extended outside the lateral wall of the cavernous sinus. In 11 patients, the gasserian ganglion was unidentified on the homolateral site of the intracavernous meningioma and tumor extended along the free edge of the tentorium cerebelli.
Conclusions: In conclusion, MRI is the first imaging modality for studying parasellar masses, including intracavernous meningiomas and for showing their full extent.

10.50 AM

***1123*** **The use of image analysis in monitoring the progression of the cerebral atrophy changes in children infected with the HIV virus**
N. Roberts, M. W. Bourne, G. H. Whitehouse; Liverpool

Children infected with HIV develop a progressive encephalopathy in 30–50% of cases. This manifests as loss of developmental milestones, impaired brain growth and progressive motor dysfunction. On MRI this is seen as marked diffuse cerebral atrophy with sulcal and ventricular dilatation. A reduction in these changes has been demonstrated after treatment with anti-viral agents. The progression of cortical and deep atrophy changes as shown by MRI correlates well with the progression of neurological dysfunction. Using maximum likelihood image classification techniques, training areas comprising of fewer than 1% of the field of view have been applied to multiple echo (i.e. TE 30 and TE 80 msecs.) images of a 5 mm thick axial slice at the level of maximum ventricular cross section. This technique divides the pixels in the field of view into two classes; i.e. brain tissue and CSF. Additional image analysis techniques, using a line detection algorithm and binary morphological operations are used to determine the inner boundary of the skull, and pixels outside of this boundary are excluded from the analysis which follows. The ratio of internal to external CSF space, and the ratio of CSF space to brain substance at the level of the image are determined and changes in these ratios, between examinations at 6 monthly intervals over a period of two years have been monitored. The degree of atrophy measured by this method is correlated with the neurological complications and antiviral treatment.

11.00 AM

***1124*** **Optimization of MR sequences: when fast scans should be used?**
F. di Salle, S. Cirillo, R. Morrone, F. Golia, M. Menditto, R. Elefante, F. Smaltino; Napoli

The Authors examine limits and advantages of Fast imaging MR sequences, in comparison with Spin-Echo images, and they try to point out when a fast sequence cold be useful to the diagnostic evaluation of the main brain pathologies.
A careful "in vitro" experience has been carried on test objects with well-known relaxometric characteristics, utilizing both Fast sequences and Spin-Echo sequences. Spin-Echo signal intensity had a good correlation with T1 and T2 values of test tubes; data obtained by echo-gradient did not show a similar linear correlation with relaxation parameters.
This non-linear correlation between signal intensity and relaxation parameters in fast imaging could limit the clinical usefulness of echo-gradient sequences. On the other hand the high sensibility to magnetic field dishomogeneity of echo-gradient scans can be useful when it is expected to find out any pathology (i.e. angiomas, haemorrhage) stirring up a local magnetic dishomogeneity.
Spin-Echo and Gradient-Echo diagnostic effectiveness is thus compared in the main brain pathologies to assess the role the latter can have in the diagnostic algorithm.
Further useful application of fast sequences are considered such as the study of vascular pathology by flow selective fast images.

11.10 AM

***1125*** **A comparison of single voxel versus CSI techniques for localized $^1$H MRS of the human brain**
R. Sauter, M. Schneider, K. Wicklow, H. Kolem; Erlangen

Single voxel techniques based on the stimulated echo (STEAM) or second spin echo (SE) provide a high degree of localization and spectral resolution. Chemical shift imaging (CSI) techniques offer the possibility of spatial mapping of metabolites. It has been the purpose of this study to evaluate the performance of CSI and single voxel techniques with respect to localization, sensitivity and spectral resolution.
Experiments on phantoms and volunteers have been carried out on a 1.5 T whole-body MR scanner (SIEMENS Magnetom) using the standard circularly polarized head coil. The STEAM-, SE- and CSI-localization techniques have been implemented and compared for the echo times TE = 270 ms, 135 ms and 40 ms. The typical spatial resolution was 8 ml. For the CSI experiments a large VOI (typically 80 × 80 × 20 mm$^3$) was preselected with the SE-technique to avoid contamination from subcutaneous fat.
Results of phantom and volunteer measurements show similar sensitivity for CSI and single voxel techniques when echo times of 270 ms or 135 ms are used. The SE-technique shows the expected twofold improvement in SNR when compared to the STEAM-technique. For TE = 40 ms, single voxel techniques are superior in sensitivity and spectral resolution, while the CSI spectra are affected by residual eddy currents. Furthermore, CSI spectra show decreased spectral resolution in locations near strong susceptibility changes (frontal sinus, auditory canal). Single voxel techniques show a clear superiority with respect to the delineation of the VOI.
We conclude that CSI techniques are especially useful for follow up studies in cerebral infarction and therapy, where the spatial distribution of lactate, cholines, creatine and NAA is of primary interest. Providing optimal delineation of the VOI and access to a larger number of cerebral metabolites short TE single voxel techniques will be preferred for biochemical studies.

