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ENDOCRINOLOGY

1

THE EFFECTIVENESS OF MULTINODULAR LARGE TOXIC GOITER THERAPY USING 131-I

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The treatment of multinodular large toxic goiter is still the actual clinical problem, especially when therapy with antithyroid drugs is ineffective, there are some side effects after such a therapy or the surgery is not possible (the contraindications, disagreement of patient). The aim of study was to establish the effectiveness of radioiodine therapy using 131-I in the group of patients with multinodular large toxic goiter. The examined group included 17 women (aged 62–82). In all patients multinodular large toxic goiter (size by USG more then 100 ml) was detected. The mean of goiter volume in examined group was 195 ml (range 100–370). The hormonal profile (TSH, FT4, FT3), anti-thyroid antibodies (aTPO, aTG, TSHAbTRAK) serum level, growth factors (insulin, IGF-1, GH) serum level were estimated. The radioiodine uptake after 5 and 24 hours, 131-I thyroid scintigraphy and USG guided fine needle aspiration biopsy were done. No malignant nodules were detected. Each patient started from 30 mCi doses of 131-I fractionated therapy. The control study and next 131-I dose (30 mCi 131-I) was repeated every 3 months. After 6 months (and after total dose of 60 mCi of 131-I) we found: 10 patients (59%) with clinical and laboratory euthyroidism, 6 patients (35%) with hyperthyroidism and 1 patient (6%) with hypothyroidism (L-thyroxine substitution was started and 131-I therapy was continued because of large goiter). The mean of goiter volume decreased to 147 ml (range 67–297). After 9 months (and after total 90 mCi 131-I dose) we found: 12 patients (71%) with clinical and laboratory euthyroidism, 2 patients (12%) with hyperthyroidism and 3 patients (17%) with hypothyroidism. The mean of goiter volume decreased to 123 ml (range 56–217). In 16 cases radioiodine therapy for thyroid ablation is continued. No correlations between decrease in thyroid volume, radioiodine uptake and anti-thyroid antibodies levels were detected ($p > 0.05$). In the period of 9 months, no statistically significant changes of radioiodine uptake, anti-thyroid antibodies, growth factors levels were observed ($p > 0.05$).
Conclusions:
1. In some cases of of multinodular large toxic goiter, the radioiodine therapy can be the best alternative way for antithyroid drug and surgery therapy.
2. The fractionated radioiodine therapy of multinodular large toxic goiter is safe and effective method but continuation of nodules observation is necessary.
3. The effectiveness of fractionated radioiodine therapy gradually decreases and partially depends on TSH level (the necessity of long-term monitoring and, if it is necessary - thyroxine substitution therapy).

2

DIFFERENTIATED THYROID CARCINOMA — EXPERIENCES WITH RADIOIODINE TREATMENT IN CHILDREN

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Introduction: Differentiated thyroid carcinoma (DTC) is a rare tumor in children and adolescents. Similarly to the adults, radioiodine therapy plays an important role in the management of DTC in the development age. Aim of the study was to evaluate the efficacy of radioiodine therapy in children treated in our center from 1999 to 2003.
Material and methods: Up to now, 37 children with DTC were treated with radioiodine in our department, i. e. 4.6% of all patients with DTC. 32 girls and 5 boys were 9 to 18 years old (mean 15.3 ± 2.2 years) at the time of the first ablation treatment. Histologically, papillary carcinoma was diagnosed in 27 children (73.0%) (follicular variant in 8 children [21.6%]), follicular carcinoma — in 9 children (24.3%) and oxyphilic carcinoma — in 1 case (2.7%). In 8 children multifocal form of carcinoma was diagnosed. In 5 children (13.5%) cervical lymph node metastases were found. In two of these children additionally distant DTC metastases were diagnosed. The radioiodine whole body scan was performed during endogenous stimulation of TSH. TSH concentrations were from 32 to 310 mU/l (mean 127 ± 54; median 108). Concentration of thyroglobulin was from 0,26 to 302 ng/ml (mean 22 ± 65; mediana 3.6). Volume of the thyroid tissue remnants after thyroidectomy assessed by ultrasound was from 0.05 to 2.27 ml. All children were treated with ablation doses of radioiodine of activity from 50 to 90 mCi (mean 64 ± 11).
Results: Until now, 30 children (81.1%) were subjected to radioiodine diagnostics again, ca. 6 months after ablation treatment. In 20 of them (66.7%) complete remission was diagnosed and in these children no further radioiodine treatment was required. Indications for the second radioiodine treatment were present in the remaining 10 children (33.3%) who received radioiodine with activity from 60 to 150 mCi depending on individual staging. Eight out of these children have been already referred to us for the third radioiodine whole body scan. In all of them complete remission was observed. They are now followed up in the outpatient clinic according to the management guidelines.
Conclusion: Radioiodine treatment is an effective method in children with DTC — in 2/3 of patients effective ablation was achieved after the first radioiodine therapy, in the remaining 1/3 — after the second course of radioiodine treatment.

3

QUALITY OF LIFE IN GRAVES'OPHTALMOPATHY

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The methods of Graves' disease treatment have been modified during latest twenty years. The main symptom which determined specific emotional reaction was always orbitopathy. The negative effect of orbitopathy seems to be the most important problem influencing the health-related quality of life (HRQL) in Graves' patients. The notion "quality of life" which appeared in scientific publication in 80-ths is described as great influence of disease and treatment on patients life.
The aim of our study was exploration of some psychological functions and their role in ophtalmmopathic patients' quality of life .
We examined 48 women with Graves' ophtalmopathy (GO) aged from 32 to 64 yr., average 43 SD = 8.17. All women were actively working until the hospitalisation. They were asked to complete the experimental questionnaire based on London's St. George Hospital (in our modification). We used also: Temperament Inventory (EAS-D) in addition for adults, estimating: emotionality-distress, emotionality-fear, emotionality-anger, activity, and sociability, STAI Questionnaire (State-Trait Anxiety Inventory) and Beck's Depression Scale. We compared the scores with two reference populations of 'healthy' persons and to "GO "patients. All patients were invited for a follow-up ophthalmologic examination.
We have interpreted obtained results as: 1. anxiety tendency, 2. subjective decreased mood, 3. decreased social tendency.
Obtained results let us to conclude that in examined group:
1. There is tendency to fear and anxiety reactions and to avoid danger situations and person.
2. There is subdepressive mood.
3. There is low social tendency (social isolation).
4. Decreased quality of life is connected with eyes symptoms/pains, discomfort, vision problems and decreased subjective attraction.
5. Eyes' problems generate: social avoiding, job troubles absence, less efficiency, resignation/and economical status' decrease.

4

EARLY EFFICACY OF ABLATION WITH FRACTIONATED RADIOIODINE IN PATIENTS WITH DIFFERENTIATED THYROID CARCINOMA

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Introduction: Treatment of differentiated thyroid carcinoma (DTC) includes ablation with radioiodine under endogenous TSH stimulation. According to the guidelines, patients without lymph nodes or distant metastases are treated with 60 mCi (2.2 GBq) of 131-I. Current regulations accept treatment with such high activities only in the conditions of specialized wards equipped with a sewage decontamination system. From 1999–2002, due to deficiency of such hospital beds in the region, part of DTC patients were treated on an outpatient basis with fractionated 131-I doses. Aim of this study was to evaluate, whether the use of fractionated radioiodine did not affect the efficacy of ablation.
Material and methods. Out of 642 patients with DTC who were treated with radioiodine from 1999 to 2002 in our center, 366 patients treated with 131-I for the first time 1–3 months after total thyroidectomy were retrospectively selected. According to the mode of treatment, the patients were retrospectively assigned into one of two groups: Group 1–treatment with a single activity of 60 mCi (77 patients, 21.1%); Group 2 — treatment with two activities of 30 mCi administered every 24 hours (289 patients, 78.9%). As advised by the guidelines, all patients were subjected to a radioiodine diagnostics 6–9 moths after ablation, during discontinuation of L-thyroxin suppression, comprising measurement of: TSH and thyroglobulin (Tg) concentrations, 24 hours iodine uptake (U 24), volume of the remnant thyroid tissue by ultrasound (V) and a whole body scan. Patients with partial remission, stagnation or progression of the disease were qualified to the second radioiodine treatment (singlese activity) and patients with complete remission were sent to further outpatient follow-up. Early success rate (SR) of the ablation was the percentage of patients with complete remission. SR in both groups was compared.
Results: Both groups were comparable in terms of sex and age structure. During the primary diagnostic before ablation no statistical difference of TSH, Tg, U24 and V was found. The same parameters obtained during the secondary diagnostics 6–9 months after ablation were as follows (mean ± SD; median):

	Tg (ng/dl)	U24 (%)	V (ml)
Group 1	10.8 ± 55.2; 0.9	1.17 ± 1.18; 0.9	0.17 ± 0.33; 0.05
Group 2	7.1 ± 68.6; 0.62	1.14 ± 1.17; 0.9	0.19 ± 0.61; 0.06
p	0,012	ns	ns

Complete remission was achieved in 43 patients from group 1 and in 177 patients from group 2 (SR 55.8% v. 61.2%, p = ns). As soon as the adequate hospital ward with a decontamination system was organized and the regulations of ambulatory treatment were modified, therapy with fractionated doses of radioiodine was abandoned.
Conclusion: Treatment with fractionated doses of radioiodine did not significantly influence the early efficacy of ablation in patients with DTC.

