

Bilateral Hypoplasia of the Posterior Communicating Artery: A Morphological Case Report

Nagawa Edith¹, Mwaka Erisa² and Kalungi Sam³

¹Department of Human Anatomy, Habib Medical School, Islamic University, Uganda

²Department of Human Anatomy, Makerere University College of Health Sciences, Uganda

³Consultant Pathologist, Ministry of Health, Uganda

*Corresponding author: Edith N, Department of Human Anatomy, Habib Medical School, Islamic University, Uganda, Tel: +256-781563660; E-mail: edithnaga67@gmail.com

Received Date: July 14, 2017; Accepted Date: July 30, 2017; Published Date: July 31, 2017

Copyright: © 2017 Nagawa E, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Abstract

The Circle of Willis is linked to the vertebra-basilar system by an important posterior communicating artery (PCoA), and in case of internal carotid occlusion it acts as the sole source of blood supply to the cerebral hemispheres. External diameters have been used to determine hypo plasticity of these arteries with the normal diameter being above 0.5 mm. Hypo plasticity of the PCoA is a risk factor for ischemic infarctions in cases of internal carotid artery occlusion. In this article we present a rare case of hypo plastic bilateral posterior communicating arteries in a female cadaver. Hypo plasticity of the PCoA is an attributable factor to ischemic infarctions in cases of the internal carotid occlusion. Even when neurosurgery is a possibility, access is limited by the micro size of these arteries.

Key words:

Hypo plasticity; Occlusion; Ischemic infarctions

Introduction

The posterior communicating artery (PCoA) is a significant anastomotic link between the anterior and posterior cerebrovascular systems. This form of connection renders vital communication between the Circle of Willis and the vertebra-basilar system which are the major sources of blood supply to the brain. Occlusion, hypoplasia or aplasia of the PCoA can significantly affect arterial supply to the brain. Case reports have been reported of the PCoA serving as the major blood supply to the cerebral hemisphere following unilateral hypoplasia of the internal carotid artery; thus occlusion, aplasia or hypoplasia of this artery can significantly compromise arterial supply. Variations of the PCoA have been reported, where unilateral, bilateral aplastic and hypo plastic arteries were seen in a number of cases by [1]. Some authors have opined that variations in cerebral arterial flow can predispose to migraines and cerebro-vascular accidents [2]. The PCoA in its branching pattern arises from the internal carotid artery via the anterior cerebral artery and the basilar artery via the posterior cerebral artery though cases have been reported of it arising directly from the basilar trunk. A normal PCoA is reported to have an external diameter of 1.00- 1.5 mm and average length of 1.33-1.36 cm irrespective of the origin [1] and an external diameter of less than 0.5mm irrespective of length is deemed hypo plastic [3,4]. The significance of length and diameter is associated with the availability of enough blood supply to the brain [5]. Argued that the volume of blood flow is inversely proportional to the artery length and the arterial diameter is directly proportional to it. Thus the shorter and wider the artery is the more efficient the transmission of blood to its target organ. In this article we present a rare case of hypo plastic bilateral posterior communicating arteries in a female cadaver.

Case Report

During post-mortem of an adult female cadaver at the Kampala city council authority (KCCA) mortuary in Mulago, examination of the vasculature at the base of the brain revealed bilateral hypo plastic and grossly thinned PCoA that appeared like threads (Figure 1). The medical history was unknown since this was an unclaimed body, presented by the police officials to the mortuary. Measurements of the left and right PCoA were taken before and after formalin fixation, but there was no significant difference (Figures 1A and 1B). The basilar trunk had normal bifurcation into two posterior cerebral arteries connected to the internal carotid by the hypo plastic communicating arteries. There were no perforating branches arising from the two PCoA. The other arteries that comprise the Circle of Willis were normal.

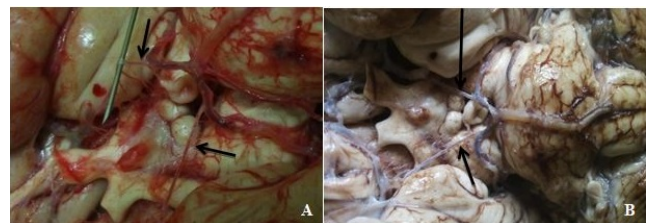


Figure 1: Fresh (A) and formalin fixed (B) Cadaveric brain showing hypoplastic posterior communicating arteries. Note that the left PCoA is larger than the right.

