Differentiation of Aneurism from Infundibulum of the Posterior Communicating Artery

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AN ARTERIOGRAPHIC demonstration of aneurysms encountered in the lower portion of the C1 segment of the internal carotid artery, below the origin of the anterior choroidal artery and at, or near, the junction with the posterior communicating artery, has remained a vexatious problem because of the danger of interpreting a benign projection of contrast material as representing an aneurismal dilatation. The subject has received little attention although discussions with colleagues reveal an acute awareness of the problem gained, in part, at the expense of negative surgical explorations. The radiographic anatomy of this site has been discussed by Saltzman in noting that the posterior communicating artery is often dilated and funnel-shaped at its point of origin at the carotid siphon, an area which may be termed the infundibulum. Although the infundibulum can fill with contrast material from the carotid artery, the subsequent course of a posterior communicating artery with a small lumen may not be visualized because of failure to fill or because of the low density of contrast material in the small-caliber vessel. The resultant sacular projection of contrast material arising from the supraclinoid internal carotid artery may be readily confused with an aneurism.

Five cases are presented in which the apparent aneurism was actually the infundibulum of the posterior communicating artery. The problems encountered in differentiating between the two alternatives are noted and suggestions are offered for establishing the correct diagnosis.

Case Reports

Case 1. A 37-year-old woman was admitted with severe frontal headaches and in a confused state. She had a history of hypertension and was found to have a blood pressure of 240/140. A lumbar puncture revealed sanguineous cerebrospinal fluid and, during the ensuing 24 hours, nuchal rigidity became evident. Bilateral carotid and right vertebral arteriograms* revealed grossly reduced circulation time, vascular tortuosity, elevation of the right carotid siphon, and an aneurismal projection from the supraclinoid portion of the right internal carotid artery.

Twenty-one days later, after medical control of her blood pressure was obtained, a low right frontotemporal craniotomy was performed utilizing intravenous tris(hydroxymethyl)aminomethane under normothermic conditions and resulting in good exposure of the vasculature in question.

Under direct observation, there was no evidence of local subarachnoid hemorrhage or of an aneurism. Tortuosity of atherosclerotic vessels, rather than hematoma, accounted for elevation of the carotid siphon. A large funnel-shaped junction of the posterior communicating artery with the internal carotid was observed; after leaving the infundibulum, the narrow posterior communicating artery angled sharply posteriorly and upwards.

Demonstration of continuity between infundibulum and posterior communicating artery might have been expected if either the carotid or vertebral arteries had been compressed during vertebral or carotid injection, respectively (cf. Case 5). The preoperative diagnosis of aneurism was enhanced by the ragged appearance of the terminal portion of the infundibular projection. In retrospect the ragged outline appears to be caused by the juxtaposition of the projection to the clinoid process.

Case 2. A 54-year-old male was admitted in coma with a history of good recovery from a "stroke" involving the left side of the body 2 years previously. The present incident began with the sudden onset of severe frontal headache followed by collapse and, subsequently, a convulsive episode. Pertinent findings include blood pressure

* Although these films have been submitted, they are not included in the publication of this report because of the large number of illustrations involved.
and right vertebral angiography demonstrated an aneurismal projection at the origin of the right posterior communicating artery (Fig. 2).

Nine days following subarachnoid hemorrhage the patient was subjected to a low, right, frontotemporal craniotomy under automatic controlled passive hyperventilation.

Under direct observation no aneurism was seen. The “lesion” noted on angiography appeared to be caused by a funnel-shaped junction of the posterior communicating artery with the internal carotid. At the lower end of this infundibulum, the posterior communicating artery abruptly narrowed and turned posteriorly. Many atherosclerotic plaques were observed. Throughout the subarachnoid space of the region explored, numerous adhesions were encountered and the brain was stained yellow-green, consistent with the recent subarachnoid hemorrhage. The course of the posterior communicating artery was demonstrated as arising directly from the aneurismal projection which proved to be the infundibulum.

Case 4. A 60-year-old male was admitted with left-sided weakness and severe right temporal headache of 1 day’s duration. Spinal fluid was entirely normal. Right carotid arteriography demonstrated an aneurismal projection of contrast material from the lower end of the C1 portion of the internal carotid artery. Subsequent injections resulted in films (Fig. 3) which prove that the projection represents a large descending infundibulum from which the posterior communicating artery arises and continues abruptly upward and backward over the tentorial edge. This patient was not operated on.

Comment. Attention is directed to Figs. 3 and 4A which allow comparison with a proven internal carotid aneurism near the junction of the internal carotid and posterior communicating arteries. Fig. 4B is an orbital

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**Fig. 1. Case 2.** Carotid arteriogram demonstrating the bulging infundibulum.

**Fig. 2. Case 3.** Carotid arteriogram revealing a dilated infundibulum of the posterior communicating artery.

**Fig. 3. Case 4.** Lateral view following carotid injection revealing a dilated infundibulum leading into the posterior communicating artery.