

Time Spatial Labeling Pulse Sequence for the Screening of Renal Artery Stenosis: A Non Contrast Enhanced Approach

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INTRODUCTION

It is well known that Renal Artery Stenosis (RAS) is the major cause of renovascular hypertension. It is also recognized as an important cause of chronic renal insufficiency and end-stage renal disease. In the elderly, atherosclerosis is responsible for two thirds of cases of clinically significant renal artery stenosis which compromises renal function and structure. With a continuously growing elderly population and the possible increase in prevalence of RAS and ischemic nephropathy, the need for non-invasive diagnostic tools and effective therapeutic measures is dramatically growing. Until recently, Contrast Enhanced MRA (CE-MRA) was considered as a non-invasive technique for the evaluation of RAS. The recent link between gadolinium and nephrogenic systemic fibrosis (NSF) in patient with renal insufficiency ranked down CE-MRA to the least invasive technique with a considerable risk for patients with RAS.

In this work we explored the clinical value of a totally safe new commercially available non-enhanced MRA technique, Time-SLIP, in the screening of RAS.

MATERIAL AND METHODS

Ten patients (7 men aged from 35 to 68 years) with suspected RAS were explored to obtain pre-treatment evaluation for endovascular or surgical revascularization interventions.

All MR images were obtained on a 1.5T MRI system (Vantage, TOSHIBA, Tokyo). Time SLIP is an arterial spin labeling technique that can be used with Fast Advanced Spin Echo (FASE) [3] or with balanced SSFP [4] sequences. Both 2D and 3D acquisition are possible and it can be used with respiratory or ECG gating. For studying the renal arteries, we used the balanced SSFP sequence with respiratory-gating and the following parameters: TR=5.2 ms, TI=1200 to 1800 ms, TE=2.6 ms, FA 120, FOV 35x35 cm, Matrix 256X256, Speeder Factor 2, slice number =35, Fat Sat on, and time =4.30 min.

The image quality original slices and the MIPs in several planes was visually assessed by an experienced radiologist and scored as: bad quality non interpretable, moderate quality but interpretable or good quality.

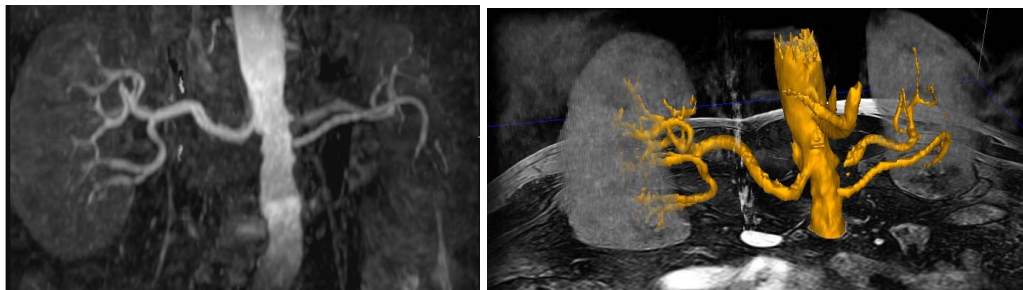


Figure 1: A 65 years old man, with atherosclerosis lesions in the coronary and the lower extremity arteries and a decreased renal function. The image was scored as good. On the right renal artery, there are irregularities of the ostium wall but no significant stenosis. On the left side a main renal artery and an accessory artery to the lower pole of the kidney. On both arteries significant stenosis were well depicted with a decreased flow in the distal arteries. The angiogram confirmed the diagnosis and a stent was placed in the main left artery. (a): MIP image. (b) Volume and surface rendering after manual seed point selection and automatic region growing.

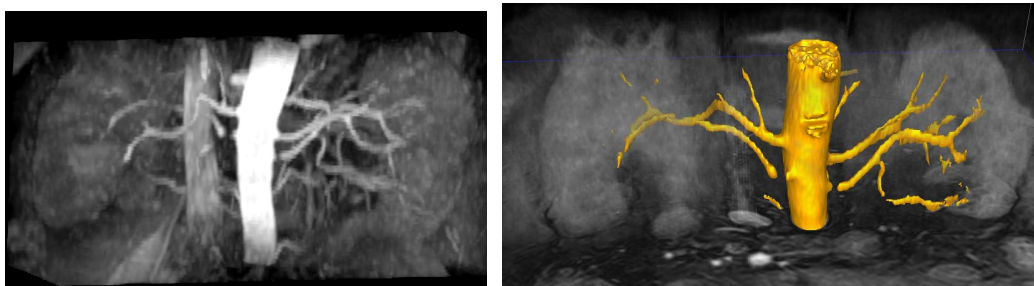


Figure 2: A 68 years old man with hypertension and a serious renal failure. The image was scored as good. It shows on each side, a main renal artery and an accessory artery to the lower pole with a bilateral significant stenosis. An endovascular treatment was decided and performed. The angiogram confirmed the diagnosis and bilateral stent was placed. (a): MIP image. (b) Volume and surface rendering after manual seed point selection and automatic region growing.

RESULTS

The Time_SLIP image was scored as good in 8 patients, Moderate in 1 patient and poor in 1 patient; in this case the blood flow was very slow and it had been impossible to obtain strong enough signal in the renal arteries to interpret. In 3 cases severe stenosis were detected and later confirmed by intra-vascular ultrasound. Two of these cases are presented in figures 1 and 2.

CONCLUSION

Time-SLIP MRA is a reliable technique for RSA screening and diagnostic in patients with moderate to severe renal dysfunction. It is totally non invasive and therefore can be performed on any patient. It is a fast examination and with respiratory gating, it does not require any breath hold, which is often uncomfortable to the (elderly patients).

REFERENCES

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