CARDIOLOGY

5

INFLUENCE OF PREVIOUS HYPERTHYREOIDISM ON ABLATIVE RADIOIODINE TREATMENT OF DIFFERENTIATED THYROID CARCINOMA

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Introduction: In some patients with hyperthyroidism, differentiated thyroid carcinoma (DTC) is diagnosed after surgery. As all patients with DTC, they are then subjected to thyroid ablation with radioiodine. Theoretically, previous hyperthyroidism influencing iodine metabolism may decrease the effective dose of radioiodine and thus limit the efficacy of ablation. Aim of this study was a retrospective analysis of efficacy of radioiodine treatment in patients with DTC who had been treated for hyperthyroidism.
Material and methods: Out of 579 patients with DTC who were treated in our department between 1999 and 2003 and who had been subjected to at least one control radioiodine diagnostics 6–8 months after ablation, patients who had been diagnosed and treated for hyperthyroidism before surgery were retrospectively selected, constituting Group H. The remaining patients in whom hyperthyroidism had never been diagnosed were included in the control group (Group C). Ablation success rate (SR) as assessed in the first control diagnostics 6–8 month after ablation in both groups was compared.
Results: 69 patients (11.9%) aged 11–76 years (median 52 yrs) were qualified to Group H. The Group C consisted of 510 patients (88.1%) aged 12–84 yrs (median 50 yrs). Papillary thyroid carcinoma was relatively more frequent in Group H than in Group C (H — 89.8%, C — 80.4%); follicular thyroid carcinoma — slightly more frequent in Group C (H — 10.1%, C — 15.5%). Lymph nodes metastases were found in 5 patients of Group H (7.2%) and 72 patients of Group C (14.1%). Parameters obtained during the first radioiodine diagnostics in both groups are listed in the table 1:

Table 1.

	Group H	Group C	p
TSH [mU/l]	61.6 ± 51.4	77.0 ± 46.1	< 0.05
Tg [ng/ml]	44.8 ± 147.8	35.4 ± 111.0	ns
Iodine uptake at 24 h (%)	6.8 ± 6.9	5.8 ± 5.7	NS
Volume of thyroid remnants in US [ml]	1.1 ± 0.8	1.6 ± 5.5	NS

All the patients were treated with ablative dose of radioiodine and 6–8 months later a control diagnostics was performed. Based on ultrasound of the neck, Tg concentration, iodine uptake and whole body scan, complete remission was diagnosed in 34 patients of Group H (SR = 49.2%) and in 294 patients of Group C (SR = 57.6%). The difference in SR was not significant (test χ^2).
Conclusion: Previous hyperthyroidism did not significantly influence the early effect of radioiodine ablation in patients with DTC.

6

CHANGES OF LV VOLUMES AFTER PHYSICAL STRESS IN PATIENTS WITH CAD

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Background: Our previous observations showed a post-stress reduction of LVEF in patients with CAD, increasing between 1st and 3rd hr after termination of exercise. The aim of this study was to check the effect of the physical exercise on the LV volumes.
Material and methods: Fifty five pts with CAD and 9 healthy subjects (NMS) were studied. All subjects underwent gSPECT 1 hr after tetrofosmin administration at rest (R) and, on the next day, 1 hr (S1) and 3 hrs (S3) after tetrofosmin injection at peak physical stress. Data were acquired using a double head camera, over a 180° circular orbit. LV end-diastolic (ED) and end-systolic (ES) volumes were calculated using a commercially available QGS software.
Results: In CAD ES volume was equal to 51.8 ± 37.8 at R, 52.4 ± 35.6 at S1 and 55.7 ± 38.6 at S3. No significant differences were found between R and S1 values. On the other hand, comparisons between R and S3 as well as between S1 and S3 ES values revealed highly significant differences, with $p < 0.001$. The increase in ES volumes between R and S1 were observed in 21/55 pts (38 %) and between R and S3 in 37/55 pts (67 %). In NMS, ES volume amounted to 29.9 ± 10.3 at R, 35.9 ± ± 18.5 at S1 and 35.9 ± 16.7 at S3, with no statistically significant differences between those values. The average ES values were at each time-point higher in CAD than in Nms, although the differences were not significant. In each group LV ED volumes measured by all three examinations were similar to each other (CAD: 101.5 ± 46.4, 99.1 ± 43.2, 99.7 ± 46.1, respectively) (NMS: 74.8 ± 20.0, 75.0 ± ± 19.0, 74.3 ± 21.2, respectively). Similarly to ES, ED values were at each time-point distinctly higher in CAD than in NMS, although the differences were not significant. In CAD, both ED and ES volumes calculated from data acquired during all three examinations showed significant negative correlations with LVEF ($p < 0.001$).
Conclusions: In the majority of pts with CAD, physical stress leads to an increase in the left ventricular ES volume.
The post-stress increase in the ES volume grows stronger between 1st and 3d hr after termination of exercise.
Reduction in LVEF occurring in pts with CAD after exercise depends mainly on the enlargement of the ES volume.

7

EVIDENCE FOR EXTRAVASATION OF INTRACORONARY ADMINISTERED BONE-MARROW DERIVED CD34+ STEM CELLS IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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Background: Increasing experimental data as well as initial in-man experience indicate that bone marrow — derived stem cells do have a potential for myocardial regeneration. The protocols of currently ongoing clinical phase 2/3 trials evaluating functional benefits of bone marrow-derived stem cells do involve intracoronary administration of autologous bone marrow stem cells (BMC), although a direct evidence of BMC cells extravasation and tissue migration after intracoronary administration is missing.
Aim: The purpose of the study was to evaluate the extravasation and tissue migration of autologous CD34+ stem cells after intracoronary administration in patients with acute myocardial infarction (AMI).
Material and methods: 8 patients that underwent AMI treated with primary PTCA of a proximal lesion in one of the main coronary arteries were included into the study. In all patients, at day 2–6 after AMI onset, under local anesthesia, ca 30 ml of bone marrow aspirate was obtained by sternal puncture and CD34+ cells were isolated from bone marrow aspirate by magnetic cell sorting using the Dynal® CD34 Progenitor Cell Selection System. This kit contains Dynabeads® for the positive isolation of the CD34+ cells plus DETACHaBEAD® for the release of the captured cells (from the beads). Cells were subsequently labeled with 0.4–0.8mCi (15–30MBq) of 111-Indium-oxinate (Mallinkrodt). Cell suspension was administered sub-selectively intracoronary into the infarct-related artery at the time of a brief coronary flow decrease. An over-the-wire balloon was inflated for 120 seconds and cells were delivered via the internal catheter lumen. Whole-body scans using a double-head Varicam gamma camera were performed in each patient after 24 hours.
Results: Main regions of uptake were detected over liver, spleen and heart. Based on evaluation of activity in the regions of interest, we estimated that 1–11% of injected activity was concentrated in the heart, whereas uptake in the spleen and the liver was 3–17% and 12–45% of total injected activity, respectively.
Conclusions: Our preliminary data provide evidence for stem cell extravasation and tissue migration after intracoronary administration in patients with AMI. Detailed studies evaluating possible correlations of stem cell tissue migration with cell administration protocol used as well with clinical data, including the time of primary PTCA after AMI onset and timing of cell administration, are needed.

8

APPLICATION OF DIPIRYDAMOLE STRESS TC-99MIBI SPECT IN PATIENTS WITH SIGNIFICANT AORTIC STENOSIS

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Background: Exercise cardiac stress testing in patients with significant aortic stenosis is generally avoided for safety reasons. Furthermore, the studies that actually addressed the value of exercise testing both with and without myocardial Tc99MIBI scintigraphy for the diagnosis of coronary artery disease (CAD) proved to yield low specificity. Nowadays there are no safe and accurate means for noninvasive assessment of the presence, extent and severity of CAD in patients with significant aortic stenosis. Our study aimed to assess overall safety and usefulness of dipirydamole stress myocardial perfusion scintigraphy for detection of CAD using single-photon emission computed tomography (SPECT) in patients with aortic stenosis.
Material and methods: The study comprised 20 patients with significant aortic stenosis who were compared with 20 patients with CAD designated as CCS II and III. All patients underwent a 5-minute dipirydamole infusion (1.5 mg/kg body weight) protocol stress technetium-99m sestamibi SPECT. Visual 17-segment SPECT analysis used a standard five-point scoring system ranging from 0 (normal tracer uptake) to 4 (absent uptake). The SPECT results were considered abnormal if more than two segments had a stress score 3 2. These results were compared to the same number of patients diagnosed with CAD. All patients also underwent coronary angiography procedure. The respective results in the groups were subsequently compared using the U-Mann-Whitney test and Pearson's correlation nonparametric test.
Results: Sensitivity of gated SPECT study was calculated at the level of 83% in the studied group vs. 100% in the controls, with positive predictive value at 88% vs. 90%, respectively.
Hemodynamic responses during dipirydamole stress testing demonstrated no significant differences in the net change in systolic blood pressure (30% vs. 25%, patients with aortic stenosis vs. control subjects), heart rate (20% vs. 20%), dyspnea (25% vs. 30%) or incidence of chest pain (30% vs. 30%).
Conclusions: Dipirydamole Tc99m MIBI SPECT study was established to be well tolerated, safe and diagnostically accurate in patients with significant aortic stenosis and suspected CAD.

