

## CLINICAL EVALUATION OF NMR-CT.

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Clinical evaluation of NMR-CT partic-  
ularly in diagnosing diseases of the  
central nervous system (CNS) and myocardi-  
um were examined.

NMR-CT were performed on the patients  
with CNS and myocardial diseases by  
Toshiba, Hitachi, and Shimazu experimental  
machines using 0.12 0.15 Tesla resistive  
magnet coils. Imaging method of the former  
two machines was the projection reconstruc-  
tion method and that of the last machine  
was the spin-warp method, a sort of the 2D  
Fourier transformation method.

Our imaging technics were spin echo and  
inversion recovery sequences. In the former,  
because of the short echo delay time,  
the signal intensities related with  
spin-lattice (T<sub>2</sub>) relaxation time were  
almost cancelled. In the latter recovery  
interval was determined 300-400 msec.  
ECG gated inversion recovery images at  
endosystolic and endodiastolic period  
were performed in myocardial examinations.  
NMR-CT images were compared with X-CT  
almost at the same time in CNS diseases,  
but with cardiovascular nuclear medicine  
study in myocardial diseases.

For our limited initial experiences  
with NMR-CT, we could not reach suffi-  
cient conclusions, but NMR-CT was useful  
in diagnosing CNS and myocardial diseases.

In CNS diseases there are mainly three  
advantages in NMR-CT.

First was its ability to depict optional  
plane images. Sagittal plane especially  
provided more precise anatomical infor-  
mations particularly about mid-line struc-  
tures. Second was T<sub>1</sub> calculating images,  
from which we could have any informations  
with regards to differential diagnoses or  
components of fluid of the lesions.  
In myocardial diseases ECG gated in-  
version recovery technic was useful,  
because cardiac muscle could be visualized  
clearly without using any contrast materi-  
als nor radioisotopes. In 8 patients we  
could measure the ejection fractions of  
the left ventricle on NMR images, and  
these results were satisfactory correla-  
tion with that of nuclear medicine study.  
In 8 patients motions of the left ven-  
tricle could be evaluated on NMR images.  
In the present state only axial tomography  
could be obtained by gated NMR-CT, therefor  
motion of inferior wall of the left ven-  
tricle could not be evaluated satisfac-  
torily. In the future these evaluations  
should be performed on the NMR-CT images  
parallel to true axis of the heart.

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Based on our clinical experiences of  
nuclear magnetic resonance imaging (NMR-CT)  
by Mark-J(1000 Gauss resistive magnet) we  
obtained the preliminary data base of in  
vivo spin-lattice relaxation time (T<sub>1</sub>) as  
shown in the following table. The main  
advantage of NMR-CT are as follows,  
1. Sagittal and frontal tomograms. 2. Discrimi-  
nation of vascular structure without con-  
trast enhancement. 3. Less bone artifacts  
compared with X-ray CT.  
The potential of NMR to differentiate among  
different pathologic entities remains to be  
fully elucidated.

Table T<sub>1</sub> data of N.I.R.S. NMR imaging system  
(0.1T)

Tissue and disease		T <sub>1</sub> (m sec)
Brain	white matter	285±17.6
	gray matter	377±15.4
	tumor	472±69.6
	edema	499±48.5
Thyroid gland	normal	275±18.2
	hyper thyroidism	319±15.5
Liver	normal	211±14.2
	tumor	432±22.4
Muscle	normal	286±24.5
Fat	normal	186±19.5
Spleen	normal	425±45.5
Kidney	parenchyma	466±29.6