

8th International Congress of the Croatian Society of Nuclear Medicine

Highlights from Šibenik, May 9–12, 2014

D. Huić; D. Grošev; S. Kusačić Kuna; A. Mutvar; A. Tea Golubić

Department of Nuclear Medicine and Radiation Protection, University Hospital Centre Zagreb, Croatia

Keywords

Croatian Society of Nuclear Medicine, nuclear medicine congress

Summary

The Eighth International Congress of the Croatian Society of Nuclear Medicine was held in Šibenik, May 9–12, 2014. It gave an overview of the status of nuclear medicine in the region. 85 papers were selected. The program included 22 invited lectures, 32 oral presentations and 31 poster presentations. Presenters came from 14 European countries (Austria, Croatia, Italy, Slovenia, Hungary, Bosnia and Herzegovina, Germany, Serbia, Monte Negro, Bulgaria, UK, Russia, Netherlands, France), and from USA and India. This report includes top 24 papers as ranged by the international Scientific Committee, which might be interesting to the readers of *Nuklearmedizin*.

Correspondence to:

Prof. Dražen Huić
Department of Nuclear medicine and Radiation Protection, University Hospital Centre Zagreb
Kišpatičeva 12, 10000 Zagreb, Croatia
E-mail: dhuić@kbc-zagreb.hr

Schlüsselwörter

Kroatische Gesellschaft für Nuklearmedizin, nuklearmedizinischer Kongress

Zusammenfassung

Der 8. Internationale Kongress der Kroatischen Gesellschaft für Nuklearmedizin vom 9. bis 12. Mai 2014 in Šibenik bot einen Überblick über den Stand der Nuklearmedizin in der Region: 85 Beiträge waren ausgesucht worden. Das Programm enthielt 22 geladene Vorträge, 32 mündliche Präsentationen und 31 Poster-Präsentationen. Die Referenten kamen aus 14 europäischen Ländern (Österreich, Kroatien, Italien, Slowenien, Ungarn, Bosnien-Herzegowina, Deutschland, Serbien, Montenegro, Bulgarien, Großbritannien, Russland, Niederland, Frankreich), den USA und Indien. Dieser Bericht umfasst die 24 vom internationalen wissenschaftlichen Komitee am besten bewerteten Arbeiten, die für Leser der *Nuklearmedizin* von Interesse sein könnten.

8. Internationaler Kongress der Kroatischen Gesellschaft für Nuklearmedizin
Highlights aus Šibenik, 9.–12. Mai 2014
Nuklearmedizin 2014; 53: A113–A121
received: February 28, 2014

The Eighth International Congress of the Croatian Society of Nuclear Medicine was held in Šibenik, May 9–12, 2014, under the auspice of Croatian Ministry of Health and European Association of Nuclear Medicine (EANM). After several successful congresses in Opatija the Organizing Committee decided to move down south to the beautiful Šibenik – a historic coastal town, located in central Dalmatia. It was a very special occasion since this year our Society

celebrates the 20th anniversary of the first congress which took place in Zagreb, 1994 (1–7).

This year's congress was the perfect opportunity to meet many of the world experts and to present nuclear medicine achievements from the region and abroad in the form of oral or poster presentations.

For the Eighth International Congress 85 papers have been selected. We had 22 invited lectures, 32 oral presentations and

31 poster presentations. Presenters came from many European countries (Austria, Croatia, Italy, Slovenia, Hungary, Bosnia and Herzegovina, Germany, Serbia, Monte Negro, Bulgaria, UK, Russia, Netherlands, France), and even from USA and India.

This report includes top 24 papers as ranged by the international Scientific Committee. The majority of the abstracts are dealing with oncology and thyroid topics.

All sessions started with invited – introductory lectures as a part of continuing medical education (CME) program. The EANM president **Verzijlbergen F** (Rotterdam) gave an overview of biomedical imaging and therapy in metastatic prostate cancer. He was followed by a comprehensive lecture given by **Kostakoglu L** (New York) describing the role of PET/CT imaging in various stages of lymphoma. **Dizdarević S** from Brighton presented the exciting role of a novel alpha emitting Radium-223 chloride treatment in patients with prostatic cancer. **Giammarile F** from Lyon reviewed the state of the art as well as the new developments in sentinel lymph node biopsy procedure in breast cancer.

CME lectures continued with two lectures devoted to cardiology. **Jager P** (Zwolle) described possibilities of one-day SPECT, calcium scoring and coronary CT in patients with cardiac diseases. On the other hand, **Mirzaei S** from Vienna underlined the role of cardiac innervations' estimation by using MIBG scan of myocardium.

The neurology session started with **Bartenstein P** (Munich) lecture about the various possibilities of molecular imaging in early diagnosis of Alzheimer disease.

Knešaurek K from New York elaborated all pro and contra arguments explain-

ing the current status of PET/MRI imaging. The set of papers devoted to radiochemistry started with the lecture of **Decristoforo C** (Innsbruck) who explained the possible role of ^{68}Ga -imaging, especially in the view of $^{99\text{m}}\text{Tc}$ shortage.

Parameswaran RV from Bangalore, India, started the session devoted to radiotherapy by giving the lecture about the role of ^{90}Y microspheres in primary and metastatic liver tumours. He was followed by long-term dean of European School of Nuclear Medicine **Hoefnagel CA** (Amsterdam) who gave a historical review of MIBG therapy in patients with neuroendocrine tumours. The series of invited lecturers was completed by the lecture of **Ivančević V** from Celle who gave a talk about the radionuclide therapy of bone metastases.

The oral presentations started with the session devoted to the role of ^{18}F -choline imaging in patients with prostate cancer. **Hodolič M** (Ljubljana) presented the study performed in two centers which included 738 patients, underlying the role of ^{18}F -choline PET/CT in appropriate treatment of patients with prostate cancer. **Tabain A** (Zagreb) compared ^{18}F -choline PET/CT with standard diagnostic imaging procedures in restaging of prostate cancer patients. She concluded that standard bone scanning is still reliable but in some cases PET/CT resolved equivocal findings. **Golubić AT** from Zagreb presented the paper about unspecific choline lymph node uptake, which can be found in 43% of patients and must be carefully judged when interpreting ^{18}F -choline scans.

Sentinel lymph node technique was presented in many papers reflecting the fact that this diagnostic modality is used in many clinical centers. **Garcheva M** (Sofia) explained the role of SPECT/CT in sentinel node mapping of patients with melanoma. This hybrid method improves accuracy and reduces the number of false positive and false negative findings.

Horvatić Herceg G from Zagreb described the role of preoperative ultrasound examination combined with fine needle aspiration biopsy in reducing the number of sentinel lymph node biopsies in about 16% of the patients. **Punda M** (Zagreb) underlined the importance of SPECT/CT in the

detection of sentinel lymph nodes in head and neck melanoma.

Two papers have been devoted to breast cancer patients. **Kustić D** from Rijeka presented the paper about the impact of sentinel lymph node biopsy on breast cancer follow-up in 704 patients. **Mutvar A** (Zagreb) compared two different radiotracers using two-day protocol combined with SPECT/CT. The tracer with larger particles allowed better visualization of sentinel lymph nodes on the next day.

Thyroid cancer was the topic of many presentations. **Franceschi M** from Zagreb presented the long term follow-up study of more than a thousand papillary and follicular cancer patients concluding that histological type of the tumor is a significant predictor of survival. **Kusačić Kuna S** (Zagreb) reported the usefulness of ethanol injection in thyroid cancer lymph node metastases when surgery is not possible. She found a significant reduction of the involved lymph nodes size without serious adverse events. **Žagar I** from Ljubljana described how neoadjuvant chemotherapy was effective in 45% of patients decreasing tumor size in locally advanced thyroid cancer. **Medvedec M** (Zagreb) compared the total prices for community of radioiodine ablation if performed with recombinant TSH stimulation or after simple thyroid hormones withdrawal. He found the other option more reliable in many countries.

Three very interesting papers regarding thyroid function in various clinical settings were presented. **Bogović Crnčić T** from Rijeka screened the population of pregnant women for autoimmune thyroid disease and found out 11% of pregnant women with subclinical thyroid disorder, suggesting that the routine screening of all pregnant women should be considered.

