

EVALUATION OF MYOCARDIAL METABOLISM BY CARDIAC IMAGING USING ACCUMULATED RADIOPHARMACEUTICALS

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The myocardium is composed of specialized muscles, which relies mainly on fatty acid and sugar metabolism. The changes of the cardiac energy-producing system during heart failure have been proved using autoradiography techniques. The objective of this study was to evaluate fatty acid and sugar metabolism in experimentally induced chronic heart failure in a rat model, using accumulated radiopharmaceuticals.

Lewis male rats with experimentally induced dilated cardiomyopathy, and considered as being in chronic heart failure (CHF) (n= 37) and normal Lewis male rats (n= 20) were used as the animal model. All rats were injected with radiopharmaceuticals {labeled fatty acid (I131- 9MPA) and labeled sugar (C14- 2DG)}. Heart muscle tissue was sampled at 5, 10, 30, 60 and 120 minutes post injection from the CHF rats, and at 10 and 60 minutes post injection from the normal rats. Two sets of autoradiographs of heart cross sections were analyzed and the time-accumulation curve obtained with use of the MATLAB image processing software to evaluate fatty acid and sugar metabolic functions.

With regard to fatty acid metabolism in the normal rats, heart cross section diameters were unchanged and the colour changed from reddish to orange, while in the rats with CHF, the myocardial colour changed from reddish through orange/yellowish to greenish colour, and the myocardial thickness was increased. When sugar metabolism was evaluated, in normal rats the myocardial colour changed from greenish to orange/yellowish, and in those with CHF, it changed from greenish colour through yellowish/orange to reddish colour. The time-accumulation curve clearly showed that the fatty acid metabolic process decreased with time as an exponential decay and sugar metabolic process increased with time exponentially. The normal myocardium gets much energy by fatty acid metabolism. This study revealed that the myocardial energy producing system in experimentally induced CHF shifts from using fatty acids to using sugar.