organ of interest was measured and the percentage of radioactivity related to the administered dose was determined. In the same way, the biodistribution of [99mTc-CIP] and [99mTc-EHIDA] complexes was done.

The results confirmed that hydrophobic organometallic [99mTc(CO)3(H2O)3]+ precursor allows forming of Tc (I) complexes with dihydrolipoic and IDA derivatives based on the tricarbonyltechnetium (I) core. The changes in structure of DPD and EHIDA with [99mTc(CO)3(H2O)3]+ and investigation of their chemical and biological behaviour, in comparison with the some one for [99mTc-DPD] and [99mTc-EHIDA] complexes, were presented.

DOD and EHDIA were synthesized and prepared in kit form in INS Vnča. Carbonyl labelling agent Isolink (Malinkirk Medical B.V.) and carbonyl precursor NCRS Demokritos approved according a directive for use, were applied. The samples (0.1 ml) of each ligand dissolved in water and with pH adjusted to desired value were added to a vial containing 0.9 ml of [99mTc-carbonyl neutralised to pH 7.5 and pH = 5.5 respectively. After heating (30 min) and cooling down to room temperature, reaction products were analysed by HPLC equipped with UV and g-detector, with TEPAP 0.5 M, methanol and water as solvent.

Biological evaluation of [99mTc(CO)3(H2O)3]+ and [99mTc-EHIDA] complexes involve the bio distribution examination on Wistar rats. The animals were sacrificed sixy and 3.5 min after application of 0.1 ml of [99mTc-carbonyl tagged DPD and EHIDA (74 kBq)] respectively. The radioactivity in the organ of interest was measured and the percentage of radioactivity related to the administered dose was determined. In the same way, the biodistribution of [99mTc-CIP] and [99mTc-EHIDA] complexes was done.
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EXTERNAL QUALITY ASSURANCE — THE RESULT OF THYROID DETERMINATION BY RIA T4-INEP IN THE INTERNATIONAL MEASUREMENT EVALUATION PROGRAMME IMEP 17

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External quality assurance (EQA), previously named as external quality control, is the set of procedures operated by an external agency for objective comparison of the laboratory results with an agreed target. The Isotope Measurement unit of the Institute for Reference Materials and Measurements (IRMM) develops and performs reference measurements using primary methods, produces certified isotopic reference materials, and organises international measurement evaluation programmes (IMEP) in the nuclear and non-nuclear fields. IMEP aims at establishing SI-traceable reference values through application of primary methods of measurements. The Consultative Committee for Amount of Substance (CCQM) of the International Committee for Weights and Measures (CIPM) defines these as methods having the highest metrological qualities. In 1999, IRMM launched IMEP 17, the evaluation programme for trace and minor constituents in human serum. The programme is organized in collaboration with C-AQ IFC (Committee for Analytical quality of the International Federation for Clinical Chemistry and Laboratory Medicine) and members of EQA-ML (European committee for the External Quality Assurance programmes in Laboratory Medicine). The preparation of two test materials from pools of fresh human serum started in 2000 by DEKS Hertev University Hospital and Statens Serum Institut, Copenhagen, Denmark. The pool of Material 1 was unmodified to resemble a normal patient serum. This material was used for thyroxin determination. Isotope dilution mass spectrometry (IDMS) was used as the primary method for thyroxin quantitation. Immunoassays were used for routine laboratory measurements, and thyroxin was the only constituent measured by immunoassay in IMEP 17. The reason is probably that EQA of immunoassay present some additional problems arising from the use of biological reagents. Participating laboratories has received certified test samples, which were analysed using routine measurement procedure. IMEP participated through the Society of Medical Biometrics of Serbia and Montenegro. Test samples were measured following the protocol, by immunoassay RIA T4, INEP. The measurement was done in June 2002 and the result was sent to regional coordinator. The outcome of the programme was available at the beginning of 2003. IMEP-17 reference value for thyroxin is 9.7 ± 6.5 nmol/L and the value measured in INEP was 9.4 ± 5.6 nmol/L i.e. deviation from the certified value is below 5%.

