

ŚRĪNGĀṬAKA MARMA AND THE CIRCLE OF WILLIS: AN INTEGRATIVE NEUROVASCULAR PERSPECTIVE

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ABSTRACT

Sushruta, the father of surgery, in the 6th chapter of sharira sthana of Sushruta Samhita, “Pratyekamarmanirdesha Adhyaya” has described this unique concept of marma, which deals with the study of vital points on body, which are 107 and one of them is Śrīngāṭaka marma. Śrīngāṭaka Marma is described in classical Ayurvedic texts as a vital junction of multiple *Siras* located in the Urdhva Jatru region, playing a crucial role in the functioning of the sense organs.^[1] The Circle of Willis, a central arterial anastomotic network at the base of the brain formed by left and right Anterior cerebral artery, Anterior communicating artery, left and right Internal carotid artery, ensures continuous cerebral perfusion and supports higher neurological functions.^[2] Although described in different medical paradigms, both structures represent central neurovascular convergence points. This article explores the conceptual and functional correlation between Śrīngāṭaka

Marma and the Circle of Willis, emphasizing their shared significance in maintaining sensory and cerebral functions.

KEYWORDS: Marma, Śrīngāṭaka, Sira, Prana, Indriya.

MATERIAL AND METHOD

Sushruta Samhita and its commentaries other contemporary Human Anatomy books were used for this work.

INTRODUCTION

The concept of *Marma* in Ayurveda denotes vital anatomical sites where the convergence of structural and functional elements such as *Sira*, *Snāyu*, *Māmsa*, *Asthi*, and *Sandhi* occurs.

Among these, *Sira Marmas* are particularly significant due to their vascular predominance and their role in maintaining physiological integrity. In the Urdhva Jatru region, which encompasses the head and neck, several Marmas are described as essential for the proper functioning of sensory and neurological activities.

Śṛṅgāṭaka Marma, as described in *Suśruta Saṃhitā* (*Śārīra Sthāna*), is one such vital Marma situated in the cranial region. It is characterized as a meeting point of multiple *Siras* that supply the *Ghrāṇa* (nose), *Netra* (eyes), *Karṇa* (ears), and *Jihvā* (tongue). This description highlights its role as a central junction for channels associated with the sensory organs. Injury to this Marma is said to result in profound impairment of sensory functions, indicating its critical importance in the maintenance of *Indriya* activities.

In modern anatomical understanding, the Circle of Willis represents a crucial arterial network located at the base of the brain, formed by the interconnection of major cerebral arteries. It functions as a collateral circulatory system, ensuring continuous and regulated blood supply to the brain, which is essential for higher neurological and sensory functions.

Although originating from distinct medical paradigms, both *Śṛṅgāṭaka Marma* and the Circle of Willis reflect the concept of a central neurovascular convergence that supports vital functions. Therefore, exploring the relationship between these two structures provides an opportunity to interpret classical Ayurvedic knowledge in the light of modern neurovascular anatomy, offering an integrative perspective on their functional significance.

Further studies may help in exploring the clinical applications of this correlation in a more comprehensive manner.

