THE EFFECT OF IODINATED CONTRAST MEDIA ON THE RENAL GFR AS EVALUATED BY ASL MRI

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Introduction

As the usage of iodinated contrast media (CM) increases, Contrast-induced nephropathy (CIN) has become one of the most prevalent causes of acute renal failure, especially in patients suffering from diabetes or cardiovascular pathology (1, 2). Previous research on CIN has been limited by the methods to monitor renal blood flow (RBF) and glomerular filtration (GFR) (3). Accordingly, we aimed to quantify the functional response to iodinated CM injection in rabbits using PASL technique with variable echo time acquisitions (VTE-ASL) to label blood as an endogenous tracer in rabbit kidney, combined with a hypothetic two-compartment model to estimate RBF, renal blood R_2* and GFR.

Materials and Methods

Six New Zealand white rabbits (male, body mass range 2.5–3.0 kg) were included, and each acted as its own control. Experiments were conducted on a 3T GE MR scanner with a commercial QUADKNEE coil. The ASL images were acquired with variable TEs: 20, 40, 60, 80, 100, and 120ms, with other imaging parameters as: TR 3000ms, flip angle 90°, 5mm slice thickness, inversion time (TI) :1500ms. The baseline ASL images were obtained before iodinated CM injection. After a 24-hour control period, the rabbits received an intravenous injection of iopamidol-370 with dosage of 6ml/kg body weight. RBF maps were quantified by ASL data (the renal cortex: 0-600 ml/100 g/min, the medulla: 0-250 ml/100g/min).

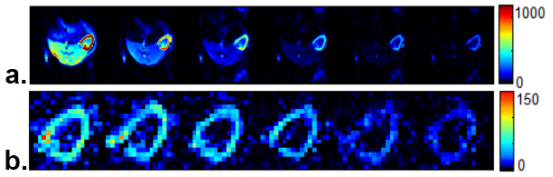

Figure 1. (a) Raw rabbit ASL and (b) ΔM images with varied TEs. From left to Right: TE = 20, 40, 60, 80, 100, 120ms. Renal perfusion signal contrast is well demarcated.

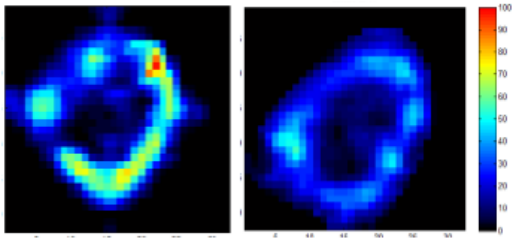

Figure 2: GFR changes induced by iopamidol: before and after CM injection.

Results

The ASL images revealed enough spatial information to visually determine tissue contrast between the renal cortex and medulla (Fig.1). Fig 2 shows representative baseline GFR image before and after contrast injection from a rabbit's left kidney. As shown in Fig.3, the cortical GFR was reduced after iopamidol-370 administration (pre-CM 27.1 ±4.2 ml/100g/min, post-CM 17.7±4.5 ml/100g/min, paired t test, *P*=.04).

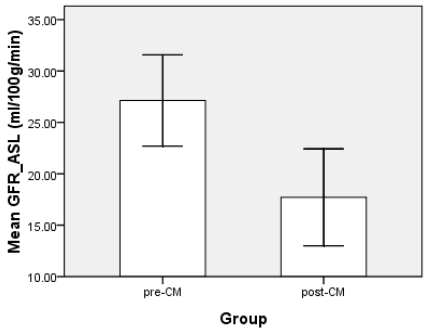

Figure 3: GFR reduction following iopamidol administration.

Discussion and Conclusion

Evaluation of the iodinated CM effects on renal hemodynamics and oxygenation is critical to help us better understand and prevent CIN. By using noninvasive ASL techniques, our study demonstrated that non-ionic, high-osmolality iopamidol-370 produces a reduction in kidney function.

References

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