The length and diameter of both arteries was measured using a digitalized Draper expert sliding Vernier caliper with a precision of 0.1 mm. Two separate readings were taken and the average computed (Table 1). Diameter measurements were taken at three points along the

arteries (proximal, mid-point and distal) average of which was considered as the diameter of the PCoA. The left PCoA was slightly wider than the right as shown in Table 1.

PCoA	Proximal diameter (mm)	Distal diameter (mm)	Average diameter (mm)	Length (mm)
Left	0.55	0.3	0.41	13.89
Right	0.48	0.2	0.38	11.8

Table 1: Showing the diameter and lengths of the hypo plastic Posterior Communicating Artery.

Discussion

The PCoA in this cadaver were considered hypo plastic basing on comparisons with average dimensions that have been reported by several authors [1,4].

The external diameter of the PCoA is used to categorize this artery into the fetal or adult type. Fetal PCoA have an external diameter of less than 0.5mm [6]. Reported congenital anomalies of the PCoA (fetalism) in 7-20% of the Albanian population; with 43% of these being hypo plastic cases [6]. also reported that 17% of the cadaveric brains in his study had hypo plastic PCoA; implying that different populations have varying prevalences and thus varying risk exposures. Reduction in the diameter of the PCoA might significantly affect the blood supply to the brain and predispose to ischaemic stroke [7]. Individuals with hypo plastic PCoAs stand a higher risk of developing ischaemic cerebral infarctions with occlusion of the internal carotid artery.

Basing on our measurements, the diameter of the hypo plastic arteries reduced distally with respect from the posterior cerebral arteries i.e. left-0.3, right -0.2 mm. The thinning out of these arteries could present complications even in cases were surgery would be the resolution for clearing PCoA blockages. Despite the arteries being wider proximally, this still doesn't resolve the reduction in blood transported by these arteries and neither does it make surgery at proximal points easier.

Embryologically, hypo plasticity of blood arteries is explained by a deficiency in reticular fibers in the arterial tunica which also predisposes them to aneurysms and eventual rupture [8,9]. Hypo plastic arteries like any other may tend to dilate under different disease conditions like cardiovascular diseases. Radiographic imagery could mistakenly diagnose dilated hypo plastic PCoA as normal basing on their external diameter therefore other measures of observing arterial thickness should be used and vessels monitored in high risk groups like those with cardiovascular complications to avoid abrupt intracranial hemorrhage.

Conclusion

Hypo plastic PCoAs if present should be among the highly prioritized and monitored arteries in high risk groups especially patients with brain tumours, trauma injuries and cardiovascular complications given their significance in anastomosis between the Circle of Willis and the vertebral basilar complex and the likely consequence of their blockage.

Acknowledgements

This case was acquired with the assistance of mortuary attendants at Kampala City council Authority mortuary, Mulago Kampala Uganda.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Hegedus K, Molnar L (1987) Anatomical patterns of hypo plastic posterior communicating arteries and their implications for cerebrovascular diseases. *European Archives of Psychiatry and Clinical Neuroscience* 236: 241-246.
2. Kamath S (1981) Observations on the length and diameter of vessels forming the circle of Willis. *Journal of anatomy* 133: 419.
3. Keele CA, Neil E (1973) Samson Wright's Applied Physiology. *American Journal of Physical Medicine & Rehabilitation* 52: 45.
4. Kumar K, Saraswathi G (2016) Bilateral Absence of Posterior Communicating Arteries-A Case Report. *International Journal of Scientific Research* 4.
5. Okuno T, Nishiguchi T, Hayashi S, Miyamoto K, Terashita T, et al. (1988) A case of carotid superior cerebellar artery anastomosis associated with bilateral hypoplasia of the internal carotid artery represented as the rupture of posterior cerebral artery-posterior communicating artery aneurysm. *No shinkei geka. Neurological surgery* 16: 1211-1217.
6. Pedroza A, Dujovny M, Artero JC, Umansky F, Berman KS et al. (1987) Microanatomy of the posterior communicating artery. *Neurosurgery* 20: 228-235.
7. Saha A, Bhagyalakshmi B, Mandal S, Bandopadhyaya M (2013) Variation of Posterior Communicating Artery in Human Brain-A Morphological Study. *Gomal Journal of Medical Sciences* 11.
8. Schomer DF, Marks MP, Steinberg GK, Johnstone IM, Boothroyd DB, et al. (1994) The anatomy of the posterior communicating artery as a risk factor for ischemic cerebral infarction. *New England Journal of Medicine* 330: 1565-1570.
9. Shemsi E, Rroi A (2011) Variations Of Circle Of Willis Related With Hypoplasia Of Posterior Communicating And Ischemic Stroke. *Cerebrovascular Diseases* 31: 217.