

# **Die Verbesserung der diagnostischen Stereotaxie durch Einbindung von 3D-MR (T1, T2), MR-Spektroskopie und Perfusions-MR-Tomographie**

## **Improving diagnostic stereotaxy : coupling 3D-MR (T1, T2), MR- spectroscopy and perfusion-MR**

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### **Introduction**

The treatment of newly discovered intracranial lesions generates debates about appropriate diagnostic and therapeutic options. Computer supported fusion of different image modalities, high precise definition of entry and target coordinates as well as the ability of a display to provide the surgeon a choice among options based upon both patient's and the tool's coordinate systems make the stereotactic procedure to a safe and high precise instrument. The aim of this study was to determine the efficiency and the results of image supported brain biopsies in seven cases using T1w-, T2w-MR, MR-spectroscopy and perfusion-MR as a routine procedure and to determine the value of MR-based findings to influence the surgical decision.

### **Material and methods**

Seven patients (four female, three male; 47,3 years mean age) with an intracerebral tumor lesion were evaluated. In all cases the acquisition of routine image series (T1w-, T2w-MR, nativ and with contrast media) was associated with the visualization of diffuse lesioned brain changes without detecting representative tumor foci. Additional image modalities were used to analyse tumor regions with pathological perfusion (perfusion-MR) as well as metabolite ratios (MR-spectroscopy) of the brain for further definition of biopsy targets

and neuropathological analysis. Prior stereotaxy MR-spectroscopy for evaluation of ratios of N-acetylaspartate to creatine (NAA/Cr) and/or choline to Cr (Cho/Cr) as well as MR to evaluate perfusion abnormalities were realized. For planning and stereotaxic procedure image acquisition in the MRI (Magnetom "Vision", Siemens, Germany, 1.5 Tesla) was performed in the following way: stereotaxic head ring was mounted to the skull (Zamorano-Dujovny, ZD, Leibinger, Germany) in local anesthesia. Contrast media was given in a standard dose just before image acquisition to improve detail informations (passing vessels) as well as to describe the extension of the suspect lesion.

Image slices with one millimetre thickness with no intervall between guaranteed a high level of accuracy. A total of 250 T1w 3-D-images per patient was used (FOV: 25 cm, matrix: 200 x 256, repetition time: 11.4 msec) for data processing. Image fusion using RSPS (Remote Surgical Planning Software, Stryker Leibinger, Germany) workstation was done slice by slice as follow: MR and MR-spectroscopy (three patients), MR and perfusion-MR (one patient), MR, MR-spectroscopy and perfusion-MR (three patients). A serial biopsy, beginning 7 mm away from the tumor lesions periphery and ending in the centre of the lesion was done after definition of target and entry coordinates using a side cut Sedan aspiration cannula (Ø 2,5 mm outer diameter). Approximately 5-9 tissue samples were obtained. Control MRI was performed routinely on the next days.

## Results

Six biopsy manoeuvres yielded diagnostic tissue and were classified: astrocytoma (WHO II) in two patients and one case each of oligoastrocytoma (WHO II), CNS-Lymphoma, anaplastic glioma and toxoplasmosis. Despite the multimodality no neuropathological diagnosis could be verified in one case.

## Discussion

The computerized stereotactic surgery basing on preoperative acquisition of different image modalities convinced in the majority of cases in the hands of an experienced radiologist and neurosurgeon. Despite of the time and cost consuming procedure, image supported stereotactic neurosurgery implicates the possibility to localize the intracranial pathological changes, to define the target and entry coordinates. It is our conclusion that image guided surgery allows a precise localization of the tumor lesion and an exact preoperative planning of tumor resection and stereotactic biopsy. Integration of MR-spectroscopy and perfusion-MR are useful tools to increase the reliability and precision in stereotaxic procedures.