Jukić T (Zagreb) presented the study supported by UNICEF whose aim was to assess iodine intake in school children by using thyroglobulin as a biomarker for iodine deficiency. He concluded that thyroglobulin is a sensitive indicator and found out iodine sufficiency in school children of Zagreb region. **Gaberšček S** from Ljubljana compared thyroid function in 2889 individuals before and after increase in mandatory salt iodization. She found out conse-

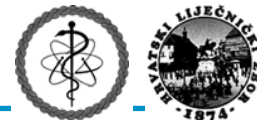
quently higher incidence of euthyroid Hashimoto's thyroiditis and relatively increases of Tg antibodies in comparison with TPO antibodies.

From the session of neurology three papers from Zagreb have been selected for this review according to the Scientific Committee judgment. **Divošević S** presented the role of PET in patients with refractory temporal lobe epilepsy regarding glucose metabolism and depression symptoms. She reported the reduced glucose metabolism in temporal region in those patients. **Samardžić T** described perfusion brain SPECT as a useful method for differential diagnosis of various dementia types. This might lead to the implementation of the preventive strategies and the optimal treatment for particular patient. **Petrović R** found out by using perfusion SPECT that all ten studied patients with eating disorders have some kind of asymmetry – hypoperfusion in at least one area of the brain.

In the session Physics/ Chemistry **Krošelj M** (Ljubljana) described the fully automated preparation of radiolabelled peptides in self shielded radiosynthesis box with its main advantage of small size and low weight, suitable for PET and α -radioisotopes. **Socan A** from the same group presented the way to label haematopoietic progenitor cells by $^{99\text{m}}\text{Tc}$ -HMPAO that enables imaging with SPECT and “in-vivo” monitoring of cell trafficking with good spatial resolution. **Grošev D** from Zagreb reported about the collaboration with International Atomic Energy Agency (IAEA) from Vienna. This project included imaging of ^{133}Ba sources in water phantom for simulation of ^{131}I quantitative imaging in therapy. SPECT/CT imaging was proposed for accurate dosimetry.

Interesting study about ^{90}Y microspheres in the treatment of primary and metastatic liver tumours in India was presented by **Parameswaran RV** (Bangalore). He reported that this method is a powerful tool to achieve regional tumour response and disease control in hepatic malignancy.

The role of V/P SPECT in detection of other cardiopulmonary diseases beyond pulmonary embolism was presented by **Begić A** from Sarajevo. She found this method useful in chronic obstructive



pulmonary disease, left heart failure and tumours.

Gladić Nenadić V (Zagreb) pointed out the high rate of false positive results for ^{99m}Tc MIBI parathyroid scintigraphy in area with high prevalence of thyroid diseases. She suggested that in such circumstances combined use of neck ultrasound and ^{99m}Tc MIBI scintigraphy should be mandatory.

As a part of the Congress, **10th Alpe-Adria Symposium** was organized as a joint effort of Austrian, Croatian, Italian and Slovenian societies of nuclear medicine. Two main topics were discussed:

- Hypothyroidism and
- Infection/Inflammation imaging.

The review of diagnosis and treatment of subclinical hypothyroidism was given by **Zaletel K** and **Pirnat E** from Slovenia. The possible connection of obesity and thyroid function was explained by **Fabris B** from Italy. What is the possible influence of hypothyroidism on pregnancy was reported

by **Bogović Crnčić T** (Croatia). **Malle P** from Austria reported on Hashimoto's thyroiditis associated with thyroid nodules. Hypothyroidism and ophthalmopathy was the topic of **Jukić T** presentation (Croatia).

Modalities of infection/inflammation imaging were reviewed by **Grmek M** and **Ležaič L** (Slovenia). How to scan the patients with suspected orthopedic prosthesis infection was explained by **Dobrenić M** from Croatia. **Englaro E** from Italy described how to assess the treatment with antibiotics in spondylodiscitis. The way to use nuclear medicine methods in fever of unknown origin was presented by **Gallo-witsch HJ** (Austria). Finally, **Di Gregorio F** from Italy gave the talk about arteritis imaging.

All lectures were well attended and followed by fruitful discussion.

The next international congress of the Croatian Society of Nuclear Medicine will take place in three years while dates and the venue will be announced soon.

References

1. Ivancevic D, Dodig D, Schicha H. Highlights of the First Croatian International Congress of Nuclear Medicine, Zagreb, October 13–15, 1994. *Nuklearmedizin* 1994; 33: 51–55.
2. Dodig D, Ivancevic D, Schicha H. Highlights of the Second International Congress of the Croatian Society of Nuclear Medicine, Zagreb, October 24–26, 1996. *Nuklearmedizin* 1996; 35: A113–A118.
3. Dodig D, Ivancevic D, Schicha H. Highlights of the Third International Congress of the Croatian Society of Nuclear Medicine, Opatija, May 10–12, 1999. *Nuklearmedizin* 1999; 38: A120–A125.
4. Dodig D, Poropat M, Ivancevic D, Schicha H. Highlights of the Fourth International Congress of the Croatian Society of Nuclear Medicine, Opatija, May 12–15, 2002. *Nuklearmedizin* 2002; 29: 1545.
5. Dodig D, Težak S, Poropat M et al. Highlights of the Fifth International Congress of the Croatian Society of Nuclear Medicine, Opatija, May 12–15, 2005. *Nuklearmedizin* 2005; 44: A183–A184.
6. Dodig D, Težak S, Huic D et al. Highlights of the Sixth International Congress of the Croatian Society of Nuclear Medicine. *Nuklearmedizin* 2008; 47: A125–A131.
7. Dodig D, Težak S, Huic D et al. Highlights of the Seventh International Congress of the Croatian Society of Nuclear Medicine, Opatija, May 15–18, 2011. *Nuklearmedizin* 2011; 50: A141–A148.

Selected abstracts

1

[18F] FLUOROCHOLINE PET/CT IN PATIENTS WITH PROSTATE CANCER: WHOLE BODY EVALUATION MODALITY

Marina Hodolić, Tanja Barešić, Valentina Bodanza, Jure Fettich, Marino Cimitan
Nuclear Medicine Unit, National Cancer Institute CRO IRCCS, Aviano, Italy
Dept for Nuclear Medicine, University Medical Centre Ljubljana, Slovenia

Introduction: Conventional radiological and nuclear medicine modalities are suboptimal to provide efficient guidance for management of primary and recurrent prostate cancer disease. At present 18F-fluocholine (FCH) PET/CT is the only one-shot imaging modality that can give an answer about status of prostate cancer disease in the whole body.

Purpose: To evaluate the role of FCH PET/CT in the clinical setting for choosing optimal therapeutic strategy to individualized treatment of patients with prostate cancer disease.

Material and Methods: Data from 738 patients with prostate cancer disease, who underwent FCH PET/CT for the staging or restaging for detecting disease, were reviewed. 175 patients had 18F-FCH PET/CT scans before radical prostatectomy because of high risk of extracapsular disease (Gleason score > 7), while 563 patients were evaluated after treatment because biochemical relapse documented by PSA relapse (408 patients with Gleason score >=7, and 155 with Gleason score < 7). Positivity of FCH PET/CT scan was correlated with PSA values (ng/ml) as well as with Gleason score.

Results: FCH PET/CT detected unknown distant metastases in 52% of 175 patients at initial staging (91/175), and in 35% of 563 patients with biochemical relapse (199/563). Detection rate of FCH PET/CT for distant recurrence in patients with biochemical relapse showed a linear correlation with PSA level and reached 54% (136/250) in population with PSA =/> 4 ng/ml. However unknown metastatic disease was also be diagnosed in 24% of intermediate-high risk patients with PSA level < 1 ng/ml.

Conclusion: In our patient population FCH PET/CT contributed to selection of appropriate individualized treatment in one-third of cases due to detection and exact localization of the disease.