11.20 AM

***1126*** **Localized 1H MR-spectroscopy in acute stroke**
S. Felber, F. Aichner, G. Birbamer, F. Gerstenbrand; Innsbruck

Initial applications of 1H MR-Spectroscopy (MRS) have shown potential to observe ischemic metabolism in-vivo. This study was initiated to assess the impact of 1H MRS into the routine diagnosis of acute stroke.
MRS was performed not later than 8 hours after ischemic stroke in 10 patients. Spectra of 8 volunteers and 8 chronic infarctions served as base-line. All exams were performed on a 1.5 T system (Siemens, FRG). The protocol consisted of T1 and T2 weighted sequences followed by shimming on the volume of interest (VOI) and a 3-12 min acquisition of localized spectra using a stimulated echo sequence (STEAM, TR: 1500 ms, TE: 270 ms, NEX: 128-512).
All spectra had sufficient signal/noise and resolution for evaluation. The weighted images were mandatory to target MRS in acute ischemia. Lactate was present in acute infarctions, reflecting anaerobic glycolysis, up to 2 weeks in follow-up. N-acetyl-aspartate (NAA) as indicator of viable neurons, decreased according to size and duration of ischemia. Cholines and Creatine/phosphor creatine maintained volunteer levels in the acute phase.
1H MRS can routinely extent diagnostic information from morphology in biochemistry and holds promise to monitor pharmacologic effects for improved managment of stroke in future.

11.30 AM

***1127*** **Localized brain proton MR spectroscopy of chronic MS patients**
P. Van Hecke, K. Johannik, C. Van Ongeval, S. Verellén, P. Demaerel, G. Marchal, G. Wilms, H. Carton, A. L. Baert; Leuven

Purpose: To investigate the origin of the altered N-acetyl-aspartate (NAA) / phosphocreatine + creatine (PCr + Cr) and choline (Cho) peak intensities in brain localized proton spectroscopy of chronic MS patients.
Methods: N-acetyl-aspartate, creatine and choline peak intensities were measured at 1.5 T in 22 chronic MS patients and 17 healthy volunteers, using the STEAM localized proton spectroscopy method. Possible changes in metabolite T1 and T2 relaxation times were investigated using different values of TR and TE.
Results: The ratios NAA/Cho and NAA/Cr were significantly smaller (NAA/Cho = 0.79) in the MS than in the normals ($p < 0.001$); the ratio of Cho/Cr was not significantly altered ($p > 0.5$). Spectra did not reveal meaningful lactate or lipid peaks. No significant difference was found between the relaxation times T1 and T2 of the MS ($n = 5$) and of the control group ($n = 6$) ($p > 0.5$).
Conclusions: The decrease in the metabolite ratios NAA/Cho and NAA/Cr is not a relaxation effect but is the result of metabolite concentration changes. Since the ratios NAA/Cho and NAA/Cr are reduced by the same factor and the ratio Cr/Cho is unchanged, the reduced ratio is attributed to a decrease in NAA concentration in the plaque containing tissue of chronic MS patients.

11.40 AM

***1128*** **$^1$H magnetic resonance spectroscopic imaging of the human brain**
P. R. Luyten, J. A. den Hollander, J. Bunke; Hamburg

Purpose: To observe noninvasively the spatial distribution of metabolites in the human brain.
Methods: All measurements were performed on a regular 1.5 T whole-body MR imager. Water suppression was achieved by a selective adiabatic inversion pulse at the water frequency. For spectroscopic imaging a combination of spatially selective excitation and phase encoding in two orthogonal directions was implemented. Threedimensional volume selection was used to obtain slice selection and suppression of the very intense lipid signals originating from subcutaneous fat and bone marrow. Whole Hahn echoes were acquired using a 90°–180°–180° sequence. Slice widths of 1.5 to 2.5 cm and 32×32 phase encoding steps over a field of view of 22.5 cm yielded nominal voxel sizes of about 1 cc. Metabolite images were reconstructed by calculating spectral integrals for the resonances of interest and representing these values in grey-scale.
Results: The implemented technique allowed the acquisition of 1024 spectra over a large region of the human brain in a single measurement. Met

# ECR '91

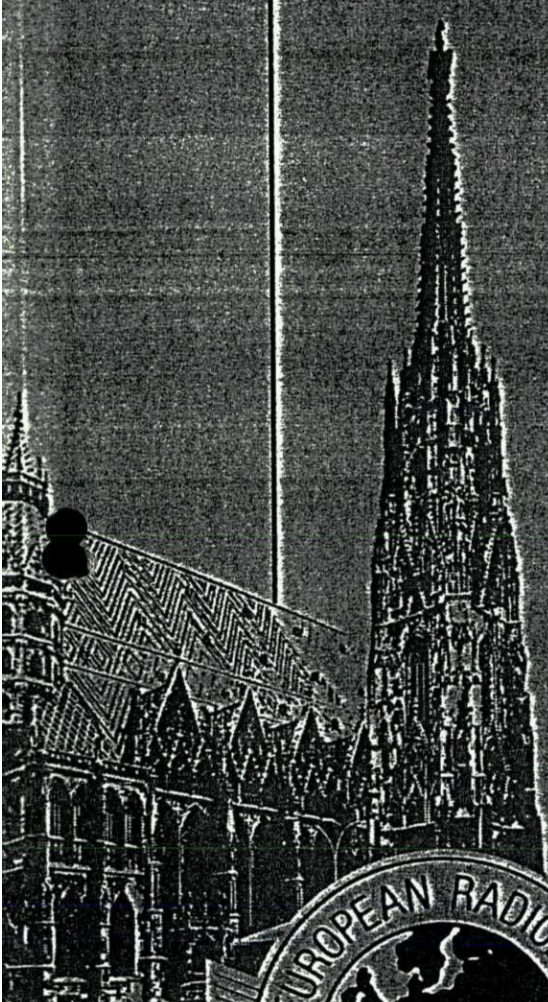
## European Congress of Radiology

# Scientific Programme

## and Abstracts

Supplement to
European Radiology
Vol. 1

**Vienna, Austria**
**September 15-20, 1991**



Springer International