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CONCEPT OF SIRA IN AYURVEDA AND ITS CORRELATION WITH THE VASCULAR SYSTEM: A CRITICAL REVIEW

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ABSTRACT

Ayurveda describes Sira as one of the vital anatomical structures responsible for the transport and circulation of body constituents essential for sustenance of life. Classical Ayurvedic texts, particularly *Charaka Samhita* and *Sushruta Samhita*, elaborate Sira as channels that carry Rakta, Rasa, and other vital elements throughout the body, playing a crucial role in nourishment, waste removal, and maintenance of physiological balance. Sira are counted among the *Dashapranayatana* and are considered *Avedhya* (non-puncturable) at specific sites due to their life-sustaining importance. The detailed description of Sira Vibhajana (classification), Sira Sankhya (number), and Sira Vedhana (venesection) reflects a sophisticated understanding of circulatory dynamics in ancient Ayurvedic science.In contemporary anatomy, the vascular system—comprising arteries, veins, and capillaries—performs functions analogous to those attributed to Sira, including circulation of blood, oxygen, nutrients, and metabolic by-products. This critical review attempts to correlate the Ayurvedic concept of Sira with the modern vascular system by analyzing structural, functional, and clinical similarities. The review highlights that although Ayurveda does not explicitly differentiate arteries and veins in the modern sense, the functional attributes of Sira closely resemble venous and capillary networks, particularly in the context of Rakta circulation and therapeutic bloodletting procedures. Understanding this correlation not only bridges traditional Ayurvedic anatomy with modern biomedical science but also enhances the clinical relevance of Ayurvedic procedures such as Siravedha. The integrative interpretation

of Sira provides a broader perspective on the ancient conceptualization of circulation and underscores the scientific depth of Ayurvedic anatomical knowledge.

KEYWORDS: Sira, Ayurveda, Vascular system, Rakta, Siravedha, Ayurvedic anatomy, Circulation.

INTRODUCTION

Ayurveda, the ancient Indian system of life sciences, presents a holistic and integrative understanding of the human body, wherein structure and function are inseparably linked. The discipline of *Sharira Rachana* (anatomy) in Ayurveda is not merely descriptive but is deeply rooted in physiological, pathological, and therapeutic relevance. Among the various structural entities described in Ayurvedic literature, Sira occupy a position of exceptional importance due to their role in the sustenance of life and maintenance of internal equilibrium.

Classical Ayurvedic texts, especially *Charaka Samhita* and *Sushruta Samhita*, provide elaborate descriptions of Sira as channels responsible for the movement and circulation of vital substances such as Rakta, Rasa, and other nutritive and metabolic elements. The life-sustaining nature of Sira is emphasized by their inclusion among the *Dashapranayatana*—the ten vital seats essential for survival. Further, the concept of *Avedhya Sira* (non-puncturable vessels) highlights an advanced awareness of critical vascular structures whose injury could result in catastrophic outcomes.

In modern biomedical science, the vascular system is recognized as a complex network of arteries, veins, and capillaries that ensures circulation of blood, oxygen, nutrients, hormones, and waste products. Although Ayurveda and modern anatomy evolved within entirely different epistemological frameworks, striking functional and conceptual parallels exist between the Ayurvedic concept of Sira and the modern vascular system.

This critical review aims to explore the concept of Sira as described in classical Ayurvedic texts, analyze its anatomical and physiological attributes, and correlate it with the contemporary understanding of the vascular system. By doing so, the article seeks to bridge traditional Ayurvedic knowledge with modern anatomical science while preserving the integrity of the classical concepts.

Concept of Sira in Ayurveda

Etymology and Definition

The word *Sira* is derived from the Sanskrit root *"sru"*, which denotes flow or movement. This derivation itself indicates the primary functional attribute of Sira—continuous

movement of substances within the body. Ayurveda conceptualizes Sira as tubular structures through which essential body constituents circulate, ensuring nourishment, vitality, and functional harmony.

Sushruta Samhita describes Sira as carriers of Rakta and other fluids that pervade the entire body, supporting physiological activities and sustaining life[1]. Charaka emphasizes their role in maintaining the balance of Dosha and Dhatu through uninterrupted circulation[2]. Unlike modern anatomical definitions, Ayurveda defines Sira more functionally than structurally, reflecting a physiological rather than purely morphological approach.

Distinction Between Sira, Dhamani, and Srotas

Ayurvedic texts distinguish between Sira, Dhamani, and Srotas, all of which are transport pathways but differ in function and characteristics. Dhamani are associated with pulsation and active propulsion, indicating movement away from the heart, while Sira are primarily responsible for the return and redistribution of fluids. Srotas represent a broader concept of micro- and macro-channels involved in transportation and transformation.

This functional differentiation suggests that Sira more closely resemble the venous and capillary components of the vascular system rather than arteries. The absence of pulsation (*spandana*) in Sira further supports this correlation.