9

UTILITY ASSESSMENT OF IN VIVO LABELED RED BLOOD CELLS IN IMAGING HEMODYNAMIC DISORDERS OF VENOUS SYSTEM OF LOWER LIMBS POST SUBCUTANEOUS INJECTION 99m-TECHNETIUM

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Introduction: The venous insufficiency (VI) of lower limbs is the most widespread disease and its frequency still increase. The earlier stage of VI can be non-symptomatic. The Doppler ultrasound technique is the most common diagnosis method using in recognizing disorders of venous circulation of the lower limbs. Other useful method can be radioisotope technique as phlebography, which allows to functional evaluation of disorders of venous circulation of the lower limbs. This method has a very important sense in questionable results of standard diagnosis examination.
Aim of the study: The purpose of this study was utility evaluation of radioisotope phlebography using in vivo labeled red blood cells in the venous insufficiency of the lower limbs diagnosis.
Material and method: Analysis included 26 patients (17 women, 9 men, mean age 51 years). Each patient received intravenous 5 ml methylenediphosphoniane (Amersham). Than after 15 minutes (apply pressure above ankles) each patient was injected subcutaneous (in web space of the both feet) 99m-technetium with activity 150–200 MBq. Static acquisition with the use of X-Ring gamma camera (from feet to pelvis, move 10 cm/min) has been started after 3 minutes post injection of the isotope and next acquisition with decompression was performed.
Results: In all patients good quality functional images of the venous vessels of the lower limbs were visualized. There was now case of any local or general undesirable symptoms post injection of the radiotracer. In 8 patients normal functional image of venous vessels were observed, whereas in 18 cases disorders in venous circulation (block in deep veins outflow and insufficiency of perforating veins) were shown. Results of radioisotope phlebography confirmed in 25 cases with results of ultrasound examination. Only in one case radioisotope phlebography was shown disorders of venous circulation of the legs despite normal ultrasound investigation.
Conclusions: Relatively long-time subsists of the tracer in the intravenous space and good layout of the radioactivity in venous vessels include significant advantages of this method. Radioisotope phlebography using in vivo labeled red blood cells can be technique with choice in cases of difficulty in intravenous injection of the radiofarmaceuticals due to oedema.

NEUROLOGY

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DaTSCAN AND SPET IN THE DIAGNOSTICS PARKINSON'S DISEASE AND PARKINSONIAN SYNDROMES

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The aim of this study was to verify the diagnostic value of the radiopharmaceutic [^{123}I]FP-CIT (DaTSCAN) in functional imaging of the presynaptical dopaminergic system in patients with Parkinson's disease and parkinsonian syndromes: multiple system atrophy, orthostatic hypotonia Shy-Drager, essential tremor. Material and methods: that pilot study group investigated of 8 patients in which either preliminary diagnosis or suspicion of Parkinson's disease, parkinsonian syndrome or multiple system atrophy was set. Imaging of the brain with SPET (dual head detector Varicam Elscint) and MRI were performed. The radiopharmaceutic DaTSCAN was administered intravenously in the dose 145-148 MBq. SPET images were reconstructed by filtered backprojection with the use of Butterworth filter. The images were inspected visually. Images from SPET and MRI were superimposed by means of the workstation Hermes (Nuclear Diagnostics) with designated regions of interest (ROI) in the striatum and occipital cortex in order to assess semiquantitatively the binding of dopamine transporter. Results; from the group of 8 patients evaluated with the use of DaTSCAN four had normal results, and four — abnormal. The preliminary diagnosis was sustained in 3/8 of patients (including Parkinson's disease in two patients and multiple system atrophy in one patient). In the remaining 5 patients the preliminary diagnosis was changed, namely: in 2 cases the essential tremor was diagnosed, in 1 case — Parkinson's disease, in 1 case — orthostaic hypotonia Shy-Drager , and in 1 case — despite the tremor of the upper limbs results were normal. In all 8 patients the tracer proved to be useful in the confirmation of clinical diagnosis, especially in the differentiation between the essential tremor and Parkinson's disease. In the case of multiple system atrophy the imaging revelaed significant loss of nigrostriatal dopaminergic neurons. Such loss was observed also in the cases of Parkinson's disease affecting the posterior parts of the striatum.
Conclusions: [^{123}I]FP-CIT (DaTSCAN) is the radiofarmaceutic which enables insight into the function of dopaminergic neurons in the nigrostriatal system and is of diagnostic value in differentiation between Parkinson's disease and essential tremor, and parkinsonian syndromes.

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DIAGNOSTIC EFFICACY OF ^{131}I ALPHA METHYLTHYROSINE SCINTIGRAPHY (SPECT/MR FUSED IMAGES) FOR DETECTION IF THE RECURRENCE OF BRAIN GLIOMAS

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Basic assumptions and objective: Radical treatment of gliomas includes surgery and radiotherapy. In majority of cases, however, there occurs a recurrence, and the most important factor influencing clinical success of further treatment is its early detection as well as differentiation of the neoplastic growth from a present scar and radiation effects.
The first tool used at present for above purpose is MRI investigation. In some proportion of cases results of MRI are inconclusive and possibility of relapse remains still as suspicion. Scintigraphy with labelled aminoacids, both by applying PET and SPET techniques remain as possible alternative because neoplastic cells demonstrate avid uptake of protein precursors.
In our studies ^{131}I alphamethylthyrosine, a radiopharmaceutical manufactured in Poland, has been used. This ^{131}I labelled compound is much less expensive that the ^{123}I labelled analogue; use of ^{131}I, although delivering higher dose, was found justified in patients with already diagnosed malignancy. Head images obtained by means of MRI and SPET scintigraphy, have been fused by means of a specially designed computer programme.
Objective of the study was assessment of clinical efficacy of the above mentioned procedure when applied to early detection of glioma relapse.
Material and methods: 21 patients have been studied who had been surgically treated and subsequently irradiated because of the diagnosed glioma of the brain (III/IV grade of malignancy acc to WHO classification). MRI has been performed using a 1.55 Magnetom Vision Plus (Siemens) unit in T1 dependent mode, before and after Gd DTPA i.v. administration. SPET scintigraphy of the brain was performed using a double head gamma cammera (ELSCINT), using a high energy collimator. A 64x64 matrix was applied with 35 sec. step by step acquisitions starting 15 min after intravenous administration of the radiopharmaceutical (RF) at activity of 74 MBq.
In patients with increased focal uptake of the RF a site of the highest uptake was delineated in the matrix and a count-rate quotient tumour/non-tumour calculated.
Images were fused applying a 3D overlying technique using a PC working station. The procedure was based on statistical analysis of 3 dimensional distribution of voxels with maximization of statistical probability (mutual information).
Results: In 13 patients the MRI imaging disclosed presence of a polymorphic focus suggesting a tumour recurrence. In 8 subjects the result was equivocal due to presence of post surgery and irradiation sequelae. In all 13 patients with a positive relapse in the MRI diagnosis and in 4 with the equivocal image there was an enhanced RF uptake in SPET image. In 4 patients the scintigraphy yielded a negative result. SPET/MRI image fusion enabled a topographic localisation of the area with the peak activity, in most cases corresponding to the solid tumour visualised in MRI. In 4 patients the fused image indicated precise localisation of the relapse in the suspected region. Verification of the results was made by means of tumour MRI spectroscopy and/or by histology investigation of the tissue fragments, obtained by means of stereotactic biopsy or during surgery.
Conclusions: The SPET study utilising ^{131}I alphamethylthyrosine enables confirmation of the presence of neoplastic tissue in a morphologically identified area that may correspond to the site of tumour glioma recurrence. In equivocal MRI images the scintigraphy may disclose or exclude relapse. The fused MRI/SPET images form a very useful tool for selection of the site for mR spectroscopy and for tissue sampling by means of stereotactic biopsy. The results can also be used for planning the brachytherapy. It seems also important that 131I alphametylthyrosine yields images of good quality.

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NEUROANATOMICAL CORRELATES OF POST-STROKE APHASIAS ASSESED BY rCBF SPECT

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Aims and background: there is no common consent, how the particular speech functions are correlated by particular brain structures. The aim of the study was to study neuroanatomical correlates of chosen post-stroke aphasias.
Material and methods: the study involved 50 patients with left-hemisphere stroke and mild to moderate aphasia. To asseses the degree of aphasia Boston Diagnostic Aphasia Examination (BDAE) was applied, rCBF SPECT scanning was performed using ^{99m}Tc-HMPAO (Amersham, UK) and a triple-head gammacamera MS-3 (Siemens, Erlangen, Germany). Analysed were intercerebral blood flow asymmetries and regional cerebral blood flow normalised to cerebellar perfusion.
Results: in Broca's aphasia dominated changes in frontal and —to lesser extent — parietal lobe and striatum, wherease in Wernicke's aphasia changes were seen mostly in temporal and parietal cortex. In global aphasia SPECT scanning showed an extensive perfusion deficit in perisylvian area and thalamus.
Conclusions: 1. Those results indicate the need of reconsideration of neuroanatomical correlates in aphasia, particularly the role of subcortical lesions; 2. In particular types of aphasia the patterns of rCBF changes differ; 3. rCBF SPECT scanning should play a major role in aphasiological studies.

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rCBF SPECT SCANNING IN PATIENTS WITH PARKINSON'S DISEASE AND DEMENTIA

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Background and aim of the study: Dementia in Parkinson's disease (PD) is 2–6-fold more frequent than in the rest of population. It presents numerous diagnostic difficulties due to lack of uniform diagnostic criteria, specificity of PD itself, including bradyphenia and motor slowing-down and concomitant depression, which may mimic dementia. Psychological testing may be difficult. The aim of the study was the evaluation of the usefulness of rCBF SPECT scanning in this group of patients.
Material and methods: 44 PD patients were enrolled in the study: PD non-demented (11 patients), PD with mild, selective cognitive impairment (20 patients), PD overt-demented patients (13 subjects); control group were 20 healthy volunteers. rCBF SPECT has been performed using ^{99m}Tc-HMPAO (Amersham, UK) and a triple-head gammacamera MS-3 (Siemens, Germany). Interhemispheric CBF changes were assessed using an asymmetry index; regional CBF changes by cerebellar normalization. MRI scanning has been performed using 0.5 T device Gyroscan (Philips, Low Countries), white matter changes assessed in ARWMC scale.
Results: when compared with controls PD patients had significantly lower CBF in all cerebral regions except the thalami and basal ganglia. In demented PD patients this hypoperfusion was more pronounced in temporal and occipital lobes. The number of focal perfusion deficits in demented PD patients was significantly higher for whole cerebellum and left, but not right hemisphere. MRI findings as measure by ARWMC white matter changes scale were non-contributory.
Results: those results may suggest mixed vascular/neurodegenerative pathomechanism of cognitive impairment in PD. rCBF SPECT scanning may play an important role in differential diagnosis of cognitive impairment in Parkinson's disease.

