

**CONCEPT OF SIRA IN SUSHRUTA SAMHITA: A REVIEW WITH MODERN
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ABSTRACT

The Sushruta Samhita, one of the Brihatrayi (the three principal classical texts of Ayurveda), is regarded as the foremost authority on surgical science and is especially renowned for its detailed exposition of Sharira (Śārire Suśrutaḥ Śreṣṭhaḥ). It provides a comprehensive description of Sira, Dhamani, and Srotas, clearly distinguishing their characteristics and functions. However, the term Sira is used in different contexts to denote blood vessels and, in certain instances, nerves, making its precise anatomical interpretation challenging when compared with modern anatomy. Hence, a systematic review is required to establish a clearer understanding of the concept. **Aim and Objectives:** (1) To identify and compile all references related to Sira in the Sushruta Samhita. (2) To analyze the concept of Sira described in the text and correlate it with modern anatomical structures. **Methods:** Relevant references from classical Ayurvedic literature, particularly the Sushruta Samhita, along with modern anatomy textbooks, were reviewed and critically analyzed to understand the anatomical concept of Sira. **Observations:** Numerous scattered references related to Sira were identified in both Ayurvedic classics and modern anatomical literature. **Conclusion:** Based on the textual analysis, the concept of Sira described in the Sushruta Samhita can be correlated with blood vessels, lymphatic vessels, and certain neural structures recognized in modern anatomy.

KEYWORDS: Sira, Dhamani, Srotas, Sushruta Samhita, Artery, Vein, Modern Anatomy.**INTRODUCTION**

The Sushruta Samhita, one of the three principal classical texts of Ayurveda (Brihatrayi), is regarded as the foremost treatise on surgery. Owing to the fundamental role of anatomy in surgical practice, Sushruta devoted considerable attention to the detailed study of Sharira Rachana (human anatomy) before describing surgical procedures. This emphasis suggests that anatomical knowledge had reached a more advanced stage during Sushruta's period.

Prior to Sushruta, anatomical understanding in the Vedic era was primarily derived from the dissection of animals performed during sacrificial rituals. The Brahmanas and Kalpasutras also mention several anatomical structures that correspond to organs found in the human body. However, Sushruta was the first scholar to systematically

describe the method of human cadaveric dissection and strongly emphasized its importance in the study of anatomy. Although the technique was relatively primitive by modern standards, it represented a significant milestone in the evolution of anatomical science in ancient India and marked an important advancement in medical education.

Because of his pioneering contributions, Sushruta is widely regarded as the Father of Anatomy in Ayurveda, and the Sushruta Samhita is considered the most authoritative text on Sharira.

According to Dr. B. G. Ghanekar, the Sharira section of the Sushruta Samhita remains comprehensive and intact, although its interpretation requires careful scholarly analysis.

Sushruta provides a detailed description of Sira Sharira in the seventh chapter of Sharira Sthana, titled "Siravarna Vibhakta Nama Shariram." His concepts of Sira Shariram and Siravedhya Vidhi are distinctive and hold considerable clinical significance. However, the interpretation of the term Sira remains challenging because it is used in different contexts to denote various anatomical structures. In some instances, it refers to blood vessels, whereas in others it appears to represent nerves or similar structures. This variation in terminology makes it difficult to establish a precise correlation with the anatomical classifications used in modern medicine.

AIMS AND OBJECTIVES

1. To identify and compile all references related to Sira described in the Sushruta Samhita.
2. To understand the anatomical concept of Sira as explained by Sushruta and correlate it with structures described in modern anatomy.

MATERIALS AND METHODS

The present study is based on an extensive literary review. References related to Sira were collected from various Sthanas of the Sushruta Samhita and critically analyzed. Relevant information was also gathered from standard modern anatomy textbooks, including B. D. Chaurasia's Human Anatomy and Gray's Anatomy, to compare and correlate the classical Ayurvedic descriptions with contemporary anatomical concepts.

DISCUSSION

The term Sira is believed to have originated from the Vedic word Hira, which denotes channels responsible for carrying blood toward the heart. In Ayurveda, Sira is an important anatomical structure and has been the subject of considerable debate due to its varied interpretations. It generally refers to tubular channels that transport Rasa and Rakta throughout the body and is sometimes considered synonymous with Srotas.

