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

Qingjun Wang[1], Yong Guo[2], Jianming Cai[3], and Minghua Huang[4]

[1]*Department of Radiology, Chinese Navy General Hospital, Beijing, Beijing, China, People's Republic of,* [2]*Department of Radiology, Chinese Navy General Hospital, China, People's Republic of,* [3]*Chinese PLA General Hospital,* [4]*Chinese Navy General Hospital*

## 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). The DSA, 2D-BB-MRI and 3D-BB-MRI were prospectively performed for all these patients within 1 week prior to CAS. 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:

[1]. Van Laanen. et al. J Cardiovasc Surg (Torino) (2008); 49: 743-747.

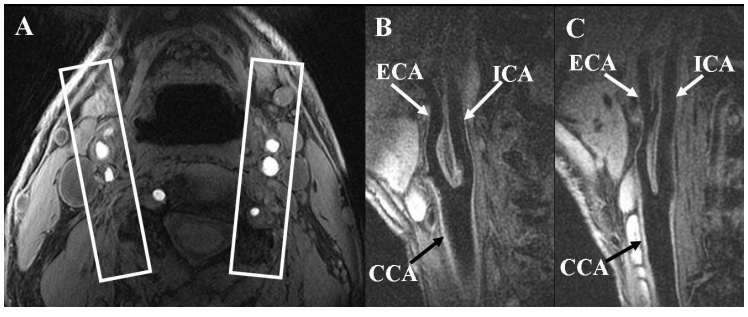


Fig.1 First, the original image of 3D-TOF was used to determine the level of maximum luminal stenosis and carotid bifurcation (A). Bilateral 3D-BB-MRI images were localized and acquired based on the 3D-TOF image (B and C). CCA: common carotid artery; ECA: external carotid artery; ICA: internal carotid artery.

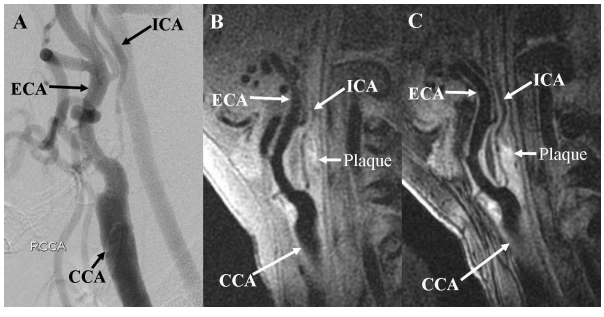


Fig.2 The DSA showed severe stenosis of right ICA (A). The 2D-BB-MRI showed plaque and narrowed right ICA (B). The 3D-BB-MRI also showed the plaque and narrowed right ICA, but more clearly.