2

18F-FCH PET/CT COMPARED WITH STANDARD DIAGNOSTIC IMAGING PROCEDURES IN RESTAGING OF PROSTATE CANCER PATIENTS

A.Tabain¹, A. Balenović¹, M. Stipičić², M. Solaric³, A. Fröbe², K. Kovčičić², Z. Kusić²

¹Medikol Outpatient Clinic, ² Clinical Hospital Center "Sestre Milosrdnice" Clinical Department of Oncology and Nuclear Medicine, ³ University Hospital Center Zagreb, Oncology Clinic

Aim/Introduction: The aim of this study was to evaluate the contribution of 18F-fluorocholine PET/CT in restaging of prostate cancer patients and to compare it with conventional diagnostic imaging modalities. **Methods:** We assessed 40 prostate cancer patients (pts) with rising PSA levels (range 0.2-180.0 ng/ml, mean 10.13, median 2.21) after radical therapy and compared the results of bone scintigraphy (BS), contrast enhanced abdominal pelvic computed tomography (CT) and 18F-FCH PET/CT (FCH), according to the site of the disease. We evaluated concordance between CT and FCH if local soft tissues were the suspected site of the disease as well as the results of BS and FCH in case of possible bone involvement. **Results:** Out of 21/40 (52.5%) FCH positive pts, with PSA values (mean, median) of 17.15 ng/mL, 6.20 ng/mL, there were 17 pts with locoregional involvement of pelvic lymph nodes or prostate bed, 2 with both local and bone involvement, 1 with solely bone metastatic disease and 1 with distant soft tissue metastases. There were 19/40 (47.5%) FCH negative pts, with PSA values (mean, median) of 2.44 ng/ml, 1.42 ng/ml. The results obtained by CT were concordant with FCH in 23/40 (57.5%) pts and discordant in 17/40 (42.5%) pts. BS was concordant with FCH in 29/40 pts (72.5%), while discordant in 11/40 (27.5%), where FCH mostly resolved equivocal BS findings.

Conclusion: FCH is superior diagnostic modality for detection of recurrent disease in restaging of prostate cancer pts, especially in soft tissues, but potential pitfall could be the timing of procedure due to low metabolic activity of small and slow progressing lesions. BS is wide available and reliable diagnostic method for detection and follow up of pts with suspected bone metastatic disease.

3

THE UNSPECIFIC LYMPH NODE UPTAKE OF F-18-CHOLINE IN PATIENTS WITH PROSTATE CANCER

Golubic AT¹, Mutvar A¹, Zuvic M¹, Huic D¹

¹University Hospital Centre Zagreb, Department of Nuclear Medicine and Radiation Protection

BACKGROUND: Prostate cancer is the most common malignancy in men in Europe and the US. F-18- choline PET/CT is considered as a particularly useful mechanism in several stages of patient care, but with the added information gained from revealing multiple pathophysiological processes, other sites of tracer uptake have been observed, especially in lymph nodes out of the pelvis.

AIM: The aim of this study was to recognize, describe and evaluate the unspecific uptake of F-18- choline in patients with prostate cancer. **METHODS:** 39 patients (median age 73 y; range 50-86) with prostate cancer (Tx-T3N2M1) were included in this study. They underwent F-18-choline PET/CT for staging or restaging of prostate cancer. Whole-body PET/CT was acquired 20 minutes after the F-choline administration (Siemens Biograph PET/CT; mean activity administered 180 MBq, 3 minutes per bed position). The mean follow up period was 8 months.

RESULTS: Unspecific accumulation of F-18-choline in lymph nodes was found in 17 patients (43.6%). Most of these findings (N=12, 30.7%) are nonspecific accumulation of the tracer in mediastinal lymph nodes. Other sites of unspecific tracer uptake were pulmonary hili (N=6, 15.5%), axillary lymph nodes (N=4, 10.3%) and inguinal lymph nodes (N=4, 10.3%). Mean SUV values for mediastinal lymph nodes, pulmonary hili, axillary and inguinal lymph nodes were 5.1, 5.3, 3.4 and 3.8, respectively. Mean SUV values were considerably lower than tracer uptake values measured in confirmed metastases sites (bone metastases mean SUV max value 12.9, metastatic lymph nodes mean SUV max value 9.1). **CONCLUSION:** F-18-choline PET/CT is a valuable and an established functional diagnostic imaging method for staging and restaging prostate cancer. However, uptake of the tracer can often be seen in lymph nodes not related to primary disease. Patient history, clinical examination, laboratory tests and correlation with other imaging methods, must be taken into consideration when interpreting F-18-choline PET/CT findings.

4

INCREMENTAL ROLE OF SPECT/CT FOR SENTINEL LYMPH NODE MAPPING IN MELANOMA MALIGNUM

M. Garcheva¹, I. Kostadinova¹, E. Kostadinov², P. Trojanova², T. Sedloev² 1- Department of Nuclear Medicine, 2- Department of Surgery, Medical University- Sofia

The sentinel lymph node excision (SLNE) is one of the most important staging and potentially therapeutic procedure for patients with melanoma malignum (MM). SPECT/CT visualization of the lymphatic drainage provides additional data for the regional lymph nodes localization. The aim of the study was to determine the clinical importance of the hybrid ^{99m}Tc-nanocolloid/low-dose CT mapping in patients with MM. Forty seven patients (pts) (27 women and 20 men, 49.13±15.8 y) were examined. The stage of the primary tumor was - Breslow II in 8; Breslow III in 20; Breslow IV in 14; Breslow V- in 5 pts. The injection was intradermal, peritumoral or periexcisional with activity between 18 and 74 MBq, according to the time delay to surgery. The mapping was successful in all but one patient (sensitivity 98%). The hybrid imaging was crucial in 14 (30%) out of 46 patients with drainage visualization: a/ patients with difficult regional anatomy and proximity of the tumor and regional lymph nodes - facial, or ear tumors (n=4); b/ pts after previous regional surgery (complicated excision, implants, n=2); c/ pts with faint radiopharmaceutical uptake (n=1); d/ pts with unusual drainage pattern for a proof of eventual lymph node: subcutaneous scapular, subxyphoid, abdominal, or thoracical (4 pts) e/ in cases with suspected artifacts (3 pts). As a whole- 69 lymph node territories were detected in the investigated pts. Seven unusual (in 7 pts) and 7 bilateral drainage patterns were visualized (20%). Ten false positive subcutaneous, or cutaneous foci of uptake without corresponding CT-findings, were localized and unnecessary procedures were avoided. The exact localization was achieved in 46/47 of the examined patients (98%). The histology of SLN was positive in 10 pts (21%): two with stage of the primary tumor Breslow III, three with Breslow IV, five with Breslow V.

We consider that the hybrid SPECT/CT technique improves the accuracy of SLN mapping in MM, due to decrease of the false positive and the false negative results, facilitates their surgical detection and reduces the false negative histological status.

This study is part of IAEA project №16462

5

INTRODUCTION OF US-GUIDED FNAC IN PREOPERATIVE STAGING PRIOR TO SENTINEL LYMPH NODE BIOPSY: BENEFIT FOR PATIENTS WITH CUTANEOUS MELANOMA

Horvatic Herceg G¹, Bracic I, Kusacic-Kuna S¹, Mutvar A¹, Antulov J¹, Herceg D.^{1,1} Clinical Hospital Centre Zagreb, Zagreb

Regional lymph nodes involvement is critical to the overall survival of patients with stage I/II melanoma. Sentinel lymph node biopsy (SLNB) is widely accepted as a screening method for assessing the extent of metastases to regional lymph nodes for the purpose of planning a complete lymph node dissection (CLND).

This study was designed to evaluate the value and possible benefits of preoperative ultrasound (US) examination and US-guided fine needle aspiration cytology (FNAC) for the detection of non-palpable lymph node metastases in patients with cutaneous melanoma. Methods: The prospective study included 101 consecutive patients with cutaneous melanoma (55 females and 46 males; mean age 54 years, range: 21–81 years) planned for SLNB. All patients were examined by US before preoperative lymphoscintigraphy. FNAC was performed in suspicious lymph nodes (round shaped lymph node, eccentric cortical hypertrophy, and a loss of normal hilar vascularization). In cases of malignant findings, patients were submitted to CLND. The findings were correlated with pathohistological outcomes after CLND. Results: US and US-guided FNAC were true positive in 16 cases, with no false positive results. All FNAC findings were confirmed by pathohistology. There were 9 false negative results out of 85 patients with negative echographic findings. In those patients pathohistology revealed metastases, mostly in form of small foci of tumor cells or individual atypical cells. The sensitivity, specificity, positive predictive value, and negative predictive value of US combined with FNAC were 64%, 100%, 100% and 89.41%. Conclusion: Detection of possible regional melanoma metastases by US, combined with power Doppler and FNAC to be performed before sentinel lymphoscintigraphy, can spare patients unnecessary surgical sentinel node staging. In our study, 15.8% (16/101) of our patients with FNAC-proven regional metastasis were sent directly to CLND without previous surgical staging. For patients with a negative US finding, SLNB remains the best diagnostic option. The introduction of US-guided FNAC as a preoperative algorithm for all patients with cutaneous melanoma, as a less invasive and complementary method to SLNB, significantly improves the course and decreases the cost of treatment.

