

The Saskatchewan Pipeline embolization device experience

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Introduction

The Pipeline embolization device (PED) has gained acceptance in the endovascular community for use in treatment of complex intracranial aneurysms not amenable to conventional treatment. Long-term follow-up of the device beyond 6 months is not well represented in literature. Current case series report a wide range of complication and success rates with the device. We present our to-date experience and follow-up with the device.

Methods

Data from 23 patients treated between March 2009 and July 2013 was prospectively collected and retrospectively reviewed. Patients were treated by two surgeons. Decision to use the PED was made on a case-by-case basis. Patients were pretreated with aspirin and clopidogrel and heparinized intra-operatively. All cases were performed under general anesthetic. Concomitant use of coils was left up to the discretion of the treating surgeon. All patients were monitored in a neuro-observation or intensive care unit setting post-operatively. All patients underwent MRA and/or CTA during admission. Follow-up imaging was performed at 6 months. All patients were placed on dual antiplatelet therapy for at least 6 months. Discontinuation was at the discretion of the treating surgeon.

Patient and aneurysm characteristics were recorded at baseline. All perioperative morbidities and mortalities were compiled. Modified Rankin Scale was used as clinical outcome measure in follow-up. Angiographic cure, evidence of recanalization and presence of residual filling were recorded at angiographic follow-up.

Results

A total of 45 devices were deployed successfully for 23 aneurysms in 23 patients. Patients were followed angiographically for a mean of 16.7 months and clinically for a mean of 18 months.

Table 1: Presentation, aneurysm location and aneurysm characteristics

Asymptomatic	8 (34.8%)	Anterior	Supraclinoid	7	Neck Size	6.9 (1.3-23)
Headache	8 (34.8%)		Cavernous	3	Fundus diameter	11.5 (1.5-24.4)
SAH	2 (8.7%)	Posterior	Communicating	3	Fundus:Neck	1.7
Focal Deficit	2 (8.7%)		Petrous	2	PED used per pt	2 (1-7)
Visual Complaints	2 (8.7%)	PCA	Ophthalmic	2	Total devices	45
Family History	1 (4.3%)		A2	1		
		Cervical		1		
			Vertebrobasilar	2		
		Basilar Apex		1		
				1		

Table 2: Angiographic and clinical outcomes

Angiographic Outcome	Angiographic cure	15 (65.2%)	Clinical Outcome (mRS)	0	16 (69.6%)
	Recanalization	2 (8.7%)		1	3 (13%)
	Residual filling	6 (26.1%)		2	1 (4.3%)
				6	3 (13%)

Complications

Mortalities = 3 (13%)

- Recanalization and second stage coiling
- Vasospasm after treatment of dissecting A2 aneurysm
- Hemorrhagic rupture POD 4 for giant ICA aneurysm

In-stent stenosis = 2 (8.7%)

TIA/Stroke = 1 (4.3%)

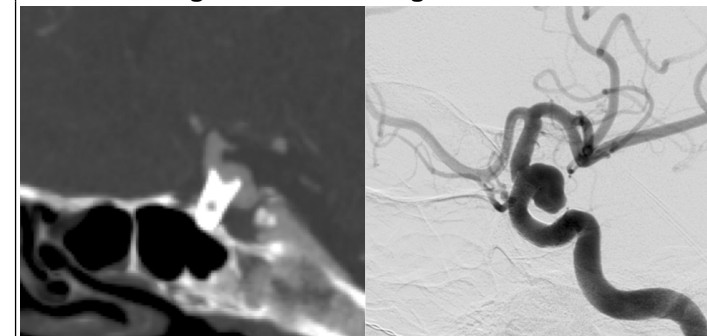
Stent migration = 1 (4.3%)

Interesting Case

A 61 year-old female was investigated for headache and was found to have a wide-necked 10.2 mm left clinoidal ICA aneurysm. She was treated with a single PED. Surgery was successful. She experienced sudden-onset severe headache on POD 1. Neuroimaging revealed interval stability of the PED across the neck of the aneurysm. She was discharged on dual-antiplatelet therapy. At routine follow-up, CTA showed proximal migration of the PED with the distal end of the device projecting into the dome of the aneurysm. Her headaches continued.

She was treated by placement of a second overlapping PED to cover the aneurysm neck. Her headaches improved and the aneurysm was cured at last follow-up.

Image 1: Proximal migration of PED



Conclusions

- The PED has a role in treating aneurysms not amenable to coil embolization or open surgical clip ligation.
- The high morbidity and mortality associated with these devices may relate to complexity of the treated aneurysms.
- We recommend early follow-up imaging for recognition of device related complications like stent migration.

Learning Objectives

By the conclusion of the session, participants should be able to: 1) Describe the principles of flow diversion in treating intracranial aneurysms, 2) Understand the Saskatchewan pipeline experience, 3) Discuss appropriate use of the pipeline embolization device in treatment paradigms.

Selected References

- Chalouhi N, et al. Delayed migration of a pipeline embolization device. *Neurosurgery*. 2013 Jun; 72(2 Suppl Operative):ons229-34
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