

Incidence of Berry Aneurysms of the Unpaired Pericallosal Artery: Angiographic Study

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Summary. The highest incidence of aneurysms at bifurcations of different configuration among all cerebral arteries occurs at the bifurcation of large unpaired pericallosal arteries. A berry aneurysm was present in seven (41%) of 17 unpaired pericallosal arteries in our material.

Key words: Aneurysm – Azygos pericallosal artery – Bihemispheric pericallosal artery

Introduction

According to the cooperative study of intracranial aneurysms [9, 14], the occurrence of berry aneurysms of the pericallosal artery (postcommunicating section of the anterior cerebral artery) is estimated at about 2.6%. Estimates of other authors [2, 6, 7, 10, 15, 16] vary only slightly from this figure (2–6%). The majority (70%) of aneurysms of the pericallosal artery are located close to the genu of the corpus callosum just where the callosomarginal artery branches off [2].

Many authors maintain that the bifurcation of the unpaired pericallosal artery (*A. pericallosa azygos*) (APCA) is the site of berry aneurysms in an unusually high proportion of cases [2, 4, 5, 8, 12]. Among 22 aneurysms of the pericallosal artery Pool and Potts [12] found three at the bifurcation of an APCA (13.6%).

However, only few such aneurysms at the above mentioned location are known. Most of the cases reported happened to be single observations [3, 4, 5]. There are opposing views concerning the incidence of the unpaired pericallosal artery. In a work compiled by ten authors, who investigated 2153 vascular sys-

tems, 23 APCA (barely 1%) were recorded [1]. Baptista [1] studied the various anomalies of the pericallosal artery carefully, and after examining 381 brains he found only one APCA (0.26%) whereas angiography on 107 patients by LeMay and Gooding [8] revealed four such cases, representing nearly 4%. They concede however, that if the brains had subsequently been dissected, this figure would possibly have been less, since a few of these vessels could be classified as a bihemispheric pericallosal artery. Baptista found 45 bihemispheric pericallosal arteries in 381 brains (12%). He endeavoured to define clearly the characteristics of the APCA and the bihemispheric pericallosal artery with their different variations, as well as the accessory pericallosal artery:

1. APCA: Only an unpaired trunk of the pericallosal artery is present, from which arise mesial branches to both hemispheres. The unpaired main trunk divides, close to the corpus callosum, into two pericallosal arteries.

2. Bihemispheric pericallosal artery: Both pericallosal arteries are present, but of varying calibre. The more developed artery sends branches to supply the medial surface of the opposite hemisphere, while the less developed pericallosal artery supplies the medial surface of the ipsilateral frontal lobe. While the differentiation of the various types mentioned is easy on anatomical specimens, an exact angiographic determination of a particular type (in spite of bilateral injection of the internal carotid artery and/or applying the compression test) is difficult, if not impossible. This differentiation is even more difficult if only unilateral angiography is performed, due to the frequent asymmetry of the anterior cerebral artery in the precommunicating section. It is not rare to find one or more smaller tributaries of the pericallosal artery crossing over the midline to supply the medial surface of the adjacent hemisphere.



