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Case Report

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Two variations of the anterior communicating artery: a clinical reminder

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Abstract

Of the 30 cadavers we examined two unusual variations of the anterior communicating artery (ACoA) were observed. In the first case ACoA was duplicated with a fenestrated anterior cerebral artery (ACA). In the second case, an oblique ACoA was present. Further, two branches of the oblique ACoA were joined the right ACA. The clinical significance of the cases has been disscussed.

Key words: [anterior cerebral artery] [anterior communicating artery] [fenestration] [duplication] [variation]

Introduction

It is important to emphasize the anomalies of the cerebral circulation, as they are not rare and may profound clinical implications [1, 2].

The vascular anatomy in the region of ACoA is generally quite complex. Many descriptions of the anomalies and variations in vascular anatomy of the ACA (fenestration or segmental duplication, duplication, triplication, azygos) and ACoA (fenestration or segmental duplication, duplication, triplication and absence) are given in the literature [1, 3]. Sometimes the term fenestration is used as the synonymous with segmental duplication. However, fenestration is the partial duplication of the artery, whereas parallel extension of the similar artery is termed as duplication [4]. It is sometimes difficult to differentiate a fenestration of the ACoA from a duplication because of the shortness of the artery. So these anomalies usually are described together in literature with an incidence of 7.5 to 40% in autopsy studies [5, 6].

In this study we describe two autopsy cases with unique variations of the ACoA. Detailed knowledge of the vascular anatomy of the ACoA and recognition of the anomalies have significant importance in surgical approaches to cerebral artery aneurysms.

Case Report

The calvaria were removed via routine autopsy dissections and the brains were removed out of the skull together with the vascular structures. Of the 30 autopsy cases we examined we observed two unusual variations of the ACoA.

Case 1

The first case was a 29 years old female with a fenestration on the right ACA and duplication of the ACoA. The fenestration of the ACA was oval in shape and located at the level of the ACoA. Among the duplicated ACoA one was shorter (0.07 mm) than the other (0.3 mm), and a triangular opening was formed between them (Figures 1A, 1B).

Case 2

The second case was a 40 years old female with an oblique ACoA. Further, two branches of the oblique ACoA arised, one united to the anterior and the other to the posterior

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surface of the left ACA. The length of the oblique ACoA was 0.7 mm and two branches were 0.5 mm each (Figures 2A, 2B). Therefore, a partial triplication of the ACoA were observed. No macroscopically visualizable aneurysm was present and no other variation was detected in the circle of Willis in both cases.

Discussion

The variations of the anterior circulation of the brain, like many other vascular variations, may not have significance in disease, though it is of great importance in the surgery of the region. The vascular anatomy in the region of ACoA is generally quite complex due to its embriyological development. The ACoA has not yet formed in one embryo of 21–24 mm stage; it is a single large canal in embryos of 21 and 23 mm, and is large, but still rather plexiform of 24 mm [7]. Incomplete fusion of this plexiform anastomosis may lead to a fenestration or a doubling or tripling of the ACoA, explaining the high incidence of variations found in the adult brain [7, 8] The most frequent anomalies of the ACoA were duplication, triplication and/or fenestration [1]. The present study demonstrates two cases of ACoA, which has not been partly classified in the early study by Adachi [9].

Recent studies showed that the variations of the ACA and ACoA were associated with intracranial aneurysms [2]. The explanation underlying the association between variation and aneurysms were the defects occured where termination of the fusion of the embryonic vessels, giving rise to the intervening segment of duplicated vessels which proved histologically normal. They speculated