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MEASUREMENT OF SERUM THYROGLOBULIN LEVELS — WE NEED STANDARDIZED INTERNATIONAL GUIDELINES?

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Thyroglobulin (Tg) is synthesized and secreted by both normal and malignant thyroid cells. Hence, serum Tg levels are convincing indicator of thyrocytic activity. Detectable and increasing Tg levels in patients with thyroid carcinoma after “total” thyroidectomy or radioactive thyroid therapy indicate considerable amount of active thyrothyrone or cancer recurrence. An understanding of the malignant disease, its natural history and biochemistry of Tg allows laboratories to determine the characteristics of suitable Tg assays. In current laboratory practice there are several immunoassay methods such as radioimmunoassay, immunoradiometric assay, enzyme-immunoradiometric assay and immunoluminometric assay. Results are often subject to significant variations regardless of the method used. Interferences of Tg autoantibodies are already known (giving a rise to false negative results) as well as the use of heterophile anti-Tg antibodies in analytical procedure (giving a rise to false positive results). In Serbia, unlike in the EU countries there is no national or international standard for Tg measurements. The use of various analytical procedures, lack of standards and national guidelines may lead to clinical malpractice. The most important recommendations can be summarized: a) there should be precise national guidelines scheme of specimen requirements and sample stability; b) the use of international Tg reference standards such as CRM-457 is highly recommended; c) manufacturers of the assay kits should verify and quote the lowest detectable dose (LDD) calculated on precision profiles derived from “blanked” patients samples; d) manufacturers and laboratories should detect the analytical range of the assay based on the 10% CV on LDD and upper limit of the normal values; e) it is recommended that laboratories should notify clinicians of interference due to endogenous Tg antibodies and indicate the most likely nature of the interference; f) Tg autoantibodies should always be detected simultaneously using a sensitive immunoassay rather than a haemagglutination method; g) for a particular Tg method the results of a clinical assessment of the assay performance should be available. The clinical sensitivity and specificity (positive and negative predictive values) of the assay should be clearly quoted; h) laboratories should run internal QC samples which encompass the range of results reported by the laboratory. A sample with a Tg concentration close to the LDD should be run with each assay to ensure that the quoted LDD is being achieved; i) an external quality assessment should be established to facilitate method comparison and monitoring assay performance.

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STANDARIZATION OF HETEROGENOUS ANTIGENS IMMUNOASSAYS

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Biological standardization is organized and promoted by the World Health Organization (WHO). According to standards of International Organization for Standardization (ISO), the establishment of diagnostic assays should be achieved within the context of a reference system comprising: reference material, reference measurement procedure and reference measurement laboratories. The role of reference system is to provide that a numerical value assigned to the reference material is traceable through the defined reference method, associated with a specified uncertainty and that is commutable with clinical values. Standardization of glycoprotein immunoassay is complicated by several problems including microheterogeneity, crossreaction, matrix effects as well as the need to measure concentration close to the detection limit. Different immunoassays, based on antibodies with different specificities, could measure a mixture of protein isotins differing with respect to glycosylation, degradation or complex formation. During WHO Consultation on International Biological Standards for In vitro Diagnostic Procedures held in Geneva in September 2000, it had been proposed that the reference system for heterogenous antibodies should be achieved through a process of consensus. The proposal is that the term international conventional reference material (ICRM) would be used for such antibodies, instead of a primary international biological reference material. The assignment of a numerical value to an ICRM would be achieved using an international reference measurement procedure within an international conventional reference measurement system. Reference measurement laboratories would be embolded in a network that can prove their competence. The aspects of competence include the low uncertainty in the measurement results, the Quality System and consistently excellent performance in proficiency/external quality assessments. The developing technology poses a number of problems for the WHO biological standardization programme: in meeting the increased demand, in using recombiant materials on place of natural materials, in moving towards the use of more transparent units, and in standardization of complex heterogenous preparations. Heterogenous antigen immunoassay standardization include all of these problems. The results of heterogenous antibodies determination by immunoassay from different manufacturers will be discussed.

