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CARDIOLOGY

1

WHAT IS THE IMPORTANCE OF FUSED IMAGES OF PET-SPECT-CT-CT CORONARY ANGIOGRAPHY AFTER AMI AND REVASCULARISATION IN MULTIVESSEL DISEASE?

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Aim: Sought the diagnostic advantages of multimodality and fused images by PET/CT and SPECT and CT coronary angiography (MSCT) in pts with multivessel diseases after myocardial infarction (AMI) and revascularisation procedures (ACBG, PCI). What is the diagnostic importance of simultaneous physiological (perfusion-SPECT and metabolism-PET) and anatomical (MSCT) information: 1 — to decide the effectiveness of revascularisation (open or restenosed arteries), 2 — to detect the "culprit lesion" i.e. which coronary artery is responsible for ischaemia?
Material and methods: In 10 cases after AMI and revascularisation procedure (5 patients with PCI, 5 patients with ACBG) in multivessel diseases were analysed the results of F-18-FDG PET/CT (Siemens Biograph) and Tc-MIBI gated SPECT (Mediso-CardioSPECT D90) examinations fused images. For image fusion PMOD 2,75, for 3D display MIP and volume rendering (VolView 2,0), for SPECT reconstruction InterWiew XP1.04 (Mediso Ltd.) were used. We evaluated the myocardial viability analysing PET-SPECT matching (non-viable) or mismatching (viable).
Results: After PCI we could in one case (1/5 patients) find by SPECT-PET fused images a large "scare", without ischaemia (SPECT-PET fused images, "matching") and by MSCT open arteries without restenoses, in two cases (2/5 pts) restenosed arteries (MSCT) and severe ischaemia (SPECT-PET fused images, "mismatching") in the field of restenosed arteries. After ACBG 4/5 cases the grafts were open, non-stenosed by MSCT and without ischaemia on SPECT-PET fused images. In the case of stenosed graft (1/5) severe ischaemia ("mismatch") was verified on SPECT-PET fused image.
Conclusion: Our preliminary results by PET-SPECT-MSCT fused multimodality images could give through the simultaneous physiological (SPECT-PET) and anatomical (MSCT) informations about the effectiveness of revascularisation procedure, the most accurate diagnosis of restenosed arteries and their authentic place in AMI patients with multivessel disease after revascularisation procedures ie PCI and ACBG.

2

DUAL ISOTOPE F-18 FDG AND TC-99M MIBI MYOCARDIAL SPECT IN PATIENTS WITH HODGKIN'S DISEASE AFTER CHEMO-AND MANTLE RADIOTHERAPY

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Aim: We evaluated myocardial perfusion and metabolism years after this combined treatment for Hodgkin's disease had been applied.
Material and methods: 30 patients with Hodgkin's disease (HD) with a mean age of 46.4 were studied (16 females, 14 males). All of them were treated with mantle radiotherapy [only mantle or (sub)total nodal irradiation] and chemotherapy at a mean of 15.5 (8–26) years ago. 30 healthy patients with normal myocardial blood flow made up the control group. Patients with HD underwent F-18 FDG/Tc-99m MIBI DISA SPECT. In the control group only the myocardial perfusion was assessed. Results were evaluated using a dedicated quantitative myocardial perfusion program package (ACSP-2, Elscint). Quantitative polar maps were generated both from the perfusion and metabolic images. From the polar map the average activities of 16 regions were expressed as the percentages of the highest activity.
Results: In patients with HD the basal segments and two inferoapical segments of the myocardium had significantly lower perfusion values compared to those of healthy patients ($P < 0.0001$; Bonferroni corrected significance level: 0.0032). Nevertheless, the metabolism of these segments was preserved and it did not differ significantly from that of the other segments.
Conclusions: On the basis of our results we can conclude that combined modality therapy decreases the perfusion of basal myocardial segments, but does not affect the glucose metabolism of these heart muscle cells. Finally, we advise the cardiologic follow-up of patients with HD.

3

ASSESSMENT OF MYOCARDIAL VIABILITY AND PERFUSION WITH FDG-PET AND MIBI-SPECT AFTER TRANSPLATATION OF PROGENITOR CELLS IN ACUTE MYOCARDIAL INFARCTION

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Aim: The aim of the present study was to evaluate the effects of intracoronary infused bone marrow derived progenitor cells (CD34+) on regional myocardial viability and perfusion in patients with first episode of acute myocardial infarction.
Material and methods: Seven patients were treated by percutaneous revascularisation and stenting of the occluded artery; 6 left anterior descending (LAD), 1 right coronary artery (RCA). All patients received intracoronary infusion of autologous CD34+ bone marrow stem cells 12 ± 1 days after the revascularisation. All patients underwent FDG-PET and MIBI-SPECT before transplantation and 6 months afterwards during follow-up. For quantitative evaluation of myocardial [^{18}F]FDG and [^{99m}Tc]MIBI uptake a ventricular segmentation scheme (16 segments) was applied. Mean signal intensities (MSI) of the segments assigned to the LAD/RCA distribution were calculated for each patient.
Results: PET studies showed a highly significant increase of the MSI in the infarct area from 56.6 ± 11.8% to 72.2 ± 13% ($p = 0.007$). No statistically significant differences were found in myocardial [^{99m}Tc]MIBI uptake before (52.8 ± 10.3%) and after (59.0 ± 15.9%) stem cell transplantation($p = 0.152$).
Conclusion: Our results indicate that local intracoronary CD34+ progenitor cell therapy results in a significant increase in myocardial viability of the infarct zone.

4

TRUE "FALSE POSITIVE" MYOCARDIAL SCINTIGRAPHY? THE DILEMMA OF PATIENTS WITH POSITIVE MYOCARDIAL SCINTIGRAPHY AND NORMAL CORONARY ANGIOGRAPHY

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Aim: Clinical data of patients with high clinical probability of ischemic heart disease (IHD) with reversible perfusion defect on stress myocardial perfusion scintigraphy (MPS) but without significant coronary artery stenosis on coronary angiography (CAG) were retrospectively analysed.
Material and methods: 618 patients with reversible perfusion defect on MPS and sent to CAG within two months were studied. Tc-99m-tetrofosmin MPS (one-day protocol, 400 + 700 MBq) was performed and semiquantitatively evaluated. 53 out of 618 patients had no significant stenosis on CAG. Correlation between clinical findings and abnormal MPS were analysed in this group of patients.
Results: 35 out of 53 patients had typical, 15 had atypical angina, 3 had dilatative cardiomyopathy (DM). 44 patients had hypertensive disease (HD), 14 had non-insulin-dependent diabetes mellitus (DM). 13 had both HD and DM. The final clinical diagnoses were: 36 patients had IHD. 13 had HD (5 of them also had DM), 1 had DM, 2 had hyperlipidemia. In 1 patient diagnosis was "sine morbo", this patient had "true" false positive MPS.
Conclusions: In patients with high clinical probability based on demographic data and risk factors of IHD, positive stress MPS can reflect impairment of myocardial perfusion even if CAG is negative. This can be explained in large majority of patients by microangiopathy associated with HD and/or DM.

5

NITROGLYCERIN-AUGMENTED TC-99M-TETROFOSMIN MYOCARDIAL SCINTIGRAPHY IS A SUBSTITUTE FOR REST TL-201 SCINTIGRAPHY?

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Background: Nitroglycerin-augmented myocardial scintigraphy at rest with Tc-99m--labelled perfusion agents (NG-Tc) and rest-redistribution Tl-201 myocardial scintigraphy (Tl) are widely used to visualize jeopardized but viable myocardium.
Aim of our study was to compare NG-Tc and Tl in post-infarction patients with fixed perfusion defects on stress-rest Tc-99m-tetrofosmin myocardial SPECT.
Material and methods: Stress-rest Tc-99m-tetrofosmin SPECT were performed using one-day protocol. Resting injection was given after sublingual nitroglycerin administration. Patients with at least one large fixed defect underwent a Tl SPECT (images at 20 minutes and 3 hours) within 4–14 days. NG-Tc and Tl scintigrams of 49 patients were compared semiquantitatively using a 13-segment model and scoring system of 0–3 scores (0: normal, 3: absent perfusion).
Results: 180 out of 637 segments showed fixed perfusion defect on NG-Tc scintigraphy. 45 of them showed improved Tl-201 uptake, 9 had lower Tl uptake. Mean segmental score were 1.58 ± 1.01, 1.76 ± 1.06 and 1.78 ± 1.06 on NG-Tc, rest-Tl and delayed-Tl scans respectively, showing significant ($p < 0.01$) increase of relative uptake on both Tl-201 images.
Conclusions: Myocardial segments with fixed perfusion defect on NG-Tc SPECT have more uptake with Tl-201. Rest-redistribution Tl SPECT can not be substituted by NG-Tc SPECT in postinfarction patients.

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PREDICTIVE VALUE OF STRESS TC99M-TETROFOSMIN GATED AND REST — REDISTRIBUTION TL-201 MYOCARDIAL PERFUSION SPECT BEFORE NON-CARDIAC SURGERY

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Aim: To determine the perioperative cardiac risk in patients for non-cardiac surgery by Tc99m-tetrofosmin gated myocardial perfusion SPECT.
Material and methods: Tc-99m-tetrofosmin stress myocardial perfusion SPECT and gated SPECT in rest (GSPECT) were performed in 100 randomly chosen patients with intermediate risk for coronary artery disease preoperatively. In case of fixed defect (36 patients), additional Tl-201 rest-redistribution perfusion SPECT was also performed. Perioperative myocardial ischemia (PI) was detected by continuous monitoring.
Results: Patients were divided into 5 groups: I. normal findings, II. reversible defect with EF > 45%, III. reversible defect with EF < 45%, IV. fixed defect with EF > 45 %, V. fixed defect with EF < 45%. PI was detected in 13 patients. In group I ($n = 23$) no PI was found. PI occurred in 1 patient of group II ($n = 24$) and in 8 patients of group III ($n = 17$). In group IV ($n = 21$) no PI was observed. In 4 patients of group V ($n = 15$) PI was detected, all of them had Tl-201 uptake in the fixed defect.
Conclusions: Our results prove the predictive value of GSPECT in perioperative risk stratification. Patients having low EF (< 45%) and reversible perfusion defect or fixed defect with viable myocardium have high risk of PI.

ONCOLOGY AND SENTINEL NODE

7

MULTIVARIATE ANALYSIS OF MYOCARDIAL SPECT POLAR MAP IMAGES

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Aim: Quantitative evaluation of myocardial SPECT (MS) studies is usually based on comparison to a gender-specific reference database. However, there may also be further factors that influence the regional activity distribution, apart from coronary artery disease (CAD). We present the framework of a statistical evaluation approach for MS studies that can account for the effect of several such confounding factors simultaneously.
Material and methods/Results: A reference database was developed on 58 patients without angiographic CAD, undergoing a 2-day stress-rest tetrofosmin MS study. The regional effect of various clinical and imaging variables was analyzed by univariate and multivariate linear regression for the polar map segmental values. Gender, body weight, hypertension, hypercholesterolemia, left ventricular ejection fraction, resting systolic blood pressure and heart rate at radiopharmaceutical injection were found to be independent predictors of the regional count density. The utility of the method was assessed on MS studies of 85 patients with angiographic CAD.
Conclusions: The left ventricular activity distribution in MS images is influenced by various factors beyond myocardial ischemia. Accounting for these effects with a multivariate prediction model may enhance the accuracy of the diagnosis of CAD.

8

ONCOTHERMIA (ELECTRO-HYPERTHERMIA) I. FIRST RESULTS IN ONCOTHERMIA BASIC RESEARCH

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Aim: Hyperthermia applications for cancer therapy has been documented for thousand years. Since then numerous hyperthermia methods were developed including energy delivery by electric field, but the exact mechanism of action of the oncological electro-hyperthermia is still the subject of the scientific debate and the method is not widely accepted by oncologists. In our present work we had compared the effects of two hyperthermia methods *in vivo* and *in vitro* models: the classical heat delivery versus capacitively coupled electro-hyperthermia. Both methods were also compared to an untreated control.
Material and methods: The *in vitro* test system was a human hepatocellular carcinoma cell line (HepG2) grown onto the surface of a thin glass coverslips. The *in vivo* model was a tumor bearing Nude mice, the tumor was originated from HepG2 and HT29 cell lines. The electro-hyperthermia device was a 13.56 MHz sinus wave radiofrequency generator. The energy transfer was carried out by capacitive coupling, the treated sample was placed between a specially designed condenser electrodes. The classic heat delivery method was done by a thermo-regulated hotplate in case of the in vitro system and an infra red emitter in case of nude mice. The heating dynamics and the total hyperthermia time of the treated samples was kept identical in both hyperthermia method. Permanent temperature monitoring was done using a fluoroptic temperature measurements system (Luxtron).
Results: Significant differences were observed in cell viability, cell morphology and tumor tissue structure compared untreated control to electro-hyperthermia treated samples vs. samples treated with heat alone. Also significant differences were detected between the treatments in apoptotic pattern and different immunohistochemical properties (beta-catenin and HSP70 distribution).
Conclusions: Our present preliminary results indicate that extensive further research is needed to clarify the basic principles and mechanisms of action of electro-hyperthermia to became a widely accepted and scientifically proven tumor treatment method, as well as an effective supportive treatment for isotope-therapies.

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ONCOTHERMIA (ELECTRO-HYPERTHERMIA) II. EFFECT OF ELECTRO-HYPERTHERMIA TO THE TUMOR UPTAKE OF CERTAIN RADIOPHARMACEUTICALS — FIRST PILOT STUDIES

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Aim: The complete mechanism of action of electro-hyperthermia involves many effects which could affect the radiopharmaceutical uptake of certain tumors. The most important interactions are expected in the phenomena of the thermophoresis, in the thermodiffusion and in the relatively less investigated electo-endocytosis.
In our present study the distribution changes of different ^{99m}Tc-labelled radiopharmaceuticals (^{99m}Tc-DMSA(V), ^{99m}Tc-MDP, ^{99m}Tc-Liposoma) were investigated by the action of electro-hyperthermia treatment in in vivo model.
Material and methods: The experimental animal was a tumor bearing nude mice xenograph model. In vitro cultivated HepG2 (human hepatocellular carcinoma) and HT29 (human colorectal cancer) cells were used to induce a tumor. Two separated tumors were induced in each mouse by injecting subcutaneously the tumor cell suspension to the femoral region both sides. To make the comparison accurate, only those animals were used for the studies, which had symmetrically grown tumors in the same size. Right after the intravenous injection of radiopharmaceuticals one of the tumors of the experimental animal was treated by electro-hyperthermia for 30 minutes, the other lesion was the untreated control. During the treatment permanent temperature monitoring was performed using a fluoroptic temperature measurement system (Luxtron). The achieved temperature was 42–43°C in the treated tumor while it remained 36–37°C in the control tumor. The radiopharmaceutical uptake in the tumor was measured by a nanoSPECT/CT dual modality imaging system recently developed by the Mediso-BioScan. The quantitative analysis of the radiopharmaceutical uptake in the tumor was measured by standard voxel analysis.
Results: We found that due to the effect of electro-hyperthermia the radiopharmaceutical uptake in all the cases was higher in the treated tumor compared to the untreated identical control on the same animal. In case of ^{99m}Tc-Liposoma the gain was significant (30–40%), [$p < 0.05$]; while the similar increase was smaller in the case of ^{99m}Tc-DMSA(V) (10–15%).
Conclusions: According to the present advantageous results we found a definite enrichment of ^{99m}Tc-labelled radiopharmaceuticals in vivo by effect of electro-hyperthermia. Our present investigations show that a large-scale cooperative research is required to develop an effective tumor therapy methods based on this revealed effect.

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THE IMPORTANCE OF SENTINEL LYMPH NODE DETECTION IN PROSTATIC CANCER

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Background: The lymph node (LN) metastases of prostate cancer (PC) can be found most frequently in standard 4 regions. The probability of metastatic cases are estimated on the basis of predictive nomograms. Is there any advantage of the sentinel lymph node detection (SLN) comparing these informations.
Material and methods: SLN detection where performed in 59 cases (mean age: 61 ± 10 years, clinical stage: T1c-2 N0M0, PSA: 9.54 ng/ml). 200 MBq Tc-99m SentiScint was injected into prostate. After 3 and 24 hours static (AP, PA, LLAT, RLAT views and sitting positions) pictures, in 12 cases SPECT examinations were performed as well. During the operation γ-probe was used for the detection of SLN. The removed SLN-s where analyzed histopathologically as well.
Results: During lymphoscintigraphy SLN could be found every case, the number of it was > 2 in 45/59 cases. The SLN were found in 2/59 cases (3%) outside the standard regions. With pathological examinations metastases were diagnosed in 10/59 pts (17%).
Conclusions: The results of SLN examination (lymphoscintigraphy + SLN detection and removing with γ-probe + histopathological examination) proved to be useful method in the treatment of pts with PC, comparing the estimated probability of metastases with predictive nomograms (17% *versus* 2–3%) and the standard regional localisation of metastases (in 3% of pts outside these regions!).