Fig. 1. Azygos pericallosal artery

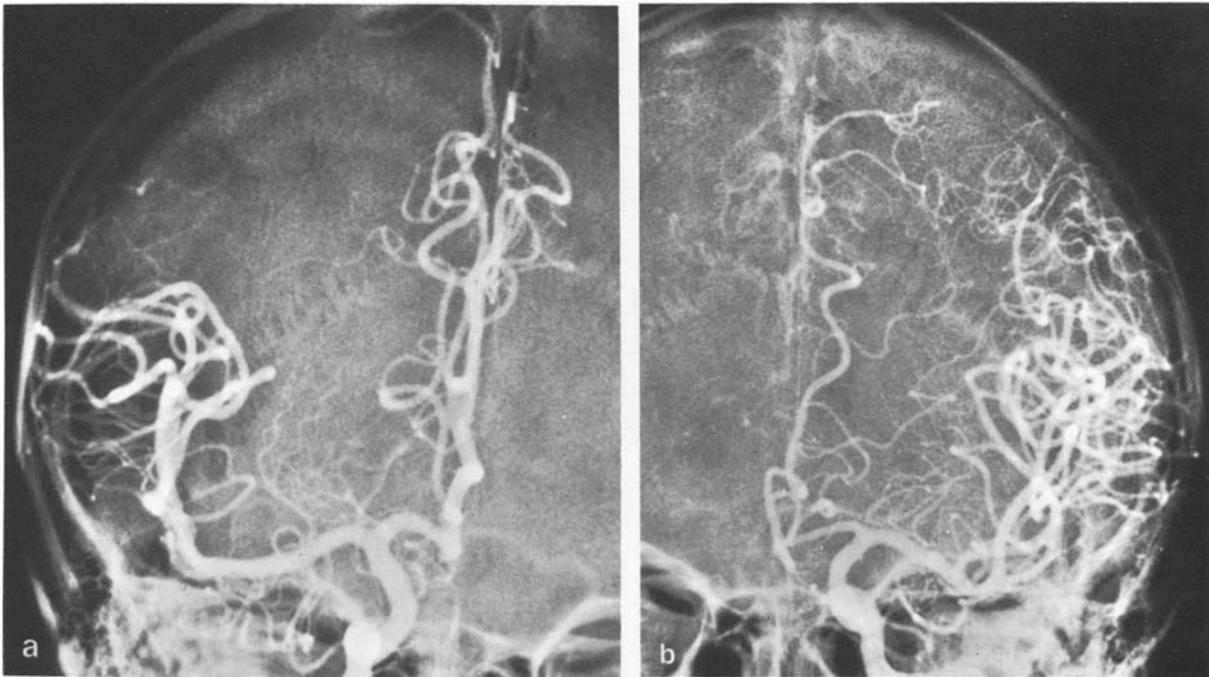


Fig. 2, a and b. Bilateral carotid angiography of a bihemispheric pericallosal artery. **a** Right side; **b** Left side

Material

In the following study we have endeavoured to investigate angiographically the relationship between the frequency of unpaired trunks and the incidence of berry aneurysms of the pericallosal artery. In accordance with observations of other investigators, the

most frequent location of berry aneurysms distal to the anterior communicating artery (postcommunicating section), is the point where the callosomarginal artery branches off from the pericallosal artery close to the genu of the corpus callosum. For the evaluation of our angiographic material, we shall confine ourselves to the following criteria: only a large single

pericallosal trunk, which unequivocally divides into two branches of similar diameter close to the genu of the corpus callosum, will be considered to be an unpaired pericallosal artery (azygos pericallosal or bihemispherical pericallosal type). The vessel distal to the point of division of the unpaired pericallosal trunk will be called "supracallosal pericallosal section". An unpaired pericallosal trunk was considered to belong to the azygos pericallosal group, if during the carotid injection both anterior cerebral arteries were filled and only a single large pericallosal trunk emerged, which supplied all mesial branches of both hemispheres and divided into two supracallosal pericallosal sections close to the genu of the corpus callosum (Fig. 1). We define as bihemispheric pericallosal artery a pericallosal trunk arising from the anterior cerebral artery and branching into two supracallosal pericallosal sections close to the genu corporis callosi. At the same time the usually thin opposite anterior cerebral artery sends off one or two branches to supply the frontal mesial ipsilateral hemispheric surface e. g. frontoorbital artery, frontopolar artery and internal frontal artery (Fig. 2).

We are aware that the number of bihemispheric pericallosal arteries identified in our material is less than that found in anatomical specimens. Nevertheless, for the relevant question of anomalies we thought it better to exclude all cases which were not proven unequivocally to belong to these two groups.