6

DISCORDANT SENTINEL LYMPH NODES IN HEAD AND NECK MELANOMA PATIENTS

Punda M¹, Staničić J¹, Stipić M¹, Ivkić M², Kos M³, Pastorčić Grgić M², Gršić K², Kusić Z¹
Dpt. of Oncology and Nuclear Medicine¹, Dpt. of Head and Neck Surgery², Dpt. of Pathology³, UHC "Sestre milosrdnice", Zagreb

Lymphoscintigraphy (LS) in patients (pts) with head and neck melanoma (HNM) provides guidance to surgeons for the neck dissection planning and the SPECT-CT enables precise anatomic localization of sentinel lymph nodes (SLNs). However, studies reported on unexpected drainage pathways in 8-43% of pts. The aim of our study was to evaluate discordance of detected SLNs in pts with HNM compared to clinically predicted lymphatic drainage according to O'Brian's map. Materials and methods: 67 patients (35 m, 32 f) with HNM underwent SLN biopsy. After peritumoral injection of 99mTc-nanocolloid, immediate dynamic and static planar imaging was performed and 2-4 hours later SPECT-CT imaging was done. Results: A total of 171 SLNs were detected in 64/67 patients (range 1-6, mean 2.5). The SLN was tumor-positive in 6/64 patients. Out of 8 (12.5%) pts with discordant SLNs, 4 had neck melanoma. All discordant SLNs were tumor-negative (Table). Conclusion: Detection of SLNs in the clinically unexpected neck levels or inside of more distant drainage regions changed the surgical planning in patients with HNM, mostly in those with primary melanoma of the neck.

Melanoma site (No. of pts)	Predicted O'Brien drainage	Localization and No. of pts with discordant SLNs
Anterior scalp (3)	I-III or IV, par.	Contralateral parotid (1)
Coronal scalp (10)	I-V, parotid	Retroauricular (1) occ. (1)
Posterior scalp (6)	II-V, occip.	Nuchal (1)
Preauricular (3)	I-III or IV, par.	
Ear (10)	II-V, occip.	
Upperface (11), nose (4), lowerface (8), ant upp. neck	I-III of IV, par.	
Ant low. Neck (4)	II-V	Axilla (1)
Coronal upp. neck (1)	I-V, parotid	
Coronal low. neck (0)	III-V	
Post upp. neck (2)	II-V, occip.	
Post low. Neck (5)	III-V	Nuchal (1) occ. (1) axill.(1)

7

IMPACT OF SENTINEL LYMPH NODE BIOPSY ON BREAST CANCER FOLLOW-UP

D. Kustić¹, I. Iskra¹, S. Grbac – Ivanković¹, N. Giroto¹, T. Bogović Crncić¹.
¹Clinical Department of Nuclear Medicine, Clinical Hospital Center Rijeka

Aim: The purpose of this study was to evaluate the impact of sentinel lymph node biopsy (SLNB) results on follow-up of patients with breast cancer.
Patients and methods: SLNB results obtained between years 2007-2011. from 702 patients with breast cancer, mean age 58.7±9.3 years, were analysed and categorized according to the presence and size of metastases as well as pathohistological type and stage of primary tumour. During follow-up until January 2014, PET-CT scan was requested by oncologist in 53 cases.
Results: Out of 704 SLNB (2 patients with biopsies on both breasts), positive SLN involvement resulted in 199 (28.27%), while in 503 (71%) pts was negative. In 163 positive pts (81.9%), the cancer was qualified as invasive ductal, in 28 (14.1%) as invasive lobular, in 5 (2.5%) as mixed invasive, in 2 (1%) as ductal in situ, and 1 patient (0.5%) was diagnosed with lobular in situ type. Tumour stage was determined to be T1 in 95 (55.6%), T2 in 66 (38.6%), T3 in 5 (2.9%), T4 in 4 (2.3%), and „in situ“ in 1 patient (0.6%). Out of 171/199 cases (with single SLNB performed), micrometastases (SLN μ M) were found in 57, while 114 had metastases greater than 2 mm (SLNM). Out of those with SLN μ M, T1 stage was confirmed in 40 (70.2%), and T2 in 16 (28.1%) respectively; while among those with SLNM, T1 stage was determined in 55 (48.2%), and T2 in 50 (43.9%), respectively. In more than 4 years of follow-up, in 22 out of 199 positive patients (11.06%) ¹⁸F-FDG PET-CT was performed, and was positive for cancer progression in 14 (two thirds), 2 of which had SLN μ M. In 503 SLNB negative pts PET-CT was done in 31 (6.16%), and progression was found in 11 (one third).
Conclusion: In patients with SLN μ M, T1 stage of breast cancer was predominant (70%), while almost equal proportion of T1 and T2 stages was found in those with SLNM, indicating that larger primary tumours are more likely either to be associated with bigger SLN metastases or to spread by lymphatic invasion. During follow-up, SLN positive patients were also referred to PET-CT scan twice as often as those free of SLN metastases, with double rate of positive findings in terms of disease progression. These results confirm the long term importance of SLN biopsy in women diagnosed in early stage of the disease, while prognostic value of SLN μ M in long term follow-up remains to be further investigated.

8

THE SENTINEL NODE MAPPING FOR BREAST CANCER: 2- DAYS PROTOCOL COMBINING SPECT/CT

A. Mutvar¹, D. Huić¹, G. Horvatić Herceg¹, D. Grošev¹, A. Dujmović¹, M. Duduković¹, B. Cvjetičanin¹,¹ University Hospital Centre Zagreb

AIM: Sentinel node (SN) biopsy has become an acceptable alternative to elective axillary lymph node dissection in patients with early stage breast cancer. Despite widespread use of sentinel node mapping for breast cancer patients many aspects of this procedure are still controversial and protocols not standardized yet. In this study we evaluated the accuracy of 2- days study protocol using two different tracers and the value of SPECT/CT.

METHODS: 79 patients with early stage breast cancer were evaluated. Tc99m-colloid (small particle tracer /16 patients or large particle tracer / 62 patients) was injected in the breast tissue around the tumor. Conventional lymphoscintigraphy and subsequently SPECT/CT was performed. Hand-held gamma probe was used for identification of the SLNs.

RESULTS: SNs were visualized on planar images in 88, 6% and on SPECT/CT in 96, 2% patients. The biopsy of SN was successful in 84, 6% and complete axillary dissection was performed in 15, 4%. Metastases in SN were found in 18 patients (23, 07%), in 11 patients only in SN. No false negative results were observed. Positive impact of adding SPECT/CT in the protocol was noticed in 39/79 patients (49, 4%). **CONCLUSION:** 2-days protocol procedure is feasible with high accuracy. We noticed better visual performance with large particle tracer on the day of operation. SPECT/CT provided relevant additional information in 39/79 (49, 4%) patients and revealed the exact anatomical location of sentinel nodes.

9

DIFFERENTIATED THYROID CANCER: COMPARISON BETWEEN PAPILLARY AND FOLLICULAR CANCER IN ONE INSTITUTION

Franceschi M¹, Jukić T¹, Rončević S¹, Granić R¹, Staničić J¹, Punda M¹, Dabelić N¹, Gladić Nenadić V¹, Petranović Ovcariček P¹, Šiško Markoš I¹, Sonicki Z², Kusić Z¹. ¹Department of Oncology and Nuclear Medicine, UHC "Sestre Milosrdnice", ²School of Public Health "Andrija Štampar", Zagreb, Croatia

The purpose of our study was to assess survival rates and prognostic factors in a retrospective review of 1167 patients (pts), female (f): male (m) ratio 4:1 with papillary thyroid cancer (PTC) and 191 pts (f:m ratio 3.2:1) with follicular thyroid cancer (FTC). All pts were operated on between 1970 and 2011 with subsequent follow-up in our institution. Mean follow-up time was 10.6 years (range 0.5-41 y). Median age at the time of diagnosis for PTC pts was 47 (range 6 to 83 y) and for FTC pts was 46 years (range 13 – 78 y). Median PTC size was 12 mm (range 1 to 100 mm) and FTC size was between 7 mm to 90 mm (median 32.5 mm). Local metastases were found during the initial operation in 252 pts (27%) with PTC and 16 pts (8.4%) with FTC. Distant metastases were detected in 40 pts (3.4%) with PTC (f: m was 1.3:1) and 29 pts (15.2%) with FTC (f: m was 1.8:1) at the time of presentation. Median tumor size in these pts was 32.5 mm and 62.5 mm. Prognostic factors: age (<45y and >45y), gender, tumor size (<40 mm and >40 mm), presence of local and distant metastases at the initial presentation were evaluated with univariate (Kaplan-Meier Survival Curves, Log-rank test) and multivariate analysis (Cox Regression) (p= 0.05). Results: Fourteen pts with PTC (5 f and 9 m) died from disease, with mean age of 63 years, mean tumor size of 45 mm, 8 had distant metastases at the time of initial diagnosis. Nineteen pts with FTC (10 f and 9 m) died from disease, with mean age of 66 years, mean tumor size of 57 mm, 18 had distant metastases at the time of initial diagnosis. The 5-year cancer-specific survival rate was 99.1% for PTC and 92.7% for FTC pts, 10-year cancer-specific survival rate was 98.8% for PTC and 90.6% for FTC pts, (p<0.001). Significance of various prognostic factors was obtained. Conclusions: Histological type (PTC vs. FTC) is highly significant factor for cancer specific survival. Pts with papillary and follicular thyroid cancer should be analyzed separately.

10

PERCUTANEOUS ETHANOL INJECTION IN THYROID CANCER METASTASES TREATMENT

Kusacic Kuna S, Tomic Brzac H, Horvatic Herceg G, Bence Zigman Z
Clinical Department of Nuclear Medicine and Radiation Protection, Clinical Hospital Centre Zagreb, Croatia

AIM: The aim of study was to evaluate the successfulness and side effects of percutaneous injection of 95 % ethanol (PEIT) for management of thyroid cancer neck metastases.

PATIENTS AND METHODS: PEIT was made in a group of patients with high risk of repeated surgery. 22 patients with solitary metastasis in the neck (16 women, mean age 61 years ; range 26-81 years) were treated. All treated lymph nodes were previously citologically confirmed as malignant by ultrasound guided fine needle aspiration biopsy (US-FNAB) and by presence of thyroglobulin in the aspirate. All of patients have undergone total thyroidectomy and most of them had been operated several times because of recurrent disease. Ethanol was injected directly into each node and the volume of ethanol used in treated nodes depends on their size. All treated patients were periodically followed by Color Doppler ultrasound.

RESULT: In the majority of patients, after one or more treatments, a significant reduction of nodal size as well as decrease of thyroglobulin level were noticed (nine nodes showed 80 % reduction in size). There were statistical differences in size between nodes before and after therapeutic sclerosis (in terms of longitudinal and anteroposterior diameter as well as in volume of treated nodes). Two nodes were completely disappeared. In four patients with a more widespread disease and metastases in the lungs and bones satisfactory results were not achieved. No serious adverse events were related to percutaneous ethanol administration. Some of patients experienced mild local pain at the site of injection. One patient developed temporary dysphonia.

CONCLUSION: The PEIT is a safe, alternative treatment modality that can be helpful in reducing disease progression in selected group of patients with recurrent thyroid cancer neck metastases. Surgery is always a choice if disease progresses..

11

NEOADJUVANT CHEMOTHERAPY IN PATIENTS WITH LOCALLY ADVANCED FOLLICULAR OR HUERTHLE CELL THYROID CARCINOMA

Besic N, Auersperg M, Gazic B, Dremelj M, Žagar I
Institute of Oncology Ljubljana, Slovenia

METHODS: The study included 29 patients with follicular thyroid carcinoma (FTC) or Hürthle cell carcinoma (HCTC) who had T3 or T4 tumor and were treated with neoadjuvant chemotherapy (ChT) from 1979 to 2004. A mean tumor diameter was 9.3 cm. Extrathyroid growth of tumor was present in 15 patients. Regional and distant metastases were detected in 6 and 12 patients, respectively. With respect to the site of metastatic spread, the lung was involved in eight patients and the skeleton in five. ChT consisted of vinblastine in 19 cases, vinblastine with adriamycin in 5 cases, or other ChT regimens in 5 cases.

RESULTS: Altogether, 67 cycles of ChT were given and tumor size decreased by >50% in 13 patients (=45%). ChT was effective in patients with FTC and HCTC in 47% and 43%, respectively. In the patients with and without distant metastases, the primary tumor size decreased by >50% in 17% and 65% (p=0.02), respectively. R0, R1, and R2 resection was performed in 15, 10 and 4 cases, respectively. Histopathology revealed that ChT (i.e., wide areas of tumor necrosis) was effective in seven patients (24%). The 5- and 10-year cause-specific survivals of the patients were 77% and 47%, while the 5- and 10-year disease – free intervals were 57% and 46%, respectively. Six patients are alive (median survival 162 months), four of them have no evidence of disease, six patients died of other causes (median survival: 101 months), while 17 patients died of FTC or HCTC (median survival: 72 months). Among them, 16 died of distant metastases, while only one succumbed to locoregional recurrence and distant metastases.

CONCLUSIONS: ChT before surgical procedure may be effective in order to decrease the tumor size in FTC or HCTC in 45% of patients.

12

AGE OF rhTSH AND MYTHS OF COST-BENEFITS

M. Medvedec
Department of Nuclear Medicine and Radiation Protection
University Hospital Centre Zagreb

The objective of this work was to reconsider common preparation of thyroid cancer patients for radioiodine ablation on the basis of simple cost-benefit estimations, despite the fact that there has been actually no evidence that either maximal absorbed dose rate or total absorbed dose per unit administered therapeutic activity of I-131 has clear benefits over the elevation of thyroid-stimulating hormone (TSH) concentration by either thyroid hormone withdrawal (THW) or injection of recombinant human thyroid-stimulating hormone (rhTSH).

In this work the national statistical and billing data were used, together with quantitative clinical data from our patients and from the literature.

The national incidence rate of thyroid cancer as a primary site has recently been about 11 and amongst the top 15 primary sites nationwide. The cost of rhTSH has been roughly twice the national average net pay per month, and the estimated duration of sick-leave is about ten days less in case of rhTSH-aided patient preparation. In most of the cases thyroid remnant ablation procedure at recommended TSH concentration level may be completed within three weeks following total thyroidectomy and/or THW.

It appears that high rates of thyroid remnant ablation and low recurrence rates are achievable in totally thyroidectomized patients without significantly compromising the patient's quality of life by prolonged hypothyroidism. These results should be achievable by single administration of moderate I-131 activity and by thyroid hormone supplementation started or restarted just a few weeks after surgery or THW. If the costs of rhTSH- vs. THW-aided radioiodine therapy in certain countries or certain patients are much higher, such an approach seems reasonable.

13

NEWLY DISCOVERED THYROID AUTOIMMUNITY IN PREGNANT WOMEN

T. Bogović Crnčić¹, I. Krištofić², N. Giroto¹, D. Kustić¹, I. Mrakovčić Šutić³, S. Grbac-Ivanković¹. ¹Clinical Dept. of Nuclear Medicine, ²Dept. of Obst. and Gynecol., Clinical Hospital Centre Rijeka; ³Faculty of Medicine, University of Rijeka.

The aim of our study was to screen the population of pregnant women for autoimmune thyroid disease. **Patients and methods:** The study included 185 pregnant women with no history of previous thyroid disease. The TSH, free thyroxine (FT4) and free triiodothyronine (FT3) levels in serum were measured, as well as auto-antibody titres against thyroid peroxidase (TPOAb) and thyroglobulin (TgAb). The control group consisted of 44 healthy, non pregnant women in reproductive age. The laboratory methods used were radioimmunoassay (RIA) and chemiluminescent method (ILMA). Pregnant women were divided in groups according to their hormone levels: normal pregnancy, euthyroid women with elevated antibody titres, subclinical/clinical hypothyroidism or hyperthyroidism. **Results:** Out of 185 pregnant women, 26 (16%) had elevated antibody titres and normal hormone levels. The mean TSH was 2.49 mIU/L in the first half and 2.3 mIU/L in the second half of pregnancy. The mean FT4 was 13.2 pmol/L in the first and 11.4 pmol/L in the second half, while mean FT3 level was 4.75 pmol/L in both periods of pregnancy. There was no statistically significant difference in the mean TSH, FT4 and FT3 levels in euthyroid women with elevated antibodies compared to healthy pregnant women. Sixteen out of 185 pregnant women, (8.6%) had subclinical/clinical hypothyroidism. Their mean TSH value was 7.84 mIU/L, mean FT4 level was 10.8 pmol/L while FT3 level was 4.9 pmol/L. Five out of all pregnant women, (2.7%) had subclinical /clinical hyperthyroidism. The mean TSH value was 0.004 mIU/L, FT4 20.25 pmol/L and FT3 6.41 pmol/L. **Conclusion:** Our results demonstrate the presence of thyroid autoimmunity in the population of pregnant women with no previous history of thyroid disease. Regarding the result of 11% of pregnant women with unexpected subclinical thyroid disorder and bearing in mind the influence of maternal thyroid disease on pregnancy outcome, the routine screening of all pregnant women or women planning pregnancy should be considered.

14

THE VALUE OF THYROGLOBULIN AS A BIOMARKER FOR IODINE DEFICIENCY

T. Jukić¹, R. Granić¹, M. Franceschi¹, D. Krilić¹, V. Jureša², M.B. Zimmermann³, Z. Kusić¹

¹Dpt. of Nuclear Medicine and Oncology „Sestre milosrdnice” U.H.C., Zagreb

²School of Public Health “Andrija Štampar”, Zagreb

³Laboratory for Human Nutrition, ETH Zürich, Switzerland

Background: Current methods for assessment of iodine intake of a population comprise measurements of urinary iodine concentration (UIC), thyroid volume by ultrasound (US-Tvol) and newborn TSH. Serum or dried blood spot thyroglobulin (DBS-Tg) is a new promising functional iodine status biomarker in children. **The aim** of the study was to assess iodine intake in schoolchildren in the region of Zagreb and evaluate the value of DBS-Tg in schoolchildren as a new biomarker for iodine deficiency (and/or excess) in relation to UIC. The investigation was part of a large international UNICEF study of 6-12y-old children. Median cut-off Tg <13 µg/L and/or <3% Tg values >40 µg/L indicates iodine sufficiency. **Patients and methods:** 159 schoolchildren (median age 9.1±1.4y) from Zagreb and Jastrebarsko were included with measurements of UIC, US-Tvol, DBS-Tg, T4, TSH and iodine content in salt from households of schoolchildren (KI/kg of salt). **Results:** Median UIC was 205µg/L (range 1-505µg/L). Thyroid volumes in schoolchildren measured by US were within the normal range according to reference values. Median DBS-Tg was 12.1µg/L with 3% of Tg values >40µg/L. High Tg values were in UIC range <50µg/L and UIC range >300µg/L (U-shaped curve of Tg plotted against UIC). All children were euthyroid with average TSH 0.7±0.3mU/L, and T4 62±12.5nmol/l. Average KI content per kg of salt was 25mg/kg (range 19-36mg/kg). **Conclusions:** Presented data indicate iodine sufficiency in schoolchildren from the region of Zagreb. Thyroglobulin is a sensitive indicator of both iodine deficiency and iodine excess in children. It complements the use of UIC to measure recent iodine intake and US-Tvol to assess long term response. Iodine content in salt from households was in compliance with Croatian law (20-30 mg KI/kg of salt).

15

THYROID FUNCTION BEFORE AND AFTER INCREASE IN MANDATORY SALT IODIZATION

S. Gabersček¹, N. Novak¹, K. Zaletel¹, E. Pimat¹, S. Hojker¹

¹Department of Nuclear Medicine, University Medical Centre Ljubljana, Slovenia

Aim. In 1999, Slovenia increased mandatory salt iodization from previous 10 mg to 25 mg of potassium iodide per kg of salt. Our aim was to establish thyroid function before and after increase in iodine supply.

Patients and methods. Retrospectively, we included 2889 individuals with healthy thyroid gland or with euthyroid Hashimoto's thyroiditis (EuHT) referred to our department between 1995-1998 and 1999-2002. Healthy subjects (HT) were negative and EuHT positive for thyroid peroxidase (TPO) and/or thyroglobulin (Tg) antibodies. In all, TSH, fT₄, and fT₃ were measured. We calculated the fT₄/fT₃ ratio.

Results. In HS as well as in EuHT, the fT₄/fT₃ ratio was lower in the period 1995-1998 than in the period 1999-2002 (p<0.001, p<0.001, respectively) on behalf of higher fT₃. In 1995-1998, the fT₄/fT₃ ratio was higher in HS than in EuHT (p<0.001). However, in 1999-2002, the fT₄/fT₃ ratio did not differ between HS and EuHT (p=0.206). A higher incidence of EuHT was established in 1999-2002 than in 1995-1998 (p<0.001). In the period 1999-2002, the portion of EuHT patients with increased solely TPO antibodies was lower, the portion of EuHT with increased levels of solely Tg antibodies was higher, and the portion of EuHT with increased levels of both types of antibodies was higher than in the period 1995-1998 (p<0.001, p<0.001, p=0.005, respectively).

Conclusions. After increase in mandatory salt iodization, the function of thyroid gland in HS as well as in EuHT changes, thyroid in EuHT differs less from the healthy thyroid, the incidence of EuHT is higher, and the incidence of TPO and Tg antibodies changes in favor of Tg antibodies.

16

PET IN PATIENTS WITH REFRACTORY TEMPORAL LOBE EPILEPSY - RELATIONSHIP BETWEEN BRAIN GLUCOSE METABOLISM AND DEPRESSION SYMPTOMS

Đivošević S¹, Hećimović H², Bedek D², Sajko T²;

¹Medikol PET/CT Centre Zagreb, ²University Hospital Centre "Sestre milosrdnice" Zagreb, Croatia

The aim of this study was to establish the relationship between regional brain glucose metabolism with the degree of depressive symptoms in examinees with refractory temporal lobe epilepsy.

73 examinees filled in the BDI questionnaire on the day of the ¹⁸F FDG brain PET and were divided into two groups, with BDI<15, without depressive symptoms, and BDI≥15, with pronounced symptoms. We have analyzed brain glucose metabolism and interconnection between PET, BDI, EEG and brain MRI. 30.1% of examinees had depressive symptoms. The highest frequency of reduced glucose metabolism was in temporal region. Patients with right-sided temporal glucose hypometabolism and right-sided hippocampal sclerosis had lower BDI score. High level of correspondence between PET, EEG and MRI was perceived, with pathological PET in 90,1% of examinees with normal MRI. Quantitatively we did not found any differences in glucose hypometabolism intensity or number of hypometabolic brain regions, with lateralising asymmetry in frontal, temporal, parietal and primary visual cortex. Examinees with depression have statistically significant lower values of brain glucose metabolism in the anterior and posterior medial temporal region, with right-left asymmetry and correlations between frontal and temporal regions, as opposed to those without depression. These parameters are different depending on diverse structural brain changes and localization of epileptogenic zone. Our results may contribute to early recognition of depression and timely choice of optimal treatment of persons with epilepsy.

17

DEMENTIA DETECTION USING PERFUSION BRAIN SPECT

 Samardžić T.¹, Petrović R.¹, Klepac N.², Borovečki F.²
¹University Hospital Zagreb, Clinical Department of Nuclear Medicine and Radiation Protection

²University Hospital Zagreb, Clinical Department of Neurology

AIM: Mild cognitive impairment (MCI) is a clinical syndrome consisting of a measurable or evident decline in memory or other cognitive abilities with little effect on daily living activities. The aim of this study was to evaluate early cerebral hypoperfusion changes on brain SPECT images in patients with different cognitive and memory symptoms indicating possible dementia. **MATERIAL AND METHODS:** In a period of few months we performed perfusion brain SPECT in a selected group of 45 patients with clinical diagnosis of MCI (mean age 67,36 y) after the administration of 1110 MBq of Tc99m ECD. Images were reconstructed and analyzed visually and semiquantitatively. All patients underwent mini-mental state examination (MMSE). **RESULTS:** The average MMSE score was 25,48. We found pathological deterioration in rCBF in all patients. The hypoperfusion patterns found in our patients were indicative to AD in 31.1%, and to frontotemporal dementia in 13.3% pts. In 15.6% pts the hypoperfusion pattern was typical for vascular dementia. In a group of 18 pts (40%) we found reduced CBF in different brain regions but the perfusion patterns were nonspecific for classification to any type of dementia. **CONCLUSION:** Perfusion brain SPECT is a useful imaging method for differential diagnosis of various dementia types. Our findings suggest that perfusion brain SPECT must be an usual neuroimaging method in the very early stage of cognitive impairment detection. Proper type of dementia recognition will lead to implementation of proper preventive strategies and treatment, because different dementia types require different therapeutic approach.