REVIEW OF LITERATURE

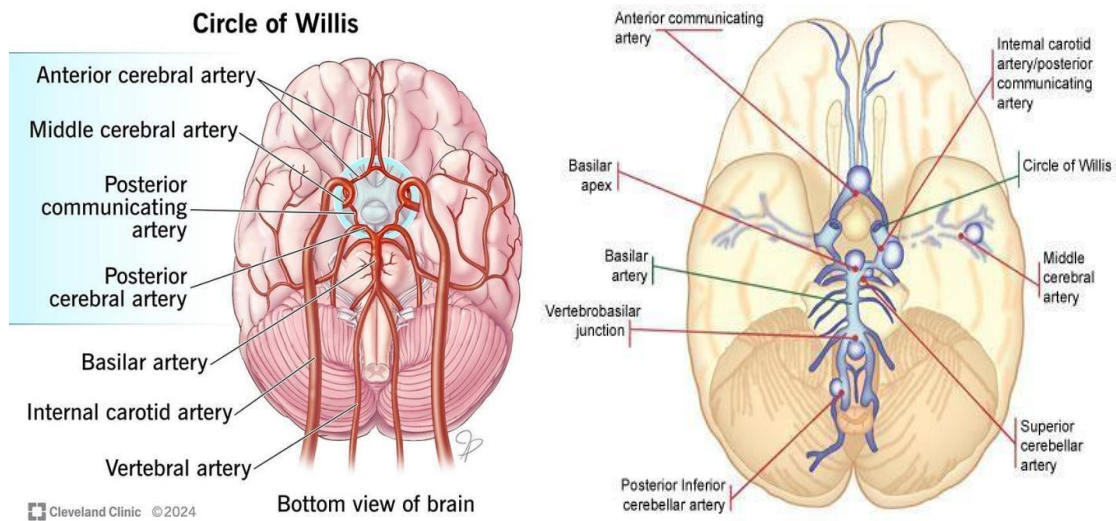
I. Śṛṅgāṭaka Marma

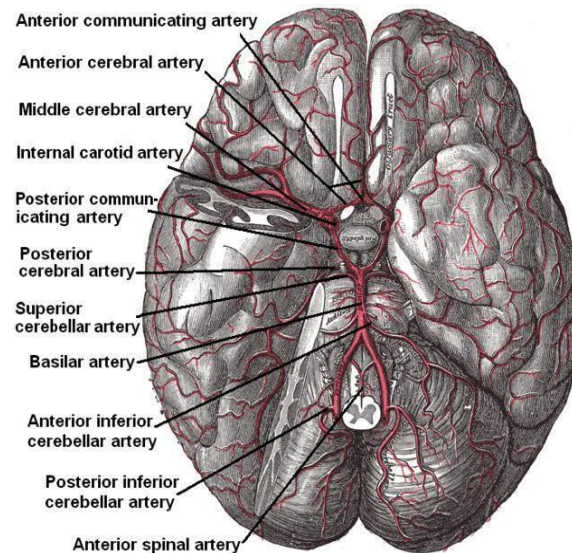
Śṛṅgāṭaka Marma is described in Suśruta Saṃhitā (Śārīra Sthāna) as a *Sira Marma* situated in the *Urdhva Jatru Pradeśa*. It is counted among the bilateral Marmas and is said to be located in the deeper cranial region, representing the convergence of channels associated with the sensory organs. The *pramāṇa* of this Marma is described as *ardhāṅgula*, indicating its subtle yet vital nature.

The predominance of *Sira* signifies its vascular importance, suggesting a region of intricate circulation within the cranial cavity. Any disturbance at this site results in significant functional impairment, particularly affecting higher physiological and sensory activities.

Thus, Śṛṅgāṭaka Marma can be interpreted as a central vascular junction in the head, forming an important basis for understanding its correlation with major neurovascular structures.

II. Circle of Willis





The Circle of Willis is an arterial anastomotic network situated at the base of the brain, surrounding the optic chiasma and the infundibulum within the interpeduncular cistern. It is formed by the anastomosis of the internal carotid arteries, anterior cerebral arteries connected by the anterior communicating artery, and posterior cerebral arteries connected to the internal carotids through the posterior communicating arteries.

This vascular arrangement establishes a polygonal arterial circle that provides collateral circulation to the cerebral hemispheres. It ensures continuity of cerebral blood flow in conditions of partial vascular obstruction and plays a crucial role in maintaining perfusion of vital brain structures.

Thus, the Circle of Willis represents a central neurovascular junction responsible for sustaining cerebral circulation and higher neurological functions.

