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Endovascular Treatment of a Giant Fusiform Aneurysm of the Entire Basilar Artery

Armand Aymard,^{1,4} Jonathan E. Hodes,^{1,2} Daniel Rüfenacht,^{1,3} and Jean Jacques Merland¹

Summary: The authors describe a case of fusiform basilar artery aneurysm not amenable to surgical clipping or balloon occlusion with preservation of the parent artery. The aneurysm was treated by balloon occlusion (proximal basilar artery) after test occlusion was well-tolerated; 7-year follow-up showed good results.

Index terms: Aneurysm, cerebral; Arteries, basilar; Interventional neuroradiology

Surgical treatment of fusiform basilar artery aneurysms is a complex procedure with significant risk. This treatment consists of surgical occlusion of the basilar trunk, or ligation of the vertebral artery or arteries. Either of these procedures carry a significant perioperative morbidity and mortality. There are very few published cases of the complete obliteration and clinical cure of these aneurysms. We present a case of a giant fusiform aneurysm of the entire basilar artery that was successfully treated by the endovascular occlusion of the basilar artery, documented by angiography and 7 years of clinical follow-up.

Case Report

A 13-year-old boy presented in August 1981, following subarachnoid hemorrhage. CT revealed hydrocephalus and a giant partially calcified and thrombosed mass lesion anterior to the compressed brain stem (Fig. 1A). Angiography confirmed the diagnosis of a giant fusiform aneurysm of the entire basilar artery (Figs. 1B and 1C). He was not treated at that time. His clinical course was distinguished by the development of a left hemiparesis, difficulty in swallowing, and a bilateral cerebellar syndrome. He presented again in March 1983, in a severely debilitated state with worsened bilateral cerebellar syndrome, oculomotor dysfunction, quadraparesis, facial diplegia, and respiratory

dysfunction requiring tracheostomy. At that time, an endovascular test occlusion of the origin of the aneurysmal basilar artery was attempted. Selective catheterization of the left vertebral artery through the femoral approach was performed and a detachable contrast-filled latex balloon mounted on a 1-F polyethylene microcatheter was positioned in the lower third of the basilar artery. It was impossible to maintain the balloon in this position because, with inflation, the balloon migrated more distally into the aneurysm (Fig. 2). The balloon was repositioned more proximally at the vertebrobasilar junction, where test occlusion for 20 minutes showed perfect clinical tolerance. Patency of both posterior inferior cerebellar arteries (PICAs) (which collaterally supplied the entire cerebellum) and filling of the posterior communicating arteries was confirmed during the test occlusion by carotid and vertebral artery angiography. The latex balloon was inflated with contrast in this position and, because of the relative instability of the balloon position, was left attached to the 1-F polyethylene catheter. The latter was buried under the skin in the groin at the femoral level.

Clinically, the patient showed remarkable recovery. He experienced gradual clinical improvement, with complete regression of his cerebellar syndrome, oculomotor and other motor deficits, including disappearance of facial diplegia over the ensuing postoperative weeks. At 7-year follow-up he has a residual wide based gait, but has completed high-school and has resumed a normal life. MR demonstrates a residual prepontine mass, (Fig. 3) but arteriography shows complete exclusion of the basilar artery aneurysm.

Discussion

Surgical occlusion of the vertebral basilar arterial system for treatment of unclippable basilar artery aneurysms has been extensively described by Drake (1–3). Occlusion of the dominant vertebral artery, intra- or extracranially, can be accomplished. In Drake's series, eight of 18 patients

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¹ University of Paris VII, Lariboisiere Hospital, Department of Neuroradiology and Therapeutic Angiography, 2, rue Ambroise Pare, 75010 Paris, France.

² Present address: Department of Neurosurgery and Radiology, Wayne State University, 4201 St Antoine 6E, Detroit, MI 48201.

³ Present address: Department of Radiology, University of Minnesota, Minneapolis, MN.

⁴ Address reprint requests to Armand Aymard, MD, Department of Neuroradiology, l'Hôpital Lariboisière, 2, rue Ambroise Pare, 75010 Paris, France.