Classification of Sira

Dosha-Based Classification

Sushruta Samhita classifies Sira into four major categories based on Dosha predominance[3]:

1. **Vata Vaha Sira** – involved in movement, neural conduction, and sensory-motor activities.
2. **Pitta Vaha Sira** – associated with metabolism, heat regulation, and biochemical transformation.
3. **Kapha Vaha Sira** – responsible for stability, lubrication, and nourishment.
4. **Rakta Vaha Sira** – primarily concerned with circulation of blood.

Among these, Rakta Vaha Sira are most directly comparable to blood vessels described in modern anatomy, as they are explicitly associated with Rakta circulation.

Numerical Description (Sira Sankhya)

Ayurveda provides a remarkably systematic numerical account of Sira. According to *Sushruta Samhita*, the human body contains 700 Sira[4], distributed throughout various regions including

the limbs, trunk, and vital organs. This numerical approach demonstrates a structured attempt to map the circulatory pathways, comparable to the modern anatomical cataloging of blood vessels.

Although modern anatomy does not fix an exact number of blood vessels due to continuous branching and variability, the Ayurvedic numerical system reflects an early effort at comprehensive anatomical documentation.

Avedhya Sira: Concept of Vital Vessels

One of the most clinically significant contributions of Ayurveda is the concept of Avedhya Sira—vessels that must not be punctured under any circumstances. Sushruta enumerates 98 Avedhya Sira, predominantly located near vital organs such as the heart (*Hridaya*), head (*Shira*), bladder (*Basti*), and reproductive organs[5].

Injury to these Sira is described as leading to severe hemorrhage, loss of function, or death. This concept demonstrates an advanced understanding of vascular vulnerability and parallels the modern identification of major blood vessels such as the carotid arteries, femoral vessels, and vena cava, whose damage can be fatal.

Physiological Role of Sira

Circulation and Tissue Nourishment

The principal physiological function of Sira is the circulation of Rakta and Rasa, ensuring continuous nourishment of tissues (*Dhatu Poshana*). Charaka emphasizes that proper flow through Sira maintains the integrity and vitality of tissues and organs[2]. Any obstruction or vitiation of Sira leads to disease manifestation.

Maintenance of Homeostasis

Ayurveda attributes a broader homeostatic role to Sira, extending beyond circulation. Pitta-dominant Sira assist in thermal regulation and metabolic balance, Kapha-dominant Sira support lubrication and stability, and Vata-dominant Sira facilitate movement and communication. This integrative physiological model corresponds with modern views of vascular involvement in thermoregulation, immune response, and metabolic regulation.

Siravedha: Therapeutic Application of Sira

Siravedha, or therapeutic venesection, is a specialized procedure described extensively by Sushruta. He regards Siravedha as Ardha Chikitsa—half of all surgical treatment—underscoring its therapeutic importance[6].

Indications

Siravedha is indicated in disorders involving Rakta Dushti, inflammation, congestion, and chronic pain. Conditions such as Kushtha, Visarpa, Vatarakta, headache, and certain eye disorders are described as responsive to Siravedha. The therapeutic rationale is removal of vitiated blood to restore normal circulation and Dosha balance.

Modern Concept of the Vascular System

Modern anatomy describes the vascular system as a closed network of arteries, veins, and capillaries responsible for systemic and pulmonary circulation[7]. Veins, in particular, return blood to the heart and play a crucial role in maintaining circulatory balance, venous pressure, and metabolic waste removal.

The functional description of veins aligns closely with Ayurvedic descriptions of Sira, especially in the context of blood return, lack of pulsation, and therapeutic venesection.

Correlation Between Sira and the Vascular System

Structural Correlation

Sira are described as thin, branching, tubular structures distributed throughout the body—features consistent with venous and capillary architecture. The absence of pulsation and emphasis on fluid return strongly correlate Sira with veins rather than arteries.

Functional Correlation

Both Sira and veins are involved in:

- Transport of blood and nutrients
- Removal of metabolic waste
- Regulation of circulation and tissue nourishment

Rakta Vaha Sira show the closest functional resemblance to venous and capillary systems.

Clinical Correlation

Siravedha corresponds with modern venesection and therapeutic phlebotomy. The identification of Avedhya Sira parallels modern surgical caution regarding major vascular structures.

Critical Evaluation

Despite strong correlations, exact equivalence between Sira and veins cannot be rigidly imposed. Ayurveda employs a functional–holistic model, whereas modern anatomy follows a

structural–reductionist approach. Sira may represent a broader circulatory concept encompassing veins, capillaries, and microcirculation rather than a single anatomical entity. Recognizing this prevents misinterpretation and preserves classical authenticity.

Contemporary Relevance and Research Scope

Understanding Sira through the lens of modern vascular science enhances the scientific validity of Ayurvedic procedures and opens avenues for integrative research in vascular disorders, blood purification therapies, and microcirculatory studies.

