The Value of CT Angiography with Volume Rendering for Evaluation of Intracranial Aneurysms after Surgery: Phantom and Clinical Study

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Purpose
To determine the reliability of 3D CTA with volume rendering (VR) for evaluation of the intracranial aneurysms after clipping surgery.

Materials & Methods
First, the optimal parameters for generating VR images, which can show both residual aneurysmal lumen and surgical clip, were determined with two phantoms. One phantom was created with titanium clip and another with cobalt array clip. Second, consecutive 50 patients receiving aneurysm surgery underwent 3D CTA and VR as well as maximum intensity projection (MIP) images that were were created. Forty-six patients were operated with titanium clips and the remainings with cobalt-array clips. These images were evaluated for visualization of arterial lumen, distinction between arterial lumen and clip, and presence of metal artifacts from clip with a four-point scale.

Results
Optimal parameters for titanium clip phantom was determined as 80–90% opacity value of the lumen trapezoid and 10-20% of the clip, and the selection of voxels ranged from 100 to 500 HU for the lumen and 500 to 3000 HU for titanium clip. In all the patients treated with titanium clip, arterial lumen were depicted clearly and distinction between arterial lumen and clip were made easily on VR images without significant metal artifacts. VR images were significantly superior to MIP images for the evaluation. Optimal parameters of cobalt-array could not be identified and the evaluation in vivo were impossible due to severe metal artifacts.

Conclusion
VR images of 3D CTA can be used for evaluation of the postoperative aneurysm using titanium clip.

References