From 1959 to 1979 uni- or bilateral carotid angiographies were performed on 7782 unselected patients for various indications. We observed 17 distinct cases of large unpaired pericallosal trunks which divided into two supracallosal pericallosal sections close to the genu of the corpus callosum. This corresponds to barely 0.2% of the total number of patients examined. Four of the 17 unpaired pericallosal trunks were of the APCA type, while 13 belonged to the bihemispheric pericallosal type. In 27 of the total number of 7782 patients we found a ruptured berry aneurysms of the pericallosal artery distal to the anterior cerebral artery (postcommunicating section). Three patients had two aneurysms of the pericallosal artery. Therefore 0.35% of all patients on whom arteriography was performed over the period of 20 years, had an aneurysm of the pericallosal artery. Of the 17 patients with unpaired pericallosal arteries, 7 (41.1%) had aneurysms at the bifurcation of the unpaired trunk close to the genu corporis callosi. Two of these aneurysms of the unpaired pericallosal trunk were located at the point of division of an APCA (Fig. 3) and five were located at the point of division of a bihemispheric pericallosal artery (Figs. 4, 5). Of the 27 patients with berry aneurysms of the pericallosal artery, seven or 25.9%

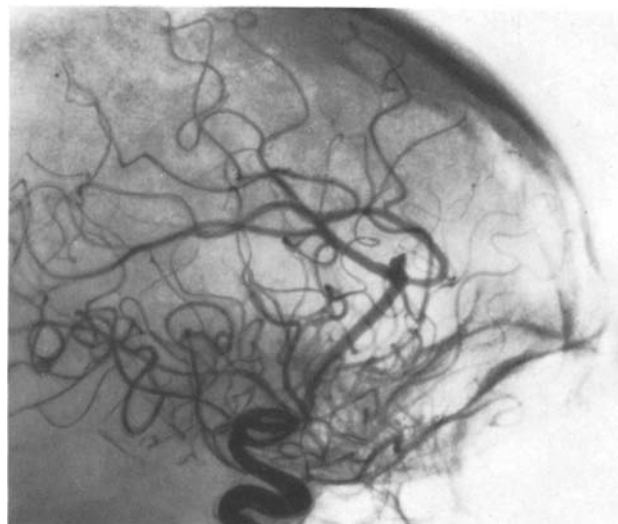


Fig. 3. Aneurysm at the bifurcation of an azygos pericallosal artery

had the aneurysm at the bifurcation of an unpaired pericallosal trunk into two supracallosal pericallosal sections.

The age of these patients ranged from 31 to 69 years with an average of 55 years. It does not deviate from the average age of patients with other intracranial aneurysms. For the purpose of comparison we studied the vertebral angiograms of 1085 patients over the same period of time, who were referred to the same clinic for various reasons. Berry aneurysms were observed in 15 cases (1.5%) at the bifurcation of the basilar artery into the two posterior cerebral arteries. According to the statistical results of the cooperative study [9, 14], the incidence of aneurysms at the distal section of the pericallosal artery is only slightly higher than at the cranial bifurcation of the basilar artery.

The few cases of children with severe brain malformations were not included in this study. In two of those children we suspected an unpaired pericallosal artery, but in both cases the blood vessels were so incompletely demonstrated, that a positive identification was not possible. Neither of these children was observed to have an aneurysm [compare 11, 13].

Discussion

We do not claim that our angiographic investigation covers the whole incidence of bihemispheric pericallosal arteries. But from our study we may claim that only 0.2% of a randomised large population had a large unpaired pericallosal trunk. Thus the typical APCA stands in a ratio of 1:3 to the bihemispheric

