

Analysis of early angiographic outcome using the Penumbra Coil 400 system in comparison to standard coils in the embolization of cerebral aneurysms: a retrospective review

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#### Introduction

The initial experience with the large diameter Penumbra Coil 400 (PC400) system has been positive regarding safety, efficacy, improved packing density, and cost effectiveness but followup data is limited.

### Methods

This is a single-center, retrospective review of 76 aneurysms treated with PC400 coils compared to 301 aneurysms treated with a variety of different bare platinum and bioactively coated coils. Atypical and giant aneurysms were excluded as well as those that had previous treatment. Occlusion classification was determined immediately after the procedure and at short-term follow-up.

#### Results

Compared to controls, the PC400 group had fewer coils used (3.53 vs. 5.44, p<0.05), decreased procedure time (48 min. vs. 64 min., p<0.05), and increased packing density (31.70% vs. 24.83%, p<0.05; Table 1). Compared to controls, there were more grade III (71.05% vs 38.21%, p<0.05) and fewer grade I aneurysms (13.16% vs 30.23%, p<0.05) in the PC400 group immediately following the procedure. At first follow-up, however, more aneurysms in the PC400 group improved (51.28% vs 28.71%, p<0.05) in angiographic grade (Figure 1). Both groups had similar rates of acceptable outcome (grade 1 or 2) at first follow-up (PC400 79.49% vs. Control 77.22%).

# Figure 1

**Immediately After Procedure** 





Angiographic images of a middle-aged patient with a ruptured basilar tip aneurysm treated with PC400 coils immediately after the procedure (left) and at 6.1 months (right). The grade III aneurysm has progressed to a grade aneurysm.

#### Table 1

|                                | PC400  | Control   | P Value            |
|--------------------------------|--|---|--------------------|
| Treatment Type                 | Stand Alone: 68.42% (52)<br>Stent Assist: 26.32% (20)<br>Balloon Assist: 5.26% (4) | Stand Alone: 60.47% (182)<br>Stent Assist: 27.57% (83)<br>Balloon Assist: 11.96% (36)   | 0.88600<br>0.09840 |
| Coil Type                      | Penumbra: 100% (76)  | Orbit: 44.19% (133)<br>GDC: 21.93% (66)<br>Trufill: 10.63% (32)<br>Galaxy: 10.30% (31)<br>Matrix: 9.63% (29)<br>Target: 2.99% (9)<br>Hydrocoil: 0.33% (1) |                    |
| Number of Coils                | 3.53   | 5.44  | 0.00190**          |
| Coil Length (cm)               | 28.07  | 56.20   | 0.01700*           |
| Coil Volume (mm <sup>3</sup> ) | 56.15  | 40.19   | <0.00001**         |
| Packing Density                | 31.70%   | 24.83%  | <0.00001**         |
| Procedure Time                 | 0:48   | 1:04  | 0.00016**          |

## Conclusions

Compared to control coils, PC400 coils achieve higher packing density with fewer coils and decreased procedure time. Furthermore, although there was a larger number of grade III aneurysms in the PC400 group immediately after the procedure, there was a greater tendency for these aneurysms to improve in angiographic grade at first follow-up leading to similar rates of acceptable outcome.

#### **Learning Objectives**

By the conclusion of this session, participants should be able to: 1) Understand how PC400 coils compare to control coils during initial treatment; 2) Understand how PC400 coils compare to control coils at 6 month follow-up regarding aneurysm occlusion class

#### References

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