Correlation Between Śṛṅgāṭaka Marma and the Circle of Willis

Śṛṅgāṭaka Marma, described as a convergence of multiple *Siras* in the cranial region, represents a site of intricate vascular interconnection responsible for maintaining higher physiological functions. Similarly, the Circle of Willis forms a central arterial anastomotic network at the base of the brain, ensuring adequate and continuous cerebral blood supply. Both structures demonstrate the concept of a central vascular junction, where multiple channels unite to support vital functions. In Śṛṅgāṭaka Marma, this convergence is associated with the functional integrity of the sensory organs, whereas in the Circle of Willis, it is related to the maintenance of cerebral perfusion and neurological activity.

Functionally, both can be interpreted as regulatory centers that ensure continuity and stability of higher functions. Disturbance to Śṛṅgāṭaka Marma leads to impairment of sensory activities, while compromise of the Circle of Willis results in cerebral ischemia and neurological deficits. This similarity indicates that both structures play a crucial role in sustaining the functional equilibrium of the cranial region.

Thus, Śṛṅgāṭaka Marma may be conceptually correlated with the Circle of Willis as a central neurovascular convergence, where structural interconnection supports essential physiological functions.

Functional Significance

Śṛṅgāṭaka Marma plays a crucial role in maintaining the functional integrity of higher sensory activities by facilitating the proper flow of *Rakta* and *Prāṇa* within the cranial region. Its involvement in the coordination of sensory channels indicates its importance in sustaining *Indriya* functions.

Similarly, the Circle of Willis ensures adequate cerebral perfusion through its collateral circulation, thereby supporting higher neurological activities such as cognition, perception, and coordination. The uninterrupted blood supply provided by this arterial network is essential for maintaining normal brain function.

Thus, both structures are functionally significant in preserving higher integrative activities within the cranial region.

Clinical Significance

Injury or disturbance of Śṛṅgāṭaka Marma is described to result in severe impairment of sensory functions, reflecting its vital role in maintaining neurological and sensory integrity. In modern clinical context, compromise of the Circle of Willis, such as in arterial occlusion or aneurysm, may lead to conditions like stroke, transient ischemic attacks, and other neurological deficits. These conditions often present with loss of sensory and higher cerebral functions.

The similarity in functional outcomes suggests that disturbances in central neurovascular junctions can lead to profound clinical manifestations, thereby emphasizing the importance of these regions in maintaining normal physiological function.

DISCUSSION

The present study attempts to interpret Śṛṅgāṭaka Marma in the light of modern neurovascular anatomy by correlating it with the Circle of Willis. While classical Ayurvedic texts describe Śṛṅgāṭaka as a vital point of convergence of multiple *Siras*, modern anatomy identifies the Circle of Willis as a central arterial network ensuring cerebral perfusion.

The correlation between these two should be understood as conceptual and functional, rather than structural equivalence. Both represent regions where vascular interconnections play a crucial role in maintaining higher functions. The effects of disturbance described in both systems—sensory impairment in Ayurveda and neurological deficits in modern medicine—further support this parallel.

This integrative approach highlights the relevance of classical anatomical concepts in understanding modern physiological mechanisms and provides a broader perspective for interpreting vital cranial structures.

CONCLUSION

Śṛṅgāṭaka Marma, as described in Ayurvedic literature, represents a vital neurovascular convergence point in the cranial region. The Circle of Willis, in modern anatomy, serves as a central arterial network ensuring continuous cerebral blood supply.

The conceptual and functional similarities between these two structures suggest that Śṛṅgāṭaka Marma can be interpreted in relation to the Circle of Willis as a key regulator of higher sensory and neurological functions. This correlation offers an integrative understanding of classical and modern concepts and emphasizes the importance of central vascular networks in maintaining physiological integrity.

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Illustrations and Figures

1. Diagram of Circle of Willis – B.D. Chaurasia, Volume 3
2. Diagram of Circle of Willis – Gray's Anatomy
3. Online anatomical illustration – TeachMeAnatomy