ONCOLOGY

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THE CONNECTED PALLIATIVE THERAPY OF PAINFUL OSTEOBLASTIC--OSTEOLYTIC BREAST CANCER BONE METASTASES USING RADIOISOTOPE AND BISPHOSPHONATE

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The cancer bone metastases in 75% of patients with advanced breast cancer are detected; osteolysis predominates in 70% of cases (indication for bisphosphonate treatment), but in 30% osteoblastic component is observed, that gives the possibility for use of radioisotope therapy. The aim of this study was to evaluate the effectivness of connected therapy using Sr^{89} or Sm^{153} and bisphosphonate therapy in the group of breast cancer patients with multiple osteoblastic-osteolytic (mixed) bone metastases. The study included 20 patients with breast cancer and multiple painful bone metastases detected by scintigraphy and by radiogram or CT or MRI (the type of metastases), with tendency to hypercalcaemia. Before (2–12 months) radioisotope therapy 14 out of 20 patients have been treated with local irradiation of the bone and bisphosphonate, but without good results. Each patient received a standard dose of strontium-89 (Metastron) or samarium-153 (Quadramet) combined with intravenous infusion of pamidronate (Aredia) or zoledronate (Zometa). The bisphosphonate therapy was repeated every month. The group of 10 patients treated at the same time with bisphosphonate only was observed. For assessment of therapy effectivness; pain relief (VAS scale), a reduction in analgesic requirements and motor activity (ECOG and Karnofsky scale) were evaluated.

Pain relief effect	Sr^{89} + Aredia (n = 12)	Sm^{153} + Zometa (n = 8)	Bisphosphonate therapy only (n = 10)
Good effect VAS < 2	4	4	2
Moderate effect VAS < 5	4	3	2
No effect VAS > 5	4	1	6

During follow-up, 4 and 8 weeks after the radioisotope therapy a statistically significant pain relief effect (VAS scale) from 7 to 4 ($p < 0.05$) was observed. Analgesic requirements decreased to 30% of dose on average. The motor activity of the points evaluated according to ECOG scale increased from 3 to 2 and from 40 to 60 in Karnofsky scale. No pathological fractures, hypercalcaemia, but 2 serious cases of pancytopenia with clinical manifestation were observed. The results of treatment in the group with radioisotope and bisphosphonate were better than in the group treated with bisphosphonates or radioisotope only.

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INDUCTION OF RADIOIODINE UPTAKE IN NON-FUNCTIONING METASTASES OF DIFFERENTIATED THYROID CANCERS — IS THERE A ROLE FOR REDIFFERENTIATION THERAPY WITH 13 CIS RETINOIC ACID

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Cellular dedifferentiation and resulting loss of radioiodine avidity occurs in about 1/3–1/2 of patient with the diagnosis of differentiated thyroid cancer (DTZ). In that case no efficient therapeutic methods have been developed up to now. Laboratory studies on redifferentiation effect of 13 cis retinoic on thyroid cancer cells may become a solution to this problem.
The aim of the study was to evaluate role of 13 cis retinoic acid in an induction of radioiodine avidity in non-functioning metastases of DTC.
Material: Thirty four patients suffering from distant metastases or locoregional recurrence of DTC that did not show radioidine uptake in post-therapy scintigraphy were included into the study. 13 cis retinoic acid (Roaccutan®) was administered for 6 weeks before radioiodine therapy (for the first 7 days 1 mg/kg of body weight, than 1.5 mg/kg). Radioiodine therapy was performed with the aid of human recombinant TSH (Thyrogen®) — 0.9 mg i.m. during two consecutive days. On the third day 100 mCi of radioiodine was administered. Post-therapy whole body scintigraphy was performed on the day six.
Results: On post-therapy scintigraphy radioiodine uptake was visible in 7/34 (21%) of the treated patients. Age of the patient, histological type of the cancer and time from thyroid cancer diagnosis did not correlated with the probability of radioiodine uptake induction. Serum thyroglobulin level before and after retinoic acid application did not show any statistical significant differences (1123 v 1254 ng/ml; $p > 0.05$).
Eleven patients (32%) were lost from observation, and the median time of observation for the remaining 23 patients was 5 months (range: 6 to 30). Radiological examination reviled in 6/34 (18%) patients stable disease and in the other 17/34 (50%) progression of the disease was observed. One patient died.
There was no correlation between radioiodine avidity and clinical effect. Stagnation of disease was observed in 3 (43%) patients with restored radioiodine uptake and progression in 2/7 (29%). Two patients were lost from observation.
13 cis retinoic acid was well tolerated and in 85% of patients was administered in accordance to the study protocol. Five patients had marked side effect and the dose had to be decreased to 1 mg/kg for the whole duration of therapy. The most frequent side effects included: dryness of lips and skin.
Conclusions: 13 cis retinoic acid can induce radioiodine uptake in about 20% of patents with non-functioning thyroid cancer metastases. However, this effect does not influence clinical course of the disease.

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SENTINEL NODE BIOPSY IN TREATMENT OF PATIENT WITH MELANOMA AMELANOTICUM OF THE PENIS — THE CASE REPORT

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Melanoma amelanoticum of the penis is a rare neoplasm. In majority of cases, the neoplasm is locally advanced on presentation. Management of primary tumor as well as of regional lymph nodes is of a crucial importance. In many cases regional lymph nodes are not palpable. Sentinel node biopsy allow the early detection of metastases in lymph nodes. We present the patient who underwent partial amputation of penis due to giant penis tumour. Postoperative histopathology revealed melanoma amelanoticum. Prior to sentinel node biopsy the patient had lymphoscintigraphy with ^{99m}Tc on an albumin carrier administered into the penis stump (Nanocoll, 72 MBq in 0.5 ml, given in 4 sites). The examination revealed lymph flow into the inguinal lymph nodes on both sides. Two sentinel nodes in the group of regional inguinal nodes on the left side, and one on the right side were identified. Sentinel nodes biopsy was done about 24 hours after lymphoscintigraphy. Fifteen minutes prior to biopsy 1ml of dye Patentblau V was given. Intraoperatively radiation was measured with hand-held gamma radiation detector. Two sentinel nodes were identified in the left inguinal area, and one on the right side. The nodes dyed blue and the radiation level was almost 20-fold higher than in surrounding tissue. The course of lymphoscintigraphy and operation was documented by photography. Histopathology (H&E) and immunochemistry (HMB 45) revealed the presence of micrometastasis in one of the sentinel nodes in the left groin. The patient underwent left ilioinguinal lymphadenectomy. Examination of material obtained during operation revealed in one of the nodes the presence of metastasis 2 mm in diameter. The postoperative course after sentinel node biopsy and lymphadenectomy was uneventful. The patient received adjuvant treatment (DDP + DTIC). During 5 month postoperative observation there was no progression of the disease. Conclusions: Sentinel node biopsy allowed for early detection of metastases and early selective lymphadenectomy with adjuvant therapy.

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THE PRE-OPERATIVE LYMPHOSCINTIGRAPHY IS A NECESSARY PART OF SENTINEL LYMPH NODE BIOPSY IN PATIENTS WITH SKIN MELANOMA OF THE TRUNK

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Background: In Poland sentinel lymph node biopsy in skin melanoma patients is a standard procedure in third level reference centers. The method require the special equipment. Therefore, the availability of the method is limited.
Objectives: To assess whether it is possible not to perform a pre-operative lymphoscyntygraphy in patients with skin melanoma of the trunk, undergoing a sentinel node biopsy.
Material and methods: From 1.12.1999 to 31.12.2003 in the Department of Surgical Oncology, Medical University of Łódź, in 120 patients with trunk skin melanoma sentinel node biopsy was performed. There were 50 women (42%) and 70 men (58%) in the studied group. Age ranged from 32 to 87 years. In all of them preoperative lymphoscintigraphy (Nanocoll — 2 mCi, 0,5 ml) in the Department of Nuclear Medicine, Medical University of Łódź, intra-operative blue dye mapping and intra-operative detection of gamma radiation were performed.
Results: Pre-operative lymphoscintigraphy allowed for the detection of sentinel node(s) in all studied patients (100%). In 77 of them (64%) the tracer flew to one group of regional lymph nodes. In the remaining 43 patients (36%) the tracer flew to two or three different lymph nodes groups. Sentinel node(s) were detected intraoperatively in 118 patients (98.3%). In all these patients sentinel nodes were identified using intra-operative detection of gamma radiation. Pigmentation of sentinel node(s) was found intra-operatively in 90 patients (75%). The difference between intra-operative detection rate of sentinel node using gamma-probe (98.3%) and using blue-dye technique (75%) was statistically significant ($p<0.05$).
Conclusions: The pre-operative lymphoscintigraphy is a necessary part of sentinel lymph node biopsy in patients with melanoma of the trunk. It show the directions of lymph flow from the site of primary tumor, the site of sentinel lymph node(s) in one or more groups of regional lymph nodes. The intraoperative assessment of radiation is a main measure of sentinel lymph nodes identification; the use of blue dye is less important.