To eliminate this ambiguity, Acharya Sushruta clearly distinguished Sira, Dhamani, and Srotas. In the ninth chapter of Sharira Sthana, titled "Dhamani Shariram Vyakaranam," Sushruta states that although some scholars consider Dhamani and Srotas to be modified forms of Sira, this interpretation is incorrect. According to him, Sira, Dhamani, and Srotas are three distinct anatomical entities with unique structural and functional characteristics.

Sushruta differentiated these structures on the basis of four important criteria

1. Vyanjanayatva (Differences in Morphological Characteristics).
Siras are distinguished by their characteristic colours, including crimson red, white, blue, and reddish shades. Such morphological differentiation is not described for Dhamanis or Srotas.

2. Mulasanniyama (Difference in Origin)

The three structures differ in their points of origin and number. Sushruta describes 40 principal Siras, 24 Dhamanis, and 22 Srotas, indicating that each has a distinct anatomical origin and distribution.

3. Karmavishesha (Functional Differences)

Each structure performs a specific physiological role. Siras are responsible for nourishing the body by transporting nutrients through their contractile and dilatory properties. Dhamanis are associated with the transmission of sensory functions such as hearing, vision, taste, and smell, whereas Srotas serve as channels for the transport of substances such as air, water, food, and Rasa.

4. Agama (Scriptural Evidence)

Classical Ayurvedic texts consistently describe Sira, Dhamani, and Srotas as separate anatomical entities. Their independent descriptions in authoritative scriptures further establish that these structures are distinct from one another in both structure and function.

Although Sira, Dhamani, and Srotas are distinct anatomical structures, they often appear similar due to several common characteristics. Acharya Sushruta explains this apparent similarity on the basis of the following four factors.

1. Paraspara Sannikarshata (Close Anatomical Proximity)

Sira, Dhamani, and Srotas are situated in close proximity to one another throughout the body. Similarly, in modern anatomy, veins and arteries, along with their branches, frequently course together within the same anatomical regions, making their differentiation difficult during observation.

2. Sadhrusyagama (Similarity Described in Classical Literature):

Since all three structures are involved in the transportation of Rasa and other bodily substances, they are sometimes described interchangeably in Ayurvedic literature. Their common tubular architecture further contributes to this similarity, much like the hollow structure of veins and arteries in modern anatomy.

3. Sadhrusya Karma (Similarity in Function)

The primary function of Sira, Dhamani, and Srotas is the transport of Doshas, Dhatus, and other essential substances throughout the body. In addition to their functional resemblance, these structures also share certain anatomical characteristics. According to Ayurvedic principles, all three are predominantly composed of the Akasha Mahabhuta, which provides them with a hollow, channel-like structure.

4. Sukshmata (Minute Nature)

The extremely fine and delicate nature of these structures makes them difficult to distinguish from one another. Owing to the limited anatomical knowledge and the

microscopic size of these channels, both physicians of earlier times and the general population often found it challenging to differentiate between Sira, Dhamani, and Srotas.

Anatomical Considerations of Sira in Sushruta Samhita

In the Sushruta Samhita, the term Sira is used in both a broad and a specific sense. Broadly, it denotes the vascular channels of the body, encompassing structures comparable to arteries, veins, capillaries, and lymphatic vessels. In a narrower anatomical context, however, Sira specifically refers to veins. Furthermore, in certain references, such as Sira Marma, the term is used to indicate neural structures, suggesting that its meaning varies according to the anatomical and clinical context.

Origin of Sira

According to Acharya Sushruta, Siras originate from the Nabhi (umbilicus) during embryonic development and extend upward, downward, and obliquely throughout the body. This concept is considered applicable primarily to intrauterine life. During fetal development, the umbilical cord serves as the principal channel for the transport of nutrients and oxygen from the mother to the fetus, and numerous blood vessels are connected to the umbilicus. After birth, these fetal vessels undergo physiological obliteration and no longer function in the same manner.

Therefore, Sushruta's description of Siras as "Nabhiprabhava" (originating from the umbilicus) corresponds closely with the anatomical arrangement observed during fetal life and demonstrates remarkable insight into embryological development.

