

Aneurysm Embolization Treatment Efficiency: Comparing the Penumbra Coil 400 System to Conventional Coils

Justin Robert Mascitelli MD; Aanand Patel; Ashwin Kamath MD; Maritsa Polykarpou; Henry Moyle, MD, PhD; Aman B. Patel MD

Mount Sinai School of Medicine



Introduction

The Penumbra Coil 400™ System (PC400) are new platinum coils designed specifically to enhance filling efficiency by increasing coil diameter. (1) Reported are the results of a comparison study to assess the device's filling advantage in the treatment of cerebral aneurysms compared to conventional embolic coils (Controls). Particular focus was put on the extent to which the larger diameter affects acute packing density, embolization time and aneurysm occlusion at 6 months post-treatment. This device is similar to Codman Orbit and Galaxy coils and Stryker GDC coils.

Methods

This was a single center, retrospective case-review of 111 aneurysm cases treated in 110 patients by the the device (N=16) or Controls (N=95). Aneurysm and procedural characteristics were evaluated. Aneurysm volume and packing density were calculated using AngioCalc, an open source aneurysm calculator. Aneurysm occlusion was graded using investigator reported Raymond Scale (2) classification immediately post-procedure, and at 6 (+ 2) months when patient follow-up was available. The data was then evaluated for statistical significance.

Results

There was no significant difference between patient characteristics between the groups. Although the Penumbra group had a statistically significant larger aneurysm volume (204.3 v. 154.5, $p < 0.05$) this group had a significantly greater packing density (36.2% v. 27.5%, $p < 0.005$). This was achieved with less coils, shorter procedure time and less coil length. Limited follow-up also shows a greater percentage of patients with complete aneurysm occlusion at 6 months.

Conclusions

Aneurysm embolization with the device achieved statistically significant greater packing density compared with conventional coils. This was achieved with less procedure time and less total number of coils despite statistically significant greater aneurysm volume. For patient follow-up, the device cases had a greater percentage of Class I Raymond Scale occlusion compared to the controls with available data at 6 months. Our data suggests that when compared to conventional coils, the device may be more efficient in the embolization of cerebral aneurysm, without affecting accessibility or safety. A larger cohort is needed to confirm these early observations.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of packing density on the treatment of aneurysms with embolization, 2) Discuss coil characteristics important in packing density and 3) Identify the patients that would be amenable to treatment with this coil system.

References

- 1) Dörfler A. et al. Early clinical experience of the Penumbra Coil 400 in Europe. *Interventional Neuroradiology* 17 (Suppl. 1): 141-146, 2011
- 2) Roy D, Milot G, Raymond J. Endovascular treatment of unruptured aneurysms. *Stroke*. 2001 Sep;32(9)

Presenter Disclosures

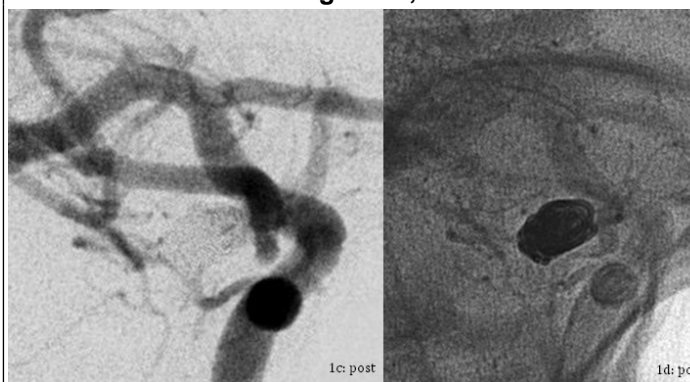
Dr. Aman Patel (the Principal Investigator in this study) receives financial compensation as a consultant and lecturer for companies that manufactures coils used in aneurysm procedures. These companies are Codman & Shurtleff, Inc. and Penumbra, Inc. Aanand Patel (a research volunteer in this study) has a related party who receives financial compensation as a consultant and lecturer for Codman & Shurtleff and Penumbra.

Images 1 a, b



Angiographic images of P Comm artery aneurysm treated with 3 Penumbra coils. Pre-treatment.

Images 1 c, d



Post-treatment. PD 46.55%. Operational time 19 minutes.

Table 1

	PC400 (N=14-16)	Controls (N=70-79)
Mean Age (yrs)	58	55
Gender Female (%)	81.8	71.8
Locations ICA / PComm. / MCA / Other (%)	50 / 31.8 / 6.9 / 12.4	41.8 / 21.9 / 8.9 / 27.8
Aneurysm Volume (mean) (cc)	204.3	187.2
Ruptured (%)	46.7	50.6
#Coils used per aneurysm (mean)	3.9*	6.1
Coil Length (mean) (cm)	36.8	56.0
Stent Assisted Coiling %	37.5	32.9
Procedure Time (mean) (min)	45.7*	64.1
Packing Density (mean) (%)	36.0**	26.1

*P < 0.05 **P < 0.005 [For non-parametric Wilcoxon Ranked Test]