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TECHNIQUE OF SENTINEL NODE BIOPSY IN BREAST CANCER PATIENTS — THE PERIAREOLAR INJECTION OF TRACER AND BLUE DYE

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Background: In breast cancer patients with negative result of sentinel node biopsy, treated in third level reference centers, axillary lymphadenectomy is not necessary. The method requires a special equipment and experience. Techniques used for identification of sentinel node(s) vary: many different radiotracers could be injected in many different sites.
Objective: Presentation of technique of sentinel node biopsy in patients with breast cancer. Description of the method: From 1.12.1999 in Department of Nuclear Medicine and in Department of Surgical Oncology, Medical University of Łódź, sentinel node biopsy is a part of treatment of breast cancer patients. Sentinel node biopsies is performed in patients with a sole breast tumor no bigger than 3 cm, without palpable axillary lymph nodes and without distant metastases, who already underwent the wide excision of primary tumor. In all patients preoperative lymphoscintigraphy (Nanocoll) is performed. Radiotracer is injected intradermally and periareolary; also near the postoperative scar (after the resection of primary tumor). The location of sentinel node is marked on the skin. Intraoperative measurements of gamma radiation and blue dyeing of lymph vessels is performed (Patentblau V). Lymph node with highest radioactivity and/or most intensive violet staining was considered as sentinel node.
Conclusion: Using presented method, we were able to successfully identify the sentinel notes in over 98% of patients. Our result are among the best results presented in literature. Preoperative lymphoscintigraphy shows the direction of lymph flow and the site of sentinel nodes. The assessment of radiation performed intraoperatively is a main measure of sentinel node identification. The use of blue dye makes The identification of sentinel node with the use of blue dye is easier and faster.

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RADIATION RISK DURING BREAST CANCER SURGICAL TREATMENT WITH THE USE OF INTRAOPERATIVE HAND-HELD GAMMA-PROBE FOR IDENTIFICATION A SENTINEL-NODE

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Introduction: Intraoperative hand-held gamma-probe identification of a sentinel-node is applied more and more often. An important problem is a question of radiation risk of operating staff and a problem of — happening sometimes — radiophobia. The aim of the study was the radiation risk of surgeons, nurses and ancillary personnel during such operation.
Material and methods: We studied the absorbed radiation doses of 28 persons involved in intraoperative hand-held gamma-probe identification of a sentinel-node in breast cancer patients: a physician who administered the radiotracer, surgeons, assisting nurses, pathologists. Sentinel node identification was done following intradermal application of 99m-Tc-nanocolloid (Amersham, England) of 0.5–1 mCi activity. For the assessment of absorbed doses ring thermoluminescence dosemeters (IBJ, Cracow, Poland) worn on right-hand fingers were applied. Dose-meters' sensitivity threshold was 0.02 mSv.
Results: in 27/28 staff persons no exceeding of sensitivity threshold was showed; in 1 nurse hand-absorbed-dose was 0.05 mSv.
Intraoperative hand-held gamma-probe identification of a sentinel-node is safe for the personnel performing and assisting the operation.

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SENTINEL NODE IDENTIFICATION IN BREAST CANCER PATIENTS

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Introduction: regional lymph nodes removal is a standard element of surgical breast cancer management. An important issue is then the identification of sentinel node (SN), i.e. the first node in the lymph drainage from tumour's area. The aim of the study was to compare radionuclide and blue-dye techniques of sentinel node identification and to assess the influence of technical modalities on the result of the study.
Material and methods: 195 patients with breast cancer were enrolled in the study divided into three groups: group I (51 pts), where combined — blue dye/radionuclide SN identification has been performed; radionuclide administered around the tumour; group II (72 pts.), where only blue dye technique was employed, group III (72 pts.), where blue dye and radiocolloid was administered periareolarly. We used ^{99m}Tc-nanocolloid (Amersham, UK), pre-operative scintigraphy using a single-head gammacamera Diacam (Siemens), intra-operative SN identification using hand-held probe NeoProbe.
Results: sensitivity, specificity, positive and negative predictive value were respectively: in group I: 92%, 100%, 100%, 96%; in group II 72%, 100%, 100%, 81%, in group III 91%, 100%, 100%, 95%. An efficiency of sentinel node identification depended on experience of surgeon, did not depend on age, the size of the tumour, percentage of fatty tissue in the breast, histopathology of the tumour.
Conclusions: combined radionuclide/blue dye technique shows higher sensitivity, specificity, positive and negative predictive in comparison to blue dye technique applied alone.

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LYMPHOSCINTIGRAPHY IN CERVICAL CANCER PATIENTS

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Background: Regional lymph node surgical management is an integral part of cervical cancer therapy. In gynaecological oncology, recent studies have confirmed the utility of the sentinel node concept in vulvar and cervical cancer. The method of marker's administration is considered to play an important role in sentinel node detection.
Material and methods: 60 patients with cervical cancer (stage IB-IIA) underwent SLN detection during radical abdominal hysterectomy. The patients were randomly divided into two groups:, the first of 30 patients with 0.5–1cm deep marker injection, the second with sub-epithelial marker injection. Gamma-camera scanning, as well as hand-held probe detection was applied.
Results: All hot nodes visualised on lymphoscintigraphy were "hot" when using the hand-held gamma probe. Deep marker injection revealed the sentinel node in 27 patients (90%) on both sides, in 3 patients (10%) only on one side. Only 40 (67%) sentinel nodes were blue-stained. Sub-epithelial marker administration revealed the sentinel node on both sides in all 30 patients (100%). In 28 patients (93,3%) the sentinel nodes were radioactive and blue-stained, in one case not-blue stained on both sides, in one case blue stained only on one side.
Conclusions: The sentinel node detection rate in cervical cancer is relatively high and depends on the applied technique. The superficial administration of radiocolloid and the blue dye into the cervix provides a higher sentinel node detection rate than deep administration in cervical cancer patients.

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RESULTS OF 131-I MIBG THERAPY IN MEDULLARY THYROID CANCER

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Meta-iodobenzylguanidine labelled with 131-I, as a catecholamine analogue, is uptaken by tumors originating from the neural crest, therefore it is used in therapy of medullary thyroid cancer (MTC).
Material and methods: a retrospective review of 62 cycles of 131-I MIBG therapy in 35 patients was performed. 1 cycle of treatment was performed in 21 patients. In 14 patients 2–5 cycles were performed. Patients received 92–200 mCi 131-I MIBG per cycle at 3–6 monthly intervals. The cumulative dose was 92–700 mCi (median 155 mCi). The median follow up was 24 months (0–62) from the first 131-I MIBG therapy and 62 months (3–336) from the diagnosis of MTC.
The indications to therapy were local disease (6 pts, 20%) or metastases (16 pts, 46%). 13 patients (34%) were treated due to high levels of plasma calcitonin (Ct) without known focuses of disease.
Results are shown in tables 1–3:

Table 1. Post-therapy scans 131I MIBG uptake:

Patients with macroscopic cancer disease n = 21	Uptake in all known focuses	10	48%
	Uptake in a few focuses	3	14%
	Negative WBS	8	38%
Patients with high level of serum Ct without known cancer focuses n = 14	Localization of disease focus	2	14%
	Negative WBS	12	86%

Table 2. 131-I MIBG therapy seldom gives objective regression.

Regression	1	3%
Stable disease	12	37%
Progression or death	17	48%
Not applicable	5	12%

Table 3. 131-I MIBG gives good palliation

Symptoms	No of patients	Response to treatment: Complete relief of symptoms	Partial relief of symptoms	Total	no response
Diarrhea	8	1	3	4 (50%)	4
Pain / immobilization	3	2	1	3 (100%)	0
Dyspnoe	4	2	1	3 (75%)	1

Conclusion: 131-I MIBG treatment results in good palliative effect in 50% of patients. The therapy should be performed only in patients with macroscopic cancer disease with a diagnostic evidence of sufficient tumor uptake.

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USE OF THE ^{131}I-LABELED MONOCLONAL ANTI-β_3 ANTIBODY FOR VISUALIZATION OF TUMOR NEOANGIOGENESIS

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Introduction: Anti-angiogenic treatment is recently drawing more and more attention. Consequently, diagnostic methods for estimation of the efficacy of such a therapy need to be developed. Among potential candidates which could serve as a specific benchmark is a monoclonal antibody (MoAb) directed against the β_3 subunit of integrin $\alpha_v\beta_3$ (CD61; BD Bioscience). Conjugating this MoAb with the gamma-ray-emitting short-lived isotopes might allow for imaging of radiopharmaceutical deposition using the gamma-camera-type detectors.
Material and methods: For estimation of the applicability of the anti-CD61 MoAb to visualize tumor blood vessels in vivo, the antibody was conjugated with iodine ^{131}I by the standard chloramine T method (radiochemical purity of the MoAb-^{131}I conjugate at 1 hour after the iodination exceeded 99%). Distribution of the conjugates in the transplanted syngeneic tumors (as murine models of angiogenesis) was carried out utilizing visualization techniques used in nuclear medicine. Biodistribution of the conjugate in the murine body was evaluated using the same model of angiogenesis as in the imaging studies. Results are expressed as percent of the injected dose per gram of tissue (%ID/g), each value representing mean and SD obtained from three animals.
Results: The intravenously applied MoAb anti-β_3-^{131}I conjugate accumulates in the subcutaneously growing Lewi's lung carcinoma and remains there for 144 hours at a high (3/1) tumor/muscle ratio. Additionally, the biodistribution reveals predominantly hepatobiliary excretion resulting in low activity in the muscles (1.16 %ID/g). These data were confirmed by the results of the scintigraphic studies showing a good visualization of neoangiogenesis in the tumor-bearing mice.
Conclusion: Using MoAb anti-CD61 as a radiotracer could form a basis for elaboration of a non-invasive diagnostic method allowing for visualization of tumor neovasculature *in vivo*, a method useful for monitoring tumor growth and evaluation of the efficacy of the anti-angiogenic therapy in early and later stages of the disease.

