

Carotid Plaque Imaging with BLADE

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INTRODUCTION: PROPELLER (periodically rotated overlapping parallel lines with enhanced reconstruction) is a self-navigating method for motion correction by repeated data acquisition of the center of k-space. BLADE is the Siemens implementation of PROPELLER technique. BLADE reduces motion artifact arising from physiological respiratory movement, arterial pulsation and swallowing. Atherosclerotic plaque in the carotid arteries is one of vulnerable risk factors of cerebral ischemic stroke. Especially, rupture of lipid-rich plaque may cause artery-to-artery embolic obstruction of cerebral arteries. Double inversion recovery, dark blood imaging (DB) sequences with cardiac gating are considered as the gold standard for a plaque imaging. This study attempts to estimate clinical utilities of BLADE for the detection and evaluation of carotid plaque in patients with ischemic stroke events.

MATERIALS and METHODS: All patients were examined at 1.5-T (MAGNETOM Avanto, Siemens) using 4-channel neck matrix coil. DB T2WI and T1WI with Cartesian k-space trajectory as a gold standard in all patients with ischemic stroke events. Multi-slice BLADE T2WI and T1WI with rotated overlapping sampling were performed in 66 vessels of 33 patients. Single-slice BLADE-DB T2WI and T1WI with cardiac gating and rotated overlapping sampling were done in 23 vessels of 14 patients. DB T2WI parameters were as follows: 2 R-R/82ms/17 (TR/TE/ETL); field of view, 16 cm; matrix size, 320; axial sections, 4 mm thick; and scan time, 2 minutes 30 seconds. BLADE T2WI parameters; 3000/78ms/11 (TR/TE/ETL); field of view, 16 cm; matrix size, 256; axial sections, 4 mm thick; and scan time, 3 minutes 5 seconds. BLAD DB T2WI; 2 R-R/78ms/17 (TR/TE/ETL); field of view, 16 cm; matrix size, 256; axial sections, 4 mm thick; and scan time, 2 minutes 30 seconds.

RESULTS: Multi-slice BLADE sequences detected carotid plaque in all vessels. BLADE showed excellent image quality without significant artifacts. No pseudonegative cases were identified, however, BLADE tended to overestimate the evidence and the size of plaque in 29%, because BLADE corrected slow turbulent flow close to carotid wall. The overall image quality of BLADE-DB T2WI was rated higher in 48% and equal in 43% compared with DB sequences.

CONCLUSION: BLADE-T2WI and T1WI are feasible for detecting not only atherosclerotic plaque but also the neighboring turbulent flow, which is a risk factor of the intimal injury. Multi-slice BLADE sequences are useful methods and the initial sequences of choice for screening of carotid plaque and its risk factor, because those can cover the entire carotid bifurcation without cardiac gating during the same acquisition time as single-slice DB imaging. BLADE DB sequences with cardiac gating are the best-preferred methods for precise evaluation of anatomical details and plaque contents. When multi-slice BLADE T2WI and T1WI show positive findings, single-slice BLADE-DB sequences with cardiac gating should be added to access carotid plaque precisely.

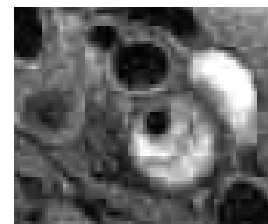


Fig.1A DB-T2WI

Fig 1B BLADE T2WI

Fig 2A DB T2WI

Fig 2B BLADE-DB T2WI

REFERENCE: Arfanakis K. Magn Reson Med. 2005 Mar;53(3):675-83.