18

REGIONAL CEREBRAL BLOOD FLOW CHANGES IN PATIENTS WITH EATING DISORDERS

 R. Petrović¹, T. Samardžić¹, R. Gregurek², D. Marcinko³
¹Clinical Department of Nuclear Medicine and Radiation Protection, ²Clinic for Psychological Medicine, ³Psychiatry Clinic; Clinical Hospital Centre Zagreb, Zagreb, CROATIA

Aim: This study is part of a continuing effort to understand the pathophysiology of the brain in eating disorders and to correlate any abnormalities in blood flow with eating disorder psychopathology. **Method:** Ten newly referred patients with a diagnosis of bulimia nervosa and four with anorexia nervosa underwent regional cerebral blood flow (rCBF) examination using SPECT. Tomograms were normalized to the mean brain activity and analysed visually and semi quantitatively. **Results:** Detailed neurologic and laboratory examinations were within normal limits in all patients. Nevertheless, SPECT studies revealed that all anorexic and bulimic patients had asymmetry (hypoperfusion) of rCBF in at least one area. For all 14 patients rCBF changes were caused by hypoperfusion in the prefrontal and temporal areas which was more prominent in the left hemisphere. Regions of the brain showing hypoperfusion included the prefrontal cortex (n = 12), temporal lobe (n = 10) and in one case global hypoperfusion was observed. In five patients hypoperfusion was found exclusively in left hemisphere. Nine patients had two or more hypoperfused areas. Bulimic patients with two or more hypoperfused areas had higher EDE scale scores than those with single hypoperfused area, but the differences were not statistically significant. **Conclusions:** Compared with the normals, all patients with eating disorders were characterized by abnormal rCBF, predominantly affecting prefrontal cortex and the temporal lobes. Previous similar studies also found alterations of rCBF in different cortical regions, but it was not certain whether they were a cause or consequence of symptoms. Different factors might explain decreased rCBF in eating disorders. It might be the consequence of neurophysiological changes following nutritional deficiencies and/or the result of some associated symptoms such as anxiety or depression. We also hypothesize that either a pathological prefrontal and temporal cortex hypoperfusion in eating disorders reflects dysfunction in neuronal activity which is responsible for the disturbances in psychological processes it mediates.

19

FULLY AUTOMATED PREPARATION OF RADIOLABELED PEPTIDES IN SELF SHIELDED RADIOSYNTHESIS BOX

 M. Kroselj¹, A. Socan¹, T. Dreger², R. Knopp², P. Kolenc Peitl¹
¹University Medical Centre Ljubljana, Ljubljana, SLOVENIA,

²Eckert and Ziegler Eurotope GmbH, Berlin, GERMANY.

Aim Appropriate shielding is in the field of PET radiopharmaceuticals crucial both for preparation (synthesis) and application due to high energy of emitted gamma rays. Production of PET radiopharmaceuticals is limited to fully automated modules which stand in big and heavy shielded boxes. By using smaller and self shielded radiosynthesis boxes the lack of space can be overcome, thus can be fitted almost everywhere in hospital environment. With the introduction of new **Modular-Lab MicroCell**, shielding becomes an integral part of the synthesis system. All other moving parts are located outside the shielding and only the cassettes are placed inside the shielding area as fluid path. Here we describe a fully automated synthesis of ⁶⁸Ga, ¹⁷⁷Lu and ⁹⁰Y radiolabeled peptides in the self-shielded box. **Results** 40 µg of peptide (27,8 nmol) were successfully labeled with ⁶⁸Ga (300 MBq) with radiochemical purity >99%. Overall reaction yields ranged from 60% to 80%. Dose rates at surface were maximum 1,5 µSv/h and at 1m distance were normal background rates. ¹⁷⁷Lu-DOTATATE was synthesised reproducibly with radiochemical purity of > 99%. Dose rates at surface and 1m distance were normal background rates. ⁹⁰Y-DOTATATE was synthesised reproducibly with radiochemical purity of > 97%. Dose rates at surface were up to 1 µSv/h and at 1m distance were normal background rates.

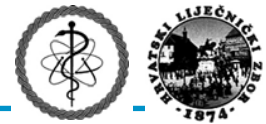
Conclusion A self-shielded radiosynthesis box is a unique solution for Nuclear Medicine departments which lack space for standard automated synthesis systems. Its main advantage is small size and low weight (app. 450kg). Newly designed single-use cassettes enable same range of synthesis as previously developed cassette systems. Results show reproducible ⁶⁸Ga, ¹⁷⁷Lu and ⁹⁰Y peptide radiolabeling. When box is placed in the controlled environment and with the use of sterile cassettes products are ready for human application. With adequate ⁶⁸Ge/⁶⁸Ga generator shielding, MicroCell provides sufficient shielding for both PET and β- radioisotopes.

20

EVALUATION OF CD34+ HPCs LABELED WITH ^{99m}Tc-HMPAO

 A. Socan¹, M. Sever¹, B. Vrtovec¹, P. Kolenc Peitl¹, M. Kroselj¹, L. Lezaic¹
¹University Medical Centre, Ljubljana, Slovenia

AIM: Several clinical studies showed the potential of the treatment with progenitor cells (PCs) when delivered to myocardium. Monitoring and evaluation of the therapy "in-vivo" is difficult and optimal method remains to be developed. The aim of our study was to label and evaluate influence of ^{99m}Tc-HMPAO labeling on CD34+ hematopoietic PCs (HPCs) during time period suitable for SPECT "in-vivo" monitoring of labeled cells myocardial homing. **MATERIALS:** Human HPCs were mobilized with G-CSF and collected by aphaeresis. CD34+ cells were enriched with an immunomagnetic separation device (MACS[®]). A fraction of the collected cells (25%), number was patient dependent (78 to 285 mio), was labeled with ^{99m}Tc-HMPAO, incubated for 20 min at room temperature, unbound radioactivity was removed by washing the cells with cell free media. Cell viability was assessed by Trypan Blue exclusion assay at different time points before and after labeling. CFC Assay (MethoCult[®]) of labeled and unlabeled HPCs was performed. Labeling stability of HPCs was assessed 150 min after cell labeling. Labeled cells (48-343 MBq) were injected through a micro catheter during coronarographic procedure together with unlabeled HPCs. SPECT images were obtained 2 and 18 hours after HPC injection. **RESULTS:** Viability of HPCs before and immediately after the labeling was 91,3±4,7% and 90,6±5,1%, whereas viabilities 150 min and 18 hours after labeling were 95,8±3,4% and 84±16,7% for unlabeled HPCs and 92,7±6,8% and 83,4±12,5% for labeled ones. CFC Assay results of labeled compared to unlabeled HPCs showed unchanged proliferation. Labeling stability of HPCs 150 min after cell labeling was 75±11,2%. SPECT images obtained 2 and 18 hours after HPCs injection enabled evaluation of the arrangement and percentage of transplanted HPCs accumulated in the heart muscle. **CONCLUSIONS:** Labeling procedure of HPCs with ^{99m}Tc-HMPAO is feasible resulting in high cell viability, unchanged proliferative ability and high labeling stability. It enables imaging with SPECT, which proves to be a suitable non-invasive method for "in-vivo" monitoring of cell trafficking with good spatial resolution.



21

ACTIVITY QUANTIFICATION OF ¹³³Ba SOURCES IN WATER PHANTOM

D. Grošev¹, S. Lončarić¹, D. Huić¹, M. Medvedec¹

¹Department of Nuclear Medicine and Radiation Protection, University Hospital Center, Zagreb, CROATIA.