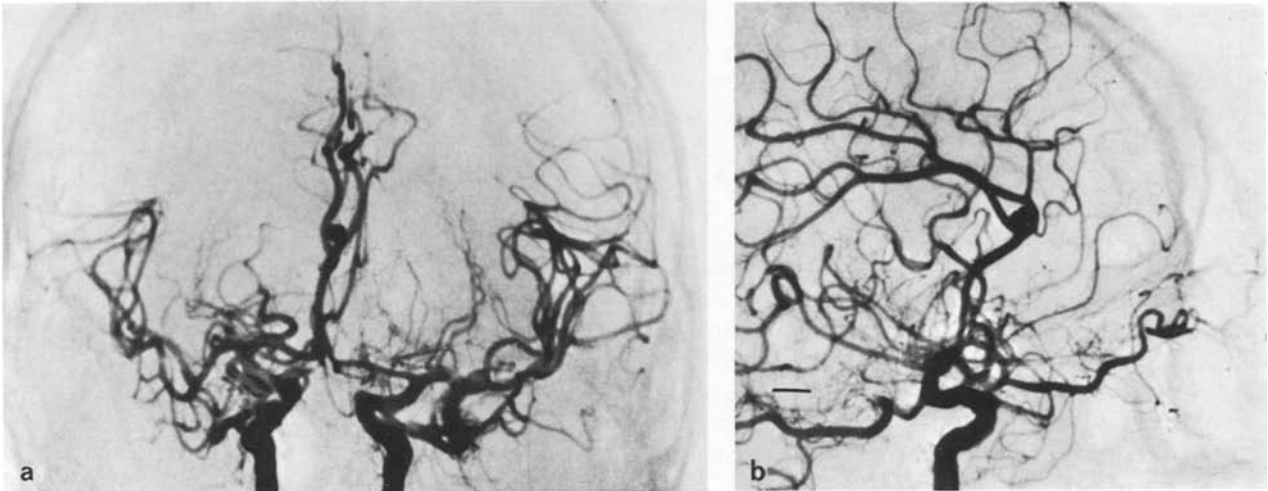


Fig. 4, a and b. Aneurysm at the bifurcation of a bihemispheric pericallosal artery. **a** AP, **b** lateral

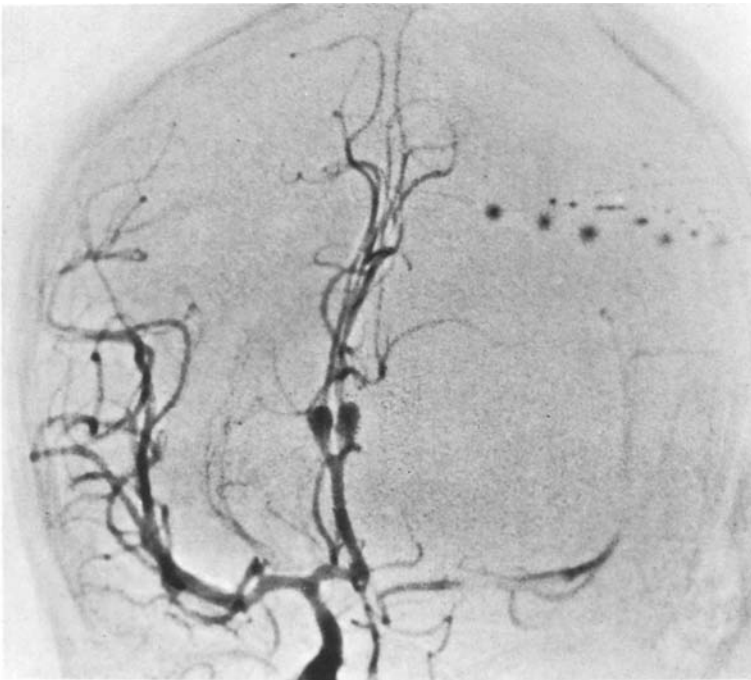


Fig. 5. Two aneurysms at the bifurcation of a bihemispheric pericallosal artery

pericallosal artery. It is more important, however, that 41.1% of all cases of large unpaired pericallosal trunks had a berry aneurysm at their bifurcation, close to the genu of the corpus callosum, into two supracallosal pericallosal sections.

Only 1.5% of 1085 vertebral angiographies revealed an aneurysm at the distal bifurcation of the basilar artery. At this division into the two posterior cerebral arteries, the same haemodynamic conditions

may be supposed to occur as at the bifurcation of the unpaired pericallosal trunk. Of all the aneurysms observed at the pericallosal artery 25% were located at the bifurcation of a wide unpaired pericallosal artery. Our results support the opinion of many investigators who maintain that the highest incidence of aneurysms in all different configurations of blood vessels, occurs at the bifurcation of a large unpaired pericallosal artery.

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Received: 29. October 1979

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