RADIOPHARMACY

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RHENIUM-188 SOLUTION OBTAINED FROM THE STATIONARY $^{188}W/^{188}RE$ GENERATOR

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Aim of the study: Rhenium-188 is a generator produced radioisotope emitting both beta ($E_{\beta max}$ = 2.1 MeV) and gamma (E_γ = 155 keV, 15%) radiation with the short physical half-life of 16.98 h. Beta particles, which range of penetration in soft tissue is 3.3 mm (maximum 10.8 mm), provide radiation suitable for destroying tumour cells with little or no damage to adjacent organs. The gamma photon can be used to monitor biodistribution and estimate dosimetry with standard scintigraphic equipment. During last decade the interest in using ^{188}Re for radiotherapy as well as for brachytherapy in the treatment of coronary vessels was growing rapidly. Because of the great interest of nuclear medicine in ^{188}Re applications, the technology of its manufacturing in the form of isotonic and sterile solution of sodium perrhenate-^{188}Re- has been developed at the Radioisotope Centre POLATOM.
Materials and methods: ^{188}Re is the product of tungsten-188 decay, the latter being produced in the nuclear reactor by irradiation of tungsten enriched in ^{186}W. The mother radionuclide ^{188}W was adsorbed on the alumina column which was conditioned with 0.9% NaCl in 0.001 N HCl and 32% HCl. The daughter radionuclide ^{188}Re was eluted from the column using 0.3 M acetic acid. The obtained solution was purified and concentrated in the chromatographic system consisting of cation exchanger AG-50W-X12, on which the sodium ions were adsorbed and anionic column Sep-Pak Accel Plus QMA Light, on which the perrhenate ions were concentrated. Sodium perrhenate-^{188}Re was eluted in small volume (1–3 ml) of saline. The radiochemical purity of ^{188}Re was checked by paper chromatography in 0.9% saline. The above described stationary generator system for preparation of sodium perrhenate-^{188}Re has been installed in the destined hot-cells, forming a complete production line in compliance to GMP requirements and according to ISO 9001:2002 standard.
Results: The developed method enabled preparation of the carrier-free solution of sodium perrhenate-^{188}Re with activity up to 180 GBq in 1 to 3 ml volume. Radiochemical purity of ^{188}Re solution was > 99.9% (content of ^{188}W < 0.02%). $^{188}W/^{188}Re$ generator could be exploited over the period of at least 6 months. The highest activity of ^{188}Re in the eluate was obtained 3 days after the previous elution, when the equilibrium between ^{188}W and ^{188}Re was reached. It was shown that ^{188}Re could be efficiently used for labelling of HEDP (hydroxyethylidene diphosphonate), radiopharmaceutical applied for palliative therapy of bone metastases.
Conclusion: The developed method for preparation of ^{188}Re in the form of perrhenate (in 0.9% NaCl solution) using the stationary $^{188}W/^{188}Re$ generator approach (easy to operate and safe from the radiation protection point of view) allows obtaining portions of ^{188}Re solution with required activity and radioactive concentration, which can be further on transported to the clinics and used for patient treatment.

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RECOMBINANT hTSH RADIOLABELLED WITH TECHNETIUM-99m, A NEW PROMISING RADIOPHARMACEUTICAL FOR THE DIAGNOSIS OF METASTASES IN DIFFERENTIATED THYROID CANCER — PRELIMINARY STUDIES

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Aim of the study: The follow-up of differentiated thyroid cancer (DTC) (after ablation by iodine 131 therapy) is currently performed by whole body scan (WBS) with iodine 131. This technique of imaging is very often characterized by poor sensitivity because of loss of iodine uptake capacity as the result of loss of sodium iodide symporter receptor gene expresion (NIS) in 30% of DTC. In such cases alternative method — imaging of TSH receptors (which are active) using radiolabelled TSH (rhTSH) might be useful. The aim of our preliminary studies was to prepare tracer — rhTSH labelled with technetium-99m with high specific activity, good radiochemical purity and stability in vitro.
Material and methods: Recombinant human thyrotropin (rhTSH) was labelled with technetium-99m using direct method with the addition of $SnCl_2$ and indirect — using the bifunctional chelating agent HYNIC (6-hydrazinonicotinamide). HYNIC-rhTSH complex was purified on Sephadex-G-25 (PD-10 column) and then was labelled with technetium-99m in presence of: tricine, EDDA,EDTA as co-ligands or without any additives alternatively. Radiochemical purity of the obtained tracers and their in vitro stability in buffer and in human serum (37°C) was studied using chromatography on BIO-SEP-SEC-S-2000 column (gel filtration) in HPLC system and paper chromatography in 0.9% NaCl. Preliminary pharmacokinetic studies were performed in healthy Swiss mice.
Results: Obtained tracers: ^{99m}Tc-rhTSH, ^{99m}Tc-HYNIC-rhTSH and ^{99m}Tc-tricine-rhTSH revealed almost 100% radiochemical purity (Tc(VII) in pertechnetate was not detected) and specific activity of 125 mCi/mg. ^{99m}Tc-rhTSH was very stable in vitro (in buffer and in serum) up to 4 hours (radiochemical purity > 99%).Tracers: ^{99m}Tc-HYNIC-EDDA--rhTSH and ^{99m}Tc-HYNIC-EDTA-rhTSH showed radiochemical purity of 60 to 80% only. The thyroid uptake of ^{99m}Tc-rhTSH tested in mice was stable and at the even level over the period of 3 hours while in the same time fast removal from the blood was observed (after 90 min — 50% and after 3 hours — 30% of injected dose).
Conclusions: After labelling with technetium-99m the obtained rhTSH complexes presented high radiochemical purity and good in vitro stability in serum. The retention of radioactivity in thyroid gives the evidence that affinity to specific receptors is not affected by the radiolabelling process. That makes the technetium-99m labelled rhTSH the promising candidate for further studies. Experiments in the tumor-bearing animals are planned in order to verify the receptor affinity of this new tracer and is potential as the radiopharmaceutical for diagnosis and follow up of DTC.

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QUALITY CONTROL OF ITRIUM $^{90}YCL_3$ MANUFACTURED AT OBRI POLATOM

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Aim of the study: Itrium-90 is widely used in nuclear medicine mostly in the form of colloids and microspheres for radiation synovectomy. In recent years the carrier-free itrium-90 was employed to radiolabelling of somatostatin analogues, which are used for receptor mediated radionuclide therapy of tumours, mainly of neuroendocrine origin. The advantages of itrium as therapeutic radionuclide are its short half life (64 h), optimal beta particles energy (2,2 MeV), decay to stable zirconium and ability to form stable complexes with various ligands. The carrier-free Y-90 is obtained from the decay of strontium-90 and is separated from the Sr-90 + Y-90 mixture by extraction chromatography method developed at RC POLATOM. Itrium-90 manufactured as a precursor for labeling should conform to the qualitative and quantitative specification which assure its pharmaceutical usefulness. The parameters having significant influence on the quality Y-90 is radionuclidic purity (and content of Sr-90, which is an undesired contamination due to its very long half life) and the content of chemical impurities, such as metallic cations, which may decrease the labeling yield of biological substances.
Materials and methods: Carrier-free itr-90 is available at Radioisotope Centre OBRI POLATOM since 2003 offered as solution of Y-90 chloride with radioactive concentration >18.5 GBq/ml. Its quality is verified by checking the following parameters: 1. identification of Y-90 beta spectrum using liquid scintillation method (LSC) ; 2. content of Sr-90 determined by chromatographic separation on the resin coated with di-t-butylcyclohexane-18-6-crown ether (Sr-Resin) followed by LSC measurement; 3. content of traces of chemical impurities determined by the optical emission spectrometry with inductively coupled plasma (ICP-OES); 4. radioactive concentration of Y-90 in a standardized ionization chamber.
Results: Ten production batches were evaluated. In 9 of them content of Sr-90 was well below 2.5 E-04%, in one batch the initial value of Sr-90 was higher but after additional purification decreased to the level observed in other batches. Content of Sr-90 was determined on the production day and, in order to verify the accuracy of the method, after cooling down Y-90 i.e. after about 3 months. Both measured values were in agreement in the range of 10–15%. ICP-OES method was used for determination of the following elements: As, Cu, Fe, Ni, Pb, Zn. In all tested batches content of As, Cu i Ni was below 1.0 μg/ml, Pb — below 5.0 μg/ml, while Fe i Zn — below 10 μg/ml. Identification of Y-90 beta spectrum was done by comparison with the Y-90 standard solution using LSC method and colegram software. The radioactive concentration of Y-90 chloride solution determined by ionisation chamber measurement was about 20 GBq/ml on the production day. Carrier-free Y-90 was also used for labelling of peptides, somatostatin analogues, DOTA-TOC and DOTATATE, and high labeling yields were obtained.
Conclusions: The methods used for quality control of Y-90 enable the determination of parameters critical for assessment of Y-90 chloride solution. The Y-90 manufactured at RC POLATOM is a carrier-free preparation conforming to the following specification: content of Sr-90 below 2.5 E-04%, content of Cu, Ni, As < 1,0 μg/ml , Pb < 5,0 μg/ml, Fe, Zn < 10 μg/ml. The high quality of $^{90}YCl_3$ is verified by the results of labelling of peptides used in receptor mediated radiotherapy.