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SUCCESS RATE OF RADIOGUIDED SENTINEL LYMPH NODE BIOPSY IN DIFFERENT BREAST TUMOURS BY INTRATUMOURAL RADIOCOLLOID ADMINISTRATION

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Background: Radioguided occult lesion localization (ROLL) and simultaneous sentinel lymph node (SN) biopsy are routinely performed in our department.
Aim: To assess the feasibility of radioguided SN biopsy using intratumoural radiocolloid administration and to investigate, whether the tumour histology had an impact on the success rate of the procedure.
Material and methods: Two hundred and sixteen women with non-palpable breast lesions were enrolled into the study. The radiopharmaceutical (99mTc-Senti-Scint) was injected intratumourally under US or X-ray guidance the day before surgery. Four hours later SN mapping, the next day open surgical tumour excision and axillary SN biopsy were carried out by using a gamma probe and blue staining guidance.
Results: Invasive tumour was found in 161 patients (group A), only DCIS was detected in 39 cases (group B) and the tumours were proved to be benign in 16 cases (group C). Axillary SNs were detected by radioguidance in 88% (142/161) of group A, in 90% (34/39) of group B and only in 69% (9/16) of group C patients. Axillary SN was detected only by blue staining in further 9, 1 and 3 cases respectively.
Conclusion: Our method is suitable for the detection of SN in patients with malignant breast tumours but it is less effective in benign lesions, which is evidently irrelevant being conscious about the definitive histopathological findings.

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STUDIES ON OCTREOTIDE GROWTH INHIBITION EFFECTS IN DAOY MEDULLOBLASTOMA CELL CULTURE AND MOUSE XENOGRAFT MODEL

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Aim: Potential antiproliferative effect of octreotide, a somatostatin analogue was tested on amedulloblastoma cell line in tissue culture and in SCID mice.
Material and methods: DaOY medulloblastoma monolayer cell culture was treated for 72 hours with octreotide, alone and in combination with cisplatin, etoposide, vincristine, irinotecan. For combined treatment the lowest effective dose of octreotide was applied (2.5 μM). SSTR2 positive DaOY medulloblastoma xenograft was established in SCID mice and treated with octreotide (20 and 100 μg/kg/day) subcutaneously for 10 consecutive days). Xenografts were scanned with the octreotide analogue ^{99m}Tc-HYNIC-TATE peptide gamma scintigraphy.
Results: ^{99m}Tc-HYNIC-TATE peptide scintigraphy could identify xenografts. 50% inhibitory concentrations (IC_{50}) were 1.2 μM for cisplatin, 0.0007 μM for vincristine, 5.8 μM for irinotecan, 0.7 μM etoposide and 22 μM for octreotide. High dose octreotide (44 μM) achieved more than 90% inhibition. In combination octreotide (2.5 μM) partially antagonized the antiproliferative effect of vincristine in monolayer cell culture.
Conclusion: Octreotide is an effective drug in DaOY human medulloblastoma, investigated both in cell culture and in xenograft model. However, the effective drug concentration exceeds conventional clinical dosage.
This work was supported by OTKA T-46938, NKFP 1A/002/2004 grants and EMIL Network of Excellence (EC-FP6).

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SENTINEL LYMPH NODE SCINTIGRAPHY (SNC) IN THE PRE- AND PERIOPERATIVE DIAGNOSIS OF BREAST CANCER

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Background: The importance of SNC in the perioperative diagnosis of breast cancer is well-known. Using the method with further completitions, results useful additional informations.
Aim: To establish, how these informations influence the treatment and management of the patients.
Material and methods: 100 women were observed whose breast cancer was proved by fine needle biopsy (FNB). SNC was performed a day before the planned operation. The radiopharmaceutical (80 MBq 99mTc-Senti-Scint) was injected peritumoral, in 4–8 portions, using US guide. Anterior and lateral planar scans were performed 1 and 3 hours after the injections from the chest and axilla. The projections of the SN were marked on the skin. With help of this markers US guided FNB and cytology of SN was performed in 71 cases. The operation was carried out the next day with removing of SN and low axillary blockdissection, or — in cases of metastatic laesions — total axillary blockdissection.
Results: The peritumoral administration of the radiopharmaceutical supports the surgeon to the adequate removing of the tumor, especially in non palpable tumors (ROLL technic). The preoperative SN biopsy showed metastatic laesions in 10 patients. The histological examination verified lymph node metastasis in 27 cases, but the SN was positive only in 14 cases.
Conclusions: The US guided peritumoral administration and preoperative FNB of SN are valuable completitions in the surgical therapy of the breast cancer, helping in the selection of the appropriate surgical procedure. If the metastasis involves only the SN to perform of total axillary blockdissection is considered by using of the low axillary blockdissection.

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POSTOPERATIVE FOLLOW-UP OF 300 BREAST CANCER PATIENTS WITH NEGATIVE SENTINEL NODE BIOPSY

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Aim: In a previous study we detected 1 axillary recurrence in 292 breast cancer patients with negative sentinel node biopsy (SNB) and no axillary lymph node dissection (ALND) during a mean of 27.2 months follow-up period. The aim of our present study is to investigate the rate of axillary recurrence in a longer follow-up period.
Material and methods: Between October 2000 and Augustus 2005 selective ALND was performed in 517 consecutive patients with a T1 or T2 breast cancer and clinically negative axillary nodes, i.e. ALND was omitted in patients with negative sentinel node (SN) biopsy. SN(s) were identified using a combined labelling method: Tc99m -labelled nanocolloid was injected peritumorally on the day before the operation and vital blue dye was injected above the tumor just before the operation. Only hot and/or blue lymph node(s) were declared as SN(s) during surgery. ALND was omitted in 323/517 patients on the basis of a negative intraoperative imprint cytology and postoperative hematoxylin-eosin (HE) and cytokeratin immunohistochemistry stained sections of SN(s). 300/317 patients were followed-up: the mean of follow-up time was 36.45 months (range 9–73 months). In 140/300 patients (46.6%) the follow-up time was 37–73 months.
Results: Axillary recurrence was found in 2/300 patients (0.66%) 11 and 23 months after the operation. In 3/300 patients (1%) local recurrence, and in 12 patients (4%) distant metastases occured in a mean of 23 months after the primary treatment.
Conclusions: During a longer follow-up period only 1 further axillary recurrence was detected in the same patient group. The rate of axillary recurrence (< 1%) is similar or lower as compared to the data published by experienced authors (Veronesi [2005]: 0.3%, Roumen [2001]: 1%, Krokke [2005]: 0.88%). Our results confirm that 1. using strict patient enrollment, 2. using combined radiocolloid and blue dye labelling technique 3. and a collaboration of a properly trained team (nuclear medicine, surgery, pathology) SN biopsy without ALND in SN-negative patients is a reliable staging procedure with a low axillary recurrence rate.

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FOLLOW UP OF IMATINIB THERAPY WITH FDG PET/CT IN GIST: A CASE STUDY

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In 2000, the patient underwent extended total gastrectomy due to not healing ulcer and positive biopsy resulting stromal tumor. The histology was a gastrointestinal stromal tumor (GIST) of fibrous subtype with strong c-KIT (CD117) positivity and high mitotic rate. In 2002 multifocal recurrence of the disease was proved by imaging and core biopsy. PET/CT examination performed in Germany showed high tracer uptake in the lesions and the disease was declared inoperable. The imatinib therapy started in June 2002 with 400 mg daily dose. Structural imaging performed during the follow-up revealed incomplete regression, and later stable disease. In July 2005 PET/CT scan done in our institute showed complete metabolic remission. The patient stopped the therapy in January 2006. The repeated PET/CT scan in august demonstrated the growth of the lesions and the appearance of pathological tracer uptake. The therapy was restarted shortly after the examination. The next scan in January this year again proved complete metabolic regression. Negative FDG PET scans in patients with GIST indicate tumor control rather than tumor free state during the imatinib therapy.

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ADRENAL METASTASIS OF PULMONARY MICROCELLULAR CARCINOMA ON BONE SCAN

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Background: 54 year old woman with pulmonary carcinoma was examined by bone scintigraphy. High radiopharmaceutical uptake had shown in the left upper lumbar region. Localisation of the hot spot was uncertain: XII rib or the upper part of the left kidney.
Aim: Exact localisation of the hot spot.
Material and methods: Images were acquired after intravenous injection of 800 MBq Tc99m-MDP by gamma camera. After planar examination Furosemide was administered. For further examination SPECT imaging of the lumbar region was proceed by Siemens Multispect II.
Results: After the administration of diuretic material the hot spot did not show any changing. The upper part of the left kidney showed by SPECT imaging. Adrenal metastasis was also verified by CT examination.
Conclusion: Calcification of primary malignancy or metastases may appear on bone scan.

PET

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CLINICAL USEFULNESS OF TC-99M-SESTAMIBI SCINTIGRAPHY IN MULTIPLE MYELOMA

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Background: Tc-99m-sestamibi (MIBI) scintigraphy (SG) is used to study various malignancies. Usefulness in the work-up of patients with multiple myeloma (MM) has been recently reported.
Aim: was to asses clinical value of MIBI SG in different clinical stages of MM.
Material and methods: 70 patients with MM had whole body MIBI SG (10 minutes after *i.v.* injection of 740 MBq MIBI) in the last four years, 14 of them (6 M, 8 F, median age of 59.8 years) had multiple scans in their follow-up. 3 of the 14 patients had monoclonal gammopathy of uncertain significance (MGUS), 3 patients were in complete remission (CR), 6 were in partial remission (PR), 6 had incipient relapse (IR) and 9 had clinically active stage of MM (CA). Clinical activity was determined by serum LDH, electrophoresis, and plasma cell content of the bone marrow.
Results: All 9 scans of the 3 patients with MGUS were normal. Normal MIBI distribution was found also in the 3 patients with CR. All patients with PR (6 cases) or IR (6 cases) had circumscribed lesions (2 of them were extramedullary) and 7 of them had moderately increased diffuse activity in the bone marrow. In all 9 CA cases intensive diffuse MIBI activity in the bone marrow was found and 8 patients had circumscribed lesions too.
Conclusions: Whole body MIBI-SG is useful to assess activity of MM in clinically equivocal cases, and it may detect extramedullary lesions as well.

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EFFECTS OF DRUGS ON THE ^{18}FDG ACCUMULATION OF P-GLYCOPROTEIN EXPRESSING AND NON-EXPRESSING CANCER CELLS

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Background: ^{18}FDG is the most frequently used glucose analogue used in the *in vivo* PET tumor-diagnostics.
Aim: To determine how cytostatic drugs, ligands used in chemotherapy modify the accumulation of ^{18}FDG in cancer cells expressing the MDR1 gene coding the P-glycoprotein (Pgp) a common reason of multidrug resistance.
Material and methods: The accumulation of the ^{18}FDG was measured in a calibrated gamma-counter.
Results: The glucose metabolism of the Pgp expressing cell lines was significantly higher ($p < 0.05$), than that of the Pgp nonexprssing counterparts. Verapamil, (a calcium channel blocker) further increased the ^{18}FDG accumulation of the Pgp positive cells but did not modify the ^{18}FDG accumulation of the Pgp negative ones. Paclitaxel, miltefosine (cytostatics), bepridil and amilorid analogues (all Pgp substrates or modulators), could modify the ^{18}FDG accumulation of the cancer cells in a Pgp dependent or Pgp independent manner. Depending on the kinds of ligands the treatments may cause hypometabolism or hypermetabolism.
Conclusions: The masking effects of the drugs — used in chemotherapy — on the ^{18}FDG accumulation in the tumors should be taken into consideration upon PET diagnosis. ^{18}FDG PET investigations, using adequate protocols may help to reveal the multidrug resistance of tumors.

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COMPARATIVE ANALYSIS OF PET AND PET/CT SCANNERS DETECTING SMALL SIZE LESIONS WITH LOW ACCUMULATION

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Aim: To compare PET and PET/CT scanners used in the country that analyse the detectibility of small lesions with low radioactive accumulation.
Material and methods: The Siemens Biograph 16, the GE Discovery ST and the Siemens ECAT 47 PET scanner were tested using the lung phantom from BIODEX. To the phantom 5 syringe of 5 mm diameter were inserted. The applied contrast values were 8 (at 3 pieces) and 4 (at 2 pieces).
Results/Conclusions: The syringes with contrast of 8 were detectable at all PET scanner, but the best contrast was calculated at the Siemens PETCT. The syringes with contrast of 4 could only be visualized by the PETCT scanners. In this case the GE scanner showed better performance in 3D mode, and it was worse using 2D acquisition mode.

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PET/CT EXAMINATIOS COMBINED WITH SENTINEL LYMPH NODE DETECTION IN CLINICALLY N0 STAGE HEAD AND NECK SQUAMOUS CELL CANCER

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Aim: To assess the feasibility of preoperative and intraoperative sentinel lymph node (SLN) detection combined with PET/CT in T1-3N0M0 head and neck squamous cell cancer (HNSCC) patients. We sought the cause of the short relapse of disease after the surgery. Was the preoperative examination appropriate? Is it true that we know everything about the lymphatic drainage of the HNSCC?
Material and methods: We evaluated 12 (6 females, 6 males) patients with HNCC, stages T1-3N0M0, mean age 47 (36–58). During preoperative assessment physical examination, cervical ultrasonography (UH) and CT were performed to exclude patients with obvious nodal metastasis. In physically, UH and CT negative cases whole body FDG PET/CT examinations were performed for the evaluation of primary lesion, metastatic lymphadenopathy and distant metastatic process. All patients underwent preoperative lymphoscintigraphy and intraoperative sentinel lymph node detection and dissection of both sentinel lymph node and PET/CT-positive lymph node(s), followed by histopathological examination as well as immunohistochemistry.
Results: 10/12 cases PET/CT showed local metastases (no distant metastases) but on the basis of histopathology 1/10 metastases proved to be false positive (reactive lymph node). 2/12 patients were PET negative, but showed micrometastases in sentinel lymph nodes. 4/10 cases were SLN negative, but the PET discovered more than one metastatic lymph node. All but one (11/12) N0 HNSCC cases underwent upstaging.
Conclusions: PET/CT is a very useful method in nodal staging of HNSCC patients. Sentinel lymph node examination, starting with lymphoscintgraphy is a powerful tool to detect nodes with only micrometastasis, undetectable with PET. Our preliminary results show that PET/CT combined with lymphoscintigraphy and intraoperative sentinel lymph node detection can improve the staging of HNSCC patients.

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EARLY EVALUATION OF RESPONSE TO CHEMOTHERAPY IN PATIENTS WITH METASTATIC COLORECTAL CANCER USING FDG PET/CT

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Aim: Our aim was to assess the effectiveness of FDG PET/CT in early evaluation of response to chemotherapy in patients with metastatic colorectal cancer.
Material and methods: Nineteen colorectal cancer patients with at least one metastasis to the liver, as detectable by CT, were included in the study. FDG PET/CT was performed before and after the first cycle of therapy. Maximum of the standardized uptake value (SUV) in the hepatic lesion was determined. At least 30% decrease of this value as the threshold of response was chosen. The PET-response was compared to the results of CT- and/or MR-imaging done in every two months.
Results: Considering the PET-response 10 true positive and 1 false negative results have been documented. Among the non-responders (determined by PET) 4 true negative and 2 false positive results have been found. Two patients have died before the first control CT exam.
Conclusion: FDG PET/CT seems to be a suitable method for early response monitoring in colorectal cancer.

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STAGING OF HODGKIN LYMPHOMA WITH PET/18FDG IN CHILDREN

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Aim: The precise initial staging and appropriate treatment of Hodgkin lymphoma (HL) in children improve of survival. 18FDG/PET became efficient method routinely used for staging with it's possibility to detect this disease at metabolic level.
Material and methods: The group of investigated patients involved 41 children with HL. At the time of diagnosis were concomitantly performed 18FDG/PET scans and other conventional imaging methods as well. It was retrospective analysis of staging, comparison of these all modalities performed. PET was performed with scanner ECAT EXACT HR+ (Siemens), multimodal fusion with CT or MRI was made with Hermes system.
Results: We analyzed 41 patients with newly diagnosed HL, 14 boys, 27 girls. In all patients USG and CT or MRI. Concordance in these modalities was in 17/35 cases (49%). 18FDG/PET caused upstaging in 8/35 (23%) cases. Semiquantitive estimation was made by help of SUV (standardized uptake value).
Conclusion: Whole-body 18FDG/PET is routinely used staging method for children with Hodgkin lymphoma. This procedure performed at the time of diagnosis is essential for regular assessment of the treatment response.

