

CIRCLE OF WILLIS: VARIANT FORMS AND THEIR EMBRYOLOGY USING GROSS DISSECTION AND MAGNETIC RESONANCE ANGIOGRAPHY

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ABSTRACT

Background: The circle of Willis is a large arterial anastomotic ring present at the base of the brain uniting the internal carotid and the vertebrobasilar systems. Branches from the internal carotid and vertebral arteries anastomose to form an arterial circle in the basal cisterns and then distribute to supply the brain. The anatomy of the circle is known to vary significantly; the vessels may be absent or sufficiently narrowed altering the hemodynamics of the circle of Willis and affecting its role as a collateral route. These variant forms can be correlated to their phylogeny and embryology. Prior knowledge of these variant forms is important in pathologies and treatment (e.g. parent artery occlusion for carotid aneurysms) resulting occlusion of carotid and vertebral arteries.

Context and purpose: Our study was undertaken to observe and compare the morphology of circle of Willis using two entirely different methods; gross dissection (GD) and Magnetic resonance angiography (MRA) and to correlate the variant patterns encountered with the possible underlying developmental events. Gross dissection was carried out in 70 human cadavers and equal numbers of MRA's of healthy individuals were studied retrospectively.

Results: Only 31 cases (22.14%) presented with a complete circle of Willis, out of which 14 (20%) were cadaveric specimen and 17 (24.18%) were in MRA group. Unilateral hypoplastic posterior communicating artery was the most common variation observed in our study (19.28%).

Conclusions: The wide variation in completeness of the circle of Willis in general population is similar to earlier observations. Review of phylogeny and embryology makes us familiar with variant forms which would be otherwise difficult to recognize and may be misinterpreted. MRA and gross dissection findings despite certain variations are comparable.

KEYWORDS: Internal carotid artery, vertebral artery, Collateral flow.

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BACKGROUND

Cerebrovascular accidents are one of the leading causes of death and disability throughout the world. The clinical manifestation of these cerebrovascular accidents reflects the area

perfused by the cerebral vessels affected. However, the situation becomes more complicated with the presence or absence of adequate collateral blood flow provided by, an arterial ring of anastomosis present at the base of brain