Structure of Sira

Sushruta compares the structure of Siras to the delicate veins of a leaf, which are thick at their origin and gradually become finer as they branch repeatedly. He further likens these branches to the tendrils of a creeping plant, where each branch divides into progressively smaller branches, forming an intricate network. According to him, blood flows through these channels in a manner similar to water flowing through irrigation canals that distribute water throughout a garden or agricultural field. This analogy effectively illustrates the extensive branching pattern and transport function of the vascular system.

Correlation with Modern Anatomy

The structural description of Sira provided by Sushruta closely resembles the organization of the vascular system described in modern anatomy. Large arteries arise from the heart and divide into progressively smaller arteries and arterioles, which ultimately form an extensive network of microscopic capillaries within body tissues. These capillaries facilitate the exchange of oxygen, nutrients, and metabolic waste products between the blood and surrounding cells. Subsequently, the capillaries unite to form venules, which merge into larger

veins that return blood to the heart.

Although arteries, veins, and capillaries all possess a central lumen through which blood flows, they differ considerably in their wall structure. Both arteries and veins consist of three distinct layers; however, arterial walls are thicker, more elastic, and capable of withstanding the high pressure generated by cardiac contractions. In contrast, venous walls are thinner and more compliant, allowing surrounding skeletal muscles to assist venous return. Veins also contain one-way valves that prevent the backflow of blood. Capillaries possess extremely thin walls consisting of a single layer of endothelial cells, enabling efficient exchange of gases, nutrients, and waste products between the bloodstream and body tissues.

The striking resemblance between Sushruta's description of Sira and the modern understanding of the vascular system reflects the remarkable anatomical observations recorded in the Sushruta Samhita, despite the limitations of the scientific tools available during that period.

General Functions of Sira

According to Acharya Sushruta, the function of Sira can be compared to a network of irrigation channels that distribute water throughout a garden or cultivated field. Just as large and small canals nourish plants by supplying water, Siras nourish the entire body by transporting essential nutrients through their contractile and dilatory properties. This analogy emphasizes the vital role of Siras in maintaining the nourishment and sustenance of body tissues.

From the perspective of modern anatomy, the vascular system comprises a continuous network of arteries, capillaries, and veins that forms a closed circulatory system. Arteries carry oxygenated blood away from the heart to various tissues, whereas veins return deoxygenated blood back to the heart. Capillaries serve as the primary sites for the exchange of gases, nutrients, and metabolic waste products between the blood and body cells.

The processes of vasodilation and vasoconstriction, which regulate blood flow and vascular resistance, are primarily controlled by the autonomic nervous system through sympathetic and parasympathetic innervation. Rhythmic cardiac contractions generate the pressure required for continuous blood circulation throughout the body. Consequently, arteries, capillaries, and veins collectively contribute to tissue nutrition and metabolic homeostasis. In addition, the lymphatic system plays a complementary role by transporting lymph, facilitating the absorption of interstitial fluid, and contributing to immune surveillance and tissue nourishment.

Classification of Sira

Acharya Sushruta classifies Siras into four major categories based on the predominance of Doshas and

their physiological functions.

1. Vatavaha Sira
2. Pittavaha Sira
3. Kaphavaha Sira
4. Raktavaha Sira

function. This classification reflects the Ayurvedic understanding of the relationship between the vascular channels and the functional principles (Doshas) responsible for maintaining normal physiological activities within the body.

Each category possesses distinct characteristics with respect to colour, structural features, and physiological

Table 1: Characteristics, Colour, Functions, and Modern Correlation of the Four Types of Sira (Adapted from Sushruta Samhita)

Type of Sira	Colour	Characteristic Features	Functions	Modern Correlation
Vatavaha Sira	Aruna Varna (crimson red)	Predominantly associated with Vata; filled with Vayu	Facilitates physical activities and motor functions without interfering with the normal functioning of the intellect (Buddhi) and sense organs (Indriyas).	Arteries and nerves
Pittavaha Sira	Neela Varna (bluish)	Warm to touch	Enhances body complexion (Kanti), maintains body heat, and stimulates appetite and digestion.	Veins
Kaphavaha Sira	Gaura Varna (whitish)	Cold to touch and stable	Provides lubrication to body structures, maintains joint stability, promotes strength, and supports tissue integrity.	Lymphatic vessels
Raktavaha Sira	Rohini Varna (red)	Neither excessively hot nor cold	Nourishes the Dhatus, improves complexion, and facilitates proper perception of touch (Sparsha).	Capillaries

