Clinical Outcomes and Procedural Highlights for Internal Carotid Artery Aneurysms Treated with the Pipeline Embolization Device

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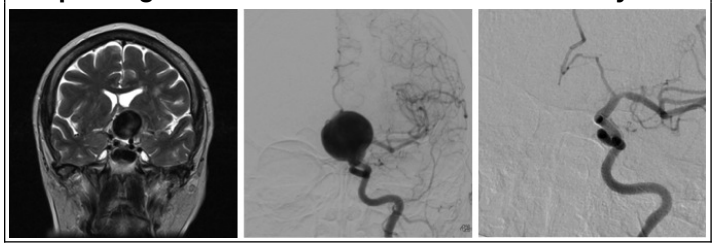
A paradigm shift in the treatment of ICA aneurysms



Introduction

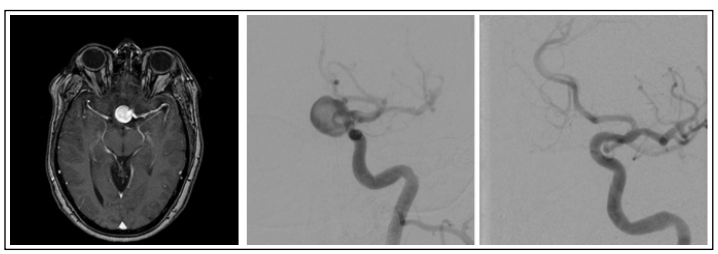
The Pipeline Embolization Device (PED) is considered a breakthrough in the treatment of intracranial aneurysms. For the past 3 years the PED has been approved for complex large and giant aneurysm in the proximal internal carotid artery. However, little is known regarding the use of PED for small aneurysms and lesions located in the distal ICA. We analyzed one of the largest cohort of ICA aneurysms treated with the PED to assess procedural complications and clinical outcomes.

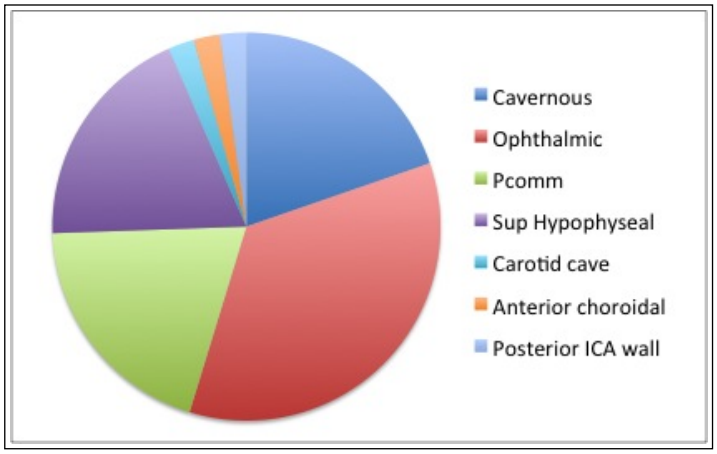
Methods

We treated 99 patients, harboring 137 unruptured ICA aneurysms between January 2011 and August 2013. Information collected included aneurysm characteristics, periprocedural variables, and functional outcomes (modified Rankin Scale).

Results

Forty eight aneurysms were located in the ophthalmic ICA, 27 in the cavernous ICA, 27 in the posterior communicating, 26 in the superior hypophyseal, and 3 each in the carotid cave, anterior choroidal, and posterior ICA wall.





One hundred and one aneurysms were small (< 10 mm), 21 were large (10-25 mm), and 7 were giant. The mean aneurysm size was 7.7 mm. The mean number of devices per patient was 1.35, which was considerably smaller than the PUFS trial (3.3). One device was used to treat 112 aneurysms (82%). In 15 patients with 34 aneurysms, one device covered the neck of more than one aneurysm. Two devices were used in 18 aneurysms, 3 devices were used in 6 aneurysms, and 5 PEDs were used in one aneurysm. Adjuvant coils were placed in 13 lesions and balloon angioplasty was performed in 30% of cases. Successful device deployment was achieved in 112 of 113 procedures (99%).

The rate of periprocedural complications was 5.3% (6/113). Permanent deficits occurred in 1.8% (2/113). One patient developed in-stent thrombosis 8 days after the procedure because he discontinued the antiplatelet therapy. One patient harboring a giant ophthalmic aneurysm suffered a delayed rupture 5 days after discharge. Two patients had minor hemorrhage within 30 days. During follow-up (mean of 10.6 months) 3 patients died (pulmonary embolism, subdural hematoma, and myocardial infarction). Four patients had mRS score = 3, all remaining patients had excellent functional outcome (mRS < 2).

Conclusions

Our study supports the premise that treatment of ICA aneurysms with PED has a rate of complications comparable to stent-assisted coiling and other endovascular techniques. Careful patient selection and adequate antiplatelet regimen are paramount to obtain comparable satisfactory clinical results.

References

1- Beckse T, et al. Pipeline for Uncoilable or Failed Aneurysms: Results from a Multicenter Clinical Trial. Radiology. 267, 858-868 (2013).

113 Pipeline Procedures - Intraprocedural Variables and Clinical Complications

Procedural variables	Procedure 1-28	Procedure 29-57	Procedure 58-85	Procedure 86-113	Total
Previously treated aneurysm (coil / stent-coil / clip)	2 / 0 / 0	2 / 0 / 2	2 / 0 / 0	6 / 0 / 0	**12 / 0 / 2**
Mean number of PEDs per patient	1.57	1.03	1.07	1.07	**1.35**
Number of PEDs deployed per patient (%)					
1	19	26	26	26	**97 (86)**
2	4	2	2	2	**10 (9)**
≥ 3	5	0	0	0	**5 (5)**
Adjunctive coils (%)	4 (14)	4 (13)	5 (17)	1 (3.5)	**14 (12)**
Balloon angioplasty (%)	7 (25)	3 (10)	8 (28)	16 (57)	**34 (30)**
Complications					
Intracranial hemorrhage	1	0	0	1	**2**
Mass effect	0	0	1	1	**2**
In-stent thrombosis	0	0	1	0	**1**
Delayed aneurysm rupture	0	1	0	0	**1**
CVA	0	1	0	3	**4**
Thromboembolic event	0	0	1	1	**2**
Carotid-cavernous fistula	0	0	1	0	**1**
Retroperitoneal hematoma	1	1	0	0	**2**
ICA rupture	0	1	0	0	**1**
Death	0	1	0	2	**3**