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Case Report

Anomalous arteries at the base of the brain – a case report

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ABSTRACT

Anomalies of the branches of internal carotid artery can lead to serious clinical conditions like stroke. We report here an anomalous pattern of the cerebral arteries. The left internal carotid artery was smaller than the right and it continued as middle cerebral artery instead of dividing into anterior and middle cerebral arteries. It also failed to give the posterior communicating artery. The right internal carotid artery was almost double the size compared to the left internal carotid artery. It gave rise to a common trunk which divided into right and left anterior cerebral arteries. The knowledge of these anomalous arteries may be useful for neurosurgeons, radiologists and clinicians in general. © **Neuroanatomy. 2008; 7: 45–46.**

Key words [circle of Willis] [middle cerebral artery] [anterior cerebral artery] [posterior communicating artery] [internal carotid artery]

Introduction

Base of the brain is closely related to the anastomosis or vertebro-basilar system and internal carotid system of vessels. The anastomosis of these two systems occurs in and around the interpeduncular fossa, in the interpeduncular cistern. This anastomosis helps in slowing down the blood before it reaches the brain and helps in collateral circulation.

The cerebral part of internal carotid artery terminates by dividing into anterior and middle cerebral arteries. It also gives anterior choroidal, posterior communicating and ophthalmic arteries. The basilar artery terminates by dividing into two posterior cerebral arteries at the upper border of the pons. Circle of Willis or circulus arteriosus cerebri is formed by the anastomosis of branches of internal carotid and basilar arteries. The anterior part of the circle is formed by the two anterior cerebral arteries and anterior communicating artery; the lateral part of the circle is formed by the two posterior communicating arteries and the posterior part of the circle is formed by the basilar artery with its two terminal branches. In the present case, the circle of Willis was incomplete due to the abnormal branching of internal carotid arteries.

Case Report

During routine dissection classes for medical undergraduates, vascular anomalies were noted at the base of the brain. The brain belonged to a male cadaver aged approximately 60 years. The left internal carotid artery was very small compared to the right internal carotid artery and it failed to give rise to anterior cerebral and posterior communicating arteries (Figures 1 and 2). It continued into the lateral sulcus as left middle cerebral artery, before which it gave left ophthalmic and anterior choroidal arteries. The right internal carotid artery was double the size of that of left artery. It gave rise to right middle cerebral artery, posterior communicating artery, ophthalmic artery, anterior choroidal artery and a common trunk which later divided into right and left anterior cerebral arteries (Figures 1 and 2). The common trunk ascended above the right optic nerve and divided into a larger left anterior cerebral and a smaller right anterior cerebral arteries just before entering the median longitudinal fissure. In the median longitudinal fissure, the walls of two anterior cerebral arteries were fused together for about 1 cm (Figure 2). Beyond this anastomosis the course of these arteries was normal.

Discussion

Variations of the origin and distribution of the arteries at the base of the brain are not uncommon. In most of the variations the brain function does not get affected due to the collateral circulation and compensation from the arteries of the other side. Anterior cerebral artery can show several variations. Bergman et al [1] have reported a few variations of the same. According to their findings, both anterior cerebral arteries can start as a single vessel and then divide into two distally. Frequently the two arteries differ in size. The larger artery then will send

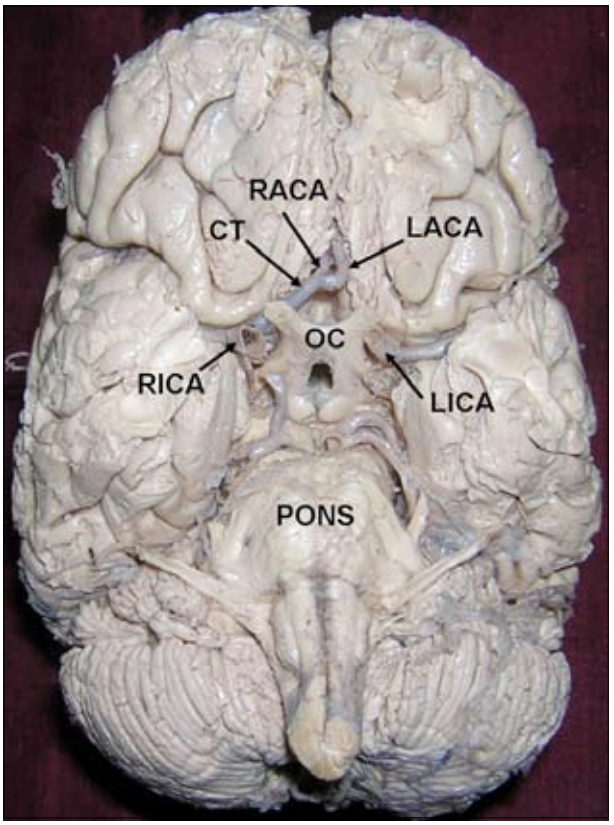

Figure 1. Photograph of the base of the brain showing anomalous arteries. Color version of figure is available online. *(**RACA:** right anterior cerebral artery; **CT:** common trunk giving rise to right and left anterior cerebral arteries; **LACA:** left anterior cerebral artery; **RICA:** right internal carotid artery; **LICA:** left internal carotid artery; **OC:** optic chiasma)*