DISCUSSION

The present review critically examines the Ayurvedic concept of Sira and attempts to correlate it with the modern understanding of the vascular system. Classical Ayurvedic texts present Sira not merely as anatomical conduits but as vital life-sustaining structures intricately involved in circulation, nourishment, and maintenance of physiological equilibrium. When analyzed in light of contemporary anatomical and physiological knowledge, these descriptions reveal striking functional parallels, particularly with the venous and capillary components of the vascular system.

Ayurveda adopts a functional–physiological approach to anatomy, wherein structures are defined by their role rather than by strict morphological differentiation. This is evident in the description of Sira as channels responsible for the flow (*sravana*) of Rakta and other vital substances. Unlike modern anatomy, which distinctly classifies arteries, veins, and capillaries based on wall thickness, direction of flow, and oxygen content, Ayurveda integrates these pathways within broader functional categories. This fundamental epistemological difference explains why Sira cannot be equated directly with a single vascular structure but rather represent a collective circulatory concept.

Among the various classifications, Rakta Vaha Sira exhibit the closest correlation with blood vessels described in modern science. Their role in Rakta circulation, tissue nourishment, and removal of metabolic waste aligns closely with the physiological functions of veins and capillaries. Additionally, the classical assertion that Sira lack pulsation further strengthens their resemblance to venous channels rather than arterial pathways. This observation reflects an advanced empirical understanding of circulatory dynamics long before the formal discovery of blood circulation in modern medicine.

The concept of Avedhya Sira provides strong evidence of sophisticated anatomical awareness in Ayurveda. The identification of specific Sira whose injury may result in severe

hemorrhage, disability, or death parallels modern surgical anatomy's emphasis on protecting major vascular structures. This suggests that Ayurvedic scholars possessed detailed practical knowledge derived from observation, surgical experience, and cadaveric dissection, even though the terminology and explanatory framework differed from modern anatomy.

The therapeutic procedure of Siravedha further supports the correlation between Sira and the vascular system. Sushruta's description of Siravedha as *Ardha Chikitsa* underscores its clinical importance in managing disorders associated with Rakta Dushti and circulatory imbalance. The rationale behind Siravedha—removal of vitiated blood to restore physiological balance—closely resembles the principles of modern therapeutic phlebotomy used in conditions such as polycythemia and iron overload disorders. This functional similarity highlights the rational and empirical foundation of Ayurvedic therapeutic interventions.

However, it is important to acknowledge that Ayurveda conceptualizes circulation within a holistic and systemic framework, wherein Sira interact with Dosha, Dhatu, Agni, and Ojas. Modern vascular physiology, in contrast, operates within a reductionist and mechanistic paradigm, focusing on measurable parameters such as blood pressure, flow rate, and vascular resistance. Therefore, while correlations can be drawn, a rigid one-to-one anatomical equivalence between Sira and veins or capillaries may lead to conceptual oversimplification and distortion of classical Ayurvedic principles.

Another important dimension highlighted by this review is the integrative role of Sira in maintaining homeostasis. Ayurvedic descriptions attribute thermoregulation, nourishment, and metabolic balance to Sira based on Dosha predominance. This aligns with contemporary evidence demonstrating the involvement of blood vessels in temperature regulation, immune response, endocrine signalling, and tissue repair. Thus, the Ayurvedic understanding of Sira appears to encompass not only gross circulation but also microcirculatory and regulatory functions recognized in modern biomedical science.

From a contemporary perspective, re-examining Sira through modern vascular concepts enhances the scientific credibility and clinical applicability of Ayurvedic knowledge. Such integrative understanding can contribute to interdisciplinary research in areas such as vascular disorders, chronic inflammatory diseases, and microcirculatory dysfunctions. It may also provide a theoretical foundation for rationalizing classical Ayurvedic procedures within evidence-based frameworks without undermining their traditional philosophical context.

In summary, the discussion reinforces that the Ayurvedic concept of Sira represents a comprehensive and functionally oriented understanding of circulatory pathways. While

differences in terminology and explanatory models exist, the fundamental principles governing circulation, nourishment, and tissue vitality show remarkable concordance with modern vascular science. Recognizing both the similarities and limitations of this correlation is essential for preserving the integrity of Ayurveda while fostering meaningful integration with contemporary medical knowledge.

CONCLUSION

The Ayurvedic concept of Sira reflects a profound and sophisticated understanding of circulatory physiology. While articulated in a distinct philosophical framework, Sira exhibit remarkable structural, functional, and clinical parallels with the modern vascular system—particularly veins and capillaries. Rakta Vaha Sira and the practice of Siravedha further strengthen this correlation. A critical and integrative interpretation of Sira not only validates the scientific depth of Ayurveda but also fosters meaningful dialogue between traditional knowledge systems and contemporary biomedical science.

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