Quantitative information about spatial and temporal distribution of radioisotope in nuclear medicine procedures is important for dosimetric studies. ¹³³Ba is suitable isotope ($E_{\gamma}=356$ keV, $T_{1/2}=10.5$ y) for simulation of ¹³¹I ($E_{\gamma}=364$ keV, $T_{1/2}=8$ d) imaging in radioiodine and radionuclide therapy. We imaged 4 cylindrical ¹³³Ba sources in a cylindrical water phantom. Activity of each source was < 1.5 MBq. The sources were produced at the *National Institute of Standards and Technology* (NIST, USA). Planar and SPECT measurements were done on a dual head gamma camera. Triple-energy window (TEW) acquisition was performed for scatter correction. In planar measurements, transmission flood source (⁵⁷Co) was used for attenuation correction (AC). In SPECT imaging, CT-based AC was applied. From measurements in air of calibration source the sensitivity factor was obtained in cps/MBq. Three consecutive acquisitions were performed in order to evaluate the reproducibility of the measurements. The results of activity measurements for the calibration source, $A_0=0.91$ MBq, showed that $A_{\text{planar}}=0.73\pm 0.03$ MBq; $A_{\text{SPECT}}=0.92\pm 0.01$ MBq. SPECT measurements with CT-based AC produced result accurate within 2%, while planar measurements underestimated activity by 20%. Therefore SPECT/CT imaging should be used for accurate dosimetry.

Acknowledgement: This work is a part of the collaboration with the International Atomic Energy Agency (IAEA, Vienna) under the Coordinated Research Project E2.10.07.

23

V/P SPECT IN DETECTION OF OTHER CARDIOPULMONARY DISEASES

Amela Begić¹, Emina Opanković¹, Sadzida Begović-Hadzimiratović¹, Amila Bašić¹, Šejla Cerić¹, Amra Skopljak – Beganović¹, Amra Hadžiredžepović², Elma Kučkalić-Selimović¹ and Marika Bajc³

¹Clinic for Nuclear medicine, University Clinical Centre Sarajevo, Bosnia and Herzegovina, ²Clinic for Pulmology, University Clinical Centre Sarajevo, Bosnia and Herzegovina, ³Department of Clinical Physiology, Lund University and Skåne University Hospital, Lund, Sweden

Ventilation/perfusion tomography (V/P SPECT) is a method of choice for diagnosis of pulmonary embolism (PE) and for follow up according the European Nuclear Medicine Guidelines. Symptoms of PE are often nonspecific and are often similar to other pulmonary diseases which makes clinical diagnosis difficult. It is known that V/P SPECT allows diagnosis of other cardiopulmonary diseases such as pneumonia, chronic obstructive pulmonary disease (COPD), left heart failure (LHF) and tumour.

The objective of this study was to determine the frequency of other pathological changes in patients with suspected PE identified by V/P SPECT.

Material and method: 331 patients with clinically suspected PE were examined with V/P SPECT. Patients were classified according V/P SPECT pattern. Pathological finding which were not PE, were grouped as other pathology. This group of patients were followed up clinically and by other laboratory tests. **Results:** Among 331 patients suspected for PE, V/P SPECT identified 80 (24, 2%) to have PE. Normal V/P SPECT pattern was found in 82 patients (24, 8%). V/P SPECT revealed other pathology in 169 patients (51%). Pattern typical for pneumonia were reported in 92 (54,4%) patients. Pathological finding typical for COPD were found in 46 patients (27%). Scintigraphic patterns typical for LHF were reported in 14 (8,3%). In 17 patients (10%), scintigraphic finding was suspected for tumour. The clinical finding together with other laboratory findings confirmed pneumonia in 85/92 patients (92%). In other 7/92 patients (8%), final diagnosis was chronic inflammatory changes. COPD was diagnosed in all 46 patients. LHF diagnosis was established in 9/14 patients (64%). Three patients were classified as having chronic cardiopulmonary disease. For other 2 patients diagnosis were not documented in clinical records. Definitive diagnosis of the tumour was found in 7/17 (41%) patients. For other 10 patients, final diagnosis was sarcoidosis in 1 patient, 3 patients had empyema, 2 patients moved from Sarajevo, and 4 patients were not confirmed (refused any further diagnostic).

Conclusion: This study shows high prevalence of other cardiopulmonary diseases among patients suspected with PE that might be identified with V/P SPECT.

22

YTTIRUM90 MICROSPHERES IN THE TREATMENT OF PRIMARY & METASTATIC LIVER TUMORS: INDIAN EXPERIENCE

RV Parameswaran¹, Ravi Gadahadh², Mary Joseph¹

¹Dept of Nuclear Medicine, ²Interventional Radiology, Manipal Hospital, Bangalore, India

Introduction: The liver is a predominant site of metastasis from a wide variety of neoplasms like Colon/pancreas and is also at risk for the development of primary liver cancer, namely, hepatocellular and cholangiocellular carcinoma. Selective Internal Radiation Therapy (SIRT) also known as Radioembolisation is a catheter-based liver directed modality for primary and metastatic liver tumors and the chief rationale of treatment being the dual blood supply of liver (hepatic artery & portal vein). **Materials & Methods:** Patients with primary & Metastatic liver tumors who are not candidates for surgery/TACE/RFA and those with portal vein thrombosis were subjected to this technique of SIRT. A total of 205 SIRT procedures have been performed in India since 2009 in a total of 10 hospitals with an average of 5 procedures per month. Most of the indications have been on inoperable Hepatocellular carcinomas with portal vein Thrombosis with the remaining few on metastatic liver tumor from primary colorectal tumor. All patients underwent initial hepatic angiogram and lung shunting scan with ^{99m}Tc-MAA. If the % of lung shunting was less than 20%, they were deemed fit for the main procedure and dose calculation was done based on body surface area. All the patients also underwent ⁹⁰Y PETCT scan the next day after the Radioembolisation. More than 30% of patients had initial side effects of embolization. Total of 8 patients had features of radiation induced liver disease. 27 patients though showed reduction in the tumor size and enhancement on follow-up scans, showed progression of the underlying cirrhotic liver disease. The average disease free survival period was about 9-11 months.

Conclusion: SIRT is a powerful tool to achieve regional tumor response and disease control in hepatic malignancy & hepatic metastases from CRC. Large prospective trials still warranted as a combination with new agents like Sorefenib and with PRRT in neuroendocrine tumors

24

VALUE OF COMBINED USE of Tc99m MIBI SPECT/ CT SCINTIGRAPHY and ULTRASONOGRAPHY in THE DETECTION OF PARATHYROID LESIONS

Gladić Nenadić V, Petranović Ovcariček P, Šiško Markoš I, Franceschi M, Kovačić K, Kusić Z. Department of Oncology and Nuclear Medicine, University Hospital Center Sestre Milosrdnice, Zagreb, Croatia

OBJECTIVE: To evaluate the usefulness of Tc99m sestamibi (Tc-MIBI) SPECT/CT scintigraphy and neck ultrasonography (US) with fine-needle aspiration cytology (FNAC) and parathormon (PTH) determination in aspirate (FNA-PTH) in detection of pathologically changed parathyroid glands. **METHODS:** Data from patients who underwent parathyroid scintigraphy with Tc-MIBI and neck US from 2006 to 2013 were retrospectively analyzed. Results were expressed as positive, equivocal and negative for detection of pathologically changed glands.

RESULTS: A group of 91 patients was evaluated. Mean age was 52 years and female/male ratio was 12:1. Tc-MIBI scintigraphy was positive in 67 patients (74%), negative in 9 (10%) and equivocal in 15 (16%). However, US with FNAC and FNA-PTH was positive in 53 (58%) patients and negative in 38 (42%) patients. From 67 Tc-MIBI scintigraphy positive patients, 47 (70%) were US, FNAC and FNA-PTH positive and 20 (30%) were negative (11 goiter, 4 lymph nodes, 4 Hashimoto thyroiditis, 1 nondiagnostic material). From 15 (22%) scintigraphy equivocal patients, 7 (46%) were US, FNAC and FNA-PTH positive and 8 (54%) were negative (4 goiters, 1 Hashimoto thyroiditis, 3 nondiagnostic material). From 9 Tc-MIBI scan negative patients, 1 (11%) was positive with the other method and 8 (89%) remains negative.

CONCLUSIONS: Our study shows high number of false positive results of Tc-MIBI scintigraphy due to patients with concomitant thyroid disease. In area with high prevalence of thyroid disease combined use of neck US and Tc-MIBI scintigraphy should be considered in patients with hyperparathyroidism.