



FROM VISION TO DECISION

## SEMINAR FRIDAY 12.04.2013

**PLACE:** 'Biblioteket' H-112 Radiology Department, HUH, 1<sup>st</sup> floor

**TIME** : 12:00-13:00

### SPEAKER/TITLE:

**1. Assoc. Professor Martin Biermann, PET-Centre HUH**

*Multimodal imaging for recurrent thyroid cancer: ultrasound, FDG-PET, contrast-enhanced CT and ultrasound-guided fine needle biopsy*

**2. Professor, Senior consultant Endocrine Surgeon Michael Brauckhoff, Surgical Clinic, HUH and Dept. of Surgical Sciences, UiB :**

*Modern imaging diagnostics in endocrine surgery: What the endocrine surgeon expects*

**3. Professor Stefan Bruckner, Department of Informatics, UiB**

3D Visualization of Multimodal Volume Data

### ABSTRACT

#### 1. Martin Biermann

#### **Multimodal imaging for recurrent thyroid cancer: ultrasound, FDG-PET, contrast-enhanced CT and ultrasound-guided fine needle biopsy (FNB)**

To compare the clinical utility of multimodal imaging (MMI) for suspected recurrence of differentiated thyroid cancer (DTC), we examined 51 consecutive patients from 6/2009 to 1/2012 according to the following protocol: (1) Ultrasound before MMI, if necessary including FNB, (2) iodine-131 (3 – 5.6 GBq) whole body scintigraphy incl. tomographic imaging of the neck (SPECT-CT), (3) positron emission tomography (PET) with F-18-fluorodesoxyglucose (FDG) with coregistered contrast-enhanced computed tomography (CE-CT) of the neck, (4) ultrasound after PET-CT including FNB of one index lesion if not already performed.

51 patients were studied (age 57 +/- 15 yrs., 57 % female, 80 % papillary TC). MMI was true positive in 32 patients, true negative in 16, false positive in 2 and false negative in 1. In the neck and mediastinum, MMI revealed a total of 43 malignant lesions in 24 patients: 6 local recurrences, 35 malignant lymph nodes and 2 other malignant lesions including 1 neuroendocrine tumour.

83 % of malignant lesions had FDG uptake and 11 % had iodine uptake. 20 prominent lesions in the head and mediastinum were benign. Of these, 25 % were FDG-positive and 10 % were iodine-positive. 13 patients had distant metastases (lung in 9, bone in 3, adrenal in 1).

MMI changed the pre-PET treatment assignment in 14 out of 32 patients with true positive imaging studies: from follow-up to active treatment of previously unknown lesions in 10 patients (7 surgery, 1 endotracheal laser ablation, 1 external beam radiotherapy, 1 radioiodine therapy), from surgery of a known index lesion to more extended surgery involving other surgical compartments in 3, from surgery to conservative therapy in 1. The remaining 18 patients received the intended treatment: surgery as planned in 10, RIT in 3, and follow-up in 5. Thus MMI correctly changed therapy assignment in 14 out of 51 patients (27 %).

Compared with conventional staging based on pre-PET ultrasound, MMI changed therapy assignment in 14 out of 51 patients (27 %). MMI including PET-CT and CE-CT of the neck has therefore become standard in our institution in all patients with suspected recurrence of thyroid cancer before repeat surgery.



## 2. Michael Brauckhoff

### Modern imaging diagnostics in endocrine surgery:

#### What the endocrine surgeon expects

Modern endocrine surgery (surgery of the thyroid, the parathyroids, the adrenals, and the neuroendocrine neoplasias (NEN) of the gastrointestinal system) is focused on minimal-invasive procedures and targeted surgery.

In contrast to "classic" endocrine surgery of the 20<sup>th</sup> century, the indication is not longer based on biochemical diagnosis only followed by surgical exploration. Modern endocrine surgery depends in a high degree on preoperative imaging as one of the main prerequisites for limited approaches.

In thyroid surgery, ultrasound and ultrasound-guided fine needle biopsy are still the gold standard whereas thyroid scintigraphy is now of limited value for surgical decision making. Elastography is a new and promising technology which perhaps may reduce the number of required biopsies. In thyroid cancer, CT, MRI, and PET-CT represent the standard imaging approach. In parathyroid surgery, high resolution ultrasound and MIBI-SPECT/CT have revolutionized the approach in primary hyperparathyroidism. In selected cases, usually recurrent disease, selective hormone analysis by angiography or C-11-methionine-PET may be indicated. Radioguided surgery may improve identification of atypical localized parathyroid glands. In adrenal surgery, PET using different tracers (in addition to CT and MRI) has an increasing impact while MIBG scintigraphy is still imported for planning therapy for pheochromocytoma. For NEN, PET has become a strong tool for localization of lesions as well as outcome prediction (strong correlation with proliferation index Ki-67).

Besides accurate detection of tumor lesions, endocrine surgery needs information concerning anatomical situations and variants including 3D imaging and the fusion of morphological and functional information. Finally, high quality endocrine surgery requires a close cooperation between surgeon and radiologist, and nuclear physician.

## 3. Stefan Bruckner

The combination of volume data acquired by multiple modalities has been recognized as an important but challenging task. Modalities differ in the structures they can delineate and their joint information can be used to extend the classification space. However, they frequently exhibit different types of artifacts which makes the process of exploiting the additional information non-trivial. This talk will present current approaches and challenges in the visualization of multimodal volume data. In particular, it will focus on how information-theoretic measures can give us insight into the relative similarities and differences between individual modalities and how such measures can be exploited to improve depiction and feature identification.