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CLINICAL ACCURACY OF TOTAL THYROIDINE, T4/TBG RATIO AND FREE THYROIDINE MEASUREMENTS IN HYPOTHYROIDISM AND HYPERTHYROIDISM

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Clinical laboratory diagnostics of thyroid function disorders comprises a number of analyses. Most of all thyroid function panels include measurements of total and/or free thyroid hormones. The aim of this study was to evaluate the clinical accuracy of total T4, free T4 and T4/TBG ratio and to establish their usefulness in evaluation of hypothrysis and hypothyrosis. Total T4, T4/TBG ratio and FT4 were first determined in healthy, euthyroid subjects (n = 100) and then in patients with hypothyrosis (n = 3) and hypothyrosis (n = 66). The reference range for each parameter was determined in each group. The values of the areas under the ROC curves were significantly higher (1 > t > 1, p = 0.05) for T4/TBG ratio and FT4 (0.9904 i.e. 0.9976) than for total T4 (0.9280) in hypothyroid patients while there were no significant difference between these parameters in patients with hypothyrosis. In conclusion, for the diagnosis of hypothyrosis, determination of the proportion of free thyroxine is of the greatest importance. No significant difference between T4/TBG ratio and FT4 was found. Determination of total T4 is not a preferable parameter because of its significant lower clinical accuracy. Each of these three parameters could be used with equal certainty in the diagnosis of hypothyrosis.
ENDOCRINOLOGY

SENSITIVITY OF DUAL TRACERS TC99M-TETROFOSMIN/TECHNETIUM-99M PARATHYROID SCINTIGRAPHY

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Aim: To estimate sensitivity of dual tracer subtraction scintigraphy with Tc99m-tetrofosmin and Tc99m in detection of abnormal parathyroid glands in patients with primary and secondary hyperparathyroidism.

Material and methods: Sixteen patients, ten with primary and six with secondary hyperparathyroidism underwent parathyroid scintigraphy preoperatively. All patients had pathohistological confirmation of diagnosis. Abnormal parathyroid glands weighed from 0.1 to 7 g. After i.v. injection dynamic scintigraphy for 25 minutes (one minute, one picture) using 555MBq of Tc-99m-tetrofosmin and three hours later, using 111MBq of Tc-99m, was performed. Tc-99m-tetrofosmin dynamic study was followed by static scintigraphy of neck and chest. After normalisation, motion correction and subtraction Tc-99m from Tc-99m-tetrofosmin picture.

Results: Abnormal scintigraphic finding was in 15 patients with sensitivity of 93.7%. Overall sensitivity for detecting 25 from 31 abnormal parathyroid glands was 78.5%, for primary hyperparathyroidism sensitivity was 90%, and for secondary 67%.

Conclusions: Positive scintigraphy in 15 from 16 patients (sensitivity 93.7 %) and detecting 25 from 31 gland (sensitivity 78.5%), shown high sensitivity of dual tracer subtraction scintigraphy with Tc-99m-tetrofosmin and Tc-99m in detection of abnormal parathyroid glands.

CURRENT STATE AND PERSPECTIVES OF APPARATUS BASE FOR MODERN SPECT

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Methods of diagnostics with use of radiopharmaceuticals are widely adopted in clinical practice. With the help of these methods different diseases at early stages are diagnosed. Sale of emission tomographs in the international market of medical devices steadily grows. At present such firms-creators as Philips (38% of market share), General Electric (30%), Siemens (28%) dominate in the market. The other firms possess about 4% of the market. In particular such firms as Toshiba, Mediso, IS2 Research and others. In order to understand the tendencies of development and usage of gamma cameras we give data from the report of the enterprise Frost and Sullivan, in this report the situation on gamma-camera market from 1997–2007 is analyzed. In the CIS countries implementation of methods of radionuclide diagnostics is hold back due to absence of modern equipment. Within the period of 1996–1998 STC "Institute for Single crystals" Khrakov and SDTB "ORIZON", Smela on basis of tomographic gamma-camera GKS–351 (which was developed in 1990 in Moscow) created a noticeably modernized gamma-camera "Takama" and by the year 2002 more than 30 sets of this kind of equipment were produced mainly for the health care service of Ukraine. In 2001 STC "Institute for Single crystals" and SDTB "ORIZON" developed new tomographic camera "OFFED-1" with rectangular view field of large scale. This tomograph passed all tests and works successfully in the Romodanov Institute of "Neurourgy", of AMS of Ukraine, Kiev.

