Interhemispheric approach with callosal resection for distal anterior cerebral artery aneurysms

Technical note

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Distal anterior cerebral artery aneurysms are commonly found near the genu of the corpus callosum. While these aneurysms may be surgically obliterated through a variety of approaches, exposure via the interhemispheric fissure is used by many surgeons. Early identification of the afferent artery may be difficult with this approach, however, particularly if the aneurysm lies just beneath the genu of the corpus callosum. The authors have modified the interhemispheric approach to distal anterior cerebral artery aneurysms by selectively exposing the feeding artery through a small anterior callosotomy. While this maneuver is not necessary for all distal anterior cerebral artery aneurysms, it can greatly enhance exposure in the region just below the genu of the corpus callosum. Experience with this technique in five patients is reported. In all cases, the limited anterior callosotomy enhanced surgical exposure. No morbidity could be attributed to the callosotomy in any patient. It is concluded that, when the interhemispheric approach is used, anterior callosotomy improves exposure of the region just below the genu of the corpus callosum and may be a useful maneuver when treating distal anterior cerebral artery aneurysms.

KEY WORDS • intracranial aneurysm • anterior cerebral artery • corpus callosum • pericallosal aneurysm

Pericallosal or distal anterior cerebral artery (ACA) aneurysms comprise 0.35% to 5.5% of all aneurysms. These lesions are most commonly found near the genu of the corpus callosum at the point of origin of the callosomarginal artery, and they are often associated with vascular anomalies of the anterior cerebral circulation such as an azygous ACA. Distal ACA aneurysms may be approached via a subfrontal craniotomy; however, many surgeons prefer to use an interhemispheric route. One potential problem with the interhemispheric approach is that the aneurysm may be encountered before one establishes proximal control. We have modified the interhemispheric approach by selectively exposing the feeding artery via a small callosotomy and we here report our experience using this technique.

Illustrative Case

This 48-year-old woman presented 1 day after a subarachnoid hemorrhage, at which time she was lethargic but would respond to voice. She had meningismus but was without focal neurological deficits. Her medical history was significant for hypertension, chronic obstructive pulmonary disease, narcolepsy, and severe asthma; these problems had been managed medically with theophylline, captopril, and methylphenidate (10 mg twice daily by mouth).

Examination. Computerized tomography demonstrated blood in the interhemispheric fissure at the level of the genu of the corpus callosum. A cerebral angiogram revealed three aneurysms arising from the distal end of an azygous ACA. In addition, there was an aneurysm at the trifurcation of the right middle cerebral artery (MCA).

Operation. The distal ACA aneurysms were exposed via an interhemispheric approach. Early in the procedure, a small anterior callosotomy was performed and the azygous ACA was encountered immediately rostral to the genu. A temporary clip was placed across this vessel, and the aneurysms arising from the head of the azygous artery were fully identified and clipped. Following the successful obliteration of the distal ACA aneu-
Discussion

About 0.35% to 5.5% of intracranial aneurysms arise from the distal ACA. An association between an agyous ACA and pericallosal aneurysms has been noted. An association between an agyous ACA and pericallosal aneurysms has been noted. Huber, et al. reviewed 7782 angiograms and found that an agyous type of ACA is associated with a greater than 100-fold increase in the incidence of pericallosal aneurysms. Baptista performed dissections of the ACA in 381 brains. In addition to agyous arteries, he found that 12% of the brains had a dominant artery arising distal to the anterior communicating artery (ACoA) which irrigated both hemispheres. He named this vessel the "bihemispheric" ACA. We have treated several patients with pericallosal aneurysms arising from a bihemispheric ACA, and it is our belief that the development of pericallosal artery aneurysms in these patients is analogous to the development of aneurysms in patients with agyous arteries.

Distal ACA aneurysms appear to be prone to intraoperative rupture; Snyckers and Drake experienced an intraoperative rupture in 50% of their patients with pericallosal aneurysms, while the incidence of intraoperative rupture of all other supratentorial aneurysms in their series was 13%. Recently, however, it appears that the development of microsurgical technique has decreased the incidence of intraoperative rupture of these aneurysms.

Distal ACA aneurysms are frequently surrounded by densely scarred arachnoid, which makes complete dissection difficult and more dangerous. Furthermore, these aneurysms often have large broad-based necks or contain atheromatous plaques which complicate the surgical management and occasionally necessitates microsurgical reconstruction of the parent vessel. Therefore, it is imperative that one adequately expose the afferent artery not only to enable proper clip placement but also to allow temporary clip placement if the need arises.

Two surgical approaches to these lesions have been discussed extensively. Subfrontal craniotomy has been recommended for aneurysms arising proximal to the distal ACA bifurcation and in the region below the genu of the corpus callosum. Yoshimoto, et al., in particular, favor this approach for all aneurysms arising distal to the ACoA to just beyond the genu, primarily because it provides early proximal control. Some surgeons have found the subfrontal approach to be extremely difficult. Exposure of pericallosal aneurysms in the area of the genu and more distally through the interhemispheric fissure has been described in detail. However, when the interhemispheric approach is employed, visualization of the pericallosal artery beneath the genu may be difficult. This problem can be partially alleviated by placing the patient in the neutral position. Adequate interhemispheric exposure of the proximal vessel often requires some initial dissection of the aneurysm and retraction in the area of the aneurysm. The problem is even more complex if the aneurysm itself lies just below the genu of the corpus callosum.

We approach distal ACA aneurysms interhemispherically in a manner similar to that described by Sundt. If the aneurysm arises at or below the genu of the corpus callosum and the feeding artery is not readily identifiable, we electively resect the corpus callosum prior to final aneurysm dissection and clipping (Fig. 2). A 5- to 7-mm callosotomy will provide adequate exposure of the parent vessel. Identification of the parent vessel in patients with either an agyous ACA or a bihemispheric ACA is relatively easy. In situations where the distal ACA's are of equal caliber, it may be more difficult to determine which vessel is filling the aneurysm. It must be remembered that these arteries do not normally lie side by side, but rather one lies in the concavity of the other. The left distal ACA has been reported to be located posterior to the right in almost three-fourths of patients. In addition to providing proximal control, a callosotomy will enhance one's ability to visualize fully the aneurysm neck when it lies beneath the genu.

We do not advocate callosal resection in all cases of distal ACA aneurysms. Over the period in which these
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operations were performed, we have clipped three additional distal ACA aneurysms in this region using an interhemispheric approach without resecting the anterior corpus callosum. We recommend resection only when it will enhance exposure. This may be particularly true in cases where the angiogram leads one to believe that the aneurysm is distal to the genu but, at the time of surgery, it is found to be just below the genu.

There is a large experience with corpus callosotomy for the treatment of seizure disorders. In these cases, extensive anterior callosotomy has been associated with minimal neurological morbidity. Although formal neuropsychological studies in such patients may indicate problems with interhemispheric transfer, this rarely affects the patient's normal activities. The amount of resection performed in seizure patients is much greater than the small resection needed to expose the distal ACA. While sophisticated neuropsychological testing was not performed in our patients, we could not detect any evidence of a disconnection syndrome with clinical testing, and the patients noted no particular problems in this regard.

In conclusion, we believe that a small anterior callosotomy should be considered when using the interhemispheric approach to distal ACA aneurysms. We have not experienced any morbidity with this maneuver, which allows one more easily to obtain proximal control prior to final aneurysm dissection and clipping. It is also useful in exposing the aneurysm neck itself in situations where the aneurysm arises from just beneath the genu of the corpus callosum.

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References


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