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DATA FOR THE USEFULNESS OF 3´-DEOXY-3´-[^{18}F]FLUOROTHYMIDINE

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Background: 3'-Deoxy-3'-[^{18}F]fluorothymidine (FLT) is an emerging new PET imaging agent for visualizing cellular proliferation in vivo based on the metabolism of thymidine. A currently published *in vitro* study showed, that up to ~50% of FLT is effluxed to media, thus the studies may not give a real result about the DNA synthesis rate.
Aim: To synthesize this popular tracer and investigate a possible role of multidrug resistance-associated proteins on efflux of FLT and its metabolites.
Material and methods: The synthesis was performed starting from 5'-O-Dimethoxytrityl-3'-O-nosyl-thymidine. For the in vitro experiments wild type, MRP4- and MRP5-transfected HEK293 cells were used. HPLC analysis was applied for the intra- and extracellular metabolite assay.
Results: Using our method FLT was reliably produced with 25% yield and 10-30 TBq/mmol specific activity. The15% of the effluxed FLT from the wild type cells was found to be phosphorilated while in case of the MRP 4/5 transfected cells this value was 50%. (The total efflux in both cases were over 50%).
Conclusion: Both transfected cell lines display higher efflux of phosphorilated FLT, suggesting a possible role of MRP4- and MRP5-trasporters as a nucleotide-pump in efflux of FLT metabolite.

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CLINICAL USEFULNESS OF FDG PET/CT IN PRIMARY STAGING PRELIMINARY RESULTS

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Aim: To asses clinical usefulness of FDG PET/CT in the primary staging of three different types of malignant tumors.
Material and methods: 52 patients with diagnosed primary tumor but with equivocal staging after clinical and radiological findings were studied. 32 patients had lung cancer (L), 16 patients had colo-rectal cancer (CR), 4 had head and neck tumor (HN). FDG PET examination was performed with Siemens Biograph PET/CT, after administering 3.7 MBq/kg F-18-FDG *i.v.*, with low dose CT protocol. The TNM stage was determined according to the UICC TNM classification.
Results: In 37 out of 52 examinations (71%) PET/CT findings changed the originally supposed stage. 7 cases (13%, [L: 5, CR: 1, HN: 1]) were down-staged, 30 cases (58%, [L: 19, CR: 9, HN: 2]) were up-staged after PET/CT examination. In 15 cases the supposed TNM stage was confirmed by PET/CT, however in 12 cases (L: 7, CR: 4, HN: 1) it revealed larger extension and/or higher number of malignant lesions than by radiological examinations.
Conclusions: In these three types of cancer PET/CT is useful in a high percentage of patients with equivocal clinico-radiological staging, it has a significant impact on therapeutic management.

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SYNTHESIS AND QUALITY CONTROL OF 2-DEOXY-2-[^{18}F]FLUORO-D--GLUCOSE

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Three years experience with the GE (9.6 MeV) Mini Trace cyclotron is given of the synthesis and quality control of ^{18}FDG for PET imaging. The cyclotron allows the specific production of 29.6 GBq/h^{-1} of ^{18}F with proton irradiation on a $H_2{}^{18}O$ target. The radioisotope is transported to the TRACERLab MX_{FDG} unit, where the synthesis of marked deoxyglucose is carried out frommannose triflate. During this process the trifluoromethane-sulfonate group is substituted by ^{18}F. The sterile and pyrogen free ABX kit, containing the necesary reagents, is employed in a computer driven system. The whole processing time is 25 minutes. After sterilization of ^{18}FDG quality control is carried out by cromatography and radiocromatography analysis (HPLC, TLC), which determines the radiochemical and radioisotopic purity including residual chemicals (acetonitrile, ethanol, Kriptofix). The product sterility and apirogenity is part of the analysis. Results indicate that the radionuclide purity is better than 99.5%, and its labelling efficiency above 95%.

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THE PROGNOSTIC ROLE OF 18F-FDG PET IN HODGKIN LYMPHOMA

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Aim: To investigate the diagnostic role of the 18F-FDG PET in the detection of residual tumour in Hodgkin disease.
Material and methods: In the last decade in Hodgkin disease patients following the primary therapy CT investigation revealed residual disease in 73 cases. 18F--FDG PET investigations were performed for restaging in all of these patients.
Results: 18F-FDG PET revealed active disease in 28 patients. Twenty-one of these patients had activity sings. In 5 of the patients complete remission was found after second-line therapy, and progressive disease was diagnosed in 16 cases. The other 7 patients did not have other activity signs, all of these patient are in stabile state. 18F-FDG PET was negative in 45 patients. In 2 of these cases recurrent disease was diagnosed in the first year. The other 43 patients did not showed activity signs.
Conclusion: Negative 18F-FDG PET result is a good prognostic sign in Hodgkin disease patients for the disease free survival after the first-line therapy. Positive 18F-FDG PET finding with other activity signs indicates second-line therapy. Other investigations are required to clarify the cause of the relative high rate of 18F-FDG positive cases, in whom second line therapy was unnecessary.

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ARISING PROBLEMS DURING ONCOLOGICAL PET-CT EXAMINATIONS

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Aim: We propose to draw attention to some relevant information which may influence the patient preparations and exam protocols, thus evaluation of the examinations.
Material and methods: We evaluated the information included in the referral forms in comparison with our pre examination status check of 1600 patients examined in our centre in 2006. We were searching for the most common discrepancies and deficiencies that may modify the previously planned examination protocol.
Results: In the referral forms, the relevant discrepancies and deficiencies were about the location, the extent and the histological subtype (including the grade) of primary tumor. Further important issues were the number and location of known metastases, and potential involvement of the central nervous system, the extremities and the urinary tract. The patient physique (weight, height), diabetes, claustrophobia, and the time of previous treatments are also important.
Conclusions: In order to select the most appropriate examination parameters it is essential to have certain anamnestic information. Therefore the clinician's information should be expanded, and closer cooperation may also be established.

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PET-CT EXAMINATIONS IN PREVIOUSLY TREATED ONCOLOGIC PATIENTS WITH ELEVATED TUMOR MARKERS

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Aim: The purpose of this study was to assess the value of FDG PET-CT examination in previously treated oncologic patients with elevated tumor markers, in detecting the marker elevation's origin after the failure of conventional imaging modalities.
Materials and methods: Whole body FDG PET-CT examinations were performed in 118 patients (51 colo-rectal, 35 breast, 12 ovarial, 8 pancreas, 4 thyroid, 4 gastric, 4 uterinal cancer patients), after unsuccessful or inconclusive previous conventional imaging in order to detect the origin of marker elevations.
Results: With PET-CT we detected disorders suggesting primary cancer recurrence or metastasis in 37/51 (73%) patient with colo-rectal cancer, 23/35 (60%) patients with breast cancer, 10/12 (83%) patients with ovarial cancer, 3/8 (37,5%) patients with pancreatic cancer, in the half (2/4) of the examined gastric, and uterinal tumor, and quarter (1/4) of thyroid cancer cases.
Conclusion: FDG PET-CT examination seems to be an accurate technique in early detection of disease recurrence in previously treated oncologic patients with elevated tumor markers.

NEUROLOGY AND PSYCHIATRY

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THE DOPAMIN TRANSPORTER ACTIVITY IN DEPRESSION AND THE EFFECT OF SERTRALINE TREATMENT

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Aim: To evaluate the DAT activity of untreated patients with depression compared to healthy volunteers. We also studied the effect of sertraline on DAT activity in depression.
Material and methods: We performed overall 18 ^{123}I-FP-CIT SPECT examinations in 6 healthy volunteers and 6 depressed patients. In age-matched healthy subjects and in patients baseline investigations were performed in depressed patients the SPECT investigation was repeated after 3 weeks sertraline treatment. Striatal volume of interest were fixed by automatic technique. The binding potential (BP) was estimated by the ratio of the specific to non-specific activity.
Results: In the patients group, the median baseline BP was 3.35, in the control group, this value was 3.58, difference was not statistically significant ($Z = -0.32$, $p = 0.74$). In the patient group, the median BP after sertraline administration was 2.98, which indicates a decrease of 11.0% of FP-CIT binding however, this alteration statistically was not significant.
Conclusion: We didn't find any significant difference in the baseline values of DAT activity between control and untreated depressed subjects. Sertraline treatment decreased the DAT occupancy (11%).

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SPATIAL STANDARDISATION OF RCBF-SPECT IN EARLY DEMENTIA PATIENTS AND HEALTHY CONTROL SUBJECTS

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Aim: In order to perform population level statistical analysis (SPM) of rcbf-SPECT in early dementia we investigated the reliability of spatial standardisation (SS).
Material and methods: SPECT and T1 weighted MRI investigations of 15 patients with early dementia and 11 healthy subjects were used. SS based on MRI and based only on SPECT data were compared using the statistical comparisons of the perfusion distributions measured in the same location of the brain. These areas were delineated in healthy regions with digital brain atlas software. For registration free of charge or commercially available and own developed softwares were applied.
Results: We have shown that the MR based SS is more accurate than the SPECT based one. However the SPECT based SS offers good input for the population level SPM analysis. In the case of severely hypo-perfused areas the MRI images are indispensable.
Conclusion: With the above limitations SPECT based SS proved to be reliable enough in this study population for the population level SPM analysis.

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CLINICAL EXPERIENCES WITH X-RING/4R DEDICATED BRAIN SPECT SYSTEM

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Aim: To demonstrate our clinical experience with X-Ring/4R four-head brain SPECT system (XR4R).
Material and methods: NaI(Tl) based detectors of XR4R offer high intrinsic resolution (< 2.3 mm in 230 * 220 mm UFOV). LEHR/UHR collimator sets are available. 2 mm isotropic voxel-size is used for both phantom and clinical studies. 123 rcbf patient studies using ^{99m}Tc-ECD/HMPAO were performed and evaluated by InterViewXP™. 52 volunteers have been acquired by both dual-head camera (ADAC) and XR4R. Iowa 3D Brain Phantom has been used also for brain structure recognition.
Results: XR4R produced morphologically highly detailed images reflecting the brain anatomy. In clinical routine the high resolution images had great impact in the diagnosis of functional abnormalities in deep brain structures. The optimum performances are provided by LEHR collimator set with ~25 min. acquisition time.
Conclusion: XR4R offers anatomically detailed high resolution functional images of the brain improving the diagnostic evaluation of rcbf SPECT studies.

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OUR FIRST EXPERIENCE WITH I-123-FP-CIT SPECT IN PATIENTS WITH PARKINSONISM

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Aim: To evaluate clinical usefulness of I-123-FP-CIT SPECT in patients with Parkinson's disease (PD).
Material and methods: Striatal dopamine transporter density was studied in 12 patients. 9 of them had PD and 3 had tremor from other neurological disorders. Three hours after *i.v.* injection of 185 MBq I-123-FP-CIT SPECT was performed. Transaxial images of the brain were evaluated semiquantitatively. Binding ratio (BR) of the striatum to the occipital cortex were calculated by using operator independent volume of interest. Clinical stage was evaluated by standard neurological (Hoen--Yahr and Webster) criteria.
Results: Mean striatal BR of patients with PD (2.1 + 0.12) was significantly lower than in patients with other neurological disorders mimicking parkinsonism (3.15 + + 0.11). Clinical condition of patients correlated with BR values. Patients with severe parkinsonism had lower BR values.
Conclusions: Our first experience indicate that I-12-FP-CIT SPECT seems to be a useful tool in differential diagnosis of clinically equivocal cases with suspected PD and it may provide an objective method of monitoring the clinical condition of patients.

GASTROINTESTINAL TRACT

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TARGETED RADIOTHERAPY OF BRAIN TUMORS

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External beam radiation therapy is rarely curative for gliomas and other central nervous system malignancies due to its lack of tumor specificity. Moreover, external beam radiation generally results in damage to adjacent normal tissues, compromising neurologic function and quality of life in the few patients who do survive. Targeted radiotherapy is an attractive alternative treatment strategy that utilizes a molecular vehicle such as a monoclonal antibody (mAb) to selectively deliver radionuclides to tumour cells. We have been evaluating the potential utility of radiolabeled mAbs specifically reactive with the extracellular matrix glycoprotein tenascin, which is over expressed in more than 95% of high grade glioma. A series of Phase I and Phase II clinical trials have been performed in both recurrent and newly diagnosed brain tumour patients with the murine and human/mouse chimeric forms of anti-tenascin mAb 81C6 and labeled with ^{131}I. In all cases, the labeled mAb was injected via a surgically created brain tumor resection cavity (SCRC); pharmacokinetics, dosimetry, toxicity and prolongation in median survival were assessed. Because of regulatory issues, these trials were done on an administered activity basis, resulting in a wide range of radiation doses to the SCRC due to variations in SCRC volume and biokinetics among the patients. Nonetheless, encouraging prolongation in median survival were observed. Our most recent trial in newly diagnosed patients was designed to deliver an average dose of 44 Gy to the 2-cm SCRC margin based on dosimetry calculated from serial imaging. Median overall survival for all patients and those with glioblastoma multiforme (GBM) was 96.6 and 90.6 weeks, respectively, longer than any other therapeutic approach described in the literature. Radionuclides that emit α-particles such as 7.2-h half-life ^{211}At (astatine) offer the possibility of combining cell-specific molecular targeting with radiation having range of only a few cell diameters. Furthermore, α-particles are considerably more cytotoxic that conventional radiation and their effectiveness is independent of dose rate and oxygen. We have just completed a Phase I trial evaluating ^{211}At-labeled chimeric 81C6 mAb administered into SCRC in recurrent glioma patients. Astatine-211 was produced at the Duke University Medical Center cyclotron and mAb 81C6 was labeled with preservation of immunoreactivity using *N*-succinimidyl 3-[^{211}At]astatobenzoate. Eighteen patients including 14 with GBM received 10 mg of mAb labeled with escalating activities (74–370 MBq) of ^{211}At. Retention of activity in the resection cavity was excellent with less than 0.5% of the injected dose found in the blood pool. Median survival in these recurrent GBM and non-GBM brain tumour patients was 52 and 97 weeks, respectively, and 3 patients including 2 with GBM survived for 3 years. We are currently performing preclinical studies to evaluate the potential of other ^{211}At-labeled compounds for the targeted radiotherapy of brain tumours.

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USE OF CORN OIL EMULSION AS A TEST MEAL IN BILIARY SCINTIGRAPHY

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Aim: Corn oil has been recently proposed as a stimulant to improve cholescintigraphy. We thought to compare the effect of milk, a test meal, used for several years in our department, to corn oil.
Material and methods: 37 subjects (30 female and 7 male) were enrolled in "corn oil group". Nineteen patients had intact gallbladder and 18 patients were formerly cholecystectomized. The "milk group" had 42 members: 21 with gallbladder and 21 cholecystectomized patients. Biliary scintigraphy was performed by injecting 100 MBq 99mTc-Techida *i.v.* We used test meals of 250 ml milk or 30 ml corn oil suspension. In patients with gallbladder, the stimulation was performed at the moment of peak filling whereas in the cholecystectomized group, 10–15 minutes after reaching the maximum of common bile duct time-activity curve. The gallbladder ejection rate has been characterized by the half time ($T_{1/2}$) of the initial fast ejection period. In patients without gallbladder, $T_{1/2}$ of the descending slope of common bile duct curve was evaluated before and after the test meal.
Results: 14 patients showed gallbladder contraction and 5 patients revealed no effect in response to corn oil ingestion. The initial fast ejection period lasted for 19.4± 2.5 (mean ± SE) minutes, $T_{1/2}$ was 30.1 ± 5.3 minutes. After milk administration, the gallbladder started to contract in 19 patients, whereas two showed no reaction. The fast ejection lasted for 18.7 ± 1.2 min, and the $T_{1/2}$ was 40.2 ± 4.6 min. The mean of "corn oil" and "milk" population did not differ significantly ($P = 0.16$). In patients without gallbladder, corn oil increased the rate of biliary flow into the duodenum in 8 cases, $T_{1/2}$ was 32.4 ± 3.5 min before eating, and 20.2 ± 2.2 min after stimulation. The biliary flow remained unchanged in 9 subjects, and became much slower in one. Administering milk, the rate of the biliary flow was accelerated in 10 patients having no gallbladder, $T_{1/2}$ was 30.7 ± 4.5 min. before eating and decreased to 13.2 ± 1.5 min after milk. In 10 patients, no changes have been observed or even had no flow in one case. In cholecystectomized patients, milk-induced bile flow was more potent compared to that of corn oil ($P < 0.05$).
Conclusion: We have shown that corn oil is effective as a test meal. Although we have proven that it is not stronger than milk, yet it can be better standardized. Having no side effects, corn oil may be convenient for patients with lactose intolerance.

