Aneurysm of the Pericallosal Artery Caused by Closed Cranial Trauma

Case Report

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Several instances of traumatic intracranial arterial aneurysm after penetrating injury or fracture adjacent to the internal carotid or middle meningeal arteries have been reported. The development within a few days or weeks after closed cranial trauma of an aneurysm on an artery shown to be free of aneurysmal dilatation immediately following the injury has rarely been documented, and must certainly be an unusual occurrence. We have recently performed serial carotid arteriograms on such a patient and have observed the development of an apparently traumatic aneurysm of the right pericallosal artery.

Case Report

A 21-year-old man was admitted to Saint Louis City Hospital on October 15, 1967, shortly after an automobile accident in which he had been struck on the head.

Examination. The patient was unconscious, with rigidity of the legs and bilateral extensor toe signs. He moved the left leg less than the right. A right carotid arteriogram performed on the day after admission (Fig. 1) disclosed no abnormality except minimal bowing of the pericallosal artery from left to right.

It was thought that the patient had bilateral cerebral contusion with more swelling on the left. He was treated with osmotic diuretics and Decadron, and regained consciousness after 4 days. He had no dysphasia or weakness of the arms but showed persistent marked weakness of the legs and feet with more motor deficit on the left and more sensory loss on the right. Spine x-rays were normal, and there was no difficulty with bladder control, so the lesion was thought to

Fig. 1. Right carotid arteriogram 1 day after injury. Lateral (left) and anteroposterior (right) projections show no evidence of an aneurysm on the pericallosal artery. The aneurysm probably arose at the first point of bifurcation of the artery (cf Fig. 3).
be in the cerebral hemispheres beneath the site of cranial trauma rather than at the spinal level. No lumbar puncture was done.

Because of persistent headache and nausea and the development of papilledema in the right eye, a left carotid arteriogram was done on October 23, 8 days after the accident. The lateral projection was normal (Fig. 2 left), but the serial anteroposterior views with compression of the right carotid artery showed subdural hematoma over the left cerebral convexity with a small shift of the pericallosal arteries and the internal cerebral veins from left to right (Fig. 2 right). There was no evidence of hematoma on the right side. In retrospect, a small aneurysm of the right pericallosal artery may be visualized on the anterior view (arrow, Fig. 2 right). This artery was not filled on the lateral projection.

Operation. A small semiliquid subdural hematoma was evacuated through a left parietal craniectomy.

Postoperative Course. The patient had immediate relief of his headache and nausea. Within 10 days he was walking without assistance, but his left foot was still very weak. He was discharged on diphenylhydantoin, 300 mg per day, and did well at home for 2 days. On the third day he complained of severe right frontal headache, had a grand mal seizure, and was brought to the emergency room of Saint Louis University Hospital.

Second Examination. On admission the patient had decerebrate posturing, left-sided seizures, and a dilated right pupil with marked retinal hemorrhages. A right carotid arteriogram was performed immediately; during this procedure his respirations became periodic and both pupils dilated. An aneurysm of the right pericallosal artery arising at a point of bifurcation was demonstrated (Fig. 3). The anteroposterior projection demonstrated the aneurysm and a large shift from right to left.

Second Operation. A right frontal craniotomy was done at once. After opening the dura, a massive subdural hematoma was encountered and evacuated. The aneurysm then began bleeding profusely and was clipped along with its parent vessel. The aneurysm was not clearly seen before clips were applied. No intracerebral hematoma was found.

Second Postoperative Course. The patient remained decerebrate or decorticate for 1 month. He then remained in a mute state with no purposeful responses to verbal or painful stimuli for 2 months. He was discharged to a nursing home where he died in January, 1968, after a brief hyperpyrexic state.

Autopsy. The autopsy examination was limited to the cranium. There was softening of the right frontal lobe. The site of the aneurysm was obliterated by four Olivecrona

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**Fig. 2.** Left carotid arteriogram 8 days after injury. Lateral projection (left) shows no abnormality. Anteroposterior projection (right) with compression of the right common carotid artery shows a small left subdural hematoma. There is a suggestion of aneurysmal dilation on the right pericallosal artery (arrow).
clips surrounded by fibrosis. The pericallosal artery was occluded proximally by one clip, and no recognizable aneurysmal wall remained grossly. Microscopic sections through this region after removal of the clips disclosed only fibrosis of the arterial walls with no identifiable aneurysm. Upon sectioning the brain, multiple old infarcts were found in the thalamus, cerebral peduncles, and the brain stem. The calcarine cortex was shrunken by laminar necrosis. These lesions were all thought to be secondary to the acute hemorrhage. No recent lesions were noted.

Discussion

The literature concerning traumatic aneurysms caused by penetrating missiles and cranial fractures has been reviewed by Araki, et al.1 To our knowledge, the only published instance of an aneurysm developing on an angiographically normal intracranial vessel subsequent to closed trauma was reported by Hirsch, et al.2 Their patient had a normal right internal carotid artery on the day of closed cranial trauma, but 8 days later a repeat arteriogram showed an intradural internal carotid aneurysm arising at the level of the posterior communicating artery. It was thought to be a true aneurysm, but had an extremely fragile wall at the time of surgery, so that it had to be treated as a lateral tear of the artery.

In our patient, it is likely that the pericallosal artery was traumatized by the edge of the falx during the automobile accident. Frontal lobe herniations beneath the falx are common occurrences with cerebral mass lesions and could occur transiently during acceleration-deceleration. Branches of the posterior cerebral arteries might be exposed to similar injury by the free edge of the tentorium, but arterial injury of this sort leading to aneurysm formation must be extremely rare, since thousands of patients have severe cranial trauma each year and very few develop aneurysms of the pericallosal or posterior cerebral arteries subsequently. Lateral wounds of meningeal or cortical arteries were recognized to be the source of false aneurysms of these vessels.3 It has been well documented that trauma (sometimes trivial) can cause rents in surface arteries, and occasionally cause subdural hematomas.2,5

The survey reported by the Central Registry of the Cooperative Study of Intracranial Aneurysms and Subarachnoid Hemorrhage,4 does not mention trauma as a factor in the formation of aneurysms, although 2.8% of all patients with subarachnoid hemorrhages from aneurysms reported trauma related to the onset of hemorrhage.

Summary

Serial arteriograms performed on a 21-year-old man after closed cranial trauma disclosed the development of an aneurysm
on the right pericallosal artery within 3 weeks after the accident. The artery appeared to be normal immediately after the injury. The aneurysm probably was caused by trauma to the arterial wall by the edge of the falx.

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References