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PRECLINICAL IN-VITRO INVESTIGATION OF DOTATATE LABELLED WITH ^{177}Lu OR ^{90}Y, POTENTIAL RADIOPHARMACEUTICAL FOR RECEPTOR MEDIATED RADIOTHERAPY

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Aim of the study: During the last decade, due to the significant progress in various related scientific fields (target, radio-peptide chemistry, monoclonal antibodies, biotechnology, etc.), a number of new radionuclides, tumor antigen binding, regulatory peptide analogues and bifunctional complexing agents are available. These are exploited for development of more effective radiopharmaceuticals suitable for receptor mediated therapy involving the beta- and beta-/gamma-emitters. The therapeutic efficacy of the new radiopharmaceutical depends on the ability of the carrier molecule to recognize the tumor cells receptors and on the physical properties of the selected radionuclide (emitted radiation, energy/range in the tissue, half-life). However, it should be remembered that the radionuclide attached to the biological molecule may affect its receptor affinity. The goal of this work was to establish the laboratory conditions at the Radioisotope Centre POLATOM to the standard of biological in-vitro laboratory and to perform the comparative evaluation of the therapeutic potential of a somatostatin analogue, DOTATATE (DOTA-Phe^1,Tyr^3-octreotate) when labelled with ^{177}Lu or with ^{90}Y. The criteria used in this evaluation were: stability of the obtained complexes after labelling, their stability in human serum and affinity to somatostatin receptors present at the rat pancreatic tumour cells AR42J.
Material and methods: DOTATATE was received from PiChem, Austria, and the radionuclides ^{90}Y (carrier-free) and ^{177}Lu (about 8 Ci/mg Lu) were obtained as chloride solutions at the Radioisotope Centre POLATOM. The labeling was carried out in acetic buffer with addition of ascorbic acid at pH = 4.5–5.3 followed by 30 min incubation at 90°C. The radiochemical purity of radiolabelled peptides was determined by TLC, HPLC and SepPack separation. Human serum stability was tested at 37°C over the period of 24 hours after labelling. The protein binding was determined using Minispin G-50 columns. The biological investigations including internalisation and receptor affinity were carried out on live AR42J cells at temperature 37°C during 120 minutes. For the determination of non-specific binding the somatostatin receptors on the cells were blocked by Sandostatin or cold peptide.
Results: The complexes of DOTATATE with ^{90}Y and ^{177}Lu were obtained with high radiochemical purity, over 98%. Good agreement of the results obtained using HPLC, TLC and SepPack separation was observed, (i.e. 24 hours after the labeling the radiochemical purity of ^{177}Lu-DOTATATE was respectively: 99.52%, 98.76% and 98.95%). The complexes of DOTATATE with both lanthanides are stable at the room temperature over at least 48 hours. No significant differences between the stability of peptide labeled with ^{90}Y or ^{177}Lu were observed (the radiochemical purity values were: after 4 hours 99.91% and 99.40%, after 24 hours 99.08% and 99.62% respectively). Similarly, both complexes are stable in human serum for at least 4 hours. The protein binding is low and for both preparations is not exceeding 2%. The investigations of cell internalization indicate that the tracers are rapidly internalizing to the AR42J cells (about 80% for ^{90}Y-DOTATATE and ^{177}Lu-DOTATATE during 60–90 minutes, while the binding to the receptors on cell surface is about 20 %). The non-specific binding is low and equal to about 1%. The somatostatin receptor affinity of ^{177}Lu-DOTA defined as concentration of cold peptide, at which half of the receptors is saturated with the radiolabelled peptide, IC, is equal to about 40 nM, which is indicating high receptor affinity of ^{177}Lu-DOTATATE.
Conclusions: The results of evaluation of radiolabelled peptides from the point of view of their radiochemical purity, stability after labelling and stability in human serum as well as investigations of somatostatin receptors affinity in AR42J cells confirm the potential usefulness of DOTATATE radiolabelled with both ^{90}Y or ^{177}Lu in receptor mediated radiotherapy.

VARIA

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SPECIFIC HEPATIC CLEARANCE OF ^{99M}Tc-HEPIDA — A RANGE OF VALUES ESSENTIAL FOR CLINICAL EVALUATION OF DEGREE OF LIVER DAMAGE

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Background aim of this study: The value of total plasma clearance of ^{99m}Tc-HEPIDA reflects in a synthetic way the degree of damage of liver parenchyma. However, a partial elimination of this radiopharmaceutical by kidneys is a disadvantage and may bias the evaluation of a function of liver parenchyma.
Thus, a method has been elaborated that enables determination of the specific hepatic clearance of ^{99m}Tc-HEPIDA (Cl_{Hp}).
It has been proven previously that Cl_{Hp} characterizes the liver performance more adequately than total plasma clearance of this radiofarmaceutical.
The aim of the study was the calculation of a range of values of Cl_{Hp} essential in clinical practice necessary for interpretation to obtained results.
Material and methods: Clearance values and conventional biochemical and histo-pathological evaluation of liver parenchyma were used in 134 individuals divided into 2 groups. The first group consisted of 48 healthy volunteers (24 males and 24 females), at the age between 19 and 55 years (av. 37). The second group contained 86 patients (53 males and 33 females), at the age of 19 to 70 years (av.43) referred from the Department of Infectious Diseases and Hepatology of the Medical University of Łódź, with various degrees of liver damage in progress of chronic liver diseases (chronic viral hepatitis — 28, alcoholic disease — 16, liver cirrhosis — 18 and other diseases: steatosis, steatohepatitis and hepatopathy — 24 individuals).
Cl_{Hp} values were determined by means of a multi-sample method, after injection ^{99m}Tc-HEPIDA complex. Normative values of Cl_{Hp} necessary for interpretation of results, were obtained using a receiver operating characteristic curves (ROC) and mean values of Cl_{Hp} among patients with severe liver damage in progress of cirrhosis.
Results and conclusions: Among healthy volunteers Cl_{Hp} did not show dependence on age. Mean values in males were somewhat higher that in females ($p = 0.005$), but lower boundaries of normal values for Cl_{Hp} (mean — 2SD) were similar among both sexes (119 ml/min/1.73 m^2 in males and 114 ml/min/1.73 m^2 in females). In that case, further consideration of normative values for both sexes together was recognized as sensible.
The following ranges of values of Cl_{Hp} important for the practical interpretation of results, were isolated:
— above 150 ml/min/1.73 m^2 — excluding with probability of about 90% the presence of significant liver damage;
— up to 130 ml/min/1,73 m^2 — pointing at liver parenchyma damage with probability of about 90%;
— between 130 and 150 ml/min/1,73 m^2 — only suggesting the impairment of liver function;
— equal or below 80 ml/min/1,73 m^2 — pointing at considerable liver damage (typical for the liver cirrhosis).

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CORTICAL SCINTIGRAPHY IN THE EVALUATION OF RENAL DEFECTS IN CHILDREN WITH VESICO-URETERAL REFLUX — OPTIMIZATION OF THE PROCEDURE AND STUDY INTERPRETATION

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Aim of the study: The objective of this study was to evaluate the variability of the interpretation of renal cortex scintigraphy as to the presence and severity of renal scarring.
Material and methods: Cortical renal scintigraphy with ^{99m}Tc-unitiol (the equivalent of DMSA) was performed in 75 children with vesicoureteral reflux. 150 scintigrams of kidneys were interpreted independently 3 times by 3 observers from different departments. Planar (PLAN) and SPECT (SPECT) scans were classified using the modified grading system of Goldraich (G) and another scoring system proposed by Howard (H). Indices of agreement were defined as the percentage of agreement among observers and the kappa statistic.
Results: Agreement (% and kappa statistic) for different renal scan methods for each grading system reported for kidneys and patients (mean values of three pairs of comparisons)

— kidneys (n = 150):			
normal/abnormal:			
PLAN:	Howard:	78% (κ = 0.58)	Goldraich: 80% (κ = 0.60)
SPECT:		65% (κ = 0.35)	77% (κ = 0.53)
grade of abnormality:			
PLAN:		68% (κ = 0.50)	66% (κ = 0.49)
SPECT:		55% (κ = 0.34)	63% (κ = 0.48)
— patients (n = 75):			
normal/abnormal:			
PLAN:		78% (κ = 0.51)	85% (κ = 0.57)
SPECT:		59% (κ = 0.20)	74% (κ = 0.31)
sum of grade:			
PLAN:		52% (κ = 0.42)	48% (κ = 0.41)
SPECT:		34% (κ = 0.19)	42% (κ = 0.22)
maximal grade:			
PLAN:		60% (κ = 0.46)	61% (κ= 0.44)
SPECT:		43% (κ = 0.26)	48% (κ= 0.42)

Conclusions:
1. In all analyzed parameters the higher agreement was obtained for planar than SPECT scans.
2. The Grading system of Goldraich allows to obtain a higher agreement in scar detection.
3. In assessment of severity of renal scarring higher agreement was obtained when images of both kidneys were classified separately (as kidneys rather than as patients). Higher agreement was obtained when images were evaluated with respect to the maximal grade of abnormality than sum of grades of both kidneys.

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OBJECTIVE EVALUATION OF VALUE RENAL OUTFLOW (OUTPUT EFFICIENCY) FOR ^{99M}TC-EC COMPLEX

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Introduction: For objective evaluation of disorders renal function were applied a lot of quantitative parameters. Save for common using, deconvolution analysis of renal transit times of the radiotracer and analysis times of decrease in activity ($T_{1/2}$), more and more interest causes indicator outflow the tracer from kidney (Output Efficiency — OE).
Aim: The purpose of this study was determination of cutoff level norm for renal outflow indicator for ^{99m}Tc-EC during 30 minutes.
Material and metods: Analysis included 54 patients (mean age 49 years) with different disorders of excretory function of kidneys. Each patient received intravenous, as a bolus, technetium- 99m labeled ethylenedicysteine (^{99m}Tc-EC) (FAM Lodz) with activity 80–100 MBq. Dynamic acquisition with using Nucline AP gamma camera (matrix 64 × 64) was started immediately post administration of the tracer. The total time of the examination was 30 minutes (60 exposures of 1 second each then 87 exposures of 20 seconds each).The kidneys were classified into three groups using results of deconvolution analysis: group I with normal excretion (maximal transit time (MTT) < 300 s), group II with dilatation of renal calyx-pelvis system (MTT = = 300–600 s) and group III with blocked empting (MTT > 600 s). Evaluation was carried out on the excretion coefficient obtained with use of Ostnucline software (Czech Republic).
Results:

Output Efficiency (OE)	Group I	Group II	Group III
Mean OE (%)	76.23	60.74	24.5
S.D. (%)	5.14	10.13	13.11
Min value OE (%)	71	28	1
Max value OE (%)	93	78	40
Number of kidneys	50	37	21

Conclusions: We shown that cutoff value of norm for indicator renal outflow ^{99m}Tc-EC complex should exceed 71 %. This parameter can be using for objective assessment of extent of disorders outflow of the radiotracer from kidneys.