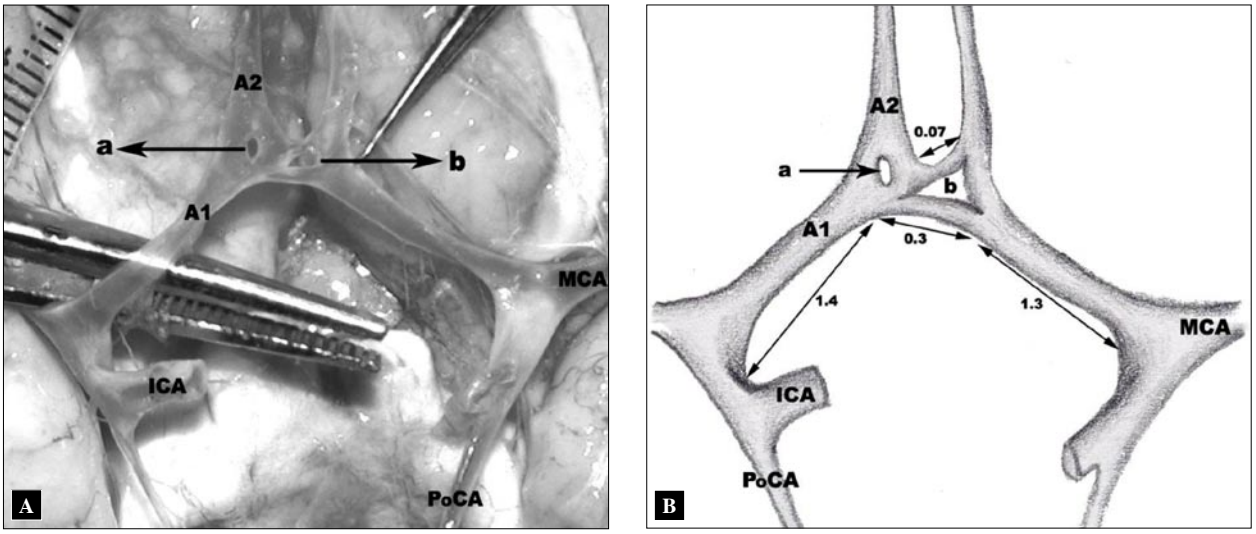

Figure 1. *Case 1.* A photographic appearance **A:** showing duplicated anterior communicating arteries (ACoA) and a fenestration of the anterior cerebral artery (ACA). Schematical illustration **B:** indicating detailed arterial measurements in mm. ***(A1:** Precommunicating portion of the anterior cerebral artery, **A2:** Postcommunicating portion of the anterior cerebral artery, **ICA:** Internal carotid artery, **MCA:** Middle cerebral artery, **PCoA:** Posterior communicating artery, **a:** Oval shaped fenestration located at the initial part of the A2 portion of the ACA, **b:** Triangular opening formed between the duplicated ACoA)*

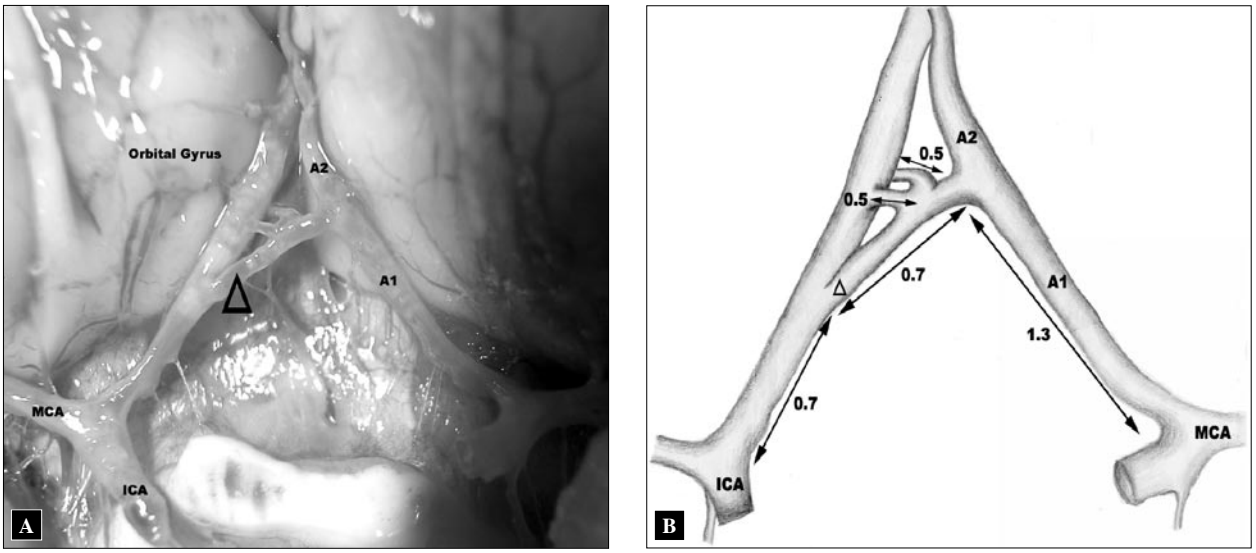

Figure 2. *Case 2.* A photographic appearance **A:** showing the oblique ACoA and the two partial ACoA's extending from the oblique ACoA. Schematical illustration **B:** indicating detailed arterial measurements in mm. See Figure 1 for abbreviations. Arrow heads indicates ACoA.

that these sites of structural wall weakness, combined with local hemodynamic forces present particularly at the proximal fenestration bifurcation were predisposed to aneurysm formation [10]. In the present case no aneurysm was detected.

Conclusion

The neurosurgical importance of this study lies in fact that during exposure of the region for different purposes, knowledge of the vascular variations will increase the success of the procedure.

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