Contralateral Approach to Coil Embolization of Proximal A1 Aneurysms Using the Anterior Communicating Artery


*AJNR Am J Neuroradiol* 2018, 39 (12) 2297-2300
doi: [https://doi.org/10.3174/ajnr.A5875](https://doi.org/10.3174/ajnr.A5875)
http://www.ajnr.org/content/39/12/2297
ABSTRACT

BACKGROUND AND PURPOSE: Aneurysms arising from the proximal A1 segment of the anterior cerebral artery are rare, and their distinctive configurations often pose technical challenges during endovascular embolization. Herein, we present 11 patients with proximal A1 aneurysms requiring a contralateral approach (via the anterior communicating artery) to coil embolization.

MATERIALS AND METHODS: From a prospectively collected data repository, we retrieved records of 11 patients consecutively treated for proximal A1 aneurysms between January 2011 and March 2018. In each instance, coil embolization was performed by the contralateral route. Outcomes were analyzed in terms of morphologic features and clinical status.

RESULTS: Aneurysms in all 11 patients were directed posteriorly and were small (<5 mm). A contralateral approach (via the anterior communicating artery) was used after ipsilateral attempts at aneurysm selection failed in each instance, despite using a variety of microcatheters. Single punctures and single guiding catheters sufficed in 9 patients, but 2 patients required dual punctures and 2 guiding catheters. All endovascular treatments ultimately yielded excellent outcomes. Although 1 symptomatic infarct was manifested in the course of ipsilateral treatment, no morbidity or mortality resulted from the contralateral access.

CONCLUSIONS: Due to angio-anatomic constraints, a contralateral strategy for coil embolization of proximal A1 aneurysms is acceptable if ipsilateral access is technically prohibitive and the vessels (contralateral A1 and anterior communicating artery) are amenable to the passage of microdevices.

ABBREVIATION: AcomA = anterior communicating artery
a contralateral approach, are shown in the Table. All aneurysms were unruptured and small (largest diameter, \(<5 \text{ mm}\)). After thorough evaluation, perceived risks, benefits, and treatment options (including aneurysm clipping) were discussed with each patient and family, who then granted informed consent. Therapeutic alternatives were formulated by neurosurgical and neurointerventional teams in a multidisciplinary decision-making process. This study was conducted with approval of institutional review boards at both hospitals.

<table>
<thead>
<tr>
<th>No.</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>An Status</th>
<th>Size of An (mm)</th>
<th>D/N Ratio</th>
<th>Double Guiding/Puncture</th>
<th>Degree of Occlusion</th>
<th>Complication</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>61</td>
<td>M</td>
<td>UR</td>
<td>2.8</td>
<td>0.8</td>
<td>Single</td>
<td>Near-total</td>
<td>None</td>
<td>Complete occlusion at 18 mo</td>
</tr>
<tr>
<td>2</td>
<td>61</td>
<td>F</td>
<td>UR</td>
<td>3.4</td>
<td>1.4</td>
<td>Single</td>
<td>Subtotal</td>
<td>Symptomatic infarction</td>
<td>Minor recanalization at 18 mo</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
<td>M</td>
<td>UR</td>
<td>2.4</td>
<td>1.4</td>
<td>Single</td>
<td>Near-total</td>
<td>None</td>
<td>Complete occlusion at 18 mo</td>
</tr>
<tr>
<td>4</td>
<td>41</td>
<td>M</td>
<td>UR</td>
<td>3.1</td>
<td>2.1</td>
<td>Single</td>
<td>Total</td>
<td>None</td>
<td>Complete occlusion at 72 mo</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>M</td>
<td>UR</td>
<td>2.6</td>
<td>2.0</td>
<td>Single</td>
<td>Total</td>
<td>None</td>
<td>Complete occlusion at 48 mo</td>
</tr>
<tr>
<td>6</td>
<td>62</td>
<td>F</td>
<td>UR</td>
<td>3.8</td>
<td>2.3</td>
<td>Single</td>
<td>Near-total</td>
<td>None</td>
<td>Complete occlusion at 6 mo</td>
</tr>
<tr>
<td>7</td>
<td>39</td>
<td>F</td>
<td>UR</td>
<td>3.0</td>
<td>1.9</td>
<td>Single</td>
<td>Near-total</td>
<td>None</td>
<td>No follow-up</td>
</tr>
<tr>
<td>8</td>
<td>52</td>
<td>F</td>
<td>UR</td>
<td>2.7</td>
<td>1.2</td>
<td>Double</td>
<td>Total</td>
<td>None</td>
<td>Complete occlusion at 18 mo</td>
</tr>
<tr>
<td>9</td>
<td>42</td>
<td>F</td>
<td>UR</td>
<td>2.6</td>
<td>1.5</td>
<td>Double</td>
<td>Total</td>
<td>None</td>
<td>Complete occlusion at 6 mo</td>
</tr>
<tr>
<td>10</td>
<td>58</td>
<td>F</td>
<td>UR</td>
<td>3.0</td>
<td>2.0</td>
<td>Single</td>
<td>Total</td>
<td>None</td>
<td>Complete occlusion at 6 mo</td>
</tr>
<tr>
<td>11</td>
<td>73</td>
<td>F</td>
<td>UR</td>
<td>3.5</td>
<td>1.8</td>
<td>Single</td>
<td>Near-total</td>
<td>None</td>
<td>No follow-up</td>
</tr>
</tbody>
</table>