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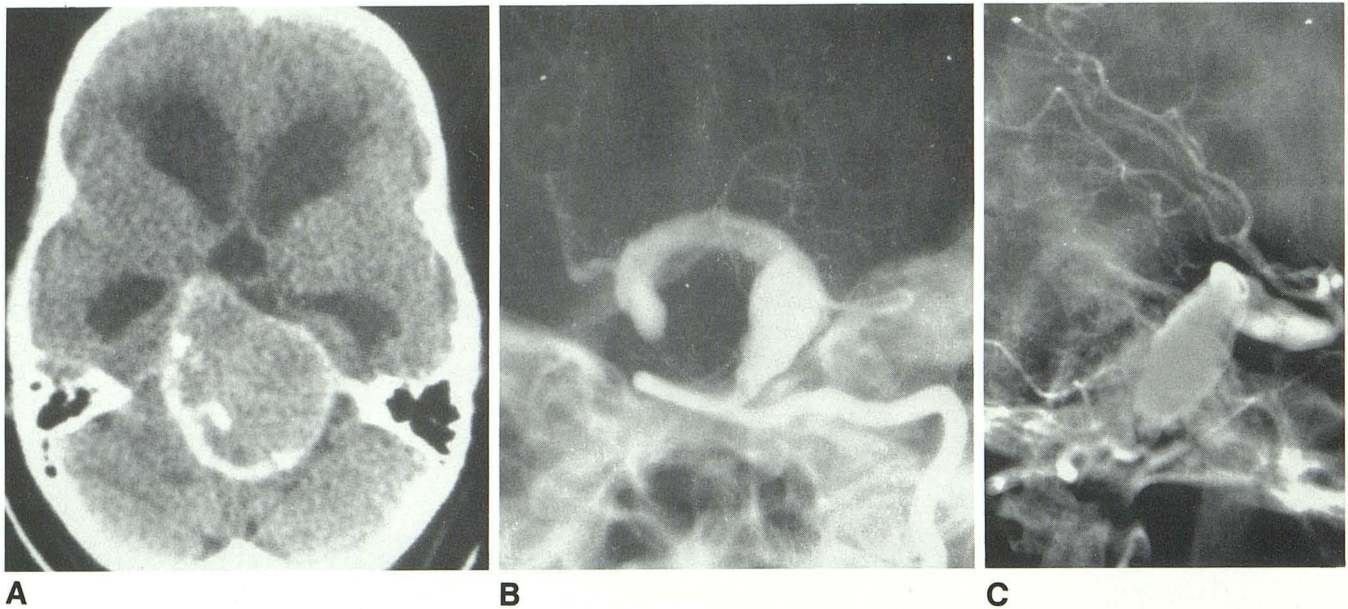


Fig. 1. CT and vertebral angiogram prior to endovascular treatment.

A, Unenhanced CT scan showing a large calcified mass lesion, displacing the brain stem and causing ventricular dilatation.

B, Anteroposterior and C, lateral left vertebral angiogram showing fusiform aneurysmal dilatation of the entire basilar artery.

who underwent vertebral artery occlusions had excellent results, four had good results, four had bad results, and four died (2). In selected cases, basilar artery occlusion has been performed (1). In Drake's experience, occlusion was accomplished by acute proximal clipping or aneurysm

trapping in 12 of 22 patients, and tourniquet occlusion in 10 of 22 patients. The outcome was excellent in 12 patients, good in two, bad in five, and three died (2). Surgical treatment is difficult in the best of hands, and carries a significant morbidity and mortality.

Proximal vessel occlusion for treatment of aneurysms that are unclippable by conventional surgical approaches is an accepted alternative. More recently, surgical occlusion has been modified by the advent of detachable balloon technology (4-11). This new technology has the significant advantage of simplicity and offers more security because the entire procedure can be done under vigilant neuroleptic analgesia. This affords the opportunity to perform neurologic testing as well as angiographic assessment affirming adequate collateral vascular supply. Endovascular therapy now permits access to the neck and lumen of otherwise unreachable aneurysms. These techniques allow "packing" of the lesion with preservation of the parent vessel or, if necessary, proximal parent vessel occlusion (10-13). In cases of giant fusiform aneurysms of the entire basilar trunk, the only therapeutic alternative is the occlusion of the basilar or vertebral artery.

When parent vessel occlusion is contemplated, the ideal location is as close to the aneurysm as is safely possible. On the pretreatment arteriogram of our case, neither the anterior, inferior, or

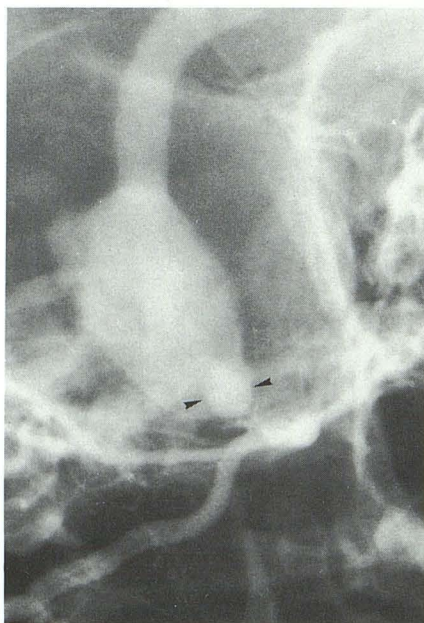


Fig. 2. Right vertebral arteriogram during treatment (right anterior oblique view). Contrast-filled balloon in origin of the basilar artery, migrating distally into the fusiform aneurysm (arrowheads).

