

Treatment of a Saccular Aneurysm at the Fenestration of the Intracranial Vertebral Artery with Guglielmi Detachable Coils

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Introduction

Angiographic demonstration of fenestrations of the intracranial vessels has been frequently documented. Fenestrations may occur in the vertebral artery (VA), basilar artery, anterior cerebral artery, middle cerebral artery, and internal carotid artery. Saccular aneurysms are frequently associated with fenestrations of the intracranial vessels. Saccular aneurysms can be of two types: those at the site of fenestration and those in other locations. To our knowledge, the case presented here, of a saccular aneurysm occurring at the site of a fenestration of the intracranial VA, is the second reported in the literature. We present this extremely rare case and discuss its embryological interpretation.

Case Presentation

A 35-year-old man developed sudden severe headache during the night. Although he was alert at that moment, he soon lost consciousness. The patient was transferred to our hospital immediately by ambulance. The patient's history was unremarkable except for hypertension which was under medical control. On admission, he was comatose with non-reactive isocoric, miotic pupils. The patient was intubated and underwent controlled ventilation.

Computed tomography showed subarachnoid haemorrhage predominantly in the posterior fossa with mild hydrocephalus. Due to poor clinical grade (Hunt and Kosnik grade V), right frontal ventriculostomy was performed. The ventriculostomy was followed by diagnostic angiography which showed a saccular aneurysm at the fenestration of the left intracranial VA. (Figs. 1a, b, c). In spite of the patient's poor clinical state, embolisation with Guglielmi detachable coil (GDC, Target Therapeutics, Fremont, CA, USA) was carried out to prevent further bleeding. GDC-10 coils with a total length of 18 cm were used. The aneurysm was occluded, and blood flow in both limbs of the fenestration was preserved. (Fig. 1d). Despite the medical, supportive treatment, this patient died on the fourteenth day due to primary brain damage caused by the initial subarachnoid haemorrhage.

Discussion

Fenestration of the basilar artery as well as the anterior spinal artery is explained by the fusion failure of the embryological longitudinal neural system at the midline [3]. Other fenestrations are explained by the segmental recanalisation due to early and transient arterial constraint during embryonic development or by the remnant of the embryological vessels [2]. The fenestration of the extracranial VA is divided into two types according to the embryological origins. In the segmental recanalisation type, a fenestration remains in the vertebral canal between the two consecutive transverse processes while in the remnant vessel type (duplication), one of the vessels leaves the vertebral canal and enters into the spinal canal and courses in the subarachnoid space between the two consecutive transverse foramina. The duplicated vessel is a remnant embryological vessel of the paramedian longitudinal system, i.e., the lateral spinal artery [2].

Fenestration of the intracranial VA is attributed either to the remnant vessel of the primitive basilovertbral anastomoses in the early embryological stage [4] or to the segmental recanalisation of the primitive VA. The basilovertbral anastomoses described by Padget parallel the longitudinal neural arteries [3], and they are the primitive intradural, segmental and inter-segmental vessels in the posterior fossa. The VA fenestration in our patient may be a fenestration of the primitive VA caused by the arterial constraint in the early embryonic stage because two limbs of the fenestration are too close together and they run in the normal course of the VA. There has been only one report of a saccular aneurysm occurring at the fenestration of

