Crescent Sign on Magnetic Resonance Angiography Denotes Incomplete Stent Apposition and Correlates with Diffusion-Weighted Changes in Aneurysm Stent-Coiling

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Introduction
Little data is available on how closely stents appose the luminal vessel wall in intracranial aneurysm stent-coiling, and on the effect of incomplete stent apposition on procedural thromboembolic complications.

Methods
Post-procedural 3.0 Tesla (3T) magnetic resonance (MR) diffusion-weighted imaging and time-of-flight angiography were obtained in 58 patients undergoing aneurysm stent-coiling using the Enterprise closed-cell and Neuroform open-cell self-expanding intracranial micro-stents.

Results
A distinctive semi-lunar signal pattern was identified using 3T-MR angiography showing flow outside the confines of the stent-struts in Enterprise but not Neuroform stented patients. This “Crescent Sign” was confirmed to correspond to incomplete stent apposition using high-resolution angiographic flat-panel computed tomography revealing flow ingress and egress out of the isolated luminal wedge.

Presence of Crescent sign was seen in 18/33 Enterprise but in 0 of 25 Neuroform cases, and was more likely in stents deployed in the tortuous internal carotid artery (P=0.034). The Crescent sign was strongly predictive of ipsilateral post-procedural diffusion-weighted imaging lesions in the entire population (OR=18; 95%CI, 4.33-74.8; P<0.0001).

In the Enterprise stent subset, ipsilateral diffusion-weighted imaging lesions were detected in 15 of 33 cases (45%); Crescent sign was seen in 12/15 with ipsilateral diffusion-weighted imaging lesions (80%) but only in 6/18 without lesions (OR=8; 95%CI, 1.61-39.6; P=0.006).

Conclusions
Incomplete stent apposition is detectable on 3T-MR angiography as a Crescent Sign and was found to be highly prevalent in Enterprise closed-cell design aneurysm stent-coiling and associated with periprocedural ipsilateral diffusion-weighted hyper-intense lesions.

These results identify an association between incomplete stent apposition and thromboembolic complications in intracranial aneurysm stent-coiling.

References

Learning Objectives
1-Be familiar with the importance of stent-wall apposition and its role in thromboembolic events
2-Learn to identify incomplete stent apposition using MR angiography and flat-panel angiographic computed tomography
3-Learn about the link between incomplete stent apposition and diffusion-weighted imaging changes in stent-mediated aneurysm coiling