branches to supplement the weaker artery. They have also found a third anterior cerebral artery arising from the anterior communicating artery. In an angiographic study [2] there was aplasia of A1 segment in 5.6% of cases, three A2 segments in 3% of cases and unpaired A2 segment in 2% of cases. When there is absence of A1 segment, usually there will be hypoplasia of the ipsilateral internal carotid artery [3]. The hypoplasia of A1 segment of the anterior cerebral artery might lead to ischemic

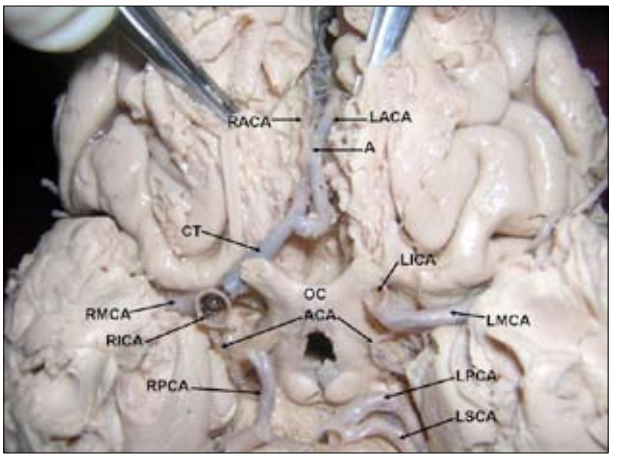

Figure 2. Photograph of closer view of interpeduncular fossa showing the anomalous arteries. Color version of figure is available online. *(**RACA:** right anterior cerebral artery; **CT:** common trunk giving rise to right and left anterior cerebral arteries; **LACA:** left anterior cerebral artery; **A:** anastomosis between to anterior cerebral arteries; **RICA:** right internal carotid artery; **LICA:** left internal carotid artery; **OC:** optic chiasma; **RMCA:** right middle cerebral artery; **LMCA:** left middle cerebral artery; **ACA:** anterior choroidal arteries; **RPCA:** right posterior communicating artery; **LPCA:** left posterior cerebral artery; **LSCA:** left superior cerebellar artery)*

stroke [4]. In a study conducted by Marco et al [5], there was one case of single (azygos) anterior cerebral artery and two cases of 3 anterior cerebral arteries. Aberrant anastomosis between anterior cerebral arteries on the orbital surface has been reported by Paul and Mishra [6]. Anterior and posterior communicating arteries may be absent. In a study conducted by Merkkola et al [7] anterior communicating arteries were absent in 22% of cases and left posterior communicating arteries were absent in 46% of cases. In such cases there was defective perfusion of blood into the left hemisphere.

In the present case, the A1 segment of left anterior cerebral artery the left posterior communicating artery was absent. Due to this the circle of Willis was represented by its right half only. The size of left internal carotid artery was also small. This would have lead to low perfusion rate of the left hemisphere.

References

[1] **Bergman RA, Afifi AK, Miyauchi R.** Anterior cerebral artery. **http://www.anatomyatlases.org/AnatomicVariants/Cardiovascular/Directory/DirectoryByRegion.shtml (accessed May 2008)**

[2] **Uchino A, Nomiyama K, Takase Y, Kudo S.** Anterior cerebral artery variations detected by MR angiography. **Neuroradiology. 2006; 48: 647–652.**

[3] **Kane AG, Dillon WP, Barkovich AJ, Norman D, Dowd CF, Kane TT.** Reduced caliber of the internal carotid artery: a normal finding with ipsilateral absence or hypoplasia of the A1 segment. **AJNR Am. J. Neuroradiol. 1996; 17: 1295–1301.**

[4] **Chuang YM, Liu CY, Pan PJ, Lin CP.** Anterior cerebral artery A1 segment hypoplasia may contribute to A1 Hypoplasia Syndrome. **Eur. Neurol. 2007; 57: 208–211.**

[5] **Stefani MA, Schneider FL, Marrone AC, Severino AG, Jackowski AP, Wallace MC.** Anatomic variations of anterior cerebral artery cortical branches. **Clin. Anat. 2000; 13: 231–236.**

[6] **Paul S, Mishra S.** The variations of the anterior cerebral artery in human cadavers: A dissection study. **J. Anat. Soc. India. 2004; 53: 15–16.**

[7] **Merkkola P, Tulla H, Ronkainen A, Soppi V, Oksala A, Koivisto T, Hippelainen M.** Incomplete circle of Willis and right axillary artery perfusion. **Ann. Thorac. Surg. 2006; 82: 74–79.**