Parent Vessel Size and Curvature Strongly Influence Risk of Incomplete Stent Apposition in Intracranial Aneurysm Stent-Coiling

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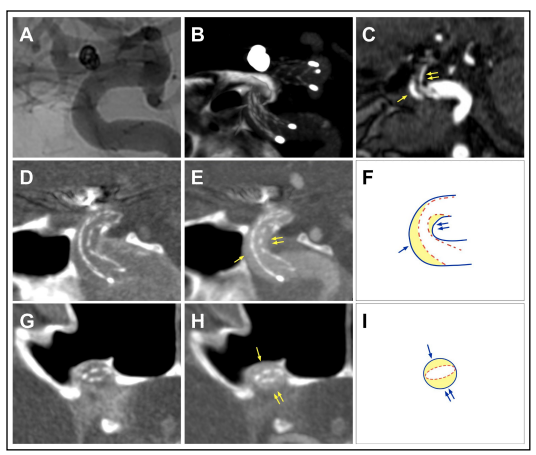
Introduction

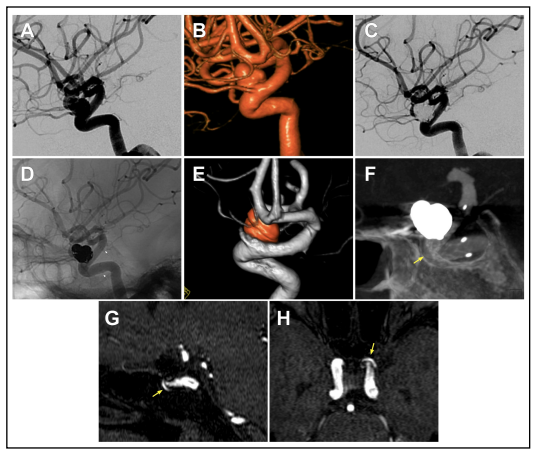
Flexible micro-stents have facilitated adjunctive coiling of intracranial aneurysms. Little data is available on stent struts' ability to maintain vessel-wall apposition once deployed in the tortuous cerebral vasculature and the prevalence of incomplete stent apposition (ISA).

Methods

Post-procedural 3.0-Tesla MRA (3T-MRA) was obtained in a cohort of 39 patients undergoing stent-assisted intracranial aneurysm coiling.

3T-MRA was analyzed for presence of ISA and supplemented by angiographic C-arm Flat-panel CT (FPCT; DynaCT). Parent vessel diameter, curvature radius, and stent-subtended arc angle were measured at the site of deployment and analyzed for prediction of ISA in the ICA.



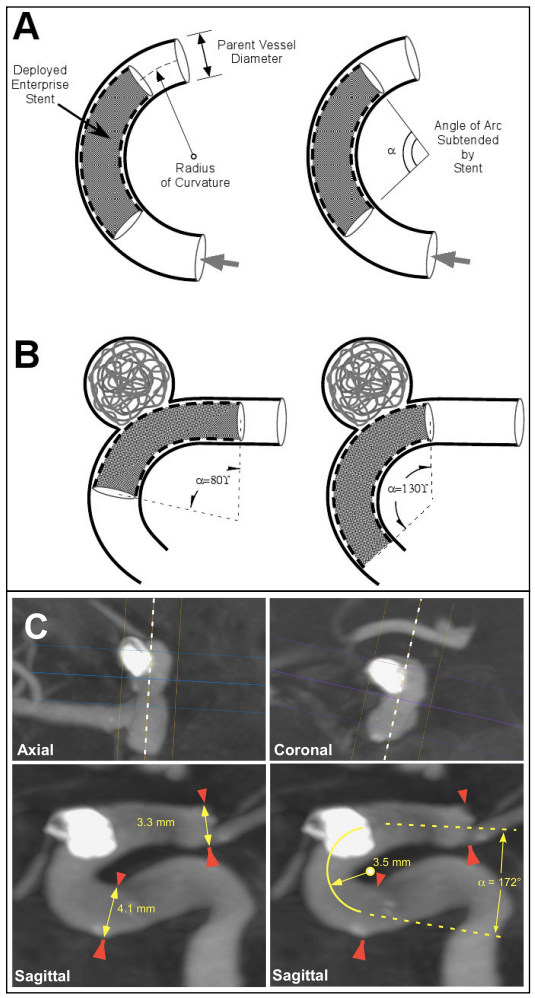


Results

3T-MRA uncovered a unique crescent flow pattern (Crescent Sign, CS) outside of the struts, which was confirmed by FPCT to indicate ISA resulting from stent crimping.

ISA was detected on 3T-MRA in 19/39 patients (49%). Univariate analysis revealed ISA in the ICA to correlate with large stent-subtended angle, small curvature radius, and large diameter, but not stent length or jailing vs. sequential technique.

Multivariate analysis identified ISA to correlate with vessel curvature radius (OR 253, P=.009), stent-subtended angle (OR 225, P=.005), and parent vessel diameter (OR 8.49, P=.044).



Conclusions

In this study, incomplete stent apposition was detectable by 3T-MRA in a significant proportion of patients undergoing stent-assisted coiling of ICA aneurysms in a vessel geometry- and stent deployment location-dependent manner. This characteristic of stent-coiling at this potentially tortuous location should be taken into account when selecting an endovascular strategy.

Learning Objectives

1-Identify presence of incomplete stent apposition in cases of intracranial stent -coiling

2-Learn link between target vessel geometric features and likelihood of developing incomplete stent apposition

References

1-Ebrahimi N, Claus B, Lee CY, Biondi A, Benndorf G. Stent conformity in curved vascular models with simulated aneurysm necks using flat-panel CT: an in vitro study. AJNR Am J Neuroradiol 2007;28:823-829

2-Cook S, Wenaweser P, Togni M, et al. Incomplete stent apposition and very late stent thrombosis after drug-eluting stent implantation. Circulation 2007;115:2426-2434

3-Benndorf G, Claus B, Strother CM, Chang L, Klucznik RP. Increased cell opening and prolapse of struts of a neuroform stent in curved vasculature: value of angiographic computed tomography: technical case report. Neurosurgery 2006;58:ONS-E380

4-Cook S, Wenaweser P, Togni M, et al. Incomplete stent apposition and very late stent thrombosis after drug-eluting stent implantation. Circulation 2007;115:2426-2434