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A Case in Favor of Aneurysmographic Studies: A Perforating Artery Originating from the Dome of a Basilar Tip Aneurysm

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Summary: A posterior perforating artery originating from the dome of a basilar tip aneurysm is reported. The exact origin of this perforator was identified by selective aneurysmography only. This observation provides an argument favoring the consideration of aneurysmographic studies before treatment of large aneurysms located in proximity to areas of normal perforating arteries.

Index terms: Aneurysm; Arteries, perforating

Anatomy of the perforating branches of the basilar bifurcation area is of major concern when surgical or endovascular treatment of basilar tip aneurysms is planned. It is generally assumed that perforating arteries do not arise from the aneurysmal sac itself (1–3). We report a case of basilar tip aneurysm in which a posterior perforating artery was found to originate from the dome of the aneurysmal sac. This anatomic disposition was recognized only after selective aneurysmography was performed.

Case Report

A 33-year-old otherwise healthy woman initially presented with a headache followed within a day by a partial right third cranial nerve palsy. Magnetic resonance (MR) imaging revealed a large (19-mm) basilar tip aneurysm, confirmed by digital subtraction angiography (DSA). The first angiographic study showed the presence of a large aneurysmal lumen with an irregular extension at the anteroinferior aspect toward the right side, accounting for the third cranial nerve compression (Fig 1A and B). The study further suggested that the P1 segments of both posterior cerebral arteries would be at least partially incorporated in the base of the aneurysmal sac, while the superior cerebellar arteries appeared to originate from the basilar artery immediately adjacent to the base of the aneurysm. Both posterior communicating arteries were identified (Fig 1C and D). It was decided to evaluate the aneurysm by selective aneurysmography before possible treatment with Guglielmi detachable coils. The direct contrast injection into the aneurysm showed a perforating artery coming off the posterior aspect of the aneurysmal sac, at some distance from the basilar tip and the origin of the right P1 segment (Fig 1E and F). A right-sided mesencephalic parenchymal blush and a corresponding venous drainage became apparent during these angiographic studies (Fig 1G).

This observation discouraged an endovascular procedure with direct treatment of the aneurysmal sac. After multidisciplinary discussion, clipping across the distal basilar artery was performed just distal to the level of the superior cerebellar arteries, in order to avoid complete occlusion of the aneurysmal cavity. However, a postoperative left-sided hemiparesis developed, and a postoperative MR study revealed the presence of a focal infarct in the right cerebral peduncle (Fig 2). Control angiograms performed 3 and 10 months after surgery showed progressive thrombosis of the aneurysmal cavity, finally resulting in its complete occlusion (Fig 3). The hemiparesis resolved progressively, and the patient's symptoms were gone at the time of the 6-month follow-up examination.

Discussion

Aneurysms of the basilar bifurcation are associated with a poorer prognosis than are aneurysms located elsewhere in the posterior circulation (3–6), in particular if projecting into the interpeduncular fossa. This has been attributed to the involvement of vital perforating arteries situated close to the area of the basilar bifurcation (4–7). The microsurgical anatomy of these perforators was the subject of several recent studies (1, 7–10). The perforating arteries generally arise from the P1 arterial segment close to the aneurysmal origin, particularly when the aneurysm is small and does not involve adjacent arteries (2). It has also been shown that perforating branches coming from P1 segments may

