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Measurement of in vivo 31P-NMR in glioma for the evaluation of the effects of chemotherapy

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The effects of chemotherapy on living tumor in mouse were investigated by measuring the 31P-NMR using a wide bore NMR spectrometer(7T). The anti-tumor effect of ACNU,5'-DFUR,and combined therapy against experimental glioma cells was examined in vivo. The inhibition rate of 203GL cells transplanted subcutaneously into mouse(n=5)was 52.3% in weight after treatment with 5'DFUR,400mg/kg/day for 10 consective days. Flowcytometric (FCM)analysis in vivo 203GL cells showed an accumulation in the cells between the 2C and 4C components after treatment of 5'-DFUR. A delay in DNA synthesis occured in the presence of this drug . Regardless of tumor origin,the NMR spectral pattern was found to be the same(PCr hardly decreased,Pi increased,and the tissue pH declined.). After injection of drug,ATP decreased and Pi increased gradually. But there were no observable changes in normal organs (n=8). We studied the evaluation of the chemotherapy,ACNU(20mg/kg or 40mg/kg),5'-DFUR,ACNU+ tegafur by 31P-NMR and examined the combined therapy in comparison with FCM analysis. In vivo 31P-NMR spectroscopy can detect the subtle change of the effects of chemotherapy and investigate earlier diagnosis more than conventional methods.

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MR IMAGES OF SEVERAL BONE DISEASES WITH INTERESTING BONE SCINTIGRAPHIC PATTERNS.

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Although bone scintigraphy is a sensitive method for detection of early stage of osseous disease by reflecting the degree of new bone formation, the image is lacking in the information of bone marrow metabolism. Therefore no specific scintgraphic patterns may sometimes be obtained in general bone diseases such as myelofibrosis and skeletal metastasis. MR images can, however, give us the knowledge of bone marrow activity rather than mineral metabolism according to the proton density of tissue water and fat.

We presented 2 cases of myefibrosis and 3 of metastatic bone disease all of which showed intersting bone scintigrphic patterns and their MR images were very useful. On MRI of myelofibrosis, bone marrow T_1 intensity was prolonged as long as that of muscle in contrast with nearly fat-equivalent intensity of normal bone marrow. In cases of bone metastases with apparently normal bone scintigraphic images, MRI showed mixed areas with long and short intensity on T_2 weighted image at location of skeletal disease. MRI considered to be a strong ancillary method for the appreciation of bone pathology when combined with bone scintigraphy.

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MAGNETIC RESONANCE IMAGING OF BRAIN TUMOR.

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MRI of brain tumor(50 cases)was compared with CT to evaluate the clinical usefulness. MRI was performed using a 0.15-T resistive magnet system(Hitachi G-10). The diagnosis of pituitary adenoma,especially microadenoma,was more efficiently established by MRI than CT. SE imaging of craniopharyngioma visualized the extent of the spread of the tumor more distinctly than CT. In patients with pontine glioma,IR images suggested a prolongation of T1 and MRI again visualized tumor more distinctly than CT. Since it is possible to obtain a sagittal plane of MRI in pinealoma,the entire scope of the tumor was visualized by MRI utilizing the sagittal plane more stereoscopically than CT. In meningioma,the tumor itself was more clearly demarcated from the surroundings by SE images than CT. In metastatic tumors,the edema surrounding the tumors which only indistinctly visualized by CT was clarified by SE imaging. MRI without interference artifact due to bone thus appeared to be useful in the diagnosis of pituitary or brainstem region surrounded by the bone. MRI also made it easy to define the extent of the edema surrounding the tumor.

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CLINICAL STUDY OF Na-23-NMR IMAGING.

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The availability of high field magnets and the unique property of sodium metabolism have brought much progress in Na-23-NMR imaging in last few years. The sensitibity of Na-23-NMR is next to that of protons in human body, nevertheless we have had difficulty in imaging of Na-23-NMR imaging, for the reason of short T2 relaxation time and low sensitibity of sodium, which is about one thousandth of that of proton. However, in recent years, machines and software of MRI had so developed that we realized the Na-23-NMR image of human brain and now we report about some experimental phantom study and several clinical studies of Na-23-NMR imaging. At first, we made ten phantoms of sodium chloride solution of different consistence, 0.1mmol/L, 0.2mmol/L, --- 1.0mmol/L. We used 1.5T machine (Magnetom) and we chose spin-echo pulse sequence TR:70-140msec and TE:13-30msec. We made ten images and we found that the signal intensity of phantom has proportional relationship to the consistence of sodium. And we applied this technique to clinical studies. In some cases the lesion of disease, such as astrocytoma, and the edeme was detected as the high signal intensity area likely, and we didn't eliminate them. In conclusion, we have succeed of making of Na-23-NMR image. And we found the lesion as high signal intensity area of Na-23-NMR, which reveals that the intense of sodium is high proportionally.