



H2 A Fistful of Dollars: An Unexpected Delayed Development and Rupture of a Traumatic Fusiform Posterior Inferior Cerebellar Artery (PICA) Aneurysm

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Learning Overview: After attending this presentation, attendees will understand the importance of suspecting and evaluating vascular lesions of the posterior cranial fossa following closed head trauma.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by showing that a cranio-cervical trauma that creates acceleration and deceleration of the cerebellum inside the skull affecting PICA at its origin can lead to the formation of intracranial traumatic aneurysms, causing ischemic processes and death of the affected subject.

Intracranial traumatic aneurysms are extremely rare, representing less than 1% of all intracranial aneurysms. Traumatic aneurysms should be suspected in the context of acute neurological deterioration following any type of closed head injury. Most of these lesions develop in the anterior circulation (i.e., in the middle cerebral artery, in the anterior cerebral artery, or in the internal carotid artery). Less than 10% of them occur in the posterior circulation. Delayed rupture occurs in about 50% of cases; the interval between injury and rupture ranges from a few hours to ten years, with an average interval of 14–21 days. The mortality rate is high, ranging between 32%–54%. As far as pathogenesis is concerned, it is suspected that the head trauma produces acceleration and deceleration of the cerebellum within the skull, tearing the PICA at its origin.

A 26-year-old man was brutally punched in the face in a disco. He was admitted to the emergency department unconscious, with a lacerated-contused eyebrow wound, and with several vital sign parameters that were severely altered. No skull fractures were evident. A head Computed Tomography (CT) scan revealed extensive subarachnoid hemorrhage, cerebral edema, intraventricular hemorrhage, and post-traumatic endocranial hypertension. Based on these diagnostic findings, the patient underwent bilateral decompressive neurosurgery. There were no complications until postoperative day ten, when suddenly the patient's hemodynamic status and neurologic condition began to worsen. Head CT scan and CT angiogram were performed showing a fusiform aneurysm measuring approximately 3.6 x 4.5mm located in the proximal portion of the left PICA. This aneurysmal dilatation showed homogeneous enhancement in the arterial phase and presented irregular profiles on the anterolateral side due to apparent rupture. Associated hypodensity of the brainstem due to vasospasm phenomena was identified, as was a vasospasm-associated filiform aspect to the arteries of the Circle of Willis. Overall, the described findings were compatible with a ruptured post-traumatic intracranial aneurysm, a rare but recognized complication of closed head trauma. Despite neurosurgical attempts to repair the vessel, the patient died after a few months following multiple episodes of massive rebleeding.

Diagnostic features useful to distinguish a traumatic aneurysm from a natural fusiform aneurysm include age and sex (i.e., traumatic aneurysms are more frequent in young males) and a history of closed head trauma with typical angiographic aneurysm characteristics, including peripheral position. Other supportive traumatic aneurysm features include aneurysm location away from a branching point with irregular contour of the aneurysmal sac, absence of an aneurysmal neck, and delayed filling and emptying with position adjacent to the edge of the sickle. The radiological images obtained in the case described above fully reflected these characteristics.

In conclusion, this case report demonstrates that a history of a closed traumatic brain injury causing intraventricular hemorrhage with massive subarachnoid bleeding in the posterior cranial fossa should raise concern for significant vascular lesions, such as a ruptured aneurysm or other rupture/dissection of the vertebro-basilar arterial system. Unfortunately, it is not possible to precisely predict the timing for development nor rupture of a post-traumatic intracranial aneurysm; the relatively few cases presented in the literature, anatomical variability of the subjects involved, and multiplicity of other involved factors preclude standardized timing. Currently, careful monitoring of patients at risk seems the only option to detect intracranial traumatic fusiform aneurysms, a rare but potentially lethal consequence of closed head traumatic injury.

TBI, Subarachnoid Hemorrhage, Traumatic PICA Aneurysm