MALIGNANT AND BENIGN CARDIAC TUMORS: DIFFERENTIATION BY MR PERFUSION ASSESSMENT

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PURPOSE:

Semiquantitative analysis of first pass perfusion may contribute additional information to tumor characterization[1]. The aim therefore was to determine whether dynamic contrast material-enhanced magnetic resonance (MR) imaging with use of kinetic parameters reveals statistically significant differences between benign and malignant cardiac tumors.

MATERIALS AND METHODS:

This study involved 23 patients with cardiac tumors (Myxoma (n=7), Lipomatous hypertrophy of the interatrial septum (n=2), Fibroma (n=1), Rhabdomyoma (n=2), Angiomyolipoma (n=1), Angiosarcoma (n=4), Rhabdomyosarcoma (n=1), Hemeangiomyosarcoma (n=1), Myoliposarcoma (n=2), Lymphoma (n=1), Metastasis (n=1)). First-pass perfusion images were acquired after administration of 0.1 mmol/kg BW gadopentetate dimeglumine (Magnevist®, Bayer Schering Pharma AG, Berlin, Germany) with a SR turboFLASH sequence on a 1.5 Tesla scanner. The data were transferred to an external workstation and postprocessing was performed using IDL 5.4 in-house written software. Contrast enhancement ratios (CER %), the maximum slope of the contrast enhancement ratio curve (% / sec) and the area under the contrast enhancement ratio curve (% * sec) were calculated. Statistical analyses were performed with the unpaired t-test. P values less than 0.05 were considered statistically significant. In addition sensitivities and specificities to differentiate benign from malignant masses were calculated for each parameter and receiver-operator-characteristics (ROC) were assessed.

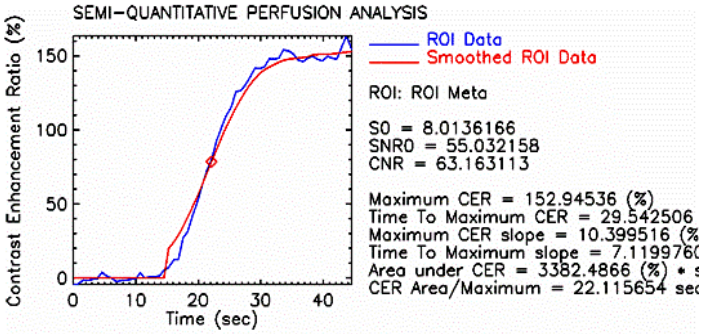

Figure 1 Contrast Enhancement Ratio curve of a 62 y/o female patient with cardiac metastasis of a sarcoma in the interventricular septum

RESULTS:

The contrast enhancement ratio (CER %) was significantly higher in malignant cardiac tumors (153.9 ± 82.5) compared to benign lesions (57.8 ± 52.5) (P = 0.0035), as was the maximum slope of CER (% / sec) (; 10.5 ± 5.9 vs. 4.7 ± 3.9; P = =.01). The values for the area under the curve (% * sec) were significantly higher in malignant cardiac lesions (4204.5 ± 2122.3) in comparison to benign lesions (1253.2 ± 1135.2 (p = 0.0011) The calculated sensitivity and specificity for the CER, the maximum slope of CER and the area under the curve resulted in 91% and 83%, 91% and 83% and 82% and 82% respectively with a cut-off value of 75%, 4%/sec and 1985%*sec. The ROC analysis revealed identical values for the areas under the ROC curves for CER and the maximum slope of CER (AUC=0.913). The ROC for the area under the contrast enhancement ratio curve was 0.803.

CONCLUSION:

Dynamic MR imaging allows detecting significant kinetic differences in perfusion of malignant and benign cardiac tumors. Semiquantitative assessment of perfusion parameters may therefore facilitate the important discrimination of these entities by determination of contrast enhancement ratios, calculation of the maximum slope of the CER curve and the area under the CER-curve.

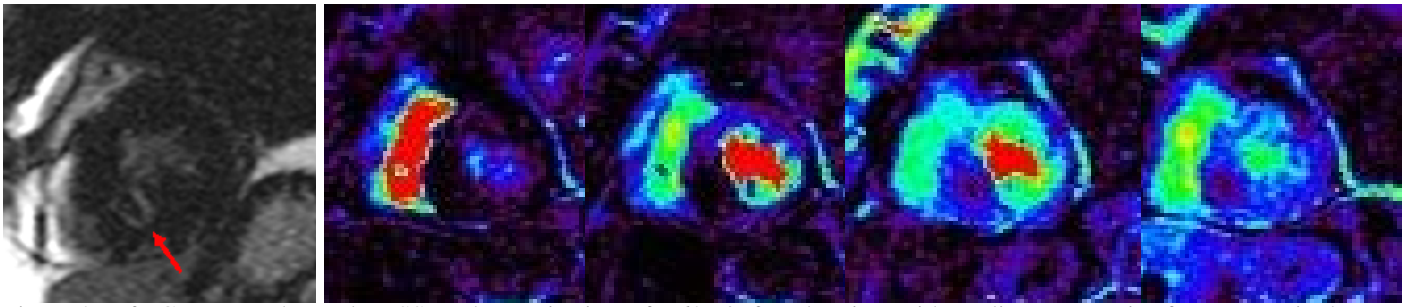

Figure 2 Left: Contrast enhanced IR SSFP short axis view of a 62 y/o femal patient with cardiac metastasis of a sarcoma in the interventricular septum; Right: Corresponding colorized first pass perfusion images in short axis orientation.

1. Moehrs OK et al. First experiences with contrast-enhanced first-pass MR perfusion imaging in patients with primary, benign cardiac masses and tumour-like lesions, Eur Radiol 2008 18: 1617–1624