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Review Article

Historical Overview of the Circle of Willis in Unani Literature

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Abstract

The *Circle of Willis*, a crucial arterial network at the base of the brain, is traditionally credited to the 17th-century English physician Thomas Willis. However, historical analysis reveals that earlier descriptions of this vascular structure exist in classical Unani medical literature. This article explores the contributions of prominent Unani scholars—such as *Ibn Sina*, *Al-Razi*, *Ismail Jurjani*, and *Mansur ibn Ilyas*—who provided detailed anatomical and functional descriptions of cerebral circulation that closely align with modern conceptions of the *Circle of Willis.* Drawing from primary Unani texts, the study highlights how these scholars recognized a vascular network surrounding the brainstem and pituitary region, attributing to it both anatomical and physiological significance within the humoral framework of their time. Their understanding, though expressed in different terminologies and embedded in the spirit-based physiology of Unani doctrine, demonstrates a sophisticated grasp of neurovascular anatomy that predates Western discoveries. This paper underscores the need to reevaluate the historical narrative of anatomical science and acknowledges the foundational role of Unani medicine in shaping modern neuroanatomy.

Keywords: *Circle of Willis*; blood supply of brain; Unani medicine; *dimag*.

1. Introduction

The *Circle of Willis* is a ring-like arterial structure located at the base of the brain, forming a critical anastomotic junction between the anterior and posterior, as well as right and left cerebral circulations. It plays a vital role in maintaining cerebral perfusion, especially in cases of arterial blockage, and supplies blood to the brain and surrounding structures.[1]

While the structure is commonly attributed to Thomas Willis, who provided a detailed anatomical description in his seminal work Cerebri Anatome in 1664, earlier accounts in classical medical literature—particularly by Unani scholars—demonstrate a foundational understanding of this arterial network, albeit not always in identical anatomical terms.[2]

2. Contributions of *Ibn Sina* (Avicenna)

Ibn Sina (980–1037 CE), known as *Avicenna* in the Latin West, was among the most influential physicians of the medieval Islamic world. His monumental work, *Al-Qanun fi al-Tibb* (The Canon of Medicine), contains references to the cerebral vasculature. In the third volume of the Canon, he describes two major vessels ascending toward the brain, which branch and form a vascular network resembling a mesh or lattice around the region of the pituitary gland—referred to as *Ghuddah Sareerah* in Unani texts. This description aligns remarkably well with the anatomical location and function of what is now known as the Circle of Willis.[3-6] *Ibn Sina's* reference to this network indicates a conceptual awareness of the cerebral arterial circulation long before Thomas Willis. Moreover, the Unani framework attributed functional significance to this network, associating it with the transformation of *Rūḥ-i-Haiwaniyya* (vital pneuma) into *Rūḥ-i-Nafsāniyya* (psychic pneuma), which was considered essential for cognitive and sensory functions.[7]

3. Insights from Al-Razi (Rhazes)

Al-Razi (865–925 CE), another eminent Unani physician, offered detailed descriptions of cerebral vasculature that further underscore the anatomical insight of early Islamic scholars. He noted that the right and left common carotid arteries bifurcate into internal and external branches, with the internal carotid ascending beside the internal jugular vein into the skull. Upon entry, it divides intricately to form a network of vessels—a clear reference to the Circle of Willis.[8]

Al-Razi also correctly identified the origins of arteries from the left ventricle of the heart and accurately described several components of the circulatory system, including the aorta and coronary arteries, further demonstrating the depth of his anatomical knowledge.[9]

4. Other Unani Scholars

Ali Ibn Abbas Majoosi (Haly Abbas) and *Ismail Jurjani* also contributed to the understanding of cerebral circulation. In their respective treatises, they described two major vessels- termed *Subāt* -

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hat ascend bilaterally from the neck, divide into smaller branches, and form an arterial network (*shabkā or naseeja*) at the base of the brain near the third and fourth ventricles.[3,10-13]

This network was believed not only to ensure continuous cerebral perfusion but also to provide time for the vital spirit (*Rūḥ-i-Haiwaniyya*) to undergo *nuzj* (maturation or concoction) and transform into the refined *Rūḥ-i-Nafsāniyya*—responsible for higher-order brain functions.[10]

5. Mansur ibn Ilyas and Anatomical Illustration

In the late medieval period, *Mansur ibn Ilyas Shirazi* (c. 1380–1422 CE) produced the first known illustrated anatomical atlas in the Islamic Golden Era. His work, *Tashrih-i-Badan-i-Insan*, includes illustrations of the brain and its vessels, indicating a refined understanding of neuroanatomy that may correspond to the Circle of Willis, though in stylized artistic form.[14,15]

6. Comparative Historical Perspective

Although ancient Greek physicians like Galen postulated the existence of a rete mirabile—a vascular network thought to mediate the transformation of bodily spirits—this concept was largely speculative and rooted in philosophical doctrine. Galen's ideas were upheld well into the Renaissance, even though Vesalius (1514–1564) later contested them based on direct human dissection.[16]

Despite Willis' formal identification of the cerebral arterial circle in the 17th century, Islamic scholars' earlier descriptions reflect a nuanced and partially correct understanding of cerebral vasculature. Their capacity to conduct dissections and produce systematic observations suggests that many ideas presumed to originate in the Renaissance were in fact refinements or rediscoveries of medieval Islamic contributions.[17,18]

7. Methodology

This study adopts a qualitative historical research methodology to explore the conceptualization of the Circle of Willis in classical Unani medical literature. The research is based on a comprehensive textual analysis of primary sources written by prominent Unani scholars, including *Al-Qanun fi al-Tibb* by *Ibn Sina*, *Kitab al-Hawi* by *Al-Razi*, *Zakhira Khwarazmshahi* by Ismail Jurjani, and *Tashrih-i Mansuri* by Mansur ibn Ilyas. These texts were examined in their original Arabic or Persian versions, along with reliable English and Urdu translations where available.

The analysis focused on anatomical descriptions of cerebral blood vessels, particularly those surrounding the base of the brain, the pituitary gland, and the optic chiasm. Terminologies such as '*uruq dimagh, mughiz al-dimagh,* and *shabkah* were critically interpreted within their historical and linguistic contexts. Comparative analysis was conducted between these classical descriptions and modern anatomical understandings of the Circle of Willis, based on contemporary neuroanatomy textbooks and peer-reviewed articles.

Secondary sources, including historical commentaries and recent academic works on contributions of Unani Scholars to anatomy and neuroscience, were also consulted to contextualize and support the interpretations. The study further employed a thematic approach to identify conceptual parallels between Unani descriptions and the structural-functional framework of the modern Circle of Willis.

This methodology enables a balanced synthesis of classical medical epistemology with modern scientific interpretation, allowing for a reevaluation of historical contributions to neuroanatomy.

8. Conclusion

The historical evidence demonstrates that Unani scholars—including *Ibn Sina*, *Al-Razi, Ismail Jurjani, and Mansur ibn Ilyas*—possessed considerable knowledge of cerebral circulation, which bears strong conceptual resemblance to the modern understanding of the Circle of Willis. Their descriptions were framed within the humoral and spirit-based physiology of the time but offer early anatomical insights that modern medicine has only formally recognized in later centuries. This highlights the need for a reappraisal of medieval Unani Scholars contributions to anatomical science, particularly in the domain of neurovascular structures.

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