KIDNEY

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EVALUATION OF THE RELATIONSHIP OF METABOLIC STATUS WITH GASTRIC EMPTYING AND DIABETIC NEUROPATHY

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Aim: To investigate the relationship with the actual glucose level, with gastric emptying and the neuropathy in 13 patients with type-1 diabetes (DM).
Material and methods: The emptying of the stomach was evaluated by scintigraphic method. The subcutaneous glucose levels were monitored continuously during the investigation. Cardiovascular reflex tests were applied for the assessment of autonomic neuropathy (AN). Sensory nerve integrity was studied with electric stimulation.
Results: The gastric emptying in diabetic patients was delayed ($T_{1/2}$: 84.4 ± 12.4 *vs.* 49.6 ± 5.5 min., $p = 0.06$). The glucose levels recorded during the gastric emptying (the lowest and highest, the mean, the highest difference) did not correlate with the gastric motility. Moderately severe AN was found in diabetics (AN score: 2.9 ± 0.5 *vs.* 0.3 ± 0.2, $p < 0.001$). The current perception thresholds on the peroneal nerve of the patients differed from controls (3.12 ± 0.9 *vs.* 0.68 ± 0.07 mA, $p < 0.05$).
Conclusions: Slightly slower gastric emptying was found in the presence of a moderately severe autonomic and sensory neuropathy in DM. The actual glucose level plays a less important role than neuropathy in the pathogenesis of delayed gastric emptying.

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THE ROLE OF STATIC RENAL SCINTIGRAPHY FOR THE DETERMINATION OF SPLIT RENAL FUNCTION IN CASE OF PEDIATRIC UROPATHIES REQUIREING SURGERY

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Aim: Dynamic renal scintigraphy (MAG3) has an important role in the diagnostic workup of pediatric obstructive uropathies (OU) and vesicoureteric reflux (VUR). Frequently surgery is indicated for the correction of anatomic abnormality or in case of severely damaged renal function (SDF) for nephrectomy. We investigated the role of complementary preoperative static renal scintigraphy (DMSA) performed for the determination of split renal function (SRF).
Material and methods: We compared SRFs calculated on the base of MAG3 and DMSA performed within one month in 40 pediatric patients (age: 1 m.–16 y.; 6 OU, 34 VUR).
Results: The difference between the percentage functions of an individual kidney calculated from DMSA and MAG3 was 0–8%.
Conclusion: DMSA based SRF has no clinically relevant added value if the functional state of the kidneys is relatively preserved. In case of SDF MAG3 tends to overestimate the function of diseased kidney due to higher background activity Consequently DMSA may verify the reasonebless of nephrectomy.

BASIC SCIENCES

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COMPARISON OF PROCEDURES FOR MEASURING RENAL CLEARENCE

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Aim: The aim of this work was to compare the well-known methods suitable for measuring renal clearence — from both chemical-laboratory and isotopic aspects, and to examine their authenticity.
Material and methods: At first, chemical-laboratory methods were carried out, the renal clearance was measured by using cystain. Two types of blood samples were collected: (i) the test tube contained coagulation accelerator, (ii) it was free of such an agent. In the isotopic examinations ^{99m}Tc-DTPA was used as radiopharmaceutical, both camera clearance and bloodtest clearance were determined.
Results: Our results are very variable. The divergences between the two chemical examinations are slight, proving obviously that there is no difference in the analysis of blood samples taken in the two types of tubes. The coagulation accelerator crystals do not influence the results of the test, however, compared to the test results of the isotopic blood samples, the divergences concerning the individual patients are large. Camera clearance data are absolutely unreliable, they depend very much on the manner of placing ROI-s around the kidneys.
Conclusion: The camera clearance should not be recommended to measure renal clearance.

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CHAPTERS FROM THE PREPARING SPECT/CT ATLAS

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Aim: We goaled to edit a nano SPECT/CT atlas describing the normal radiopharmaceutical biodistributions in healthy rodents for assisting the radiopharmaceutical research and development and companying biomedical research. The atlas will be published in hard copy and CD versions.
Material and methods: A nano SPECT/CT instrument developed by Mediso Ltd was used. All the examinations were carried-out in living, anaesthetized (isoflurane) rats and mice. All the most conventional 99mTc labeled radiopharmaceuticals t (^{99m}Tc-pertechnetate, ^{99m}Tc MDP, ^{99m}Tc MIBI, ^{99m}Tc HM-PAO, ^{99m}Tc HSA, ^{99m}Tc-colloids, ^{99m}Tc-IgGs) and some ^{177}Lu and ^{186}Re-labelled ligands were injected iv, then whole-body CT and nuclear medicine imaging was carried-out. After reconstructuring the CT, NM and fusion pictures visual and some detailed quantitative examinations (kidney, liver, thyroid … uptake) were done.
Results: We worked-out the examination protocols for the preparing atlas in healthy mice and rats by injecting the most important ^{99m}Tc-labelled radiopharmaceuticals. The whole-body CT, nuclear medicine and fusion images have been edited in a printed and CD form.
Conclusion: The nanoSPECT/CT (Mediso Ltd) instrument used by us proved to be applicable for dataful, high-resolution CT, NM and fusion imaging of laboratory animals. Radiotracer uptake by different organs calculated on an image-based way showed high correlation with conventional standard bioassay data.

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POSTVACCINATION AMYLOIDOSES IN GEESE — A SPONTANEOUS ANIMAL MODEL FOR RADIOPHARMACEUTICAL RESEARCH AND DEVELOPMENT

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Aim: Amyloid detection is a great challenge for the clinicians so developing new amyloid targeting agents is an ever rising problem in radiopharmaceutical research. The aim of this work was to study the availability of the better known ^{99m}Tc-DMSA(V) and an in-house produced ^{99m}Tc labelled anti serum amyloid-A (anti-SAA IgG) in amyloid detection in geese.
Material and methods: Altogether 16 geese (4 healthy, 12 postvaccination amyloidoses) was selected for scintigraphycal examination. Birds were sedated (ketamin-HCl, iv), catheterized in both saphenic veines, then injected with either 400 MBq ^{99m}Tc-DMSA(V) (Penta DMSA®, Medi-Radiopharma, Hungary) or with ^{99m}Tc-anti-SAA IgG (400 MBq/1 mg IgG). Dynamic scans between 0–30 minutes from ventral view, than static whole-body pictures from ventral and left lateral side were taken 30 minutes, 1, 2, 4, 6, and 24 hours after application. Geese were euthanized; heart, lungs, spleen, liver, kidneys, testes (or ovaries), and the whole GI-tract were removed and provided for ex vivo scintiscans. Samples from all the listed organs were sent for histopathological examination (HE and IH) for checking the presence of amyloid deposits. Scans were evaluated visually, residency times and internal dosimetrical data (OLINDA) were estimated and compared.
Results: Both radiopharmaceuticals failed to detect the very mild (+/– and + positive IH) amyloidosis in the organs. Only ++ and +++ positive organs could be detected. ^{99m}Tc-DMSA(V) is available for in vivo visualising the amyloid deposits in the lungs, heart, and intestines, while in the 24 hours ex vivo scans the spleen, liver and testis (ovaries) as well. Similarly, in the in vivo ^{99m}Tc-anti-SAA scans the lungs, heart, and intestines were visualised, but in the ex vivo scan spleen, liver, reproductive organs, parts of GI-tract and kidneys showed higher accumulation in diseased animals. Organs containing ++ or +++ amyloid deposits (IH) showed significantly higher mean residency times (20–80%) than healthy bird's organs.
Conclusion: Both ^{99m}Tc-DMSA(V) and ^{99m}Tc-anti-SAA IgG proved to be available for detecting amyloid deposits however doe to the not focal but systemic disease amyloid detection in the excretory organs is often difficult. Postvaccination geese found to be an ideal animal model for amyloid research.

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PREPARATION OF 99M TC LABELLED LIPOSOMES AND LIPOPROTEIN MACROMOLECULES FOR THE SCINTIGRAPHIC DETECTION OF THE PLAQES OF ATHEROSCLEROSIS AND TUMOR CELLS

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Background: We have prepared radiolabelled lipoproteins and liposomes for the scintigraphic detection of experimental atherosclerotic lesions and tumor cells in animal models.
Material and methods: We have isolated Low Density Lipoproteins (LDL) by preparative ultracentrifugation. Liposomes were obtained from fragments of lipoproteins and from phospholipids and cholesterol with similar features to lipoproteins. Radiolabelling of lipoproteins and liposomes with 99mTc were performed using sodium dithionite as a reducing agent. Radiochemical purity and *in vitro* stability of radiolabelled components were controlled by paper chromatography. Rabbits fed a diet containing 1% cholesterol for 60 days. Implantation of human tumor cells were made in nude mice. Gamma scintillation camera imaging of the rabbits and mice were performed for radiolabelled lipoproteins, and liposomes.
Results: The analytical and preparative ultracentrifugation methods proved to be useful to obtain and control lipoprotein aliquots for radiolabeling. Labeling efficiencies were more than -90% for lipoproteins and liposomes. Mean uptake of 99m Tc-labelled lipoproteins and liposomes in the aorta (mainly in aorta arch) and in carotid arteries were higher in hypercholesterolemic rabbits than in normal rabbit controls (about 3 fold quantity increased uptake in targets), which were confirmed by pathological examinations. In nude mice developed human tumor cells were detected compare with controls animals with radiolabelled LDL and liposomes.
Conclusions: Our preliminary results showed that in vivo scintigraphy revealed visible signal corresponding to atherosclerotic plaques and tumor cells by radiolabelled lipoprotens and liposomes. Liposomes can be made from lipids which closely mimic the metabolic behaviour and receptor binding features of lipoproteins and they have got importance in examinations.

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NUCLEAR MEDICINE IMAGING: A TOOL FOR REDUCING NUMBER OF LABORATORY ANIMALS REQUIRED FOR BIO-MEDICAL RESEARCH

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The animal experimentations are going through a transformation phase, with more emphasis on 3R (Refinement, Reduction and Replacement) principles laid down by Russell and Burch. Radioisotopic techniques has potential to reduce the number of laboratory animal in bio-medical research. Radioisotopes are commonly used as tracers in bio-medical research and known for quantative precision. It has wide applicability in studying different physiological and biochemical mechanisms in various organs. Nuclear imaging or scintigraphy is a simple, non invasive procedure involving the administration of a molecule or compound of interest labeled with gamma emitting radioisotope and subsequently, mapping the distribution of the radioisotope *in vivo* using a gamma camera.
The preclinical evaluations of radiopharmaceuticals require animal studies and the primary screening is performed in small rodents. These biodistribution studies are carried out to measure the localization of newer radiopharmaceutical in various organs with a function of time. These studies are invariable replaced by *in vivo* scintigraphy imaging using dedicated systems for animal imaging. The images obtained are indicative of distribution of the radiolabeled compound in the animal body. These images can be acquired at various time-interval without sacrificing the animals. The same animal can be studied over a length of time, which also minimizes experimental variation.
We have performed scintigraphic studies in rat, mice rabbits, dogs using rat, mice rabbits, dogs using various SPECT and PET radiopharmaceuticals such as ^{177}Lu-EDTMP, ^{99m}Tc-Cefteofur, ^{18}Fluroride, ^{131}Iodine labeled with a virus compliment protein. The various studies carried out are discussed in depth with emphasis on impact of scintigraphy in reducing dissections of the laboratory animals. These studies have reduced the number of biodistribution studies and ultimately the number of animals, and provided precise functional information about the new ligands. The dynamic and static high-resolution images were obtained with advanced animal imaging system nanoSPECT.

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PREPARATION AND BIODISTRIBUTION OF ^{99M}TECHNETIUM LABELLED CEFTIOFUR: A POTENTIAL INFECTION IMAGING AGENT

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Aim: To establish a labeling protocol and evaluate biokinetics of the ^{99m}Tc-Ceftiofur.
Material and methods: Labeling of Ceftiofur with ^{99m}Tc was carried out as follows: 5.0 ± 0.5 mg Ceftiofur dissolved in 80 μl of 2 M NaOH solution, 300 μg $SnCl_2$ and $^{99m}TcO^{4-}$ (~10 mCi in 0.2 ml saline) in a final reaction volume of 1ml made up with distilled water. The pH of the final solution was adjusted to 6–7 using 1 M NaH_2PO solution. The ^{99m}Tc-Ceftiofur was injected into normal, healthy animals through the tail vein for biodistribution studies. Imaging studies were carried out in normal rabbit, the images were acquired at 1, 3, and 24 h p.i. using 256 x 256 matrix size with LEHR collimator (GE Infinia system, SPECT-CT Unit, Bio-Imaging Facility, Tata Memorial Centre).
Results: The radiochemical purity (RCP) of ^{99m}Tc-Ceftiofur was > 90%. The *in vitro* stability of the complex was confirmed by carrying out RCP check over period of 4 hours. The circulating levels were a maximum (7%) at 30 min and, thereafter, decreased to 0.8% at 24 h. The liver uptake was also maximum (9.8%) at 30 min and decreased to 2.1% at 24 h. The muscle uptake was maximum (0.8%) at 30 min. Bone uptake was found to be very negligible at all time points. Excretion of the compound was both through the renal system and hepatobiliary route. Renal uptake was observed ~20 to 24% at all time points.
Conclusion: The labeling protocol of ^{99m}Tc-Ceftiofur was established and the radiochemical purity of the complex was > 90%. The prolonged presence of drug in circulation will be an added advantage for infection imaging particularly for lesions in thorax, which needs to be evaluated in animal models of infection.

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THE NA^+/I^- SYMPORTER (NIS), AS A PARADIGM FOR TRANSLATIONAL RESEARCH: "TRANSPORTING" KNOWLEDGE FROM THE BEDSIDE TO THE BENCH AND *VICE VERSA*

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The Na^+/I^- symporter (NIS), mediates active I^- uptake for thyroid hormone biosynthesis and radioiodide transport for diagnosis and treatment in thyroid cancer. We investigated the decrease in I^- transport in thyroid cancer. We have reported that in the majority of thyroid cancers, NIS is surprisingly overexpressed as compared to the surrounding tissue but retained intracellularly. We also demonstrated that the NIS carboxy terminus contains crucial information for NIS polarized plasma membrane targeting.
TSH and I^- are the two main factors that regulate thyroidal I^- transport. Strikingly we found that the downregulation of I^- transport by I^- is thyroid-specific, TSH-independent and mediated by a redox mechanism resulting in NIS oligomerization.
One of the most exciting area of NIS research — radioiodide treatment of extrathyroidal cancers — opened when endogenous, functional NIS expression was described in breast carcinoma, and the NIS cDNA was introduced into non NIS expressing tumors. Our results indicate that NIS-transported radioiodide appears to be a highly promising novel approach to achieve the targeted therapeutic destruction of mammary adenocarcinomas and their metastases.

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QUANTIFICATION OF ISOTOPE UPTAKE IN THE MOUSE THYROID USING THE NANOSPECT/CT® SMALL ANIMAL IMAGER

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Aim: Production of quantitative, calibrated in vivo data on the isotope uptake of healthy mouse thyroids using ^{99m}Tc-pertechnetate and ^{131}I with SPECT.
Material and methods: To date, Bioscan/Mediso NanoSPECT/CT is the only small animal imager proven to be capable of exact quatification of organ activity uptake with SPECT. Phantoms containing a known activity were prepared (0.1–0.3 MBq ^{99m}Tc or MBq ^{131}I per thyroid model). SPECT/CT scans were made of the phantoms. Activity in the phantoms was determined using the Voxel of Interest (VOI) technique with the dedicated software Mediso InterView XP. Following phantom measurements, 3 mice were injected with different activities (8–30 MBq) of ^{99m}TcO4 solution and SPECT/CT scans were made. Activity in thyroid and salivary glands was determined using VOI technique. Animals were then killed and activity in thyroids and salivary glands was determined in a well-type gama counter.
Results: Voxel of Interest (VOI) measurements on the ^{99m}Tc isotope phantoms equal measured values of precalibrated activity with two digits exactness if the scans contain over 3 000 000 of total counts. Duration of SPECT/CT scans remained below 20 minutes. VOI-determined activities of mouse organs were identical of those measured in well-type gamma counter with a mean difference of 5%. Good quality images were obtained using ^{131}I as well even with activities below 0.1 MBq. Due to low activities duration of ^{131}I imaging was over 3 hours.
Conclusions: Exact absolute quantification of ^{99m}TcO4 isotope uptake of mouse thyroids is possible using the Mediso-Bioscan NanoSPECT/CT imager with a submillimeter resolution also using iodine 131 isotope. This leads to new possibilities in thyroid imaging and therapy research.