Important Siras in the Body

Acharya Sushruta has described certain Siras as clinically significant because of their anatomical location and therapeutic importance. These are discussed under two major categories: Avedhya Sira (non-puncturable veins) and Sira Marma (vital structures associated with vascular components). The identification of these structures reflects Sushruta's detailed understanding of anatomy and his emphasis on ensuring safety during surgical and para-surgical procedures.

Avedhya Sira

Avedhya Siras are those vascular structures that should never be punctured during Siravyadha (venesection). According to Acharya Sushruta, injury to these vessels

may result in severe complications, permanent disability, or even death. Therefore, a physician must possess thorough anatomical knowledge to accurately identify and avoid these vital structures during therapeutic procedures.

Among the 700 Siras described in the Sushruta Samhita, 98 are classified as Avedhya Siras, while the remaining vessels may be selected for venesection in appropriate disease conditions after careful clinical evaluation. This classification demonstrates the advanced anatomical knowledge and surgical precision advocated by Sushruta, highlighting the importance of preserving vital vascular structures while performing therapeutic bloodletting.

Table 2: Avedhya Siras (Non-Puncturable Vessels) and Their Probable Modern Anatomical Correlation.

Region/Location	Number of Avedhya Siras	Sanskrit Name(s)	Probable Modern Anatomical Correlation*
Sakthi/Bahu (Upper and Lower Limbs)	8 + 8	Jāladhara, Urvi, Lohitākṣa	Great saphenous vein, femoral vessels, cephalic vein, brachial vessels, axillary vessels
Śroni (Inguinal and Gluteal Region)	8	Vitapa, Kaṭīkataruṇa	Spermatic vessels, gluteal vessels
Pārśva (Flank Region)	4	—	No major arteries or veins corresponding to this region have been clearly identified.
Pr̥sthavaṃśa (Back Region)	2	Br̥hatī	Subscapular artery and accompanying vessels
Region/Location	Number of Avedhya Siras	Sanskrit Name(s)	Modern Anatomical Correlation*
Udara (Abdomen; Above the Penis and Along the Romarāji)	4	—	Inferior epigastric vessels
Vakṣa (Thoracic/Chest Region)	14	Hṛdaya, Stanamūla, Stanarohita, Apālāpa	Intercostal vessels, internal mammary vessels, lateral thoracic vessels
Grīvā (Neck Region)	16	Aṣṭamātrikā,	External and internal carotid arteries, jugular

		Krikatikā, Vidhura	veins, occipital vessels, posterior auricular vessels
Hanu Sandhi (Temporomandibular Joint Region)	4	—	Internal maxillary vessels
Jihvā (Tongue)	4	Rasavāha, Vākvāha	Deep lingual (Profunda linguae) vessels
Nāsā (Nose)	5	Aupanāsika	Angular vessels
Tālu (Palate)	2	Tālu Sira	Palatine vessels
Netra (Eye Region)	2	Apāṅga Sira	Zygomaticotemporal vessels
Karṇa (Ear Region)	2	Śabdavāhī Sira	Anterior tympanic vessels
Lalāṭa–Nāsā–Netra Gata (Forehead, Nose, and Orbital Region)	5	Keśāntānugata, Āvarta, Sthāpanī	Nasal branch of the frontal vein, frontal branch of the superficial temporal artery and vein
Śaṅkha (Temporal Region)	2	Śaṅkha Sandhigata Sira	Superficial temporal vessels
Mūrdhā (Head/Scalp Region)	8	Utkṣepa, Sīmanta, Adhipati	Parietal branches of the superficial temporal vessels; branches of occipital and superficial temporal vessels

Sira Marma

The term Marma is found in both classical Ayurvedic literature and ancient Vedic texts, indicating its long-standing significance in Indian medical science. The concept of Marma primarily relates to the surface anatomy of vital regions of the body and has considerable importance in surgery, traumatology, and clinical practice. The word Marma literally means a vital or vulnerable point of the body. According to Dalhana, the renowned commentator on the *Sushruta Samhita*, a Marma is a site where injury or trauma can result in severe disability or even death.

