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Treatment of wide-necked aneurysms at the basilar apex utilizing an antegrade approach to stent-assisted coiling.

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INTRODUCTION

Wide-necked basilar apex aneurysms pose several challenges to endovascular treatment. Multiple treatment approach options are available: including multiple crossing “Y” stents, antegrade, and retrograde approaches. Others have detailed a retrograde horizontal stent placement strategy in patients who have a robust posterior communicating artery (PCOM) to allow device navigation.\(^1\) Here we share our experience with stent technology to achieve similar horizontal positioning using an antegrade, single-circulation approach to treating basilar aneurysms.
MATERIALS & METHODS

A retrospective review of stent placement at the basilar apex conducted at our institution from 2012 to 2018 yielded 10 cases that utilized the new antegrade approach. The patients ranged in age from 30 to 66 years. Patient selection was based on the orientation of the P1 to the basilar trunk: When the basilar artery is used as the 0 degree reference, a line was drawn through the basilar apex to create 90 and 180-degree reference points (Figure 1A and Figure 2A).
Endovascular Approach

A guide catheter is advanced to the distal cervical vertebral artery followed by road mapping angiography. AP, lateral, and 3D rotational views are then performed to assess 1) the anatomic configuration of the aneurysm at the basilar apex, 2) the aneurysm neck relationship to the P1 segment origins, 3) the size discrepancy between the P1 segment and the basilar trunk, and 4) the angle of orientation of the P1 segment in relation to the basilar artery. It is best to obtain a lateral view that is looking down the axis of the posterior cerebral arteries.
Endovascular Approach (continued)

The microcatheter is advanced into the optimal P1 segment (Figure 1B and Figure 2A). The stent is then deployed within the P1 segment and across the aneurysm neck (Figure 2B). Typically, the distal two-thirds of the stent are placed further along the distal P1. It is at this point that the deployment of the stent differs from the routine. Upon reaching the final third of the stent, the operator should increase the tension to allow for minor bowing of the stent toward the aneurysm neck. This will allow for a more horizontal orientation of the stent at the time of complete deployment (Figure 1C). Deployment should otherwise occur via a standard unsheathing motion. Following confirmation of stent deployment, the microcatheter is advanced through the stent into the aneurysm fundus followed by coil embolization (Figures 2C and 2D).
FIGURE 1
Procedural approach and potential pitfalls to stent placement; view is oriented posterior to anterior. [A] Determination of P1 angle. [B] Basilar trunk approach of microcatheter. [C] Deployment of stent across neck of aneurysm. [D] Potential pitfall of proximal stent inadvertently migrating into aneurysm. Approximately two thirds of the distal stent should be positioned in the PCA to avoid this.

FIGURE 2
Final results of coil embolization. [A] AP view of microcatheter placement in the P1 segment with sample of artery angle measurement. [B] AP view of microcatheter placement prior to embolization. [C] AP view of final coiled aneurysm. [D] Lateral view of coiled aneurysm demonstrating preservation of flow at the basilar apex below the coil mass.
RESULTS

All patients underwent aneurysm treatment with stable occlusion verified at 6 months or longer. Immediate results of each case demonstrated either complete aneurysm obliteration or minimal residual neck with patent P1-to-P1 flow (Figure 2C and D). There was no morbidity or mortality associated with any case. Angiographic results are shown in Table 1.

Table 1. Results in individual cases. Results reported using Raymond-Roy occlusion classification. Nf= Neuroform (3 and EZ versions were used), D:N= aneurysm diameter to neck ratio.

<table>
<thead>
<tr>
<th>PATIENT NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
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<tr>
<td>ANEURYSM LOCATION</td>
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<td>R SCA</td>
<td>Basilar apex</td>
<td>Basilar apex</td>
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<tr>
<td></td>
<td>5.7</td>
<td>6.7</td>
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<td>1.25</td>
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<td>NIEZ 3.0x15</td>
<td>Nf EZ 3.0x15</td>
<td>Nf3 3.0x15</td>
<td>NIEZ 3.0x15</td>
<td>Nf3 2.5x15</td>
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<td>ANGLE</td>
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<td>PACKING DENSITY (%)</td>
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DISCUSSION

The current series demonstrates a novel antegrade approach (that we like to call the “stent flip”) to create a horizontal deployment of the stent, which provides more uniform aneurysm neck coverage. The benefits of the “stent flip” technique include a lower technical complexity than the Y-stent configuration, decreased equipment cost, and the involvement of only one cerebrovascular circulation during the procedure. A potential limitation of this modified approach is a wider cell structure due to the completely open stent that is at the aneurysm neck. While this may create a higher propensity for coil herniation, this was not a difficulty in this patient series.
CONCLUSION

In this series, we have demonstrated the successful and safe application of an antegrade unilateral approach to horizontal stent deployment at the basilar apex. This technique allowed for stent-assisted coil embolization of wide-necked basilar apex aneurysms with durable occlusion. As a result of these findings, this approach is considered in our practice if the patient does not have robust PCOMs and favorable basilar-P1 orientation is present.

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REFERENCES