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PRECLINICAL EVALUATION OF ^{177}LU-LABELLED RADIOPHARMACEUTICALS: ^{177}LU-EDTMP

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^{177}Lu-EDTMP prepared in our laboratory was tested on four animal species in order to obtain relevant preclinical data on biodistribution, pharmacokinetic, dosimetry and possible side effects may occurring when compounds used for palliation in high activity dose (≥ 37 MBq/Kg bodyweight).
In a labelling experiment 2–2.2 GBq ^{177}LuCl3 in final volume of 5 ml was used. After 30 minutes of incubation radiochemical purity reached > 95%.
In mice and rats standard biodistribution and nano SPECT/CT was used. In rabbits and dog to follow biodistribution and excretion gamma camera (Nuclide-X-Ring, Mediso) was applied. With blood and urine sampling and with organs ROI technique pharmacokinetic data collection were done. Images taken up to 5 weeks supported biodistribution studies.
All animals showed fast blood clearance (MRT: 2.83 hrs) and high rate of kidney excretion (AUC = 29.2% h/g) after 2 hrs of *i.v.* injection. Bone uptake ranged 25–45% of I.D. and remained skeleton bound even after 5 weeks (MRT: 639 hrs). Scintigraphic image after 2–3 hours showed skeletal localization only Digital autoradiography in mice and rats has proven the binding to cortical bone. A radiotoxicological investigation of blood counts and different biochemical parameters showed moderate platelets decrease. Favorable pharmacokinetics and dosimetric evaluation based on residence time determination showed high normal bone absorbed dose with moderate bone morrow and kidneys dose.
^{177}Lu-EDTMP in all experiment showed fast excretion and high skeletal uptake. The moderate side effects occurring at a high activity dose predict a very efficient palliative application in human.

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SYNTHESIS OF THE 9-(4-[^{18}F]-FLUORO-3-HYDROXYMETHYLBUTYL) GUANINE, A RADIOTRACER FOR REPORTER GENE PROBES

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Cardiovascular disease remains a leading cause of death in the Western world. Recently, successful myocardial regeneration from stem cell differentiation has reported in animal studies. Subsequent human clinical trials have shown improved myocardial contractile function and perfusion after stem cell injection in patients with acute myocardial infarctions.
The reporter gene expression image study may be a powerful method for visualization of the success of the stem cell transplantation. We have synthesised the 9-(4-[^{18}F]--Fluoro-3-Hydroxymethylbutyl) Guanine ([^{18}F]FHBG), which is reported to be potent against HSV types 1. The precursor was labelled by a conventional nucleophile substitution. The intermediate was purified by SPE. The protecting groups are removable by acidic hydrolysis. The final purification was performed by RP-HPLC followed by a sterile filtration. The radiotracer was tested in vitro and in vivo.
Our results in the *in vitro* pig steam cell experiments showed a significant accumulation of the [^{18}F]FHBG in the HSV1 gene expressing cells compared with the control ones, while in the *in vivo* experiments the stem cells injected heart of the pigs showed remarkable specific [^{18}F]FHBG activity.

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PRECEDENTS AND OUTLOOKS OF NUCLEAR MEDICINE IN HUNGARY

László Kertész

Nuclear Medicine adviser in pens., organizer of the MONT

One must clearly see whether our profession can be fulfilled by true sense of vocation after having managed its acceptance a lifetime ago; the literary statement being valid also here "the greatness of a vocation stands in unifying people…". Due to a country-wide sampling last year, we can point out that this professional commitment should be two-directional. On the one hand we have to appreciate the positive, successful activity of our colleagues which needs even more selfrestraint in the present time scramble. On the other hand we must not overlook the "tracer principle" to be asserted in choosing of our work and to interpret the results — surely this being our greatest asset. Here, we may consider such possibilities like the manifestation about "dissection of the consciousness with PET" intended recently by an ATOMKI-generated Hungaro-Swedish team, also new instances of fusional nano-imaging which parallel on an advanced level with our very first efforts in the post-war years.

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TESTING AND VALIDATING OF A PARALLEL IMAGE RECONSTRUCTION SOFTWARE PACKAGE

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Aim: Our institute as a consortium member plans to build a demonstration version of a full ring small animal PET scanner. The software system attending this device has to accommodate full 3D- and conventional 2D reconstruction algorithms. For the huge calculation and storing capacity required by 3D methods demand development a parallel environment capable image registration software library.
Material and methods: We formed a test environment — including mathematical phantoms and a Monte-Carlo based simulator — with which the implemented algorithms can be validated even in the hardware engineering phase. The developed software package is capable of perform a test, that help us to specify a high calculation capability dedicated reconstruction server.
Result: With this achievement we managed to realize the principal component of a small animal PET scanner software system that can be used for modern biomedical studies.

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INVESTIGATION ON LEAKAGE AND ORGAN UPTAKE OF ^{186}RE RADIOCOLLOIDS IN RABBIT AND RAT USING NANOSPECT/CT

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Aim: Determination of the intra-articular and extra-articular biodistribution of radioactivity following injection of ^{186}Re in healthy rabbits and rats.
Material and methods: Studies have been performed using a Mediso-Bioscan NanoSPECT/CT small animal imager. 10 MBq of ^{186}Re sulphur colloid was injected intravenously for 15 Wistar rats and SPECT/CT scans were made 30 min, 1 h and 3 hours post injections. For paraarticular injections, 10 MBq of sulphur colloid was injected through the knee joint of 2 rats. SPECT/CT was performed 30 min and 1 h post injection. Two healthy NZW rabbits were killed 3 h post injection of 18 MBq of ^{186}Re sulphur colloid, their injected limbs removed and *ex vivo* SPECT/CT was performed on the intact organs.
Results: In intravenously injected rats, liver and spleen were the only organs where an uptake could be visualized. In the case of paraarticularly injected radiocolloids besides visualization of spleen and liver, SPECT/CT made possible the detection of the inguinal lymph node as a known predilectory leakage site. Results of rabbit *ex vivo* imaging show that the sulphur colloid is unevenly distributed in the intraarticular space.
Discussion: NanoSPECT/CT is an excellent high definition (0.6 mm) tool to perform in and *ex vivo* non invasive studies in small animals. This method allowed accurate *in vivo* identification and examination of organs collecting uptake after intra-articular injection of a radiocolloid, thereby opening novel perspectives in preclinical radiosynovectomy research.

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INVESTIGATION OF ACCUMULATION OF ^{11}C-CHOLINE, A PET TUMOR DIAGNOSTIC TRACER IN CANCER CELLS

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Background: ^{11}C-choline is highly accumulated in cancer cells because of their increased choline kinase activity. There is a growing importance of ^{11}C-choline PET investigations in the diagnosis of tumorous patients.
Aim: To study the effect of various pharmaceuticals and ligands on the ^{11}C-choline accumulation in tumor cells.
Material and methods: The accumulation of radiopharmaceuticals in different cancer cells was measured a calibrated gamma-counter.
Results: The ^{11}C-choline accumulation of the MDR1 gene (Pgp) expressing multidrug resistant cancer cells was significant higher than that of the Pgp negative ones. Some cytostatics, pharmaceuticals, channel blockers and Pgp substrates dramatically modified the ^{11}C-choline uptake of the cancer cells. Verapamil, bepridil, amylorid analogs and daunorubicin in a dose dependent manner decreased the accumulation of ^{11}C-choline. Paclitaxel treatment did not modify the ^{11}C-choline uptake of the transformed cells.
Conclusion: The knowledge, how the different pharmaceuticals used in chemotherapy modify the ^{11}C-choline accumulation of the Pgp-positive and negative cells may contribute a more accurate PET diagnosis. ^{11}C-choline PET investigations, using adequate protocols may help to reveal the multidrug resistance of tumors.

BONES

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EVALUATION DIFFICULTIES IN THE COURSE OF BONE SCANNING FOLLOWING A RADICAL SMALL PELVIC OPERATION

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Making a report requires adequate anatomical, physiological and pathophysiological knowledge from the analyzing doctor. However in postoperative situations it is essential to be aware of operative solutions, as well. The lack of this in case of unusual scintigraphic appearance may lead to false positive findings, or may require further — unnecessary — examinations, delaying the establish of proper diagnosis. To make a correct report therefore it is important, that the doctor should include the anamnestical facts and operative solutions in connection with the examination in the document requiring it.
In one of our bone scan cases because of lack of the above mentioned information we had to engage ourselves in a lengthy investigation to clear up the applied operative solution, which was essential to make up a correct — not false positive — report. In our other case the sufficient information made the correct interpretation possible very soon.

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INTEGRATED EVALUATION OF PANORAMIC X-RAY AND SPECT OF THE TEETH

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Aim: Teeth are traditionally visualized using panoramic X-ray; however, inflamed sites have higher contrast in bone scintigram. Our purpose was the registration and fused display of images from both modalities.
Material and methods: Panoramic X-ray and Tc-99m MDP SPECT of twenty patients were performed after attaching four reference sources to the facial skin that visualized on both modalities. We created panoramic images by projecting SPECT slices to a cylindrical surface, then registered the 4 reference points, and superimposed the transformed colored scintigram onto the grayscale X-ray image.
Results: Anatomic sites cannot be localized on both X-ray and scintigraphic images with sufficient accuracy, so external markers were required. The selected four points (subnasal, gnathion and both anguli) were enough to fit both vertical distance and azimuth angle.
Conclusion: Panoramic view obtained from scintigraphy adds valuable functional information to X-ray. They can be suitably coregistered using four external markers.

ENDOCRINOLOGY

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THE ROLE OF ^{131}I-MIBG SCINTIGRAPHY IN UNCOMMON CASE OF PHAEOCHROMOCYTOMA

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Aim: The aim of the study is to determine the role of ^{131}I-MIBG scintigraphy in an uncommon case of phaeochromocytoma.
Material and methods: Following the routine pretreatment 40 MBq ^{131}I-MIBG has been administrated in intravenous route. We obtained 48 hours images with MB-9200 Gamma camera. MRI study revealed a 3 cm diameter terime in the right suprarenal glandular region, and a 1 cm diameter lesion in the opposite side. Using contrast MR method neoplasmatic origin has been suspected.
Results: In the right supragladular region a large intensive radiotracer activity could be observed. In the left supraglandular and in the other examined regions no significant activity has been detected. Following right sided laparoscopic adrenalectomy the diagnosis of phaeochromocytoma was cleared in histopathologic way. 2 years after control MRI showed, that the previously detected terime in the left suprarenal gland doubled in size. Nuclear medicine scans revealed a nut size lesion with marked activity in the target region. Suspected MEN I. or II. syndrome have been excluded by genetic examinations.
Conclusions: The detection of hormonal active phaechromocytomas using nuclear medicine methods is a useful diagnostic approach, even in complicated cases. The sensitivity correlates with the size of the lesion.

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QUANTITATIVE THYROID SCINTIGRAPHY IN CONGENITAL HYPOTHYROIDISM

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Aim: clinical usefulness of quantitative Tc-99m-pertechnetate thyroid scintigraphy (QTS) in children with congenital hypothyroidism was studied.
Material and methods: 80 patients with CH were examined. All patients underwent the so-called T3 withdrawal test to differentiate permanent and transitory hypothyroidism. In vitro measurement of thyroid hormone serum concentration and QTS with 20-minute Tc-uptake) were performed. All patients had previous ultrasound examination (US). Tc-uptake values were defined as low (below 0.5%), normal (0.5–5.0%) and high (above 5.0%).
Results: 78 children had permanent, 2 had transitory hypothyroidism. Both patients had normal US, scintigram and Tc-uptake value. 41 patients had normal or enlarged thyroid in the physiologic location by US, but only 20 of them were visualized by scintigraphy. 13 out of these 20 children had normal, 7 had elevated Tc-uptake values. 11 patients with normal and all 7 patients with elevated Tc-uptake had permanent hypothyroidism.
Conclusions: Pathomechanism of CH is important to inform the mother regarding next gravidity. If normal thyroid tissue is visualized on the neck by US, QTS seems to be useful in the differential diagnosis of CH.

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INTRAOPERATIVE PARATHYROID ASPIRATION AND HORMONE ASSAY

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Aim: Conventional parathyroidectomy is a difficult operation and the unsuccessful rate is 5% to 10% . In order to improve the efficiency intraopertative quick aspiration parathyroid hormon assay were used.
Material and methods: Intraoperative aspiration PTH concentration was determined by 82 patients. They under went parathyroiectomy from March 2006 to January 2007 with diagnosis of primery hyperparathyroidism. Each specimen was divided into tubes and was stored in four Celsius until the quick PTH assay start. The aspiration tissue parathyroid hormone concentration was measured by cisbio quick IRMA method.
Results: Ex vivo parathyroid adenoma sample PTH concentration was always between 3500–9800 pg/ml obtaining by the semi-quantitative tissue hormone determination. PTH concentration of the aspiration thyroid tissue was beetwen 0.1–5.0 pg/ml.
Conclusion: PTH measurement from intraoperative aspiration of suspected parathyroid adenomas is clinically useful for patients. In case of hyperparathyroidism, the combined use of intraoperative aspiration hormone assay, gamma probe measurements and quick PTH examination improve the success rate and decrease the duration of parathyroidectomy as well as give a chance to apply minimal invazive parathyroidectomy.

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RETROBULBAR ^{99m}TC-DIETHYLENETRIAMINE-PENTAACETIC-ACID UPTAKE PREDICTS THE EFFECTIVENESS OF IMMUNOSUPPRESSIVE THERAPY IN GRAVES' OPHTHALMOPATHY

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Aim: We aimed to show if ^{99m}Tc-DTPA SPET is able to predict the success of imunosuppressive treatment (IT) in Graves' ophthalmopathy (GO).
Material and methods: 24 pts with GO (15 women and 9 men) were studied with GO and signs of orbital autoimmune process (CAS ≥ 4) All received corticosteroid treatment and 6 were additionally treated with orbital irradiation. DTPA SPET was performed before, and 3 to 24 months after the IT. Orbital DTPA uptakes were quantified and compared before and after IT. The calculations were performed for the entire orbit ROI as well as the anterior and posterior segments separately. The control group consisted 17 pts who had no thyroid disease.
Results: In the control group, the DTPA uptake of the orbit as a whole, the anterior, (a) and posterior (p) segments were 7.9 ± 2.6, 8.8 ± 3.0 and 6.6 ± 2.0 Bq/cm^3 (mean ± SD) respectively. The mean DTPA uptake of the 48 orbits of GO pts was higher before IT than after therapy (8.92 ± 2.31 Bq/cm^3 and 7.67 ± 3.82 Bq/cm^3, respectively, $p = 0.0003$). The a and p segment values correlated with those of the entire orbit. Of the 35 orbits with an initial DTPA uptake ≤ 10.07 Bq/cm^3 in the p segment, 11% has improved, while of those 13 orbits with an initial DTPA uptake above 10.07 MBq/cm^3, 77% has improved.
Conclusions: For a favourable treatment outcome, the positive predictive value of an initial DTPA uptake > 10.07 was 81.25 %, while a negative predictive value of a DTPA uptake ≤ 10.07 was 89.74 %. DTPA uptake above 10.07 predict responders, while pts with DTPA uptake below this are non responders.

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THYROID DIAGNOSTIC AND THERAPY PROGRAM PACKAGE

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Complex $^{99m}Tc/^{131}I$ diagnostic and ^{131}I therapy program package has been created for InterViewXP™ DICOM version in order to extend the versatility of Nucline™ TH dedicated thyroid camera. The fundament of therapy dose calculation is the thyroid mass estimation and iodine uptake determination. Geometry (lobes, nodules area and shapes) of the high quality thyroid scintigraphy — $^{99m}Tc/^{131}I$ — with well calibrated pixel-size provides the way of mass estimation. Most of the publication based estimation methods are built in the system by user definable way. More possibilities are available for iodine uptake determination too. Camera and ROI based method as well as single detector based uptake evaluations are available. The user may link together these procedures into a single clinical program. Even though, one of the menu selectable therapy calculations may up-link to the diagnostic procedure creating the complex therapy and diagnostic frame work. These algorithms widely cover the current possibilities of thyroid diagnostic and therapy.

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THE CASE OF OLD AGE TSHS II

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Aim: It has been proven in our former studies that in patients suffering from meno and postmenopausal, subclinic hyperthyreoses elevated levels of FSH-LH are responsible for higher levels of TSH. The aim of our current work was to examine the possibilities of proper diagnostics of old age subclinic hyperthyreoses.
Material and methods: We attempted to detect real hyperthyreosis by determining the elevated level of FT4 in patients above the age of 55. The increased level of FT4 of these people had been defined as normal TSH in daily routine measurements but they were no longer observed. We performed FT4 measurements of the samples of 100 patients by Isodata and Stratec 300 devices (resources of the Isotope Institute).
Results: 29 samples indicated normal thyroid function by showing normal FT4 values. Out of the higher values of FT4, 43 were slightly elevated (25.0–30.0 pmol/l), while 23 of them were considered as elevated (more than 30.0 pmol/l).
Conclusions: Regarding patients above the age of 50 the posterior FT4 measurement is reasonable even in the case of normal TSH results, since we have detected values of FT4 suggestive to hyperthyreosis in 71 percents of the observed cases.