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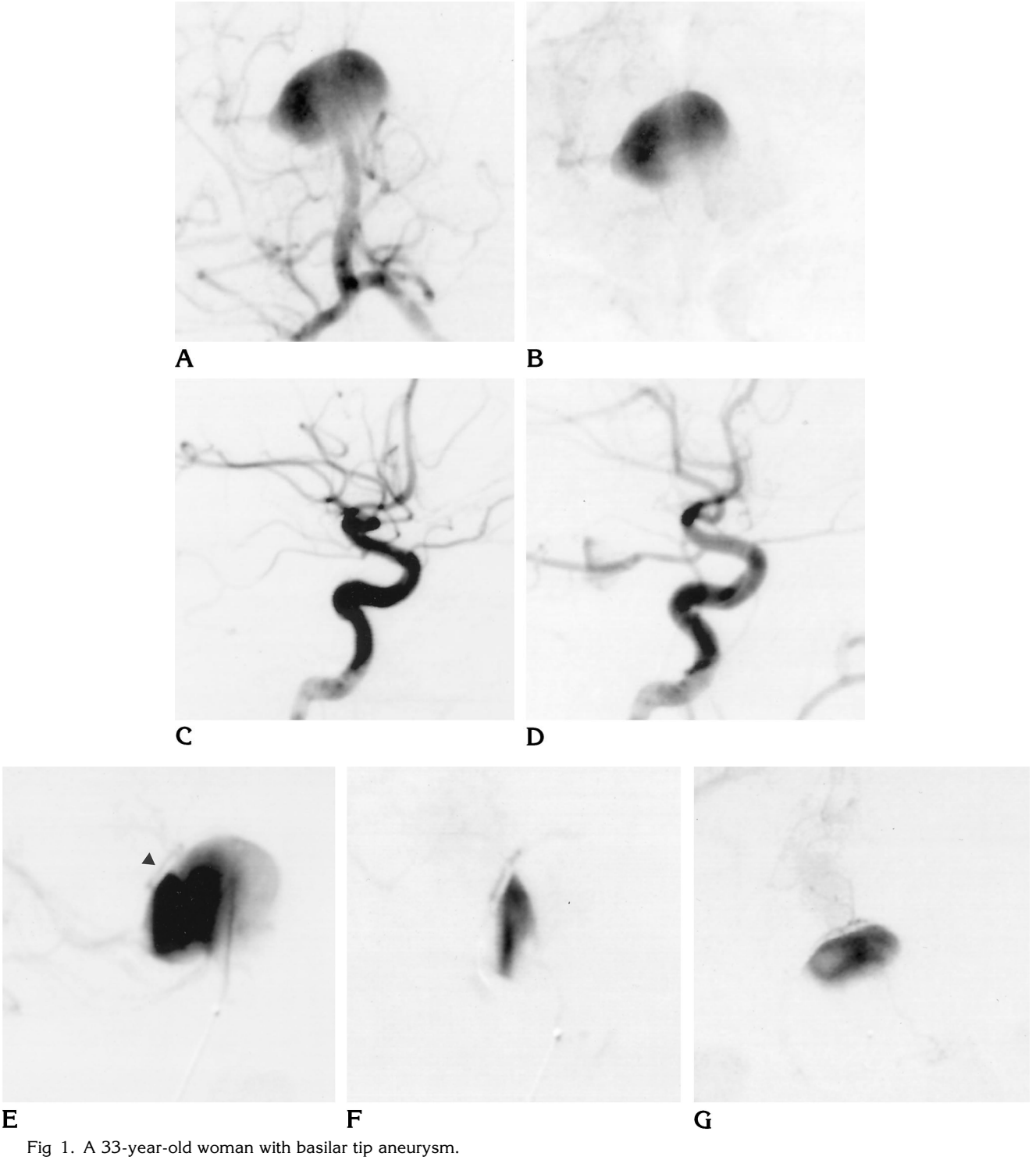


Fig 1. A 33-year-old woman with basilar tip aneurysm.

A and *B,* Anteroposterior views of right vertebral angiogram show a large basilar tip aneurysm incorporating the origin of both posterior cerebral arteries.

C and *D,* Lateral views of left and right carotid angiograms reveal the presence of both posterior communicating arteries.

E and *F,* Lateral views of selective aneurysmography. A perforating artery coming off the posterior aspect of the aneurysmal sac is identified in *E* (*arrowhead*). In *F,* the perforating branch remains opacified as long as the aneurysmal cavity is visible, while the posterior cerebral arteries are no longer identifiable.

G, Anteroposterior view of selective aneurysmography shows a right-sided parenchymal blush of the mesencephalon, indicating the territory irrigated by the perforating artery.

adhere closely to the aneurysmal sac (1–3, 5), and thus angiographically mimic origin from the aneurysmal cavity itself. However, when the aneurysm is associated with a dilatation of the basilar bifurcation or has become large, perforating arteries may be seen to originate from the base of the aneurysmal sac, particularly when the P1 segments are partially incorporated into the aneurysmal wall. In such cases, surgical or endovascular treatment may risk occlusion of the perforating arteries. The possibility of perforating arteries arising from the dome of the sac of a basilar tip aneurysm is usually denied (1, 3).

