

## Comparison between cardiac gated and non-gated multislice black blood atherosclerotic carotid artery imaging

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**Introduction:** Atherosclerotic plaque imaging has been demonstrated in-vivo using MRI. Cardiac gating has been commonly used with single slice black blood imaging. Multislice black blood vessel wall imaging can greatly reduce total examination time. The effect of cardiac gating on image quality for multislice carotid vessel wall imaging has not been assessed.

**Methods:** Four atherosclerotic patients and four healthy volunteers were subjected to two different multislice black blood imaging techniques: 1) double inversion recovery turbo spin echo (TSE), interleaved multislice rapid extended coverage (REX) [1]; and 2) multislice TSE with inflow/outflow parallel saturation bands. Twelve T2W slices, 3 mm thick, with a gap of 0.3 mm were acquired on a 1.5T MR system. All acquisitions were performed with and without cardiac (ECG) triggering. FOV of 14cm x 14cm, bandwidth of 488 Hz/pixel, matrix size of 256<sup>2</sup> and Turbo factor of 15 were used. Quantitative analysis (signal to noise ratio (SNR) and contrast to noise ratio (CNR)) was performed on all slices. All the images were also qualitatively analyzed for overall image quality, flow suppression, artifacts (ghosting, motion, etc) and vessel wall delineation by two experienced observers. A 5-point scale with 1 being the poorest and 5 being the best was used. A t-test was used to compare the SNR and CNR values while a Mann-Whitney rank sum test was used to compare the scores obtained using the qualitative analysis.

**Results:** Quantitatively, CNR (measure of flow suppression) of non-gated multislice black blood sequences was significantly higher than the corresponding gated multislice sequences (Mean±SD = 8.83±5.41 for non gated vs. 7.62±5.22 for gated multislice sequences, p<0.05). The SNR for the multislice non-gated sequences was also significantly higher than the corresponding multislice gated sequences (18.36±5.40 for non gated sequences vs. 16.17 ± 5.94 for gated sequences, p<0.05). Sample images of non-gated and gated REX sequences (Figure a and c) and non-gated and gated parallel saturation band (Figure b and d) multislice sequences are shown in the Figure. Qualitative analysis showed that there was no significant difference between overall image quality, flow suppression and vessel wall delineation comparing gated with non gated multislice sequences. Artifacts were significantly lesser in non-gated sequences as compared to gated sequences (Table 1).

**Conclusions:** In black blood multislice imaging of the carotid arteries, the use of cardiac gating did not produce any advantages in the image quality. Thus, non-gated sequences may be used instead of gated sequences in atherosclerotic carotid artery imaging, for progression/regression studies. This might shorten the total setup and examination times and improve patient comfort.

Table 1: Qualitative Analysis of Non-gated vs. gated sequences

Multislice Sequence	Overall Image Quality	Flow Suppression	Artifacts (ghosting, motion)	Vessel Wall Delineation
<b>Non -Gated</b>	3.44 ± 0.67	3.90 ± 0.49	3.42 ± 0.66	3.54 ± 0.78
<b>Gated</b>	3.22 ± 0.80	3.79 ± 0.518	3.10 ± 0.82	3.47 ± 0.81
<b>p-value</b>	0.056	0.165	<b>0.002</b>	0.459

All values expressed as Mean ± SD, Bold indicates significance (p < 0.05). 5-point scale used, 1-poorest, 5-best

### References:

1. Mani V et al. . A new interleaved multi-slice black blood double inversion recovery technique for vessel wall imaging. *Proc Intl Soc Mag Reson Med*. 2003;page 163.

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