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THE SIGNIFICANCE OF SPECT INVESTIGATION DURING PARATHYROID SCINTIGRAPHY IN PRIMARY HYPERPARATHYROIDISM

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Aim: To investigate the significance of SPECT investigation (SI) during parathyroid scintigraphy (PTS) in primary hyperparathyroidism.
Material and methods: We evaluated PTSs of 39 patients (31 females, 8 males) performed in 2 years (2005–2006) with a final diagnosis based on surgery, histology and biochemistry. After *i.v.* injection of ^{99m}Tc-MIBI early (n = 39) and late (n = 38) planar (P), early (n = 39) or late (n = 2) SPECT, with ^{99m}Tc-pertechnetate on other day P and subtraction (n = 34) images were obtained.
Results: Sensitivity of PTS for 43 lesions (L) (37 adenoma, 3 hyperplasia, 3 cancer) removed by 44 surgery was 95.3% without false positive finding. 4 Ls were detected only by SI. SI had a high impact on diagnosis of 17 further Ls; in 20 Ls the results of P investigations were verified and an improved L localisation was provided.
Conclusion: In a significant number of cases SPECT had a great impact on the effectiveness of MPS; in unequivocal Ls an improved L localisation was provided. SPECT should be performed as a routine part of MPS.

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FDG-UPTAKE OF THE THYROID GLAND IN PATIENTS WITH ABNORMAL THYROID FUNCTION OR WITH PRESENCE OF THYROID ANTIBODIES

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Aim: Correlation between thyroid uptake of F-18-fluorodeoxyglucose (FDG) and thyroid function or presence of thyroid antibodies were studied.
Material and methods: Serum concentration of TSH, FT3, FT4, anti-TPO and anti-Tg were measured in 105 consecutive patients admitted to oncological (thyroid except) FDG PET examination. SUV of thyroid gland were calaculated.
Results: In 88/105 cases thyroid function was normal. 4 patients had subclinical hyperthyroidism, 10 patients had subclinical hypothyroidism and 3 patients had autoimmune hypothyroidism. The SUV (mean ± SD) of the thyroid was significantly elevated in patients with hypothyroidism (1.46 ± 0.92 *vs.* 1.05 ± 0.06). In euthyroid patients a negative correlation between SUV and FT4 concentration ($r = -0.29$, $p < 0.05$) was found. SUV of FDG was significantly elevated in patients with high anti-TPO (1.43 ± 0.66 *vs.* 1.07 ± 0.13) or with high anti-Tg (1.84 ± 0.84 *vs.*1.04 ± 0.08) serum level as well.
Conclusions: Thyroid FDG uptake is higher in patients with high serum concentration of antithyroid antibodies. Diffusely increased FDG-uptake might refer to chronic thyreoiditis. Explanation of the inverse correlation between FDG uptake and FT4 concentration in normothyroid subjects needs further studies.

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EXPERIENCES WITH WHOLE-BODY SCAN AFTER HIGH-DOSE ABLATION OF THYRIOD REMNANT

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Aim: To compare the efficacy and safety of recombinant human TSH (rhTSH) to the conventional remnant ablation with thyroxine withdrawal in patients with thyroid cancer.
Material and methods: High-dose ablation (3700 MBq) of thyroid remnant was performed in 32 patient from January 2006, with rhTSH in 12 patients (2 men, 10 women, 46 years, 23–63), and conventional protocol in 20 patients (2 men, 18 women, 48 yeras, 16–76). TSH and thyroblobulin (Tg) levels were measured before and after the ablation. Whole-body (5 cm/min) and anterior jugular scans (100 k) were established in all patients 6 days after the treatment. The counts/million (C) of the whole-body scan and C/Tg (before treatment) rate was calculated. The enhancement of the radioiodine in the remnant and in other localization was observed on both imaging.
Results: The C/Tg ratio was higher in the patients prepared with rhTSH (0.33/0.10, $p \leq 0.05$) whereas the whole-body C value was lower (0.18/0.71, $p \leq 0.05$) comparing to the patients with conventional therapy. Remnant thyroid activity was found in 27 patients, iodine enhancement in other localization was found in 11 patients, at whom CT examinations were performed, too.
Conclusions: 1. The rhTSH-prepared patients maintained a higher quality of life during the ablation. 2. The radiation exposure to the blood is less while the efficacy of the treatment is equally good. 3. The whole-body and jugular scans are very useful in the investigation of thyroid remnant and metastases in the region of neck and chest, however it can be evaluated with caution in the abdominal region.

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SUCCESSFUL LOCALIZATION OF BRONCHIAL CARCINOID CAUSING ECTOPIC CUSHING'S SYNDROME BY 111-IN-OCTREOTIDE SCINTIGRAPHY

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Aim: Cushing's syndrome due to ectopic ACTH secretion is difficult to diagnose and treat. Up to 80% of ectopic ACTH-producing tumors have somatostatin receptors, therefore 111-In-octreotide scintigraphy is a useful method in the diagnosis of this disease.
Material and methods: A 43-year-old woman was investigated with severe Cushing's syndrome of two years duration. The ACTH was moderately elevated (150–250 pg/ml), 2-d small dose dexamethasone suppression test was positive, however, 2-d high dose dexamethasone test showed suppressible cortisol level. Inferior petrosal sinus sampling (repeated twice) supported ectopic ACTH production, no response to CRH stimulation was detected. Pitutitary MRI (twice), chest CT scan (three times), chest MRI, abdominal CT scan (twice) failed to localize the source of ACTH secretion. Octreotide scintigraphy performed in another institute one year ago was also negative. Calcitonin, urine catecholamines and urine 5-hydroxyindole-acetic acid measurements gave negative results.
Result: The localization of the tumor was attempted repeatedly by octreotide scintigraphy. Anterior and posterior chest and abdominal static and SPECT images were performed 24 and 48 hours after the injection of 111-In-octreotide. A very intensive uptake was found in the left side of the mediastinum in both time. Abdominal examination did not reveal any abnormality. The tumor was removed during chest surgery. The histological diagnosis was typical bronchial carcinoid tumor with intense ACTH positivity.
Conclusion: This case indicates that 111-In-octreotide scintigraphy could be successfully used to identify and localize ectopic ACTH-producing bronchial carcinoids.

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RESULTS OF INDIVIDUAL RADIOIODINE DOSE CALCULATION IN HYPERTHYREOIDISM

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Aim: A total of 154 patients with hyperthyroidism received 161 individually calculated radioiodine treatments between October 2004 and December 2005. M/F ratio was 25/129, age distribution: 26-87 years, mean age: 60 years. Forty-six patients had toxic adenoma, 25 patients were treated with toxic multinodular goiter, 83 patients with Graves' disease.
Material and methods: The target dose was calculated according to the etiology of hyperthyroidism: 350 Gy in toxic adenoma, 150 Gy in toxic multinodular goiter and 70–100 Gy in Graves' disease depending on the size and nodularity of the thyroid. The estimate of the thyroid mass was based on the scintigraphy, the calculation of the biological half life was simplified by the late iodine uptake (7. day) measurement, according to the previous investigations. The activity of radioiodine was calculated by the following formula: 3.5 x thyroid mass (g) x target dose (Gy)/ /late iodine uptake (%).
Results: The average radioiodine dose was 378 MBq (min. 100, max. 1180, 1. quartilis 230, median 340, 3. quartilis 500 MBq). Six and 12 months after the treatment, follow-up data were available in 91% and 83% of patients, respectively. The hypothyroidism/euthyroidism/hyperthyroidism ratio was 23/51/26% 6 months and 22/49/16% 12 months after the radioiodine treatment. Eighteen hyperthyroid patients at the 6-month follow-up were selected for a second radioiodine treatment, these patients were not evaluated during the 12-month control. According to the etiology of thyrotoxicosis, the distribution of hypo/eu/hyperthyroidism at the 6-month follow-up was 11/80/9% in toxic adenoma, 5/52/43% in toxic multinodular goiter, 35/35/ /30% in Graves' disease, respectively.
Conclusion: Our dose-calculation method resulted in excellent success rate in toxic adenomas, good success rate in Graves' disease even in international comparison but the results were not satisfactory in toxic multinodular goiters. Difficulties to determine the targeted thyroid mass in this entity may be responsible for the treatment failure.

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IMPACT OF I-131-SPECT/ SPIRAL-CT ON THE N-STAGING OF DIFFERENTIATED THYROID CARCINOMA AT FIRST RADIOABLATIVE THERAPY

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Aim: The purpose of this study was to determine the diagnostic impact of I-131--SPECT/ spiral-CT on nodal staging of patients with thyroid carcinoma (DTC) at the first ablative radioiodine therapy (ART).
Material and methods: 07/05–08/06, 29 patients had radioablation of thyroid remnants (4.6 ± 1.8 GBq I-131) for DTC. All patients underwent planar scintigraphies of the neck as well as cervical SPECT/spiral CT. SPECT/CT was performed using a hybrid camera combining a double-headed SPECT camera and a two-slice CT scanner (Symbia T2, Siemens). Two observers evaluated the planar scans and the SPECT/CT images for pathological tracer uptake independently from each other and from the clinical findings.
Results: In 8 patients from 29 were atypical Iodine-Uptake observed on the planar imaging, 6 of them were seen with the SPECT/CT as thyroid residue in the region of the Lobus pyramidalis. In 2 cases the lesions were simulated by contamination on the skin.
At 6 patients of 29 (20.7%) were 131-iodine hot spots caused by lymph nodes metastases detected with the SPECT/CT. None of these lesions could be diskriminated from the thyroid remnant tissue on the planar images. In 3 patients of them lymph node metastasis were already known postoperatively (N1), in the other 3 patients reclassification was necessary.
Conclusions: Integrated 131I-SPECT/spiral CT was found to have an additional value over planar imaging in patients with thyroid cancer at the time of the radioablation. Further examination is needed to show, how the therapeutical procedure changes with the early detection of lymph node metastases.

IMAGE FUSION

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THE IMPORTANCE OF MRI-PET REGISTRATION IN CLINICAL ROUTINE

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Aim: Registered images produced by MRI based multi-modality image processing are essential tools of diagnostic and surgical planning of neurological and neurosurgical diseases. The aim of this study was to investigate how fused images produced by various MRI (T1, T2, fMRI, DTI, MRS) and PET (FDG, Metionine) data can be used in clinical routine.
Material and methods: In our study the complex multi-modality tomographic data sets of 6 patients (3 glioblastoma, 2 oligoastrocitóma és 1 pilocitás astrocitoma) were used. For the image registration as well as the production of 2D- and 3D fused images free, commercial and in-house developed software were utilized.
Result: We found that our images significantly assisted clinicians in preparing therapeutic and surgical plans. Optimizing the established software and automatizing image registration tasks needs further development.

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DICOM AND MULTI-MODALITY BASED — INTERVIEWXP™ DCM — IMAGE PROCESSING SYSTEM

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Continuous development of the functional imaging systems as well as construction of NanoSPECT/CT™ induced Mediso Ltd. to apply new software technology on the field of image processing and management. Breakthrough of the hybrid systems and multi-modality applications demanded the uniform image managing as well as the creation of simultaneous image display and fusion techniques. Consequently, the DICOM version of graphical based InterViewXP®™ has been created. Full possibilities of the system can be accessed only through DICOM 3.0 services. Database of the DICOM server is MS-SQL 2005 with Windows®XP SP2 op. system. Installation of a local PACS is warmly suggested for routine application in order to connect directly with the evaluation workstations including the regional RIS interfaces. Other program packages (ECTB V 3.0, PMOD fusion) may up-link easily to InterViewXP™ too by common database due to the DICOM surface. Such a complex system may provide the complete image processing and managing services in a particular department.

INSTRUMENTATION AND PHYSICS

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EXPERIENCES WITH SPEECH RECOGNITION SYSTEM IN THE REPORTING OF NUCLEAR MEDICINE INVESTIGATIONS

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Aim: To demonstrate the usefulness of speech recognition system (SRS) based on our experiences in reporting nuclear medicine investigations by SRS and in the development of nuclear medicine vocabulary of SRS.
Material and methods: The Speech-Magic™ SRS based on Speech Recognition Technology provided by Philips and integrated into the Hospital Information System (e-MedSolution) by ISH Ltd. with the contribution of Medisoft Ltd. has been available at our institute since March 2006. At installation the vocabulary of SRS contained 20140 Hungarian phrases for radiology reporting.
Results: We performed 1167 dictation. 946 new phrases have been entered into the vocabulary of SRS. Currently the reporting of the most frequent investigations at our nuclear medicine department can be performed fast and almost entirely correctly by SRS.
Conclusion: SRS is a useful tool for the reporting of nuclear medicine investigations. Based on replacement of human work power it should be cost effective on a long term basis.

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TESTING AND VALIDATING OF A PARALLEL IMAGE RECONSTRUCTION SOFTWARE PACKAGE

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Aim: Our institute as a consortium member plans to build a demonstration version of a full ring small animal PET scanner. The software system attending this device has to accommodate full 3D- and conventional 2D reconstruction algorithms. For the huge calculation and storing capacity required by 3D methods demand development a parallel environment capable image registration software library.
Material and methods: We formed a test environment — including mathematical phantoms and a Monte-Carlo based simulator — with which the implemented algorithms can be validated even in the hardware engineering phase. The developed software package is capable of perform a test, that help us to specify a high calculation capability dedicated reconstruction server.
Result: With this achievement we managed to realize the principal component of a small animal PET scanner software system that can be used for modern biomedical studies.

RADIOPHARMACY

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PARADOXES OF MEASUREMENT CURVES

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In the past two decades in nuclear medicine the analog measurement techniques have been replaced by digital techniques which can be processed more comfortably. Besides their numerous advantages, digital techniques do have a main disadvantage: namely the fact that they are less compatible with living organisms. Digital measurement provides such accuracy of time, size, and other parameters that they make no sense in biology. This is all the more true for nanotechnology, when microseconds and nanometric orders of magnitude are measured, while the living matter is not present any longer, since at such dimensions the human race does not display the characteristics of living matter through the course of phylogenetic development. By illustrating the statement above with concrete examples, this essay would like to remind scientists working with nuclear measurement to take into consideration the time and space limits typical of the human organism as a biological entity.

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USEFULNESS OF NITRIDO LABELLING TECHNIQUE IN THE DEVELOPMENT OF DIAGNOSTIC AND THERAPEUTICAL RADIOPHARMACEUTICALS

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Aim: Usefulness of nitrido ^{99m}Tc and $^{186/188}$Re labelling were investigated in case of some sulphur containing as well as sulphur-free ligands. Indication fields of these potential radiopharmaceuticals are apoptosis imaging, bone scintigraphy and therapy, liver therapy.
Material and methods: Derivatized fragments of Annexin-V were labelled with ^{99m}Tc by using nitrido technique in the frame of a CRP supported by the IAEA. Beside this, both ^{99m}Tc and $^{186/188}$Re labelling of Multibone kit via nitrido intermediers were also investigated. Furthermore, optimation of a kit was elaborated, resulting in (R≡N)--diethyl-dithiocarbamate which can be dissolved in Lipiodol completely.
Results: Yields of 90–99% were obtained in case of the nitrido-^{99m}Tc labelling of the peptides and Multibone. The nitrido-^{99m}Tc peptides possess extremely high stability. Nitrido-$^{186/188}$Re labelling of "Lipiokit" and Multibone was accomplished with a yield of 92 ± 5% and less than 60%, respectively.
Conclusion: Usefulness of nitrido labelling technique was proved in ^{99m}Tc labelling of Annexin fragments as well as in rhenium labelling of Lipiodol. The "Lipiokit" may be prepared as clinical investigational product in the near future.