Acharya Sushruta defines Marma as the anatomical location where Mamsa (muscles), Sira (vascular structures), Snayu (ligaments and tendons), Asthi (bones), and Sandhi (joints) converge. These sites are considered the special seats of Prana (vital life force); therefore, trauma to any of these structures may produce serious physiological disturbances and, in severe cases, prove fatal.

Sushruta describes a total of 107 Marmas, which are classified into five categories based on the predominant anatomical structure involved. Among these, Sira Marma constitutes 41 vital points, which include.

- Nila Dhamani – 4
- Matrika – 8
- Shringataka – 4
- Apanga – 2
- Sthapani – 1
- Phana – 2
- Stanamula – 2
- Apalapa – 2
- Apastambha – 2
- Hridaya – 1
- Nabhi – 1
- Parshvasandhi – 2
- Brihati – 2
- Lohitaksha – 4
- Urvi – 4

The characteristic manifestations of Marma injury include profuse bleeding, severe pain, and progressive

loss of consciousness. Sushruta explains that the four varieties of Sira are situated predominantly in the regions of the Marmas, where they nourish the surrounding muscles, ligaments, bones, and joints, thereby maintaining the structural and functional integrity of the body. Trauma to these vital points aggravates Vata Dosha, which obstructs the normal function of the Siras, resulting in intense pain, impaired circulation, and gradual loss of consciousness.

From the perspective of modern anatomy, every organ and tissue receives nourishment through its vascular supply and functional control through its nerve supply. Most anatomical structures are associated with a neurovascular bundle comprising an artery, vein, and nerve. The Ayurvedic concept of Sira Marma appears to encompass this neurovascular complex, where the term Sira is used in a broader sense to represent not only blood vessels but also closely related neural structures. This interpretation highlights the remarkable clinical insight of Sushruta in recognizing the importance of these vital anatomical regions long before the development of modern anatomical science.

CONCLUSION

The term Sira in the *Sushruta Samhita* broadly denotes channels through which various substances and physiological forces are transported within the body. Although the term is primarily used to describe blood vessels, Sushruta also employs it in certain contexts to represent neural structures, particularly in the description of Vatavaha Siras. This indicates that the concept of Sira extends beyond the vascular system and encompasses structures responsible for the maintenance of vital physiological functions.

Based on their characteristic features, colour, and functions, the four types of Siras described by Sushruta may be correlated with specific components of the modern circulatory system. Vatavaha Siras, characterized by Aruna Varna (crimson-red colour) and association with Vayu, exhibit features comparable to arteries because of their pulsatile nature. Furthermore, their role in preserving the functions of the intellect and sense organs suggests a close functional relationship with the

nervous system, indicating that the term may include both arteries and nerves.

Pittavaha Siras, described as Neela Varna (bluish in colour) and warm to touch, may be correlated with veins, which transport deoxygenated blood and often appear bluish through the skin. Kaphavaha Siras, characterized by Gaura Varna (whitish colour) and responsible for lubrication, stability, and nourishment, closely resemble the lymphatic vessels, which carry clear lymph and contribute to tissue fluid balance and immune function. Similarly, Raktavaha Siras, described as Rohini Varna (red in colour) and responsible for nourishing the Dhatus, show functional similarity with the capillary network, where the exchange of nutrients, oxygen, and metabolic waste occurs at the tissue level.

Although the classical Ayurvedic texts do not describe the nervous system as a separate anatomical entity, many neurological functions are explained through the concept of Vata acting within the Siras. This suggests that Sushruta viewed the vascular and neural networks as closely interconnected functional systems rather than entirely separate structures.

Consequently, the Ayurvedic concept of Sira may be interpreted as encompassing blood vessels, lymphatic channels, and, in specific anatomical contexts, neural pathways.

Overall, the anatomical descriptions provided by Acharya Sushruta demonstrate a remarkably advanced understanding of the body's transport systems. While an exact one-to-one correspondence with modern anatomical structures is not always possible, the functional similarities indicate that the concept of Sira represents an integrated network responsible for circulation, nourishment, communication, and the maintenance of physiological homeostasis.

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