High-Resolution Three-Dimensional Oblique-Sagittal Black-Blood Magnetic Resonance Imaging in Preoperative Evaluation of Stenting in Atherosclerotic Carotid Stenosis

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INTRODUCTION:
Carotid artery stenting (CAS) has become an ever-increasing procedure. However, some risk factors, such as vulnerable plaque, degree of carotid lumen stenosis, and residual stenosis, were associated with increased incidence of restenosis after CAS [1]. Therefore, a comprehensively preoperative evaluation in morphology and components of atherosclerotic carotid artery is of great value for CAS. We aimed to assess the value of 3D-BB-MRI, a new high-resolution carotid imaging methods, in preoperative assessment for CAS.

MATERIALS AND METHODS:
Between April 2011 and September 2011, we consecutively studied 18 patients (15 men, 3 women, 62.8±5.6 years), who were scheduled for CAS due to cerebrovascular ischemic events (stroke, transient ischemic attack, or amaurosis fugax) in the territory of atherosclerotic carotid stenosis (involving 18 arteries). All MRI examinations were performed on a 3.0-Tesla (3.0T) MRI scanner (EXCITE HD, GE Healthcare, Milwaukee) and a bilateral 4-channel phased-array surface coil was used. A large coverage axial three-dimensional time-of-flight (3D-TOF) was first performed in order to detect the level of maximum luminal stenosis and carotid bifurcation. A quadruple-inversion-recovery T1-weighted (QIR T1W) was used to acquire the 2D-BB-MRI images. The 3D-BB-MRI images were based on a preparation of spatial labeling with multiple inversion pulses, which was added to a 3D segmented spoiled gradient-recalled echo (SPGR) sequence. To obtain a maximum coverage of atherosclerotic artery, we chose the level of maximum luminal stenosis and carotid bifurcation as reference, and localized the 3D-BB-MRI (Fig. 1). All 3D-BB-MRI images were obtained with the following parameters: TR of 6.5 ms, TE of 3.1 ms, field-of-view of 14 cm, matrix size of 256 × 256, slice number of 24, slice thickness of 2 mm with no inter-slice gap. Two radiologists analyzed the Max-stenosis, Max-TPT and location of maximal lumen stenosis, plaque rupture, degree of maximal lumen stenosis and Max-LPE on 2D-BB-MRI and 3D-BB-MRI images by consensus. Compared with matched images of DSA, the differences of ability to image these evaluation indexes between 2D-BB-MRI and 3D-BB-MRI were assessed.

RESULTS:
There was no difference in evaluating the Max-stenosis between DSA, 2D-BB-MRI and 3D-BB-MRI (P=0.121 and P=0.849). However, the correlation of 2D-BB-MRI and DSA was lower [(77.75±5.61)% vs. (80.63±4.67)%], r=0.516, P=0.001]. The results of 3D-BB-MRI are more close to that of DSA [(79.80±4.06)% vs. (80.63±4.67)%, r=0.945, P=0.001]. There was no difference in evaluating the Max-TPT between 2D-BB-MRI and 3D-BB-MRI (P=0.450). However, the Max-LPE on 3D-BB-MRI is larger than that on the 2D-BB-MRI [(16.74±5.54)mm vs. (14.01±3.89)mm, P=0.001] (Fig. 2).

DISCUSSION & CONCLUSION:
As a noninvasive examination tool, 3D-BB-MRI can objectively show the Max-stenosis, Max-TPT and Max-LPE. 3D-BB-MRI can provide a good preoperative preparation for CS.

REFERENCES: