

Oral presentation

Stress P-31 MR spectroscopy for detection of myocardial microvascular disease in Latino type-1 diabetes mellitus patients

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Introduction

Diabetes mellitus (DM) have an increased incidence of coronary artery disease. However, diabetics are also known to have microvascular disease involving the kidneys, the peripheral nerves and the retina. Accordingly, in view of the multisystem involvement of microvascular disease, involvement of the myocardium is clearly feasible. We have previously used ³¹P MRS to detect microvascular disease. We observed that a decrease in phosphocreatine (PCr), adenosine triphosphate (ATP), PCr/ATP ratio with stress myocardial ³¹P MRS suggests myocardial ischemia in the absence of coronary artery stenosis.

Purpose

The present study aims to determine if there are metabolic changes in the myocardium in patients with type-1 DM that could suggest myocardial microvascular disease by using stress ³¹P MR spectroscopy.

Methods

Patient population

Latino patients with T1DM of greater than 10 years in duration were selected from a registry of more than 2,000 Type-1 DM patients at USC. They are younger and have a lower incidence of large vessel coronary artery disease. A comprehensive history and physical examination were obtained and all subjects underwent a metabolic panel, urinalysis and a funduscopic examination.

MRI & ³¹P MRS

MR examinations were performed using a 3 T MR scanner. Both ejection fraction and high energy phosphates (HEP) were evaluated during rest and stress. The cine MR imaging was performed using a 2D-FIESTA sequence to evaluate ventricular function during rest and stress. Three set of ³¹P MRS spectra were obtained at rest, stress and recovery from the 15 mm-thick double-oblique slice which mainly covers anterior left ventricle and septum.

Results

Thirteen of 45 subjects showed a significant decrease in PCr/ATP during stress whereas seven normal controls showed no significant decrease. No significant change in ejection fraction during stress was observed. The significant drop was observed more frequently in the patients with retinopathy than without ($p = 0.01$). More than 10% difference in change of PCr/ATP ratio is anticipated with adequate power (>0.80) in diabetics with retinopathy when compared with other groups such as normal control or diabetics with no retinopathy.

Conclusion

In a subgroup of Type-1 DM patients, non-invasive stress ³¹P MRS can identify abnormal cardiac HEP metabolism that is likely microvascular in origin and predicts myocardial ischemic response. This abnormal response probably occurs earlier than retinal or renal involvement. This ischemic response in DM patients is unlikely to have epi-

cardial CAD, but suggestive of microvascular dysfunction/disease and ultimately possible cardiomyopathy.

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