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Cadaveric Study of Posterior Cerebral Artery

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Abstract:

Posterior cerebral artery is terminal branch of the basilar artery and one of the impotent arteries of posterior circulation of the brain. Development of the arteries of posterior circulation is complex event leads to morphological variability in the arteries in post natal life. Posterior cerebral artery also shows three types of variations which are adult type, fetal type and transitional type. Present study was done to know the incidence of these variations. 31 specimens show bilateral adult type and 2 specimens shows bilateral fetal type. In remaining 7 specimens, 2 specimens show adult type on right side and fetal type on left side, 3 specimens shows fetal type on right and adult type on left side, 1 specimen show fetal type on right and transitional type on left side, while another 1 specimen shows transitional type on right and adult type on left side. Knowledge of this variability is required in neurosurgeons especially while performing neuroendoscopic procedures since the arterial network is very delicate in the region.

Keywords: posterior cerebral artery, posterior communicating artery, fetal type, transitional type, adult type

Introduction:

The posterior cerebral artery is a terminal branch of the basilar artery. Surgical nomenclature divides the vessel into three parts: P_1 – from the basilar bifurcation to the junction with the posterior communicating artery; P_2 – from the junction with the posterior communicating artery to the portion in the perimesencephalic cistern; and P_3 – the portion that runs in the calcarine fissure. The posterior cerebral artery is larger than the superior cerebellar artery, from which it is separated near its origin by the oculomotor nerve, and, lateral to the midbrain, by the trochlear nerve. It passes laterally, parallel with the superior cerebellar artery, and receives the posterior communicating artery. It then winds round the cerebral peduncle and reaches the tentorial cerebral surface, where it supplies the temporal and occipital lobes. Like the anterior and middle cerebral arteries, the posterior cerebral artery has cortical and central branches. The cortical branches of the posterior cerebral artery are named according to their distribution. Temporal branches, usually two, are distributed to the uncus, parahippocampal gyrus, medial and lateral occipitotemporal gyrus. Occipital branch supply the cuneus and precuneus. The posterior cerebral artery supplies the visual areas of the cerebral cortex and other structures in the visual pathway. The central branches supply

subcortical structures. One or more posterior choroidal branches pass over the lateral geniculate body and supply it before entering the posterior part of the inferior horn of the lateral ventricle via the lower part of the choroidal fissure. Central branches arising from the posterior cerebral artery beyond the cerebral peduncle supply the peduncle and the posterior thalamus, superior and inferior colliculi, pineal gland and medial geniculate body.[1]

The microsurgical anatomy of the posterior circulation is very complex and variable. Surgical approaches to this area are considered risky due to the presence of the various important blood vessels and neural structures. Many authors have documented various anomalies as well as differences of the anatomy in this area in the Indian population as compared to the Western literature.[2]

In the present era of microscopic and neuroendoscopic procedures, the anatomy of the vessels supplying brain has gained increased significance.

Material and Methods:

Study was done by dissection method in 40 human adult brain specimens from embalmed human cadavers collected from various medical colleges. Brain was washed in running water. Scissor was used for dissection of the specimen. Arachnoid and pia matter over pons and interpeduncular cistern was removed carefully, exposing the posterior part of circle of Willis and the basilar artery. Posterior cerebral artery was studied thoroughly in situ.[3]

Observations and Result:

Three variant of the posterior cerebral artery are seen i.e. fetal type, transitional type and adult type.

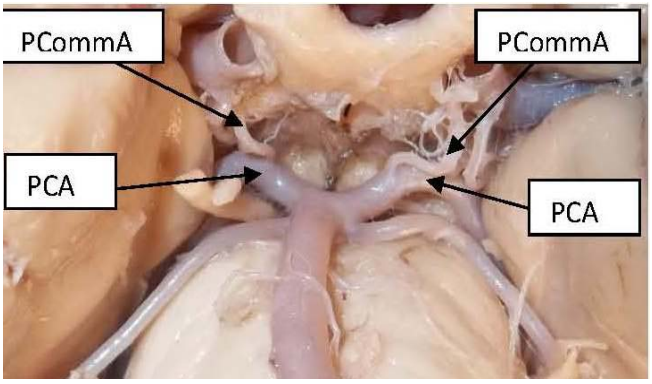
1) Fetal type: Here the size of precommunicating part of posterior cerebral artery is smaller in diameter than the posterior communicating artery. In the present study fetal type was seen in 4 specimens (10%) on right side, in 2 specimens (5%) on left side and in 2 specimens (5%) bilaterally.

2) Transitional type: Here the size of precommunicating part of posterior cerebral artery and posterior communicating artery are almost equal in diameter. In present study transitional type was seen in 1 specimen (2.5%) on right side, in 1 specimen (2.5%) on left side.

3) Adult type: Here the diameter of precommunicating part of posterior cerebral artery is more than the diameter of posterior communicating artery. In present study adult type was seen in 2 specimens (5%) on right side, in 4 specimens (10%) on left side and in 31 specimens (77.5%) bilaterally.

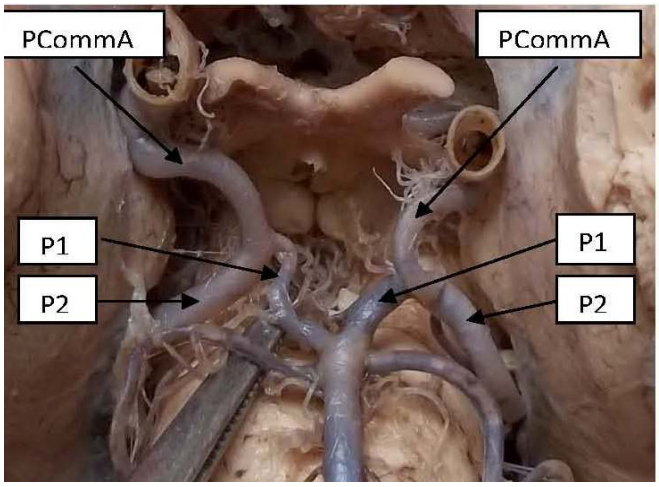
31 specimens show bilateral adult type (Photograph 1) and 2 specimens shows bilateral fetal type. In remaining 7 specimens, 2 specimens show adult type on right side and fetal type on left side, 3 specimens shows fetal type on right and adult type on left side, 1 specimen show fetal type on right and transitional type on left side (Photograph 2), while another 1 specimen shows transitional type on right and adult type on left side.

Photograph 1: Showing the Adult type of posterior cerebral artery. Posterior communicating artery (PCommA) is smaller in diameter than the posterior cerebral artery (PCA).



Photograph 2: On right side Fetal type of posterior cerebral artery (PCA) is seen, in which P1 segment of PCA is narrow than the posterior communicating artery (PCommA). On left side Transitional type is seen in which P1 segment of PCA is equal in

diameter to posterior communicating artery (PCommA).



Discussion:

During embryological development of the arteries of posterior circulation of the brain caudal division of the internal carotid artery becomes the posterior communicating artery and the stem of the posterior cerebral artery. The remainder of the posterior cerebral artery develops comparatively late, probably from the stem of the posterior choroidal artery which is annexed by the caudally expanding cerebral hemisphere, its distal portion becoming a choroidal branch of the posterior cerebral artery.[4] During further development in some cases fetal type of the posterior cerebral artery persist but in many cases adult type is noted. Few cases are noted in present and previous studies also with type between fetal and adult variants called as transitional type.

Overbeeke, Hillen and Tulleken[5] (1991) noted adult type of posterior cerebral artery in 84%, fetal type 14% and transitional type in 4% cases. Pai et al.[2] (2007) noted adult type in 56%, transitional type in 24% and fetal type in 20% cases. DeSilva et al.[6] (2009) noted adult type on right side in 4.4%, on left side in 4.4% and bilaterally in 88.8% cases. Fetal type was noted on right side in 2.6%, on left side in 3.5% and bilaterally in 1.3% cases. Transitional type was noted on right side in 1.7%, on left side in 0.8% and bilaterally in 0.9% cases. Poudel and Bhattarai[7] (2010) noted adult type in 91.4% and fetal type bilaterally in 8.6% cases. In present study adult type is seen on right side in 7.5%, on left side in 15% and bilaterally in 75% cases. Fetal type is seen on right side in 5%, on left side in 10% and bilaterally in 5% cases. Transitional type is noted on right side in 10% and on left side in 2.5% cases.

Conclusion:

Variable patterns of the posterior cerebral artery are seen. So, present work would be helpful to the neurovascular surgeons and interventional radiologists for better diagnosis and treatment of the neurovascular disorders.

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