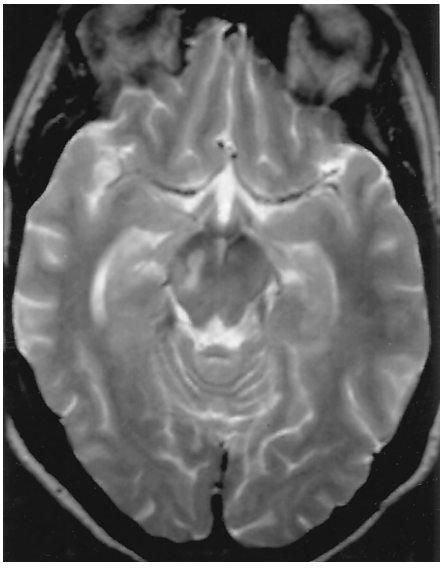
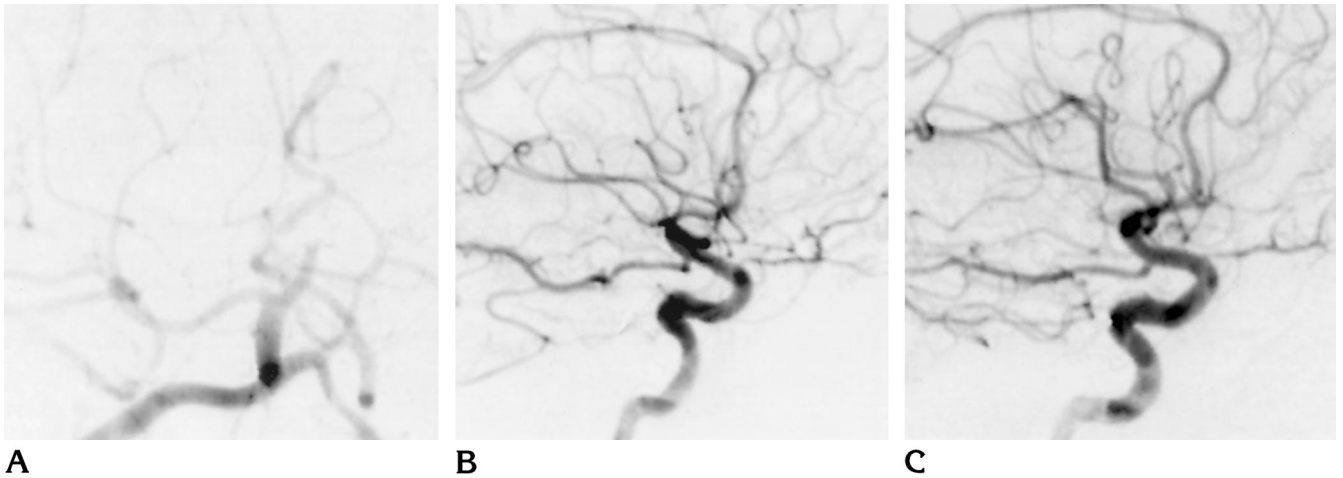


Fig 2. Postoperative T2-weighted axial MR image shows focal hyperintensity in the right cerebral peduncle.

In our case, aneurysmography clearly showed the origin of the perforating artery to be at considerable distance from the base, at the posterior superior aspect of the aneurysmal dome.

We see two possible explanations for this observation. We can first imagine an aneurysm originating from an ampular dilatation of the basilar tip, which has progressively incorporated different adjacent arterial segments in its wall. This explanation could be supported by the fact that both P1 segments appeared shortened, and that both arose directly from the aneurysmal cavity. As an alternative explanation, the perforating artery originating at considerable distance from the base of the aneurysm suggests the initial presence of a real basilar tip perforating branch, as not infrequently found by Grand and Hopkins (8).

Aneurysmography has some risk, possibly inducing aneurysmal (re)rupture or thromboembolism, in the case of partial endoluminal thrombosis. However, after our experience with this case, we would like to stress that prior to an endovascular treatment by detachable coils the presence of perforating arteries originating from the aneurysmal dome should be excluded by such a superselective study. Careful aneurysmographic study should be considered for an-



A B C

Fig 3. Control angiograms obtained 10 months after surgery show complete thrombosis of the aneurysmal cavity.

A, Anteroposterior view of right vertebral angiogram, with abrupt termination of the basilar artery immediately distal to the level of the superior cerebellar arteries due to the surgical clip (not visible on this subtracted view).

B and *C,* Lateral views of left and right carotid angiograms show good collateral flow to the posterior fossa through both posterior communicating arteries.

eurysms of specific locations, such as the basilar bifurcation, in order to avoid unrecognized proximal occlusion of a perforating branch. In addition, if this concept is generalized, one must consider that perforating arteries with a vessel size inferior to the resolution capacity of DSA may be present and overlooked at angiography.

In summary, this case demonstrates that perforating arteries may originate from the dome of a basilar tip aneurysm, and that superselective aneurysmographic studies may be required to establish such an origin.

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References

1. Caruso G, Vincetelli F, Giudicelli G, et al. Perforating branches of the basilar bifurcation. *J Neurosurg* 1990;73:259–265
2. Sundt TM. *Surgical Techniques for Saccular and Giant Intracranial Aneurysms*. Baltimore, Md: William & Wilkins; 1990:231–278
3. Yasargil MG. *Microneurosurgery*. New York, NY: Thieme; 1984;1: 233–256
4. Laine E. Arterial vertebro-basilar aneurysms. *Prog Brain Res* 1968;30:323–346
5. Drake CG. The treatment of aneurysms of the posterior circulation. *Clin Neurosurg* 1979;26:96–144
6. Chou SN, Ortiz-Suarez HJ. Surgical treatment of arterial aneurysms of the vertebrobasilar circulation. *J Neurosurg* 1974;41: 671–680
7. Saeki N, Rhoton AL. Microsurgical anatomy of the upper basilar artery and the posterior circle of Willis. *J Neurosurg* 1977;46:563–578
8. Grand W, Hopkins LN. The microsurgical anatomy of the basilar artery bifurcation. *Neurosurgery* 1977;1:128–131
9. Pedroza A, Dujovny M, Ausman JI, et al. Microvascular anatomy of the interpeduncular fossa. *J Neurosurg* 1986;64:484–493
10. Marinkovic SV, Gibo H. The surgical anatomy of the perforating branches of the basilar artery. *Neurosurgery* 1993;33:80–87