

## The detection of myocardial viability with MRI: A comparative analysis with <sup>201</sup>Ta rest-redistribution SPECT

S. Gelmez<sup>1</sup>, B. Diren<sup>1</sup>, F. Tosun<sup>2</sup>, C. Celenk<sup>1</sup>, T. Basoglu<sup>2</sup>, K. Soylu<sup>3</sup>, M. Sahin<sup>3</sup>, L. Incesu<sup>1</sup>

<sup>1</sup>Radiology, Ondokuz mayis Uni. School of Medicine, Samsun, Turkey, <sup>2</sup>Nuclear Medicine, Ondokuz mayis Uni. School of Medicine, Samsun, Samsun, Turkey, <sup>3</sup>Cardiology, Ondokuz mayis Uni. School of Medicine, Samsun, Turkey

The prediction of functional improvement after a successful medical or surgical therapy in ischemically injured myocardium is known as viability determination. The techniques that correlate best with histopathological results are Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT) and Magnetic Resonance Imaging (MRI). The purpose of this study is to compare the value of <sup>201</sup>Ta rest-redistribution SPECT and delayed enhancement (DE) MRI in the evaluation of myocardial viability. Findings were also correlated with angiographic results of the patients.

### Material and Methods

Twenty patients diagnosed as acute myocardial infarction with the findings of electrocardiography (ECG) and serum creatinine phospho-kinase (CPK) and CPK-MB levels were evaluated by both <sup>201</sup>Ta rest-redistribution SPECT and DE MRI. MR imaging was performed with a 1.5 T MR unit (Symphony, Siemens Medical Systems, Erlangen, Germany) by using 12 channel phased array abdominal coil with ECG-triggering. All images were acquired during breathhold double oblique short axis of the left ventricle 10-30 minutes after 0.1 mmol/kg Gadolinium DTPA injection intravenously. Infarct tissue is characterized by an increased signal intensity in late (10-30 minutes after) T1 weighted images. In the direction of the related literature, infarcts with a transmural component of >50% of the related segment are considered nonviable. <sup>201</sup>Ta SPECT images were performed at rest 20 minutes after injection of 4mCi <sup>201</sup>Ta. Low energy and high spatial resolution camera (ECAM, Siemens Medical Systems, Erlangen, Germany) was used.

Redistribution images were obtained 4 hours later after injection. In the direction of the related literature segments with an activity level below 50% of the normal are considered nonviable. All cases were also examined with digital subtraction angiography (DSA; Axiom, Siemens Medical Systems, Erlangen, Germany) within five days after the first admission. Stenosis over 70% of luminal diameter was considered to be significant and the arteries with that level of stenosis are accepted as infarct related arteries. Viability determination results of MR and SPECT were correlated with angiography based on perfusion territories of the infarct related arteries. All SPECT, MRI and DSA examinations were analyzed according to 17 segment model. Kappa analysis was performed to measure the strength of agreement with these methods.

### Results

340 segments on 20 patients were analyzed. 70 segments by MRI and 64 segments by SPECT were considered as nonviable. 250 segments were considered as viable by both techniques. 93% of the segments determined as viable by MRI were also viable on SPECT examination and this shows that if the SPECT examination was considered as a gold standard; the false negative value of MRI would be low. The strength of agreement was found to be moderate comparing the viability determination by SPECT and MRI

(kappa=0.57; p<0.001). When comparatively analyzed with DSA; MRI correlation was found to be better than that of SPECT in viability determination in the territory of infarct related artery.

### Conclusion

MRI can be used as a non-invasive diagnostic technique with its high specificity in the evaluation of viability in ischemically injured myocardium and particularly can be helpful in emergency conditions to determine whether aggressive medical or surgical treatment can be of help for functional recovery of the ischemic dysfunctional myocardium.