Ophthalmic artery aneurysm endovascular treatment

Stent-assisted coil embolization and flow diversion with the Pipeline embolization device (PED) are both effective endovascular treatment options for ophthalmic segment aneurysms (OSAs) of the internal carotid artery.

There were no significant differences in terms of procedural complications, angiographic, functional, and visual outcomes. PED may be more favorable for multiple adjacent OSAs [1].

Treatment with the PED carries a higher risk of impeding flow to the ophthalmic artery, although this did not result in clinical sequelae in a study [2].

Videos

Treatment of ophthalmic artery aneurysm w/ endovasc. balloon-assisted carotid occlusion

<html><iframe width="560" height="315" src="https://www.youtube.com/embed/BIQKTI9bDqA" frameborder="0" allowfullscreen></iframe></html>

Case series

Contemporary treatment for paraophthalmic artery aneurysms includes flow diversion utilizing the Pipeline Embolization Device.

Four major academic institutions in the United States provided data on small paraophthalmic aneurysms (≤ 7 mm) that were treated with PED between 2009 and 2015. The anatomical relationship of ophthalmic artery (OA) origin and aneurysm, radiographic outcomes of aneurysm occlusion, and patency of the OA were assessed using digital subtraction angiography.

OA origin was classified as follows:

Type 1, OA separate from the aneurysm;

Type 2, OA from the aneurysm neck; and Type 3, OA from the aneurysm dome.

Clinical outcome was assessed using the modified Rankin Scale, and visual deficits were categorized as transient or permanent.

The cumulative number of small paraophthalmic aneurysms treated with PED between 2009 and 2015 at the 4 participating institutions was 69 in 52 patients (54.1 ± 13.7 years of age) with a male-to-female ratio of 1:12. The distribution of OA origin was 72.5% for Type 1, 17.4% for Type 2, and 10.1% for Type 3. Radiographic outcome at the last follow-up (median 11.5 months) was available for 54 aneurysms (78.3%) with complete, near-complete, and incomplete occlusion rates of 81.5%, 5.6%, and 12.9%, respectively. Two aneurysms (3%) resulted in transient visual deficits, and no patient experienced a permanent visual deficit. At the last follow-up, the OA was patent in 96.8% of treated aneurysms. Type 3 OA origin was associated with a lower rate of complete aneurysm occlusion (p = 0.0297), demonstrating a trend toward visual deficits (p = 0.0797) and a lower rate of OA patency (p = 0.0783).

Pipeline embolization treatment of small paraophthalmic aneurysms is safe and effective. An aneurysm where the OA arises from the aneurysm dome may be associated with lower rates of aneurysm occlusion, OA patency, and higher rates of transient visual deficits [3].

Wang et al retrospectively studied 15 aneurysm cases 8 internal carotid artery aneurysm -ophthalmic artery (ICA-OphA) aneurysms and 7 posterior communicating artery (PcoA) aneurysms treated with Enterprise stents and coils. Then, based on the patient-specific geometries before and after stenting, they built virtual stenting computational fluid dynamics (CFD) simulation models.

Before and after the stent deployment, the average wall shear stress (WSS) on the aneurysmal sac at systolic peak changed from 7.04 Pa (4.14 Pa, 15.77 Pa) to 6.04 Pa (3.86 Pa, 11.13 Pa), P = 0.001; the spatially averaged flow velocity in the perpendicular plane of the aneurysm dropped from 0.5 m/s (0.28 m/s, 0.7 m/s) to 0.33 m/s (0.25 m/s, 0.49 m/s), P = 0.001, respectively. Post stent implantation, the WSS in ICA-OphA aneurysms and PcoA aneurysms decreased by 14.4 % (P = 0.012) and 16.6 % (P = 0.018), respectively, and the flow velocity also reduced by 10.3 % (P = 0.029) and 10.5 % (P = 0.013), respectively. Changes in the WSS, flow velocity, and pressure were not significantly different between ICA-OphA and PcoA aneurysms (P > 0.05). Stent implantation did not significantly change the peak systolic pressure in either aneurysm type.

After the stent implantation, both the intra-aneurysmal flow velocity and WSS decreased independently of aneurysm type (ICA-OphA and PcoA). Little change was observed in peak systolic pressure [4].

A retrospective analysis of prospectively maintained databases of 127 consecutive patients harboring 160 OSA treated with Flow diverter stents (FDS) was performed. Aneurysms were classified based on location and morphology. Follow-up with digital subtraction angiography (DSA) was performed 6 to 18 months after treatment.

Follow-up DSA was available for 101 (63.1%) aneurysms with a mean follow-up of 18 months. Complete occlusion was observed in 90 aneurysms (89.1%), near-complete occlusion (>95%) in 3 (3%), and incomplete occlusion (<95%) in 8 aneurysms (7.9%). One aneurysm was retreated with another FDS (0.9%). No risk factors for incomplete occlusion were identified. The OA was occluded at the latest follow-up in 6 cases (7.1%). Permanent morbidity occurred in 4 patients (3.1%), and there was no mortality related to the FDS procedure.

Treatment of OSA with FDS was found to be safe and effective. The retreatment rate was extremely low and aneurysms that occluded did not reanalyze [5].

[1]

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5)

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