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ANALYTICAL AND BIOLOGICAL EXAMINATION OF 111-IN-DOTA ANTIFERRITIN

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111-In-DOTA-Antiferritin was developed for examination of lymphoma disease. We studied the chemical stability of 111-In labelled DOTA-Antiferritin with different analytical methods *in vitro*. The *in vivo* studies were done with Beagle dogs. After injecting labelled compound measured serum stability, blood clearance and activity distribution in different organs by scintigraphical methods. In the first step we worked out optimum conditions of labelling procedure with 111-In. 111-In-DOTA-Antiferritin was prepared in 0.1 M, pH 6 ammonium acetate buffer + 10% 50mM EDTA Incubated at room temperature for 60 min. The radiochemical efficiency was determined by thin layer chromatography in "labelling buffer". The radiochemical purity was measured with High Pressure Liquid Chromatography, using Gel Filtration Column. The HPLC buffer was 0.1 M pH 7 sodium phosphate + 2 mM EDTA, running time 30 min., injected volume 20 μL. Using these sensitive radio-analytical methods studied serum stability and fragment activity in urine of 111-In-DOTA-Antiferritin. In these case 20 μL serum or urine was injected. Serum and urine samples were taken 2 minutes, 1, 6, 12, 24, 48 hours and 3, 5, 7, days after injection. The r radiochemical efficiency of the compound — using both analytical methods — 80–85%, decomposition measured only after 48 hours and total fragmentation after 72 hours. In the urine after 1 hour few fragment activity detected and later showed increase. The labelled antibody was injected in 5-5-healthy Beagle dogs and made initial dynamic study (0–30 min.) concerning static ventrodorsal (72 h) and right lateral opinion for examination of radioactivity distribution. ROI methods was used to quantific and to have data for the calculation of dosimetric and pharmacokinetic parameters.

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SYNTHESIS AND ^{99M}TC-LABELLING A PEPTIDE CLAIMING THE DETECTION OF APOPTOSIS *IN VIVO*

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Aim: Our aims were the synthesis, study of the stability and labelling with ^{99m}Tc of the 13 amino acids long Annexin-V protein segment, which protein plays role in detection of the apoptosis.
Material and methods: The peptide (AQVLRGTVTDFPG) was synthetized by solide phase peptide synthesis both in amide and free acid forms. The purification and the control of the purity were performed by RP-HPLC. The peptide structure was identified by MALDI-TOF. We used a new labelling method: "nitrido-labelling". The biological activity of the labelled compoud was evaluated on HL-60 human leukemia cells.
Results: The radiochemical purity of the [(^{99m}Tc≡N)CysCysANX13] complex was more than 90% both right after the labeling and after 24 h. The complex showed specific uptake in apoptotic tumor cells.
Conclusion: Using the novel "nitrido-labelling" method resulted in a relatively high radiochemical purity. Our stability examinations demonstrated the applicability of the labelled peptide in the biological investigations.

RADIOPROTECTION

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SYNTHESIS OF O-(2-[^{18}F]FLUOROETHYL)-L-TYROSINE: A CANDIDATE FOR SATELITE DISTRIBUTION PET TRACER IN HUNGARY

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Aim: We aimed the synthesis of O-(2-[^{18}F]fluoroethyl)-L-tyrosine (FET) that could be superior to FDG in characterization of primary brain tumors.
Material and methods: ^{18}F was obtained from the EclipseHP cyclotron. The chemical synthesis was carried out using TracerLab FX_{FN} general purpose module. The precursor compound chosen was obtained from ABX GmbH. TBA and Kriptofix2.2.2. were tested as phase transfer catalysts. SepPak Light Silica cartridge and reversed phase HPLC were used for purification.
Results: The protected tosyloxy-pecursor ensured one-step ^{18}F-fluorination followed by acidic deprotection in non-aqueous conditions. Catalysis with crown ether resulted in higher fluorination yield (up to 87%) compared to tetrabutylammonium-ion enforcement. Dry acetonitril gave the highest incorporation rate out of the polar aprotic solvents tested. After cartridge-, and HPLC-purification the collected FET-fraction was measured over 10 GBq (25–30% uncorrected yield).
Conclusion: L-[methyl-^{11}C]methionine (MET) and FET are equivalent in clinical usefulness, but making new PET-sites accessible by FET is an advantage that might open wider applications for PET-amino acids in Hungary.

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OCCUPATIONAL DOSE DUE TO INHALATION OF CONTAMINATED AIR IN THE LABORATORY OF NUCLEAR MEDICINE

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The radioactive concentration in the airspace of the laboratory was assessed from the daily used radioactivity by a factor dependent on the type of chemical form and medical test. The inhalation dose of occupational impact is provided by the product of inhalation rate, activity concentration in air, duration of the stying in the laboratory and the inhalation dose coefficient, separately to each of the radionuclides used.
Taking into account the applied radionuclides, ventilation and other parameters of the laboratory the average inhalation dose assessed to the staff, was 1.3 mSv. The greatest contribution come from the Tc-99m used mainly in imaging diagnostics. The part of Sm-153 (used to bone radiotherapy) provided nearly 30% of the total inhalation dose. Other radionuclides (Ga-67, Tl-201, I-125 etc.) have a total contribution less than 20%. The external dose determined by the national personal dose network by film budget takes annually nearly 1 mSv, in average for the laboratory.
Additionally the releases to the atnmospheric and aquatic environment have been assessed from the activity concentration in air and intakes of patients staying in the laboratory for 2–3 hours per investigation. The calculated releases was approximately 10% of the limits given by the proper national standards.

RIA

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PROMOTION OF RADIATION PROTECTION IN CLINICAL NUCLEAR CARDIOLOGY

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Background/Aim: Myocardial stress SPECT investigations are performed in our nuclear medicine department on three days a week, on each day by a different team, comprising a cardiologist and a technician. The aim of this study was to investigate the radiation exposure experienced by the cardiologist teams participating in the nuclear medicine work only in these 99m-Tc-MIBI stress studies.
Material and methods: Calibrated electronic personal dosimeters were used. The data were processed with the aid of a computer program. The personal doses were monitored for each team throughout 7 weeks, during 10 patient stress studies/day. The working methods of the teams were analysed in connection with their radiation exposure.
Results: The daily effective doses (mean ± SD) of the cardiologists were 9.25 ± 1.72, 16.16 ± 4.02 and 15.07 ± 3.3 microSv; of the technicians were: 9.74 ± 1.05, 12.67 ± 2.20 and 10.67 ± 3.0 microSv. The personal doses of the cardiologists and technicians exhibited considerable differences.
Conclusion: The daily effective doses of the cardiologists and technicians performing the same examinations can differ. Direct reading dosimeters are useful in planning the optimal working methods and the infrastructure of the investigation rooms.

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THE NOVEL RADIOIMMUNOASSAY METHOD FOR DETERMINING ACTIVE RENIN

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Aim: Up to now only the indirect determination of renin level was possible (by calculating Plasma Renin activity from the value of angiotensin I). We have carried out the comparative study and the automated application of the already purchasable renin kit.
Material and methods: Daily routine samples were measured (altogether 42 plasma samples) manually by Cisbio kits and by a Stratec 300 device. The results were divided into low, normal and high value groups and the data were evaluated biometrically.
Results: Our data correlated with each other in every group, considering the distinct ranges of measurment (pg/ml and ng/ml), and the normal values given by the producer.
Conclusions: 1. The measurement of angiotensin I — PRA is technically difficult, it consists of two steps blank and generated sample, it requires incubation at 37°C. 2. Active renin is a one-step method, which has to be performed at room temperature and it can be automated easily. 3. Physiologically renin is the component responsible for the capacity of the renin-angiotensin-aldosterone axle. 4. Replacing the current angiotensin I — PRA measurements with active renin method seems to be reasonable not only from clinical point of view, but either regarding measurement technology.

THERAPY

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IMPORTANCE OF RIA METHODS FOR *IN VITRO* DIAGNOSTICS

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The aim of the presentation is to show importance and real function of RIA methods with regard to a popular fallacy and false opinion.
The author presents and compares all notable characteristic (analytical sensitivity, specificity, time of analysis, automation, parameter list, cost of measurement, etc.) of RIA and non-RIA immunochemical methods. The presentation emphatically treats clinical interpretation of analytical results. The lecture demonstrates international data and expectable trends of application of RIA methods, and offers a suggestion optimal application of RIA methods.

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COMPARATIVE ANALYSIS OF THE RESULTS OF Y-90-EDTMP AND SM-153-EDTMP TREATMENT OF PAINFULL BONE METASTASES (MULTICENTRIC TRIAL)

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Aim: In advanced breast, prostate and lung cancer with multifocal osteoblastic metastasis and intolerable bone pain we used Y-90-EDTMP (Y) and Sm-153-EDTMP (Sm) for pain palliation. In this study our aim was to analyze: 1. The pain palliation effect; 2. The type and severity of side effects; 3. The influence on the mass of tumor. Finally: is there any significant difference between the two therapies.
Material and methods: We analysed the results of treated patients with Y: 145 patients and with Sm: 35 patients measuring ad 1: the pain killing effect on a 10 graded pain scale, ad 2: the number of red blood cells and platelets in every two week during 3 months, ad 3: number and size of bone lesions on bone scans performed before the therapy and after 3 months.
Results: We experienced ad 1: the pain killing effect with Y 128/145 cases (88%) with Sm 32/35 cases (91%), ineffectiveness with Y was found in 17/145 cases (12%) with Sm 3/35 cases (9%). Ad 2: As a late side effect the number of the red blood cells and platelets decreased in every case, and improved spontaneously by the 15th week. Ad 3: the reduction of the size of the metastases could be detected by bone scan with Y in 14/145 cases (9%) with Sm 3/35 (8%).
Conclusions: The pain killing effect of both Y and Sm therapy proved to be very high (Y: 88%, Sm 91%). We could not find any severe side effect. In addition to pain palliation the Y and Sm therapy can decrease the mass of the metastases as well (Y 9%, Sm 8%). Summarizing our results there was not any significant difference between the Y and Sm therapy.

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EXAMINATIONS OF RHENIUM [186RE] SULFIDE COLLOIDAL SUSPENSION USED IN RADIOSYNOVECTOMY

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Aim: Localization and pharmacokinetics of therapeutical colloid radiopharmaceuticals mainly depends on their particle sizes, the therapeutical effect caused by the beta-emitter nuclide. In our experiments we examined biodistribution of Rhenium [186Re] sulfide colloidal suspension after intra-articular injection.
Material and methods: Rhenium [186Re] sulfide colloidal suspension was manufactured by CIS bio international. Animal model was New Zealand White Rabbit. The samples were collected at 6 h, 24 h, and 3, 6, 10 and 15 days after injection with five animals in each gorup. Collected organs were blood, liver, lungs, kidneys, stomach, spleen, left popliteal lymph, left inguinal lymph node, fat, muscle, bone marrow, thyroid gland and contralateral tibia. Samples were placed in preweighed plastic test tubes and their activity directly measured in the well-type gamma counter and by Nucline X-Ring Gamma Camera. A group of organs were homogenised in physiological saline, using an Ultra Turrax Homogeniser. Knee samples were dissolved in aqua regia, a 3:1 volumetric mixture of cc. HCl and HNO_3.
Results: Before measurements linearity, sensitivity and range of detection of instruments was checked. Parallel mesurements proved to be able to keep a check our reasults and to compare different sample processing methods. We didn't observe any sample losses after homogenise of organs. We have not measured a considerable activity in no other organ or tissue type. Only in a few animals were presenting activities corresponding to 1–2% of the injected dose several days post injection. Localization of radioactivity 24 h after administration of Rhenium [186Re] sulfide colloid (percent of injected dose): injected knee: 92.86% (± SD = 5.75%), liver: 0.87% (± SD = 0.13%), lungs: 0.03% (± SD = 0.01%), kidneys: 0.23% (± SD= = 0.03%), blood: 0.17% (± SD = 0.04%). Gamma camera scans have proven that main part of the injected radiopharmaceutical stays in the synovial space 15 days post injection in rabbit knees.
Conclusions: Our experiments have shown that gamma radiation component of beta emitting therapeutic isotopes offers a significant quantification advantage.

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HISTOLOGICAL AND ARTHROSCOPICAL CHANGES AFTER YTTRIUM-90 ISOTOPE TREATMENT IN CHRONIC SYNOVITIS

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Background: 4000 patients suffering from chronic synovitis were treated by Yttrium--90/Y-90/radiosynovioorthesis (RSO). Results were recorded with 70–80% as very good or good. AIM: Our work aimed at examinig arthroscopic and tissue changes as a result of successful radiosynovioorthesis.
Material and methods: 40 patients of them suffering from Rheumatoid Arthritis (RA) were examined by arthroscop and arthroscopic-biopsy before Y-90 RSO, and 0.5–1 year or 2 years after the treatment.
Results: *Before the treatment:* The membrane is hyperaemic with grape-like clusters proliferating. The surface was covered with several layers of synoviocyst with a diffuse inflammatory infiltration beneath. *After the treatment:* Half a year later, no grape-like clusters proliferating, the surface became silk-like. The surface was covered with one layer of synoviocysts, inflammatory infiltration decreased, signs of fibrosis could be seen. The histological picture remained unchanged even 1–2 years later. No damages in cartilage could be seen. Spectral analysis did show no Y in the synovial membrane and cartilage.
Conclusions: RSO was effective in 70–80% Parallel to the improvement of the clinical pinture the macroscopic and microscopic signs of inflammation were decreasing. membrane or cartilage contained no Y deposits.

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ULTRASOUND MONITORING OF THE SYNOVIAL THICKNESS AFTER 166-HOLMIUM-PHYTATE RADIOSYNOVIORTHESIS — TWO YEARS RESULTS. PHASE III PROSPECTIVE STUDY

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Background: The first article on radiosynoviorthesis was published in 1952 by Fellinger. The traditional isotopes cause whole body radiation of 10 Rad. Isotope specialists have aspired to produce an isotope incurring lower radiation loads. (Pirick, Russel, Sledge, Junsing Song).
166-Holmium-phytate produced by us: radiation type beta energy maximum: 1.84 MeV; radiation type gamma energy maximum: 0,66 MeV; soft tissue penetration: maximum 8.4 mm; average: 3.3 mm; half-life: 26.9 hours; particle size: 0.6–2 μm.
Aim: Measure the synovial thickness after 166-Holmium radiosynoviorthesis by sonography.
Material and methods: Phases III, prospective study. 30 patients suffering from chronic synovitis, rheumatoid arthritis were examined. The protocol commenced with screening. The patients were selected according to inclusion and exclusion criteria. Gender (male/female): 7-23; age: 57.13 ± 9.87 (37–77); stage of knee joint X-ray (I/II): 7/23; duration of synovitis (years): 7.38 ± 7.21 (0.5–27); duration of disease (years): 9.1 ± 8.01 (1–27); number of punctures before the Ho-166 treatment: 12.8 ± 25.98 (3––150); number of steroid injections before the treatment: 12.9 ± 25.93 (3–150).
Holmium phytate injectable suspension marked by 600 MBq ^{166}Holmium phytate injectable suspension, and 40 mg of 1 ml triamcinolone acetonide and 1 ml of lidocaine 1%. There were 24 month follow-up period after the administration of the isotope. Inflammatory activity of the affected knee-joint was tested prior to treatment, and 3, 6, 12 and 24 months after the treatment. We measured the synovial thickness the following locations: In the midline, lateral and medial, by the condylus of femur medial and lateral.
Results: During the study period, inflammation decreased. In the first two years excellent and good results were recorded in 93.3%. Two years after radiosynoviorthesis 93.3% of patients did not need another punction. The thickness of the synovia decreased significantly. We find a significant correlation between the synovial thickness and the clinical improvement.
Conclusion: The 166-Holmium-phytate is an effective new radiopharmaceutical in the treatment of synovitis. We detect the clinical improvement by sonography. The effective dose is 555–925 MBq.

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ULTRASOUND MONITORING OF THE SYNOVIAL THICKNESS AFTER 166-HOLMIUM-PHYTATE RADIOSYNOVIORTHESIS: FOUR-YEARS RESULTS (COMPARATIVE, RANDOMIZED, SINGLE-BLIND, PLACEBO-CONTROLLED STUDY WITH INCREASING DOSAGE)

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Background: 166-Holmium-phytate has a: radiation type beta energy maximum: 1.84 MeV; and radiation type gamma, energy maximum: 0.66 MeV; soft tissue penetration: maximum 8.4 mm; (average: 3.3 mm); half-life: 26.9 hours; particle size: 0.6–2 μm.
Aim: measur the synovial thickness after 166-Holmium radiosynoviorthesis by sonography.
Material and methods: Phase I–II, randomized, simple-blind, placebo-controlled comparative study using increasing dosage. 31 patients suffering from chronic synovitis, rheumatoid arthritis, or seronegative spondylarthritis were examined. Gender (male/female): 12–19; Diagnosis (RA/SNSA): 21/10; Stage of knee joint X-ray (I/II): 7/24; Duration of synovitis (years): 7.9; Duration of disease (years): 5.72; Number of punctures before the Ho-166 treatment: 18.76; Number of steroid injections before the treatment: 18.85.
The protocol commenced with screening. The patients were selected according to inclusion and exclusion criteria. Patients were randomly distributed into four treatment arms:
— group I — 185 MBq ^{166}Holmium phytate injectable suspension and 40 mg of 1 ml triamcinolone acetonide, and 1 ml of lidocaine injection 1%;
— group II — 555 MBq ^{166}Holmium phytate injectable suspension, and 40 mg of 1 ml triamcinolone acetonide and 1 ml of lidocaine 1%;
— group III — 925 MBq ^{166}Holmium phytate injectable suspension and 40 mg of 1 ml triamcinolone acetonide and 1 ml of lidocaine 1%;
— group IV — solely 40 mg of 1 ml triamcinolone acetonide and 1 ml of lidocaine injection 1%.
There were 48 month follow-up period after the administration of the isotope. We measured the quantity of the synovial fluid and the thickness of the synovia before the treatment, and the 14th, 28th days and 3, 6, 9, 12, 24, 36 and 48 months after the treatment. We measured the synovial thickness the following locations: In the midline, lateral and medial, by the condylus of femur medial and lateral.
Results: The thickness of the synovia decreased significantly in the group II. (555 MBq) and III. (925 MBq). After a transient improve (the steroid effect) the thickness of the synovia began to rise in the group I. (185 MBq) and in the control group. We find a significant correlation between the synovial thickness and the clinical improvenes.
Conclusion: The 166-Holmium-phytate is an effective new radiopharmacon in the treatment of synovitis. We detect the clinical improvement by sonography. The effective dose is 555–925 MBq.

