The Development of Cerebrovascular Diseases in Patients with Anatomical Variants in the Circle of Willis

Ana-Maria Dumitrescu[1], Lucia Corina Dima-Cozma[2], Irena Cristina Grierosu[3], Cristina-Maria Gavrilescu[4], Claudia Florida Costea[5], Nicoleta-Loredana Hilițanu[6], Irina Luciana Gurzu[6], Bogdan Gurzu[3], Roxana Gabriela Cobzaru[7]*, Dana Teodora Anton Păduraru[8], Ana-Maria Haliciu[1], Ana-Maria Rădulescu[1], Carmen Valerica Rîpă[7] and Anca Sava[1]

[1]*Department of Morphofunctional Sciences I, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania*
[2]*Medical Department, Grigore T. Popa University of Medicine and Pharmacy, Iaşi, Romania*
[3]*Department of Morphofunctional Sciences II, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania*
[4]*Department of Biomedical Sciences, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania*
[5]*Department of Clinical Ophthalmology, "Prof. Dr. N. Oblu" Emergency Clinical Hospital, Iaşi, Romania, Grigore T. Popa University of Medicine and Pharmacy, Iaşi, Romania*
[6]*Department of Preventive Medicine and Interdisciplinarity, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania*
[7]*Department of Microbiology and Parasitology, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania*
[8]*Department of Mother and Child Medicine, "Saint Mary" Emergency Clinical Hospital for Children, Iasi, Romania, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania*

Abstract

Introduction: Cerebrovascular disease (CVD) is the second leading cause of death worldwide. Cerebrovascular disease includes several clinical-pathological entities, namely: ischemic and hemorrhagic stroke, transient ischemic attack, brain aneurysm, small vessel disease and vascular dementia, but the most common form of cerebrovascular disease is stroke. Ischemic stroke accounts for 87% of all strokes, while 10% are intracerebral hemorrhages and 3% are subarachnoid hemorrhagic strokes. The circle of Willis (CoW), even though it may present certain variations at times, it is genuinely composed of three cerebral and two communicating arteries.

Material and method: The study was based on multiple searches of PubMed, Google Scholar and SpringerLink. Using the following keywords: "circle of Willis, variations, cerebrovascular disease", "and circle of willis, variants, stroke"and"circle of Willis, variations, and aneurysm. We inspected 100 abstracts found on the mentioned topic, with the selection of only 30 full-text studies, written in English language most in connexion to our scientifcal purpose, published over the last 20 years (the period between 2004-2024). This permitted the realization of a thorogh descriptive review on the interconnection between anatomical variants of the CoW and CVD.

Results and discussion: It seems that anatomical variants of fenestration of Anterior Communicating Artery (AcoA) represent a predictive risk factor of death for hemorrhagic stroke because aneurysms can develop at this level. Hypoplasia of the A1 segment of the Anterior Cerebral Artery (ACA) afects the CoW functionality, and thus becomes a risk factor for acute ischemic stroke. Most of these patients have occlusive strokes of small vessels, especially within the striatum, respectively at the supratentorial level. Many authors have suggested an increased risk of ischemic stroke in the presence of CoW variations. There is an increased risk of infarction, particularly in the thalamic region, associated with hypoplasia of Posterior Communicating Artery (PCoA).

Conclusion: A more thorough knowledge of the implications of the anatomical variations in the development of both ischemic or hemorrhagic stroke and aneurysms could be of help in the neurology feld for the understanding of some out of ordinary clinical or particular signs and symptoms in the case of CVD, thus becoming of crucial importance for clinicians.

Keywords:

Introduction

***Corresponding author:** Roxana Gabriela Cobzaru, Department of Microbiology and Parasitology, Grigore T. Popa University of Medicine and Pharmacy, Iasi, Romania, E-mail: roxanabahnea@yahoo.com

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Material and Method:

Correlations between location of hemorrhagic/ischemic stroke and type of anatomical variant of PCoA.

Correlations between the location of hemorrhagic / ischemic stroke and the type of anatomical variant of PCA

Conclusion

Acknowledgment

Con ict of Interest

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