

# FEASIBILITY OF TEST-BOLUS DYNAMIC CONTRAST-ENHANCED MRI USING CAIPIRINHA-VIBE FOR EVALUATION OF PANCREAS MALIGNANCY.

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## Introduction

Evaluating tumor vascularity of pancreas tumor using dynamic contrast-enhanced (DCE) MRI can be helpful for differential diagnosis.<sup>1</sup> Due to breathing artifacts, it is generally difficult to acquire accurate anatomic information from DCE-MRI which continuously scans patients for several minutes.<sup>2</sup> Utilizing test-bolus DCE-MRI with small amount of contrast agent and obtaining routine 4-phase dynamic MRI with diagnostic amount of contrast agent can provide perfusion information and anatomic information simultaneously.<sup>3</sup> Thus, we aim to evaluate feasibility of incorporating test-bolus DCE-MRI into routine 4-phase MRI for pancreas.

## Material and Methods

Eighteen patients with pancreas malignancy (ductal adenocarcinoma, n=14; neuroendocrine tumor, n=4) underwent test-bolus DCE-MRI at 3.0T machine (Skyra, Siemens). To reduce motion artifacts, we adopted a CAIPIRINHA-VIBE which uses the following protocols: TR/TE 2.65/1.17 ms; flip angle 9°; 384x208 matrix; slice thickness 4mm; acceleration factor of 4. T1 map was generated from a triple flip-angle ( $\alpha=2^\circ, 8^\circ, 15^\circ$ ) method. Free-breathing serial scan was performed for 3 minutes with 2 ml bolus injection of contrast agent (Dotarem, Guerbet). From time-intensity curve (TIC) of test-bolus DCE-MRI, we estimate arterial phase (AP) and portal venous phase (PVP) scan timing of routine 4-phase MRI. Then, routine 4-phase MRI was performed with 0.2 mL/kg (i.e., full diagnostic dose) bolus injection of Dotarem. Perfusion maps of test-bolus DCE-MRI were generated using a software (Tissue 4D, Siemens). Goodness of fit of the fitted TIC was evaluated by Pearson's chi-squared test. Overall image quality of test-bolus DCE-MRI was rated on a 5 point scale (1, poor, to 5, excellent quality). Timing accuracy of test-bolus DCE-MRI to estimate AP and PVP were also evaluated.

## Results

In all patients, we obtained test-bolus DCE-MRIs covering whole liver and pancreas with high temporal resolution (3 seconds) and spatial resolution (1 x1 mm) and achieve good perfusion maps of Ktrans and iAUC parameters. The mean values of  $\chi^2$  of the fitted TIC were  $0.097 \pm 0.058$  for pancreas parenchyma and  $0.075 \pm 0.097$  for pancreas malignancy, indicating acceptable range of goodness of fit. Between pancreas ductal adenocarcinoma and neuroendocrine tumor, there was significant difference in Ktrans ( $0.112 \pm 0.009$  vs.  $0.027 \pm 0.019$ , respectively,  $p=0.034$ ) and iAUC value ( $1.47 \pm 0.85$  vs  $2.61 \pm 1.27$ , respectively,  $p=0.048$ ). Overall image quality of test-bolus DCE-MRI was excellent (score,  $4.5 \pm 0.51$ ). The timing accuracy of test-bolus DCE-MRI was excellent to estimate proper timing of AP in 88.9% and PVP in 100% of patients.

## Discussion and Conclusions

Test-bolus DCE-MRI using CAIPIRINHA-VIBE is feasible for perfusion analysis of pancreas tumor with high spatial and temporal resolution. Incorporating the test-bolus DCE-MRI into the routine dynamic MRI provides tumor vascularity information and proper scan timing of routine 4-phase dynamic MRI.

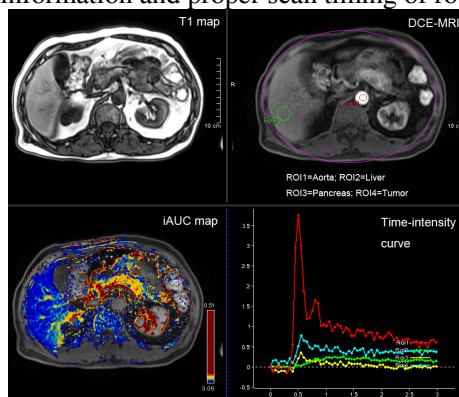


Fig. 1. Test-bolus DCE-MRI of the abdomen showed high-quality images and perfusion maps that may enable the analysis of tumor perfusion.

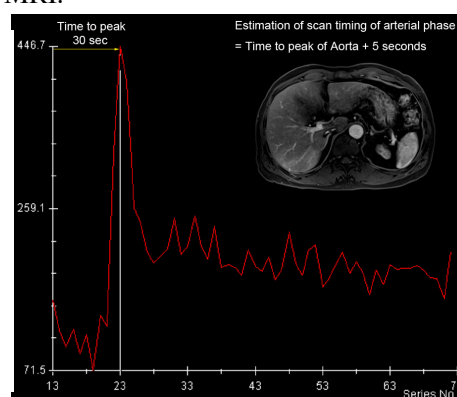


Fig. 2. Estimation of scan timing of routine 4-phase MRI using time-intensity curve obtained from test-bolus DCE-MRI.

## References

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