Case Report

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AN UNUSUAL VARIATION IN THE FORMATION OF THE CIRCLE OF WILLIS –A CASE REPORT

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ABSTRACT:

The Circle of Willis is a ring-like arterial anastomoses in the brain responsible for the distribution of oxygenated blood throughout the cerebral mass. Functionally, the circle of Willis is rarely complete even though it is the only anastomosis in brain, and also ones these branches enter the brain substance no further anastomoses occur. They behave like end arteries. During routine M.B.B.S dissection in the department of Anatomy, Kasturba Medical College, Manipal ,we came across a variation in the formation of circle of Willis. The basilar artery continued as left posterior cerebral artery. Right posterior cerebral artery was arising from right internal carotid artery. Bilateral absence of posterior communicating artery was also observed. Therefore in order to plan and design surgical and endovascular interventions and yield successful results, probability of combined anatomical variations in the region should be kept in mind by the professionals.

KEYWORDS:

Circle of Willis, Basilar artery, posterior communicating arteries, vertebrobasilar system

INTRODUCTION

Brain is a highly vascular organ and receives about 15% of cardiac output. The Circle of Willis (CoW) or Circulusarteriosus is a ring-like arterial structure located at the base of the brain. It is the major arterial anastomoses in the brain and is responsible for the distribution of oxygenated blood throughout the cerebral mass [1). The Internal Carotid (ICA) and Basilar (BA) arteries bring blood into the CoW and are termed afferent arteries. The Anterior (ACA), Middle (MCA), and Posterior (PCA) cerebral arteries transport blood away from the CoW and are termed efferent arteries. The circle is completed by one anterior (ACoA) and two posterior (PCoA) communicating arteries which allow blood to be rerouted in order to maintain oxygen supply to the cerebral tissue in the event that blood supply through any of the afferent arteries be reduced. It is the major arterial anastomoses in the brain and is responsible for the distribution of oxygenated blood throughout the cerebral mass [2]. Functionally, the circle of Willis is rarely complete even though it is the only anastomosis in brain, and also once these branches enter the brain substance no further anastomoses occur. They behave like end arteries. The circle of Willis has its greatest significance in collateral circulations of the brain especially in old people who may have reduced brain blood supply due to senile arteriosclerosis.

CASE REPORT

During routine M.B.B.S dissection in the department of Anatomy, Kasturba Medical College, Manipal, we came across a variation in the formation of circle of Willis. The brain thus obtained were freed from the overlying meninges and the circle of Willis was revealed. The arterial pattern was then painted and allowed to dry. We found a following variation in the CoW, the basilar artery continued as left posterior cerebral artery and right posterior cerebral artery was arising from right internal carotid artery. Bilateral absence of posterior communicating artery was also observed (**Fig 1**)

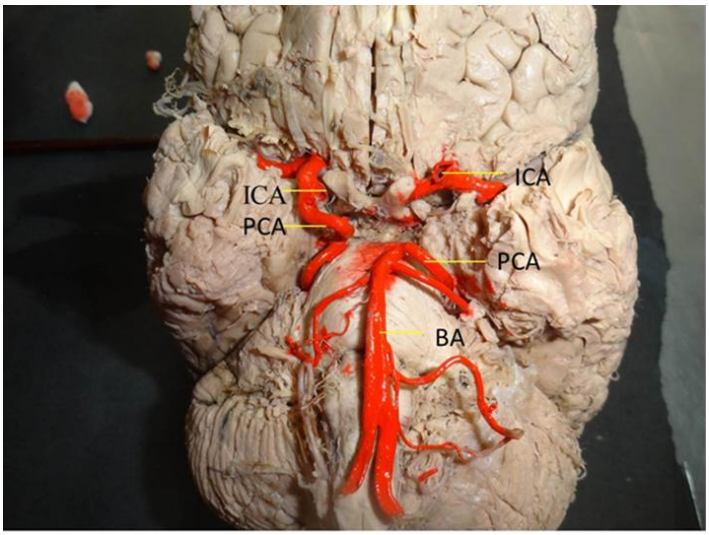

Figure 1: Photograph showing the basilar artery (BA) failing to bifurcate and continues as the left posterior cerebral artery(PCA). The right posterior cerebral artery (PCA) was arising from the right internal carotid artery(ICA). Posterior communicating artery was absent bilaterally.

DISCUSSION

Variations in the origin, termination and distribution of the arteries at the base of the brain are common. Some authors believe that in adults the anatomical configuration of the circle of Willis is closely related to blood flow in the brain-feeding arteries [3].

In embryos, the internal carotid arteries (ICAs) are formed between 28– 30 days, and the basilar artery (BA) is formed between 31–36 days, when the longitudinal neural arteries combine (4). A completely formed circle of Willis appears in the 52-day embryo and all segments are slender and have an identical caliber [5]. In the remaining fetal period, important changes occur in the basic anatomy of the cerebral vasculature. The most obvious is the change from a dominant fetal-type feeding of the posterior cerebral arteries (PCAs) from the ICA via the posterior communicating artery (PCoA) towards a normal adult configuration with feeding of the PCAs from the vertebrobasilar system

.If this process is complete, resulting in a normal adult-type circle of Willis, or incomplete with a persisting fetal type feeding of the PCA However the disappearance of the vessels that normally persist or the persistence of the vessels that normally disappear or formation of new vessels can also be attributed to hemodynamic factors and is also the probable reason for the anomalies [6)

Hollinshead WH had mentioned that the most common defect in the circle is absence of one or both posterior communicating arteries. Another relatively common variation is a major or entire origin of the posterior cerebral artery from the internal carotid artery, by way of an enlarged posterior communicating artery [7]

In our study the basilar artery failed to bifurcate and continued as the left posterior cerebral artery. The right posterior cerebral artery was arising from right internal carotid artery (Fetal type of PCA). Bilateral absence of posterior communicating artery was also observed. These multiple variations are not reported so far. Though variations of the arteries at the base of the brain are common, it is necessary to be aware of all the variations as they may breed problems in the blood flow to the brain and may cause confusions in radiological procedures (8) Therefore in order to plan and design surgical and endovascular interventions and yield successful results, probability of combined anatomical variations in the region should be kept in mind by the professionals.

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