

Results and Predictors of Outcomes from a Large Single-Center Experience with the Pipeline Embolization Device

Nohra Chalouhi MD; Badih Daou MD; Guilherme Barros; Stavropoula I. Tjoumakaris MD; David M. Hasan MD; Robert M. Starke MD MSc; Richard Dalyai MD; Robert H. Rosenwasser MD, FACS, FAHA; Pascal Jabbour MD



Thomas Jefferson University Hospital

Introduction

The Pipeline Embolization Device (PED) is the most widely utilized flow diverter. The safety and efficacy of the device remains under investigation. We present the largest single-center experience to date with the PED and identify predictors of outcomes.

Methods

A total of 335 consecutive patients who underwent PED treatment at our institution between 2011-2015 were included. Safety data was prospectively recorded peri-operatively and through follow-up. Angiographic images were independently reviewed and aneurysm occlusion classified as complete (100%), near-complete (95-99%), or incomplete (<95%).

Results

Mean aneurysm size was 9.4 mm. Aneurysms were saccular in 84% and fusiform/dissecting in 16%. Seventeen patients (5%) were treated in the setting of subarachnoid hemorrhage (SAH). The mean number of PEDs used was 1.2, and this number significantly decreased from 1.9 early in the study to 1.1 in the last year ($p < 0.05$). Complications occurred in 5% which included a 3.0% hemorrhagic complication rate, 1.5% thromboembolic complication rate, and 0.5% rate of PED migration. Predictors of complications were increasing aneurysm size, early discontinuation of dual antiplatelet therapy, and treatment in the setting of SAH. At follow-up (mean, 14 months), aneurysm occlusion was complete in 77.6%, near-complete in 9.1%, and incomplete in 13.3%. Predictors of incomplete occlusion were older patients, previously coiled/stented aneurysms, and MCA and posterior circulation aneurysms. At the latest follow-up, favorable outcomes (mRS 0-2) were noted in 95.7%. Neurological mortality was 1.7% and neurological morbidity 1.2%. Multivariate predictors of poor outcome were early discontinuation of antiplatelet therapy, increasing aneurysm size, and increasing number of PEDs.

Conclusions

Treatment with the PED has an excellent safety-efficacy profile at large cerebrovascular centers. Compliance with prolonged dual antiplatelet therapy is crucial for avoidance of complications. Off label locations and recurrent aneurysms are associated with lower occlusion rates. A single PED should be used whenever possible.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of the Pipeline Embolization Device in the management of cerebral aneurysms 2) Discuss, in small groups the safety and efficacy of flow diversion techniques

References

1. Brinjikji W, Murad MH, Lanzino G, Cloft HJ, Kallmes DF. Endovascular treatment of intracranial aneurysms with flow diverters: a meta-analysis. *Stroke; a journal of cerebral circulation*. Feb 2013;44(2):442-447.
2. Becske T, Kallmes DF, Saatci I, et al. Pipeline for uncoilable or failed aneurysms: results from a multicenter clinical trial. *Radiology*. Jun 2013;267(3):858-868.
3. O'Kelly CJ, Spears J, Chow M, et al. Canadian experience with the pipeline embolization device for repair of unruptured intracranial aneurysms. *AJNR. American journal of neuroradiology*. Feb 2013;34(2):381-387.
4. Chalouhi N, Tjoumakaris S, Starke RM, et al. Comparison of flow diversion and coiling in large unruptured intracranial saccular aneurysms. *Stroke; a journal of cerebral circulation*. Aug 2013;44(8):2150-2154.
5. Chalouhi N, Starke RM, Yang S, et al. Extending the indications of flow diversion to small, unruptured, saccular aneurysms of the anterior circulation. *Stroke; a journal of cerebral circulation*. Jan 2014;45(1):54-58.
6. Kallmes DF, Ding YH, Dai D, Kadirvel R, Lewis DA, Cloft HJ. A new endoluminal, flow-disrupting device for treatment of saccular aneurysms. *Stroke; a journal of cerebral circulation*. Aug 2007;38(8):2346-2352.
7. Wong GK, Kwan MC, Ng RY, Yu SC, Poon WS. Flow diverters for treatment of intracranial aneurysms: current status and ongoing clinical trials. *Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia*. Jun 2011;18(6):737-740.
8. Kallmes DF, Hanel R, Lopes D, et al. International retrospective study of the pipeline embolization device: a multicenter aneurysm treatment study. *AJNR. American journal of neuroradiology*. Jan 2015;36(1):108-115.