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## APPLICATIONS OF ANTICARDIAC MYOSIN MONOCLONAL ANTIBODIES TO THE IMAGING OF ACUTE MYOCARDIAL INFARCTION.

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Since the extension of myocardial necrosis was revealed to be a principal determinant of prognosis in patients with acute myocardial infarction, attention has been extensively paid to assessing infarct size. The applications of radiopharmaceuticals to imaging of myocardial infarction has been intensively studied for this purpose. Recently, a specific method for imaging of myocardial infarction has been developed by using antibodies specific for cardiac myosin on the hypothesis that damaged myocardial cells due to ischemia, permit entrance of macromolecular proteins such as anti-cardiac myosin antibodies and their fixation to myosin molecules in the myofilament. Thus, if the antibodies are labelled with isotopes, radioactivity could be accumulated in the damaged myocardial tissue and hot spots of antibody uptake could be sharply delineated by scintigrams. In this study, we developed monoclonal anticardiac myosin heavy chain antibody, HMC 48 of which high affinity constant was  $1.8 \times 10^{-9}M$ , to produce high quality images of myocardial infarction. We examined imaging of myocardial infarction experimentally in the dog using HMC 48. Anterior myocardial infarction was produced by ligation of left anterior descending coronary artery. HMC 48 was labelled with  $^{131}I$  by chloramine-T

method and given intravenously (1 mg, 1 mCi). Specific localization of HMC 48 uptake was demonstrated in the infarcted area by gamma camera. In contrast to Tc-99m pyrophosphate images, no accumulation of radioactivity was observed in structures overlying the heart such as bone, cartilage and breast. Images of thyroid glands were observed but did not interfere the discrimination of images of the infarcted area. Single photon emission computed tomography revealed very specific and distinctive localization of radioactivity in mainly apical area extending to anterior wall. We also observed that the concentration of HMC 48 was much greater in the endocardial region, where myocardial blood flow was mostly diminished after coronary ligation, than in the epicardial region. These results suggested that the concentration of the antibody was increased with increasing severity of myocardial damage due to ischemia and showed an inverse relationship regional blood flow in the infarcted myocardium. Thus, imaging of myocardial infarction using labelled HMC 48 may provide an accurate and sensitive non-invasive method for the visualization of the infarcted myocardium.

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## ECG GATED NMR-CT.

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We have been applying ECG gated NMR-CT to mainly patients with myocardial infarction (MI), and hypertrophic cardiomyopathy (HCM). Thirteen patients with MI, eight patients with HCM and 5 patients without any heart diseases were studied by ECG gated NMR imaging (spin -echo technique, TR : depends on patient heart rate, TE: 35 and 70 msec.) with 0.35 T superconducting magnet. On NMR images (MRI), we examined the wall thickness, wall motion and  $T_2$  relaxation time in the area of diseased myocardium. The lesions of old MI were depicted as the area of thin wall and  $T_2$  relaxation time of those lesions were similar to the area of non-infarcted myocardium. The lesions of recent MI (up to 3.5 months from the recent attack) were shown as the same wall thickness as the non-infarcted myocardium and the area of prolonged  $T_2$  relaxation time compared with that of non-infarcted myocardium.  $T_2$  relaxation time of each area of old MI, recent MI and non-infarcted myocardium was  $42.9 \pm 11.1$ ,  $61.7 \pm 20.1$ ,  $40.3 \pm 8.5$  msec. respectively. MRI demonstrated diffusely thick myocardium in all patients with HCM. Comparing with end-diastolic and end-systolic images, the status of left ventricular outflow tract was clearly visualized, then we could differentiate HOCM from HCM by MRI. Although we had expected to differentiate the lesions of HCM from normal

myocardium by MRI.  $T_2$  relaxation time of the areas of HCM was almost the same as that of normal myocardium. The difference of  $T_2$  relaxation time among each ventricular wall in patients with HCM was not statistically significant. In summary, ECG gated NMR-CT offers 3-D morphological information of the heart without any contrast material nor radioisotopes. ECG gated MRI provide the useful informations to diagnose MI, especially in the differential diagnosis between old and recent MI.