Note:—An indicates aneurysm; D/N, depth to neck; UR, unruptured.

**Endovascular Procedure**

All the procedures were performed with the patient under general anesthesia. Configurations and arterial architectures of aneurysms were evaluated using Integris V and Allura Clarity (Philips Healthcare, Best, the Netherlands) or an Innova IGS 630 (GE Healthcare, Milwaukee, Wisconsin) biplane system, including 3D rotational angiography. In each patient, a 300-mg loading dose of clopidogrel was given 1 day in advance of the procedure, and it was supplemented by a morning dose (75 mg) on the day of the procedure. Poor responders to clopidogrel (ie, P2Y12 reactivity

units of $\geq 285$, indicated by the VerifyNow P2Y12 assay [Accu-
metrics, San Diego, California]) received aspirin as well (300-mg
loading dose). A bolus of heparin (3000 IU) was administered
after femoral artery sheath placement, intermittent bolus doses
(1000 IU/h) were delivered thereafter, and activated clotting times
were monitored. Following procedures, no maintenance anti-
platelet medications were routinely prescribed.

Immediate and Final Outcome

Degrees of saccular occlusion were gauged during completion an-
giography using a 3-point scale of contrast retention: total occlu-
sion (no residual filling), near-total occlusion (minimal residual
filling at the base), and subtotal occlusion (any saccular filling).
Clinical outcomes were assessed using the Glasgow Outcome
Score, and follow-up anatomic results were categorized as com-
plete occlusion, minor recanalization, or major recanalization.

RESULTS

In all 11 instances, the aneurysms were directed posteriorly and
were devoid of branches. The maximum diameter of each was $< 5
mm. Angio-anatomic configurations related to the aneurysms,
including the ipsilateral A1, contralateral A1, AcomA diameter,
and so forth, are summarized in the On-line Table. The ipsilateral
approach had regularly failed in microcatheter selection of prox-
imal A1 aneurysms, despite multiple attempts using variably
shaped catheters, so a contralateral approach via the AcomA was
used. Single punctures and single guiding catheters sufficed for
coil embolization in 9 patients, but 2 patients required dual punc-
tures and 2 guiding catheters. A distal access catheter was used in
1 older patient. Immediately after coil embolization, 10 aneu-
rysms appeared successfully occluded with a residual sac persist-
ing in only 1 lesion. A procedure-related adverse event occurred
in 1 patient who had symptomatic infarction. The ischemia was
induced in the course of selecting the aneurysm by an ipsilateral
(not a contralateral) approach. Nine patients (2 treated recently
being exempt) underwent follow-up evaluations, including MRA
and/or conventional angiography. Eight patients showed com-
plete occlusion, without recanalization. In 1 patient, minor recan-
alization was evident. There were no delayed complications such as thromboembolic infarction or hemorrhage.