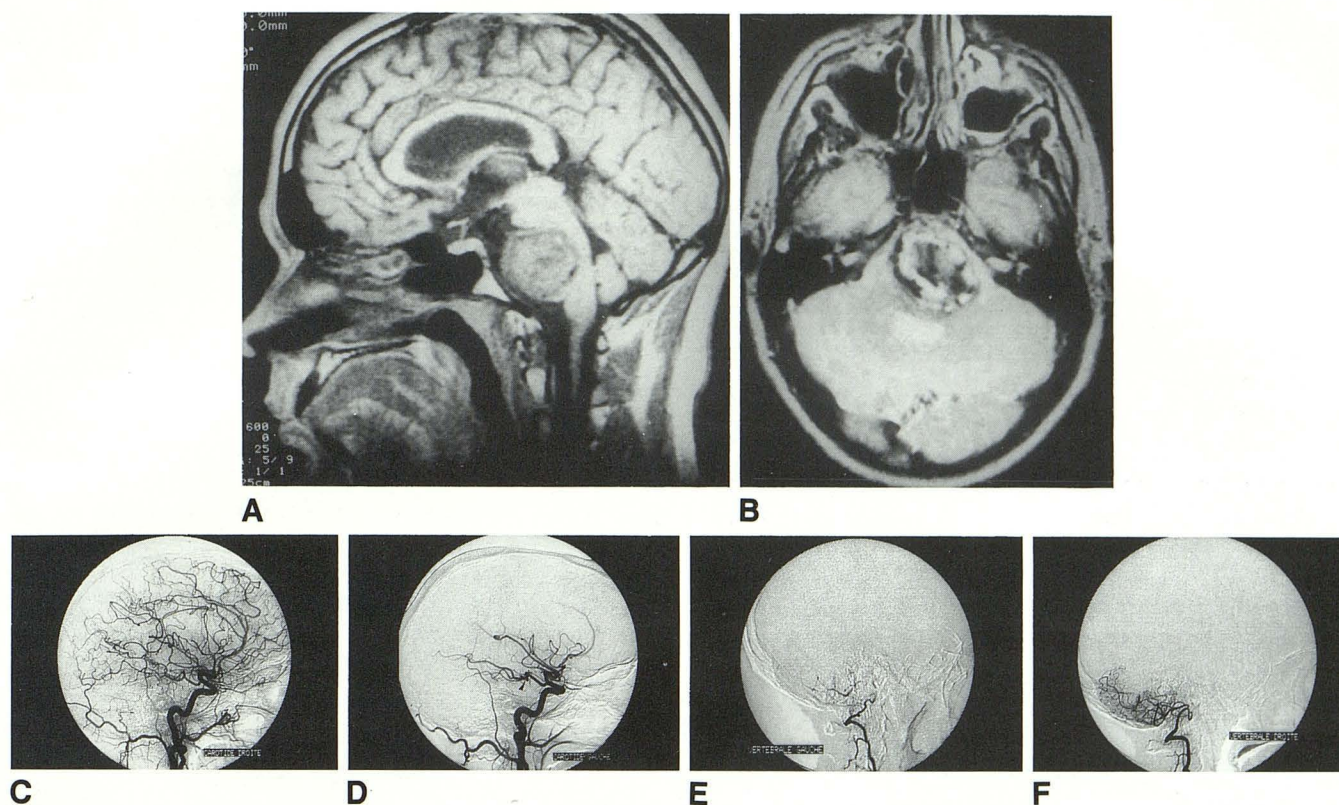


Fig. 3. Seven-year follow-up.

A, MR sagittal T1-weighted (600/25) image showing a heterogeneous retroclival mass lesion deforming the pons.

B, MR axial T2-weighted (2300/100) image showing the retroclival heterogeneous mass with low signal intensity areas representative of either hemosiderin or calcification.

C, Right carotid arteriogram, lateral projection, showing filling of the left posterior cerebral artery (PCA) from the left posterior communicating artery.

D, Left carotid arteriogram, lateral projection, showing filling of the right PCA from the right posterior communicating artery with slight opacification of the distal basilar artery.

E, Left vertebral arteriogram, lateral projection, shows filling of the left PICA.

F, Right vertebral arteriogram, lateral projection, showing filling of the right PICA.

superior cerebellar arteries were visualized, leading to the conclusion that the entire posterior fossa was vascularized by the PICAs. Thus, vertebral artery occlusion was not considered the best choice because of our concern for preserving flow to both PICAs. In our case, occlusion of the basilar artery at its origin was perfectly tolerated clinically, and bilateral carotid and vertebral angiographic studies showed adequate filling of both posterior communicating arteries and collateral cerebellar vascularization by both PICAs.

Our test occlusion was performed with only clinical and angiographic observation. More rigorous monitoring might include posterior fossa cerebral blood flow determination and brain stem-evoked potentials (14) during basilar artery occlusion. Despite the likely existence of basilar artery perforating vessels arising from the aneurysm,

the patient tolerated basilar occlusion. We believe that this can be explained by preexisting occlusion of the origins of the perforating arteries by spontaneous partial aneurysm thrombosis. In cases where temporary occlusion of the vertebro-basilar system is not tolerated, we would consider posterior fossa revascularization prior to definitive endovascular occlusion (15, 16).

To reduce the risk of sudden thrombus in treated aneurysms, heparinization might be helpful, although this was not done in our case. The use of anticoagulants is possible after endovascular occlusions, whereas fear of wound bleeding often prohibits anticoagulation after conventional surgery. In this case, absorption of the giant aneurysm is only partial (see MR study at 7-year follow-up), most likely due to calcification of the thrombus and wall.

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