

Occlusion Rates of Single versus Double Pipeline Embolization Constructs for Flow Diversion of True Ophthalmic Segment ICA Aneurysms: A Single-Institution Series of 124 Consecutive Cases

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Introduction

True ophthalmic segment internal carotid artery (ICA) aneurysms, due to branch vessel inclusion within the aneurysm fundus, have been observed to have higher rates of persistence after flow diversion. There are limited reports on the relationship between number of Pipeline embolization devices (PED) and long term angiographic occlusion.

Methods

A prospectively collected, IRB-approved database was analyzed for all patients with true ophthalmic artery aneurysms treated by PED without adjunctive coiling at our institution. Occlusion status was assessed based on the O'Kelley-Marotta (OKM) scale for flow diversion.

Learning Objectives

To explore the outcomes of single-stage single versus double Pipeline embolization devices for treatment of true ophthalmic segment ICA aneurysms

Results

A total of 124 consecutive cases were selected for analysis. 88 cases received a single PED and 36 cases received two PEDs. The two groups were evenly matched in aneurysm size (5.85mm vs. 5.41mm) and patient demographics. Five patients in the double PED group had previously been treated with single PED and were re-treated for persistent aneurysm filling. Angiographic follow-up was available in 83% of the cases in both groups, at an average of 15.5 months in the single PED group and 13.9 months in the double PED group. 56.8% (50/88) of single PED-covered ophthalmic aneurysms were completely occluded at last follow-up compared to 76.7% (23/36) in the double PED group. Conversely, 8 cases (9.1%) in the single PED group had persistent aneurysm filling compared to just 1 case (3.3%) in the double PED group (p=0.21). Despite the material risks associated with multiple PEDs, there was no statistical difference between the two groups in terms of length of stay (2.1 days vs 1.5 days, single vs double), mortality (1% vs 0%, single vs double), transient deficit (4.5% vs 5.6%, single vs double), stroke (0%), intracranial hemorrhage (0%), cranial nerve palsy (0%) or iatrogenic dissection (0%).

Conclusions

In this large series of single versus double PED for true ophthalmic ICA aneurysms, double coverage resulted in higher angiographic occlusion rates and lower rates of aneurysm persistence, without jeopardizing overall patient clinical outcomes.

Table 1: Patient characteristics and occlusion rates

| | Single PED | Double PED | P value |
|-----------------------------------|-------------------|-------------------|---------|
| Total cases | 88 | 36 | - |
| Age | 55.7 +/- 14.4 yrs | 56.9 +/- 12.6 yrs | |
| Previously treated | 8 | 6 | |
| Clip | 3 | 1 | |
| Coil | 5 | 0 | |
| Flow diversion | 0 | 5 | |
| Multiple treatments | 0 | 0 | |
| Aneurysm size | 5.85 +/- 2.94 mm | 5.41 +/- 2.43 mm | |
| Available angio follow-up | 73/88 (83%) | 30/36 (83%) | |
| Average follow-up (months) | 15.5 +/- 13.4 | 13.9 +/- 23.3 | |
| Radiographic outcome | | | |
| Complete occlusion | 50 (56.8%) | 23 (76.7%) | p=0.468 |
| Trace filling | 12 (13.6%) | 4 (13.3%) | |
| Entry remnant | 3 (3.4%) | 2 (6.6%) | |
| Aneurysm filling | 8 (9.1%) | 1 (3.3%) | p=0.210 |

Table 2: Procedural Outcomes

| | Single PED | Double PED |
|----------------------------------|---------------|---------------|
| Length of stay | 2.13 days | 1.50 days |
| Discharge to home | 85/88 (96.6%) | 35/36 (97.2%) |
| Mortality | 1 | 0 |
| Transient deficit | 4 | 2 |
| Major stroke (NIHSS>4) | 0 | 0 |
| Minor stroke (NIHSS<4) | 0 | 0 |
| Dependent ICH | 0 | 0 |
| Remote ICH | 0 | 0 |
| Cranial nerve palsy | 0 | 0 |
| Iatrogenic dissection | 0 | 0 |