

Evaluation of the arteries in the pelvis and extremities: Comparison of unenhanced MR angiography with QISS and Delta-Flow using peripheral pulse gating

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Target audience: Scientists, technologists and radiologists who are interested in unenhanced MRA for the body and extremities.

Introduction

Unenhanced MR angiography has played an important role on evaluation of the patients with renal dysfunction, who cannot tolerate use of contrast medium¹. So far, various sequences have been applied to unenhanced MR angiography. Inhance Delta Flow (GEHC) has been used for evaluation of the vasculature, which is based on different signal intensity indicating arteries on the FSE images between in diastolic phase and systolic phase using peripheral pulse gating. Recently, Quiescent Interval Single Shot MR

Angiography (QISS) has been introduced for the evaluation of peripheral arteries, which is robust technique for detection of flow in the vasculature using ECG gating². From a daily clinical point of view, to trigger the optimal timing for acquisition of the data, peripheral pulse gating is convenient to set up patients for imaging. Accordingly, the purpose of our study was to optimize the timing for data acquisition with investigational version of QISS using peripheral pulse gating and to compare unenhanced MR angiography of the pelvis and thigh using QISS with that using Delta Flow by using a peripheral gating.

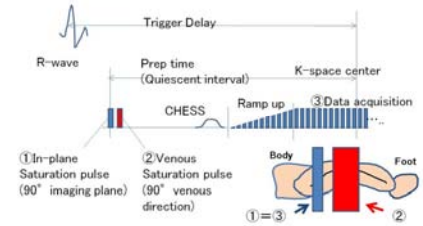


Fig. 1: QISS MRA pulse sequence

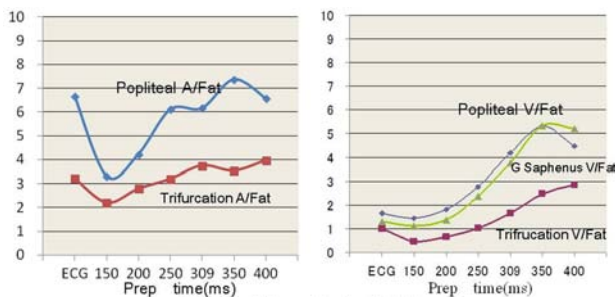


Fig.2: The ratio to fat signal

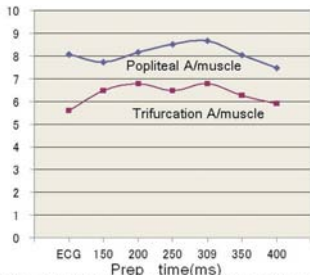


Fig. 3: The ratio to muscle signal

of the study), 12 patients underwent MRA with QISS. The parameters of Delta Flow were as follows: coronal images, FSE, TR / TE: 2100 / 62 msec, Section thickness: 2.6 mm, Overlap 1.3 mm, FA: 90 degree, matrix: 320x224, FOV: 40-48 cm. All images were evaluated using multiplanar volume reconstruction (MPVR) technique. The qualitative analysis was conducted by evaluation of the degree of image quality degradation due to motion artifact, background noise, venous artifact, and overall image quality independently, using a 5-point scale, respectively. Furthermore, we evaluated the visualization of vessels as follows; internal and external iliac arteries, femoral artery, deep and superficial femoral arteries and their branches, respectively.

Results

In the first part of the study of extremities of normal volunteers, the signal ratio of the arteries and veins to fat signal intensity (SI) increased up to at 350ms of the preparation time (Fig2). And the signal ratio of the arteries to the muscles increased increase up to at 250ms (Fig3). Recognition of the arteries with signal suppression of the veins, fat and muscles was well made around at 250ms of the prep time (Fig 4). Total count of ranks were best on ECG gated QISS images (rank 4.0), followed by those at 250ms (3.4), and 200ms (3.1) of the prep time. In the second part of the study for patients, images are shown in Fig 5. The qualitative results were as follows; MRA with QISS was equivalent to that with Delta Flow, (total image quality; QISS/Delta Flow: 4.4/4.7, motion artifacts; 5.0/5.0, blurring; 5.0/4.9, venous artifacts; 4.8/4.4, respectively). The background noises were better suppressed on Delta Flow (QISS/Delta Flow:4.3/4.9, p <0.03). The delineation of arteries on MRA QISS was also equal to that on

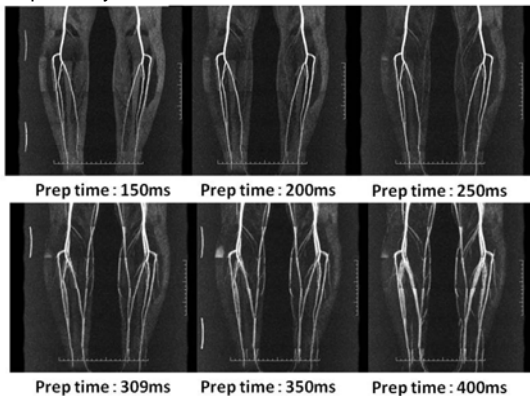


Fig.4: Volunteer QISS images with different Prep time Delta Flow (femoral arteries; QISS/Delta Flow: 4.9/4.9, descending branches: 4.7/4.6, lateral femoral circumflex arteries: 4.4/4.6, respectively).

Conclusion

Unenhanced MRA with QISS technique provides good image quality for pelvis and thighs, which is equivalent to that with Delta Flow. When gadolinium is not usable, this sequence might be an alternative choice of methods.

- 1) Miyazaki M, Lee VS, et al. Radiology 2008;248:20-43,
- 2) Edelman RR, Seehan JJ, Dunkle E, et al. Magn Reson Med 2010;63:951-958

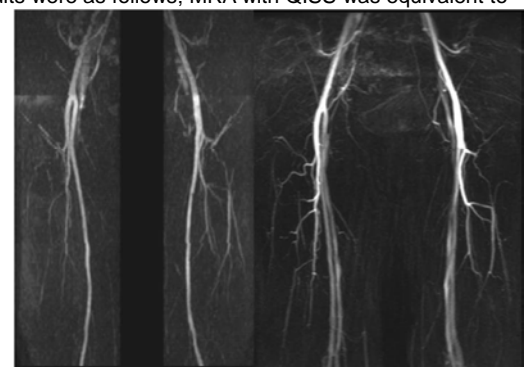


Fig.5: Image comparison