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UTILITY EVALUATION OF ^{99M}TC-IGG COMPLEX IN LYMPHOSCINTIGRAPHY OF LOWER LIMBS

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Introduction: Lymphoscintigraphy is a very important examination in lymphoedema diagnosis. This method allows evaluate of lymphatic system function on the base of outflow efficiency of the tracer from site of injection, degree of its uptake in regional lymph nodes and presence of dermal backflow. In this method found application some radiotracer. In last years were appeared the premises that one of these tracers can be labeled 99m-technetium (^{99m}Tc) human polyclonal immunoglobulin G (IgG).
Aim of the study: The purpose of this study was utility evaluation ^{99m}Tc-IgG complex in lymphoscintigraphy of lower limbs.
Material and methods: Eighteen patients (mean age 54 years) suspected of lymphoedema of lower limbs were examined. Each patient received, in the second web space both lower limbs, 50 MBq ^{99m}Tc-IgG complex (FAM, Lodz) in a volume 0.1––0.3 ml. Dynamic data acquisition with the use of X-Ring gamma camera (Mediso) was started immediately after injection the radiotracer. The static acquisition of whole body after 2–4 hours post injection of the tracer was performed.
Results: In all patients the radiotracer outflow from the site of injection (differentiate in rate flow) were noticed. It allows obtained functional image of lymphatic system lower limbs. In static phase clearly accumulation of the radiotracer in lymph nodes of pelvis was observed. In 11 cases dermal backflow were observed on the scintigrams. In 7 patients clearly asymmetry in retention of the tracer in lymphatic system were visualized. In two cases unilateral popliteal nodes were visualized. In static phase all scintigrams clearly tissue background were shown with characteristic biodistribution in the plane of chest and abdominal cavity like observed post intravenous injection ^{99m}Tc-IgG complex.
Conclusion: Subcutaneous injection of ^{99m}Tc-IgG complex allows dynamic and static imaging functional lymphatic system of lower limbs. Scintigraphic traits of lymphatic insufficiency after subcutaneous administration of ^{99m}Tc-IgG complex are similar to results obtained with common using the radiotracers in lymphoscintigraphy.

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NUCLEAR MEDICINE/ELECTRORADIOLOGY TECHNOLOGISTS: THE CONCEPTS OF MSC STUDIES AT MEDICAL UNIVERSITY IN GDAŃSK

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Transfer of training of s.c. paramedic professions to medical universities in Poland and in Europe is slow, but progressive. In Poland BSc studies in electroradiology were established at medical universities in Gdańsk (2001), Warsaw (2002) and Poznań (2003). In Medical University of Gdańsk first diplomas of BSc. of medical techniques (electroradiology) will be handed over in 2004. According to the logic of s.c. Bologna Formula — L/M/D — Licentiate/Master/Doctorate in academic year 2003/2004 will start the supplementary Master studies. Because of no pattern to follow (British and Dutch models are not applicable) as a goal to be achieved we applied the professional model of future MSc., as a supervisor of technical staff, member of administrative staff, member of research groups and a teacher.
In conclusion, two models of MSc. studies are considered:
a) full time MSc. studies: in large scale elective, assuming developing BSc. studies in choice of three out of five specializations: diagnostic imaging, radiotherapy (obligatory on of those two), paedagogics and methodology of research, economics and administration, radiological informatics with curriculum of ca. 800–1000 h/year.
b) evening classes with curriculum 300–350 h/year, 20% of elective hours; 40% of diagnostic imaging and radiotherapy, 40% of general subjects (philosophy, languages, paedagogics and methodology of research)
Conclusive remarks: fulfilling the expectations outlined above depends on a) state of law in Poland (the project of Act on Medical Professions is still not accepted by the Parliament); b) education concepts of the Ministry of Health and Ministry of Education, c) financial moves resulting from the pt. a) and b); d) local educational concepts and possibilities of particular universities, as well as supervising concepts of State Accreditation Commission.

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ACCURACY AND PRECISION OF ^{99M}TC-HEPIDA CLEARANCE DETERMINATIONS

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In the Department of Nuclear Medicine of the Medical University of Łódź an advanced method has been introduced for determination of the specific hepatic plasma clearance of ^{99m}Tc-HEPIDA. The hepatic clearance (Cl_{Hp}) is being determined as a difference between plasma clearance (Cl_{Pl}) and urinary clearance (Cl_{Ur}) of the substance.
The objective of this study was to obtain information regarding accuracy and presision of Cl_{Pl} and Cl_{Hp} of ^{99m}Tc-HEPIDA.
Material and methods: As there is no objective standard of ^{99m}Tc-HEPIDA clearance, the assessment of accuracy and precission has been based on simulation utilizing the randomised Monte Carlo procedure. In the experiment it was assumed, that results of plasma ^{99m}Tc-HEPIDA concentration decay curves, obtained in 185 patients and volunteers, reflect properly true clearance of plasma in a wide range of rates of the process. The decline has been described by fitting a biphasic exponential function whose four parameters may be obtained by iterative least square fitting of time points concentrations $C_{Pl}(t)$ to the presumed model. It had been assumed also that urine retention in the bladder (after voiding) may be neglected. For each clearance curve, as obtained from 185 studied individuals, 5000 samplings were made, in which the time decay of plasma concentrations was randomly varied by means of incidental factors of normal distribution. These factors corresponded to errors of plasma and standard solution (activity standard) pipetting (from 1 to 5%) and to stochastic variation of the count-rate (1%). The so obtained values of plasma concentration (^{99m}Tc-HEPIDA) were then used to compute the calculated clearances, and by utilizing the principles of error propagation for assessing the estimator of the error of determined value of the clearance, called here uncertainity of the result. From 5000 random trials the means, their mean square errors and mean ancertainties were computed.
The accuracy of clearance determination was then evaluated by comparing mean of the calculated clearance with those originally determined. Comparison of mean uncertainities with the mean square error permitted evaluation of the degree of agreement of the estimator with the error. As a measure of precision a coefficient of variationwas used, i.e. quotient of the mean uncertainity and the mean clearance value.
Results. *Accuracy.* There was a very tight correlation between the determined clearance and the means from computed values (r$0.98 in all cases). The computed lines of regression are practically overlying the lines of identity. These correlations are practically not affected by the uncertainity of pipeting.
The precision, to the contrary, depends to a substantial degree upon uncertainty of the pipetting. For plasma clearance value (Cl_{Pl}) > 300 ml/min and at pipetting uncertaininty of 2%, the coefficient of variations amounts to 6%; at low values of 80 ml/min the c.v. will rise to 12%.
For the specific hepatic clearance (Cl_{Hp}) the coefficient of variation at 300 ml/min eqals 7.5%; at values characterisung serious pathology i.e. 50 ml/min it will reach 20%.
Conclusions. 1. Methods for determination of ^{99m}Tc-HEPIDA clearance are sufficient accurate for purposes of clinical diagnosis.
2. The precision of Cl_{Pl} depends primarily on the magnitude of the Cl_{Pl} and for a wide range of encountered values varies from 6 to 12 %.
3. Precision of Cl_{Hp} is somewhat less favourable. At Cl_{Hp} = 300 ml/min it amounts to 7.5%, at 150 ml/min, wich is a lower boundary of normal values, it amounts to 12%. At low values of Cl_{Hp} which characterise serious liver parenchyma damage, e.g. 130 ml/min, coefficient of variations reaches 16%.

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RENAL SCARS IN ADOLESCENTS WITH TYPE 1 DIABETES MELLITUS

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Nephropathy is one of the main diabetic complications. Nowadays research results show that in patients with diabetes not only glomerulopathy but also interstitial lesions were found. These complications can be caused by chronic inflammatory process connected with diabetes.
Aim of the study: To estimate the frequency of the incidence of renal scars in type 1 diabetic adolescents.
Research group and methods: 30 patients (15 male, 15 female) at the age 19.2 ± ± 4.2 years were included in the study. Duration of diabetes was 12.1 ± 5.2 years. 38 healthy individuals (18 male, 20 female) at the age 19.5 ± 1.3 without any history of kidney disease were the control group. Renal scinthigraphy using ^{99m}Tc-EC was performed. The results of examination underwent computer analysis according to an own program to obtain renographic curves and parametric clearance images. On these images the regions of local disturbances or lack of clearance function was recognized as scars. They were mainly localised in peripheral parts of kidneys. Each examination was evaluated by two independent researchers.
Results: The renal scars were found more frequent in patients with diabetes than in control group (12/30 patients with diabetes — 40% vs in 6/38 control group — 15.8%, $p < 0.05$). In the diabetic patients the scars were noticed in both kidneys in 7 individuals, and in one kidney in 5 patients. In the control group scars were observed in both kidneys in 3 individuals and in one kidney in 3 persons. The scars were mainly found in the upper pole and lower region of the kidneys.
Duration of diabetes was a little longer in the patients in whom renal scars were recognized than in the patients without renal scars (13.3 ± 5.9 vs.11.8 ± 4.6 years, NS).
Conclusion: In the diabetic patients the renal scars occurred above twice more frequently than in the control group. This observation need future investigation based on larger study group.
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