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4-YEARS RESULTS WITH ^{166}HOLMIUM-PHYTATE TREATMENT OF CHRONIC SYNOVITIS. PHASE I–IIA, RANDOMIZED, INCREASING DOSAGE, SINGLE-BLIND, PLACEBO-CONTROLLED COMPARATIVE STUDY

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Aim: Examination of anti-inflammatory effect of 166-Holmium-phytate injection.
Material and methods: Phases I–II, randomized, simple-blind, placebo-controlled comparative study using increasing dosage. 31 patients suffering from chronic synovitis, rheumatoid arthritis and seronegative spondylarthritis were examined. Gender (male/female): 12–19; Diagnosis (RA/SNSA): 21/10; Stage of knee joint X-ray (I/II): 7/24; Duration of synovitis (years): 7.9; Duration of disease (years): 5.72; Number of punctures before the Ho-166 treatment: 18.76; Number of steroid injections before the treatment: 18.85.
The protocol commenced with screening. Patients were randomly distributed into four treatment arms:
— group I — holmium phytate injectable suspension marked by 185 MBq ^{166}Ho + 40 mg of 1 ml triamcinolone acetonide (TA) + 1 ml of 1% lidocaine injection (Lid. inj.);
— group II — 555 MBq ^{166}Ho. + 40 mg of 1 ml TA + 1 ml Lid. inj.;
— group III — 925 MBq ^{166}Ho + 40 mg 1 ml TA + 1 ml of 1% Lid. inj.;
— group IV — solely 40 mg of 1 ml TA + 1 ml of 1% Lid. inj.
There were 48 month follow-up period after the administration of the isotope. Inflammatory activity of the affected knee-joint was tested prior to treatment, and the 14th and 28th days, and 3, 6, 9, 12, 24, 36 and 48 months after treatment. Testing was done based on the following parameters: Measurement of swelling of knee-joint [cm]; Flexion – heal buttocks distance [cm]; Degree of knee-joint pain. Visual Analogue Scale (VAS-1-100); Patient's opinion on inflammation of knee-joint (VAS-1-100); Doctor's opinion on given inflammation of knee-joint (VAS-1-100).
Results: Even after 4 year period 88.2% of the findings were rated as excellent or good. 86.66% of the patients do not need another punction even after a 4 years period. We found no deviations in either haematological or chemical parameters during the study period. Administration of Holmium-166 phytate is a safe procedure. We did not detect symptoms of radiation sickness. During the study period, inflammation decreased in the group receiving 555 and 925 MBq.
Conclusion: Ho-166 isotope is an effective radiopharmacy treating synovitis. Due to its physical parameters it is optimal to treat large joints (knee) and medium size joints (hips, shoulder, elbow, wrist, ankle). Effective dosage is 555–925 MBq.

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^{166}HOLMIUM-PHYTATE-RADIOSYNOVIORTHESIS IN RHEUMATOID ARTHRITIS. TWO YEARS CLINICAL RESULTS. PHASE III PROSPECTIV STUDY.

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Background: The first article on radiosynoviorthesis was published in 1952 by Fellinger. The traditional isotopes cause whole body radiation of 10 Rad. Isotope specialists have aspired to produce an isotope incurring lower radiation loads. (Pirick, Russel, Sledge, Junsing Song).
166-Holmium-phytate produced by us: radiation type beta energy maximum: 1.84 MeV; radiation type gamma energy maximum: 0.66 MeV; soft tissue penetration: maximum 8.4 mm; average: 3.3 mm; half-life: 26.9 hours; particle size: 0.6–2 μm.
Aim: Examination of anti-inflammatory effect of 166-Holmium-phytate injection.
Material and methods: Phases III, prospectiv study. 30 patients suffering from chronic synovitis, rheumatoid arthritis were examined. The protocol commenced with screening. The patients were selected according to inclusion and exclusion criteria. Gender (male/female): 7–23; age: 57.13 ± ± 9.87 (37–77); stage of knee joint X-ray (I/II): 7/23; duration of synovitis (years): 7.38 ± 7.21(0.5–27); duration of disease (years): 9.1 ± 8.01 (1–27); number of punctures before the Ho-166 treatment: 12.8 ± 25.98 (3–150) Number of steroid injections before the treatment: 12.9 ± 25.93 (3–150). Holmium phytate injectable suspension marked by 600 MBq ^{166}Holmium phytate injectable suspension, and 40 mg of 1 ml triamcinolone acetonide and 1 ml of lidocaine 1%. There were 24 month follow-up period after the administration of the isotope. Inflammatory activity of the affected knee-joint was tested prior to treatment, and the 3rd and 3, 6, 9, 12 and 24 months after treatment. Evaulation was based on the criteria as described by Müller, Rau and Scütte the score system was developed by the authors.
Results: During the study period, inflammation decreased. In the first two years excellent and good results were recorded in 93.3%. Two year after radiosynoviorthesis 93.3% of patients did not need another punction. Administration of Holmium-166 phytate is a safe procedure. We did not detect any symptoms of radiation sickness. We found no deviations in either haematological or chemical parameters during the study period.
Conclusion: Holmium-166 phytate isotope is an effective radiopharmacy treating synovitis. Due its adventageous features it produces less radioactive damage on the organism than the traditionally used isotopes (90-Yttrium, 169-Erbium, 186-Rhenium). Due to its physical parameters it is optimal to treat large joints (knee) and medium size joints (hips, shoulder, elbow, wrist, ankle). Effective dosage is 555–925 MBq.

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TEN YEARS RESULTS OF YTTRIUM-90 RADIOSYNOVIORTHESIS IN CHRONIC KNEE SYNOVITIS OF DIFFERENT ORIGIN

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Background: Authors report on the results of Yttrium-90 radiosynoviorthesis in chronic synovitis of the knee joint.
Aim: Examination of anti-inflammatory effect of 90-Yttrium injection.
Material and methods: Out of these 617 patients 366 suffered from rheumatoid arthritis, 51 ankylosing spondylitis, 39 other seronegative spondylarthritis, 144 suffered from inflamed osteoarthritis , 3 hydrops articulorum intermitterns, 3 synovitis villonodularis, 11 from chronic traumatic synovitis. Evaulation was based on the criteria as described by Müller, Rau and Scütte the score system was developed by the authors.
Results: In the first ten years excellent and good results were recorded in 71%. They achieved excellent as well as good results at 83% of patients with rheumatoid arthritis, at 50% of patients with ankylosing spondylitis and at 55% of patients with osteoarthritis. Ten years after radiosynoviorthesis 72% of patients did not need another punction.
Conclusions: Radiosynoviorthesis is as effectiv method of treating chronic synovitis as surgical synovectomy. Even after a ten-years period 71% the findings were rated as excellent or good. 72% of the patients do not need another punction even after a ten years period. The effectiveness is worsened significantly by the stadium of the disorder and the local X-ray phase and diagnosis. P 0.00001. The treatment must be done in rheumatoid arthritis Steinbrocker stadium I–II, local stadium I–II.

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RESULTS OF ONE YEAR FOLLOW-UP — RADIOSYNOVECTOMY IN KNEE AND HIP JOINT

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Aim: One year follow-up results of 65 pts treated with radiosynovectomy were evaluated. In 17/65 cases the hip and in 46/65 cases the knee were treated.
Material and methods: The indication of radiosynovectomy was synovitis in systemic disease (PCP, SNSA, psoriatic arthritis) in 21/65 cases or in early stage of arthrosis in 41/65 cases. Mean age was 49 year (30-82), 51 female, 14 male. Before the treatment X-ray examinations, 3 phase bone scintigraphy and ultrasonography were made in every case. Yttrium-90-colloid was used for radiosynovectomy of hip and Rhenium-186-colloid for radiosynovectomy of knee. Measurement of clinical improvement was performed with HSS (Hospital for Special Surgery) score. 3 phase bone scintigraphy and ultrasonography were repeated after 3–6 months.
Results: On the basis of clinical improvement our cases were divided into 3 groups: 1. best clinical effect (HSS score 80–100), 2. intermediate therapeutical effect (HSS score 60–80), 3. low therapeutical effect (HSS score 40–60). We could register in 52/65 (80%) of patients clinical improvement 1.–3. score in HSS score system with improved mobility, pain, inflammation, oedema. Ultrasonography and 3 phase bone scintigraphy had good correlation with the clinical status.
Conclusion: On the basis of objective clinical scoring, and results of diagnostic procedures (3 phase bone scintigraphy and ultrasonography) radiosynovectomy of hip and knee was proved to be a good alternative method for the treatment of synovitis.

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HUNGARIAN EXPERIENCES WITH THE TREATMENT OF CANINE OSTEOSARCOMA CASES

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Aim: The diagnosis of canine primary bone tumors is relativelly simple but therapy is still nowadays not eligible. The basic problem is that at the time of occurance of symptoms and diagnosis in most of the patients multiple soft tissue and/or bone metastases are present. A further problem is that osteosarcoma in humans and in dogs is so called therapy-resistant tumor type so it is not responding for the known chemo-, or radiation therapy protocols.
Material and methods: In our Institute we have been diagnosed nearly 600 osteosarcoma dogs in the last 10 years — from these altogether 84 appendicular osteosarcoma dogs were treated and followed-up properly. The treatment protocols were as follows:
— group I — amputation + chemotherapy;
— group II — local radiotherapy + chemotherapy;
— group III — only chemotherapy;
— group IV — only NSAIDs.
After treatment survival times and side effects were recorded, and size changes of primary and metastatic tumors were investigated by 3-phase bone scintigraphy and X-ray, and laboratory parameters, changes in the body-weight, and lameness parameters (Batemann scores, diameter and flexibility of the joints). Results of the therapy of different groups were evaluated statistically.
Results: In the group IV. the shortest survival and greatest weight-loss was found but there were only mild side effects and no one pathological fractute. Patients of groups I., II., and III showed the longer survival times and paralell ythe more sever side-effects (no significant difference among them).
Conclusion: On the base of our experiences we can conclude the further development of osteosarcoma treatments is a need. We believe that local hyperthermia, liposoma encapsulated drugs and radiolabelled compounds could be the choices for novel protocols.

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STUDIES ON ^{177}LU-EDTMP BIODISTRIBUTION IN TUMOROUS ANIMALS

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Aim: Preclinical studies on ^{177}Lu-EDTMP in spontaneous dog tumors. Determination of pharmacokinetic parameters, assay of biological effects and side effects.
Material and methods: Following radiolabelling and quality control to study tumor uptake, 4 naturally occurring tumorous dogs (3 osteosarcoma, 1 bone metastasis form unknown origin) were inejcted with 44.4 MBq/bwkg, and clinical status, blood counts, biochemistry and gamma camera scans. At each study dosimetry was performed using OLINDA 1.0.
Results: In dogs, a high bone uptake is also present (cca. 50% after 1 week). A variable bone tumor uptake was observed depending on bone remodeling activity, calculated tumour dose fell in the range of 0.58–15.7 Gy. In one case (metastasis, calculated tumor dose: 4.7 Gy) stable disease and long term clinical improvement was oberved, in the other 3 cases (osteosarcomas) animals had to be euthanised in a month due to progression.
Conclusions: ^{177}Lu-EDTMP radionuclide therapy (RNT) is based on an appropriate bone uptake of the radiopharmaceutical. Radiotoxicological profile in dogs shows significant advantages as no white blood cell count decrease was observed at the injected high activity. Originally aimed therapy of metastases is well feasible and realistic and can easily be modelled in spontaneous dog tumours. To obtain a therapeutic tumor dose for osteosarcoma (over 60 Gy) increased activity dosing or application of additive modalities is necessary. Assessment of radiation sensitivity of the tumor prior to RNT could be a key of successful antitumor therapy beyond palliative effects as well.
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AEROSOL LUNG VENTILLATION STUDIES IN LABORATORY RABBIT MODEL FOR NEW VETERINARY PULMONARY DRUG / VACCINE DEVELOPMENT

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Radioisotope techniques are used routinely in human pre-clinical drug development. These techniques include *in vivo* and *in vitro* studies. Nuclear scintigraphy procedures are used to evaluate various pharmaceutical preparations for their distribution pattern, uptake and excretion. The most suitable radionuclide is ^{99m}Technetium, which has short half-life of six hours and gamma energy of 140 keV, suitable for *in vivo* detection. The objective of this study was to carryout lung ventilation with aerosol of ^{99m}Tc--labeled Etoposide liposomes. Etoposide is a semisynthetic epiodophyllotoxin derivative used as anticancer drug against pulmonary primary and secondary lesions. The normal healthy laboratory New Zealand White rabbits were used. Etoposide loaded liposomes were labeled with ^{99m}Tc using reducing agent, stannous chloride. The preparation was used immediately to form aerosol using ultrasonic nebulizer in isolated area to avoid aerial contamination while imaging. The imaging was performed at 2, 4, 8 and 12 hours post inhalation.
The percent uptake of labeled liposome inhalation was calculated in central and peripheral lung regions. In right central region uptake was found to be 33.72, 34.80, 31.82, 30.46 percent at 2, 4, 8 and 12 hours post inhalation respectively, whereas in left region uptake percentage was 30.84, 29.68, 27.81 and 25.43 respectively. In right peripheral region uptake was 66.28, 65.20, 68.18, and 69.54 percent at 2, 4, 8 and 12 hours post inhalation respectively, whereas in left region uptake percentage was 69.16, 70.32, 72.19 and 74.57 respectively. The ratio of central to peripheral region of right lung was 0.51, 0.53, 0.47, and 0.44, whereas at left lung it was 0.45, 0.42, 0.39 and 0.34 at 2, 4, 8 and 12 hours post inhalation respectively. This animal model of aerosol inhalation was found to be very useful in providing kinetics of the labeled compound non-invasively. This report suggests a huge potential in use of scintigraphy procedures for drug development for pulmonary targeting.

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MULTIPLE ENDOCRINE DEPENDENT TUMORS IN A DOG PATIENT WITHOUT MEASURABLE ENDOCRINE CONSEQUENCES

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Testicular neoplasmas are 5–15 percent of total tumours number in male dogs. Seminomas are the most common type of testicular tumours in dog.
The thyroid tumours are large, unilateral palpable masses in neck region in most of the cases. Although seventy percent of malignant thyroid neoplasms are carcinomas, 5–20% of them are endocrinologically active which induce the clinical signs of hyperthyroidism.
Seven — twenty one percent of skin tumours are mastocytomas in dog but the incidence of them is higher in spayed female and intact male dogs which should indicate the testosterone dependency.
Eight years old argentin dog was present at our clinic with clinical signs of alopecia, weight loss and ointment faeces. Plasma biochemical parameters were in reference ranges. The total thyroxin concentration was 30.11 nmol/l which is fit to euthyroid state. An altered density focus in right testis was visualized by the ultrasonographic examination. Neither testosterone nor estrogen serum concentrations were high. The Tc-pertechnetate uptake of left thyroid gland was increased in opposite the visualisation of right thyroid gland was decreased. The left thyroid gland, both testes and an 1 cm diameter nodule in skin were surgically removed.
Seminoma in both testes, follicular compact cell carcinoma and C-cell carcinoma in removed thyroid gland and Grade-II type mastocytoma in skin were histologically established.
The faeces got the normal consistency following the operation. The hair grows finished in sixth week after the operation and the bodyweight increased with 8 kilogram. The thyroxin concentration after transient decrease reached the 35.48 nmol/l level in four month. Plasma TSH concentration was 0.272 ng/ml.
The combination of three different endocrine tumours with a suspected hormone dependent tumour suggests the relation of their development. In spite of hormone dependent tumours the plasma hormone levels were ambiguous and reached to diagnosis with use of complex diagnostic imaging techniques.