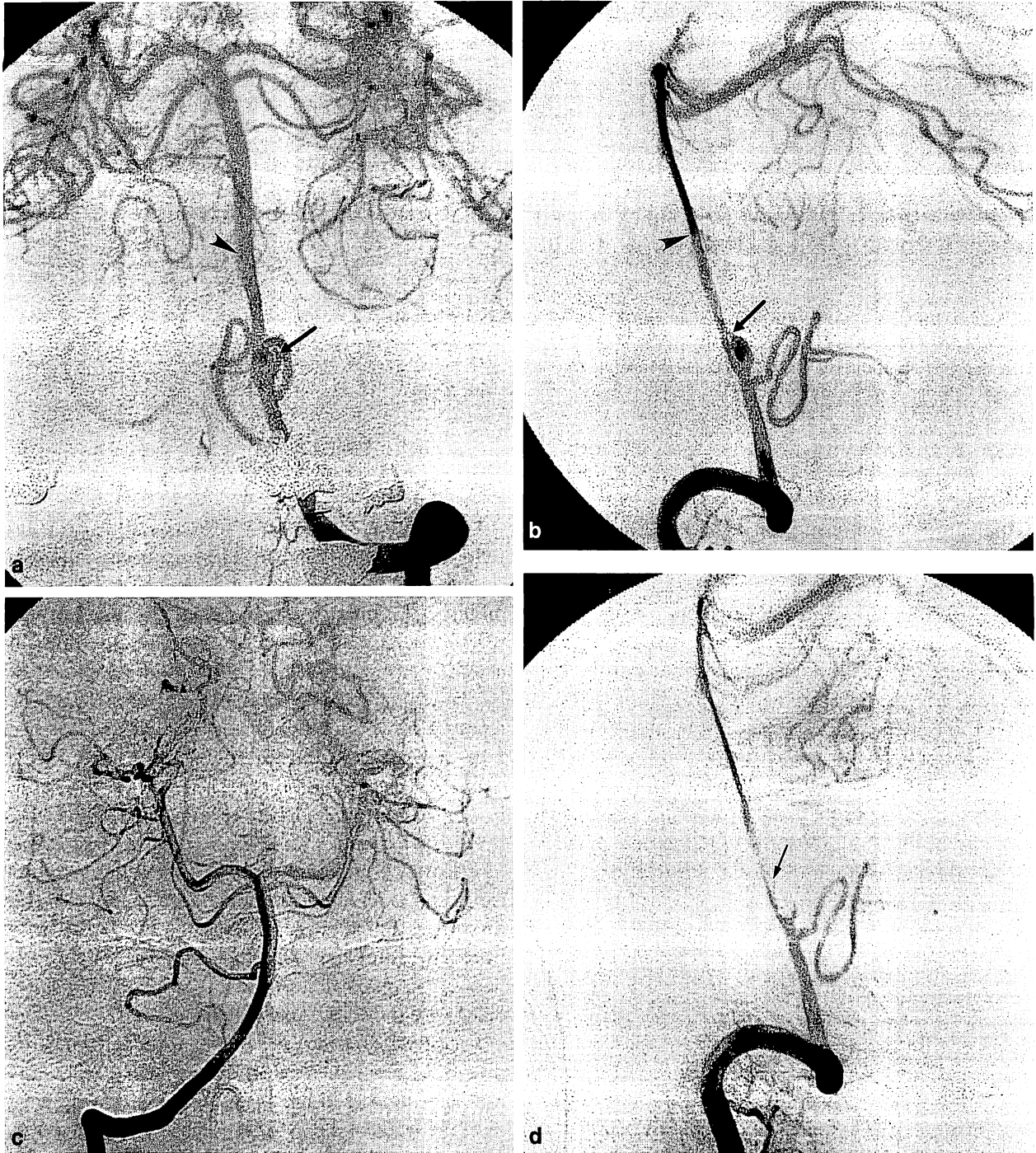


Fig. 1. (a, b) Left vertebral injection (a: anteroposterior view, b: lateral view) shows the saccular aneurysm originating from the proximal end of the vertebral fenestration. Arrow indicates the smaller limb of the fenestration. The left posterior inferior cerebellar artery originates from the vertebral artery proximal to the aneurysm. Arrowhead indicates the origin of the right anterior inferior cerebellar artery as a reference of this artery in the right vertebral angiogram. (c) Right vertebral injection (anteroposterior view) does not show the aneurysm. (d) Post-embolisation left vertebral injection (lateral view) shows occlusion of the fenestration aneurysm with the preservation of blood flow in the fenestration. Arrow indicates the flow in the smaller limb of the fenestration

the VA [1]. It is important to differentiate the aneurysm at the VA fenestration from an aneurysm of the posterior inferior cerebellar artery. In some cases of

fenestration aneurysms, fenestration is only apparent after treatment. Thus, careful angiographic observation using multiple projections and bilateral VA study

are mandatory to understand the complex anatomy and haemodynamics of the VA fenestration aneurysm.

References

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