The construction of tomograph allows placing inlet window of detection block practically in any possible way and to carry out investigations in any comfortable for patient position — lying, sitting, standing.

Two or more personal computers may be connected to the tomograph for the convenience of simultaneous survey, data-collecting, processing, archiving and transmission of the data. Tomograph set includes portable cathodegraph that allows examining cardiovascular system, to determine series of parameters of central and organ hemodynamics, to evaluate volume of blood circulation, to reveal and evaluate consolidated hemorraghes and to carry out synchronized equilibrium venous-venous study.

It is possible to carry out EKG synchronized tomographic studies with the purpose to determine size and severity of defects of myocardium walls and contractility of left ventricle of heart. Device of digital scaling is implemented in the tomograph, this device allows to improve resolution of isocromatic images by means of enlarging of image of the object under study within the limits of the selected region of interest up to matrix size of the image at proportional reduction of matrix pixel. Scale of region of interest of the object under consideration may vary from 100% to 400% at step 20% and to change position of region of interest.

Control over the removal of region of interest as well as determination region of interest is carried out by software with usage of graphic interface of user. Tomograph software support meets all modern requirements. Technical parameters of tomograph fully comply with modern requirements and do not yield to foreign samples.

VARIA

COMPARISON OF TWO METHODS FOR OPTIMAL RED CELL MASS AND PLASMA VOLUME ESTIMATION

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It is well known that using ml/kg method leads to inappropriate red cell mass and plasma volume (RCMV&PV) interpretation (particularly in obese individuals).

Aim: To present and compare the results of two proposed methods for optimal RCMVP estimation, and their impact to the interpretation of obtained results.

Material and methods: 120 patients (81 male and 39 female) with the diagnosis of polyctytosis underwent RCMVP determination using autologous erythrocytes in vitro labelled with 51Cr-sodium chromate. Two methods were performed for optimal volume determination:

1. Retzlaff's tables, based on patients sex, body weight and height;
2. The method recommended by the ICSH based on body surface area, sex and age of patients [1].

Results: There was no significant difference in the age of the investigated persons. Males were 22–76 years old (mean value = 55 years, SD ± 15 years), females 30–81 years (mean value = 68.5 years, SD ± 13 years). Body mass in males ranged from 62 to 139 kg (mean value = 83.3 kg), and in females 43.5–104 kg (mean value = 64.6 kg). The difference in real and ideal body mass was highly significant for males (mean difference = 7.1 kg, SD = 13.2 kg), while it was not the case for female patients (mean difference = 1 kg, SD = 12.5 kg).

ICSH method yielded lower optimal values in comparison to Retzlaff's method. ICSH and Retzlaff's methods differed highly significantly (p < 0.01) in male subjects to RCMVP and blood volume. Plasma and blood volume optimal values were significantly lower with ICSH than Retzlaff's method in female patients (p < 0.05), while the differences were not significant for RCM.

Concordant interpretation of RCMVP using the two methods for optimal RCMVP calculation was obtained in 101/120 patients (91.7%). Absolute erythrocytosis in 69/110 (62.72%), normal in 42/110 (38.2%) persons and PV depletion in 4/110 (3.64%) subjects.

Conclusion: Two methods for optimal RCMVP estimation differ significantly and lead to different interpretation of obtained results in 8.3% of patients. ICSH method yields somewhat lower values for optimal RCMVP compared to the Retzlaff's method.

References: