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**ANATOMICAL VARIATIONS OF THE CIRCLE OF WILLIS
AND THEIR CLINICAL & SURGICAL IMPLICATIONS**

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The Circle of Willis (circulus arteriosus cerebri, CoW) is an anastomotic ring of arteries located at the base of the brain that provides a collateral supply via the vertebral-basilar and internal carotid systems. Analysis of the CoW in several different populations have yielded data about this significant variational anatomy from how it was originally described by Thomas Willis. Knowledge of the possible variations of the CoW allows for better understanding of ischemic processes patterns and the impact of neurosurgical interventions.

Studies have used varying nomenclature to classify the variations, but most of them follow the principles of the classification that can be summarized into: 1) attenuation; 2) presence of accessory vessels (duplications, triplications), 3) vessels of anomalous origins; 4) absence of vessels. Siddiqi et al. (2013) further compared the completeness of the arterial circle and the symmetry. Across all studies reviewed, the posterior communicating artery (PCoA) presented with the highest frequency of variation.

From the clinical and surgical point of view, the aspects of aneurysms and cerebral ischemia are of interest when discussing variations of the CoW. Multiple researches have shown variations such as absence of hypoplasia of vessels to associate with both an increased risk of aneurysm formation and its rupture. Furthermore, meta-analyses have shown a positive correlation between ischemic stroke and variations in the CoW. Varga A. et al. (2019) additionally noted that severe stenosis of the internal carotid artery had a significant correlation with CoW anomalies in carotid endarterectomy subjects.

In surgical approaches, especially in the cervical region, the pre-operative assessment of the CoW help to avoid any iatrogenic damage, which can prove fatal. The link of cerebral blood supply changes due to the variational anatomy of the CoW and its relation to other operations such as carotid artery is an indispensable concern.

In conclusion, the knowledge of the prevalence of variation anatomy of the Circle of Willis is crucial for effective clinical and surgical interventions.