Patient 6

A 62-year-old woman was admitted for treatment of an unrup-
tured, posteriorly directed left proximal A1 aneurysm (3.8 mm;
depth-to-neck ratio, 2.3). The A1 segment (diameter, 2.2 mm) of
the anterior cerebral artery originated from the ICA at an acute
angle (58°), but the contralateral A1 (1.5 mm) and AcomA (1.6
mm) were of sufficient caliber to allow microcatheter passage.
Once a 6F guiding catheter was placed in the cervical portion of
left ICA, aneurysm selection by microcatheter was attempted re-
peatedly but failed, despite various catheter shapes (including
steam-shaped S and preshaped S) used. The guiding catheter was
then moved into the right ICA, and a preshaped C microcatheter
was navigated retrograde from the right A1 into the left A1 via the
AcomA. The microcatheter was first used for selective angiogra-
phy of the proximal A1 close to the aneurysm, delineating its
configuration. Once introduced into the sac, a frame coil of ade-
ficient length for stability was inserted, and additional coiling was
performed. The aneurysm was thereby successfully occluded, and
the patient was discharged complication-free on the following day
(Fig 2).

DISCUSSION

A retrograde or nonantegrade approach to coil embolization was
first described by Moret et al, in 2000. In their series, aneurysms
subjected to this innovative technique were situated as follows:
basilar bifurcation, 5; ICA bifurcation, 2; posterior communicat-
ing artery, 2; superior cerebellar artery, 2; and posterior inferior
cerebellar artery, 1. The balloon-remodeling technique was used
in all lesions. With the same objective in mind, a number of au-
thors have described the use of a retrograde approach with stent assistance. Although their original intent was delivery of protection devices for optimal neck coverage, we believe that retrograde access is also useful in proximal A1 aneurysms, helping in the selection of aneurysms after failed ipsilateral attempts. By comparison, a contralateral (versus ipsilateral) approach affords smoother routes to the aneurysm sacs. Although all aneurysms in this series were unruptured and devoid of branches, this retrograde approach may be applied even in their counterparts (when perforators arise from the aneurysm or the patient presents with hemorrhage) if the aneurysm configuration is suitable for coil embolization and key vessels (contralateral A1 and AcomA) are amenable to the passage of microdevices.

Selection of proximal A1 aneurysms is particularly difficult due to their small size, proximity to ICA bifurcation, and posterior orientation; and, the acutely angled origin of the A1 from the ICA bifurcation is problematic. As noted by Cho et al., a pre-shaped S-curve microcatheter may be preferential in the first attempts at ipsilateral selection. This microcatheter has a reported success rate of 63%. In addition to proximal angulation, it bears a tightly angled distal aspect that is almost impossible to replicate by steam-shaping. However, Lee et al. have similarly claimed that a Z-shaped microcatheter, formed by steam-shaping, is an asset under these circumstances. Although contralateral access is also feasible, the AcomA must be patent and capable of accommodating a microcatheter.

Another important point is that a retrograde approach via the AcomA does not always require 2 guiding catheters and dual femoral punctures. In double-guiding scenarios, 1 catheter generally serves for coil delivery and the other allows angiographic delineation of lesions. The present series, however, confirms that the use of a single guiding catheter and single femoral puncture readily suffices in this setting. Protection devices or additional microcatheters were not otherwise required in the patients we treated. These aneurysms were devoid of branches and were small enough to characterize through selective angiography using the same microcatheter intended for subsequent coil insertion.

At present, we do not advocate contralateral access as a first-line approach for embolization of proximal A1 aneurysms. The efficacy and safety of this approach must be further established in a larger study population. Nevertheless, it may constitute a viable alternative in disadvantaged situations in which standard methods do not apply.

CONCLUSIONS
Given the inherent angio-anatomic hindrances to coil embolization of proximal A1 aneurysms, a contralateral approach may be reasonable if ipsilateral access proves prohibitive and key vessels (the contralateral A1 and AcomA) are amenable to the passage of microdevices.

Disclosures: Moon Hee Han—UNRELATED: Consultancy: Microvention.* *Money paid to the institution.

REFERENCES