Renal Artery Anatomy and Renal Artery Stenosis: Non-Contrast-Enhanced MR Angiography Using a Time-Spatial Labeling Inversion Pulse Compared With CTA

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Purpose: To evaluate three-dimensional (3D) non-contrast enhanced MR angiography with a time-spatial labeling inversion pulse (Time-SLIP) in the assessment of renal artery anatomy and renal artery stenosis compared with computer tomography angiography (CTA).

Materials and Methods: MRA using a Time-SLIP and CTA were obtained in 25 subjects (M:F=13:12; mean age 51.4±11.5 yrs) with a 1.5T clinical system(Vantage XGV Power By Atlas, Toshiba, Japan). Coronal view were scanned first, and then adjusted the inversion time (TI) according to the coronal images. All the subjects received both coronal and axial orientation with the suitable TI. Compared the anatomy of renal artery and the degree of renal artery stenosis between the MRA using a Time-SLIP and CTA sequences by two readers.

Results: 25 patients enrolled in the study with 59 renal arteries. The variants of renal artery included accessory renal artery(n=3), early branching artery(n=2) and multi renal arteries(n=6). Both MRA using a Time-SLIP and CTA showed the same anatomy and the variants of the renal artery. Evaluation of the stenosis with MRA using a Time-SLIP by reader 1: grade 1(n=42), grade 2(n=11), grade 3 (n=4),grade 4 (n=1) and grade 1(n=42), grade 2 (n=12), grade3(n=4), grade 4(n=1) by reader 2. The Kappa value of the two readers was 0.93; Evaluation of the stenosis of CTA by reader 1: grade 1(n=42), grade 2(n=9), grade 3(n=7), grade 4(n=1) and grade 1(n=42), grade 2 (n=9), grade 3(n=5); grade 4 (n=3) by reader 2. The Kappa value of the two readers was 0.85. The Kappa value of the two modality was 0.67 for assessing renal artery stenosis.

Conclusion: The results were consistent with MRA using a Time-SLIP and CTA in showing the anatomy , variants of renal artery and renal artery stenosis. The discrepancy between them may related to the calcification of the renal artery and the change of the hemodynamic of the stenosis.

Fig 1 CT reconstruction showed multi renal artery in the right kidney

Fig 2 in the same patient as in Fig 2 MRA with a Time-SLIP showed the same renal artery variant compared with CTA
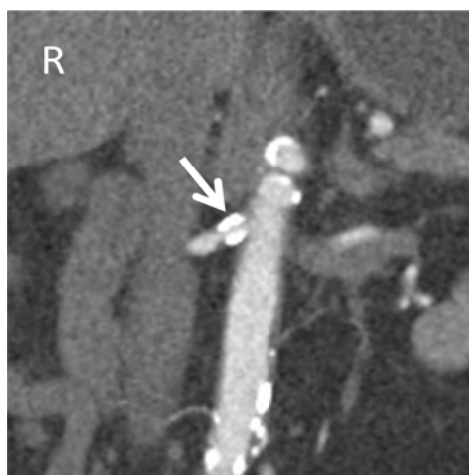

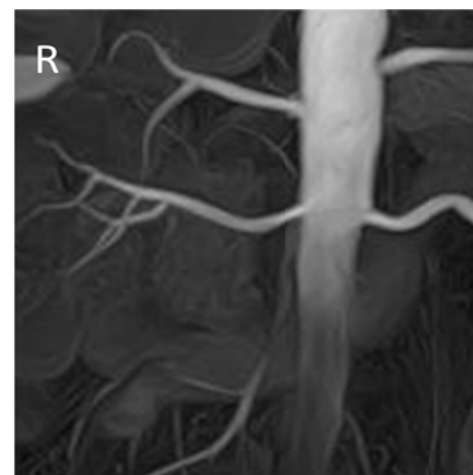Fig 3 CT construction showed signicficant stenosis(>50%) of right renal artery (arrow)

Fig 4 in the same patient as in Fig 3, the right renal artery showed no significant stenosis (<50%)