

A Conceptual Study on Rasa-Rakta Samvahana and the Role of Tridoshas in Cardiovascular Physiology

Dr. Kapil Shrivastava¹, Dr. Manu Sharma², M.D (Ayu.) Kriya Sharir

¹PG Final Year, Department of PG Studies in Kriya Sharir, Jammu Institute of Ayurveda And Research, Jammu.

²Professor, Department of PG Studies in Kriya Sharir, and Vice Principal, Jammu Institute of Ayurveda And Research, Jammu.

Abstract:

Cardiovascular physiology depends on the coordinated regulation of blood circulation, tissue perfusion, metabolism, and vascular integrity. Ayurveda explains these functions through the concept of Rasa-Rakta Samvahana, which is governed by the integrated actions of the Tridoshas. Among them, Vyana Vata governs the movement and circulation of Rasa and Rakta, Ranjaka Pitta is responsible for the formation and functional competence of Rakta, Sadhaka Pitta regulates neurocardiac and psychophysiological functions, and Avalambaka Kapha provides structural support and stability to the Hridaya. This review critically examines the classical Ayurvedic concept of Rasa-Rakta Samvahana and correlates it with current knowledge of cardiovascular physiology. Classical Ayurvedic literature, including the Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya, and Bhela Samhita, was reviewed along with contemporary scientific literature on cardiac physiology, vascular function, autonomic regulation, and tissue perfusion. The review identified significant functional similarities between Ayurvedic principles and modern cardiovascular mechanisms, including cardiac pumping, blood circulation, vascular regulation, myocardial metabolism, and neurocardiac integration. Although the Tridoshas cannot be directly equated with specific anatomical structures or physiological systems, they collectively represent a comprehensive functional framework for maintaining cardiovascular homeostasis. This integrative perspective highlights the contemporary relevance of Ayurvedic physiology and provides a conceptual basis for future interdisciplinary research in cardiovascular science and integrative medicine.

Keywords: Ayurveda; Cardiovascular Physiology; Hridaya; Rasa-Rakta Samvahana; Tridosha; Vyana Vata.

1. Introduction

Ayurveda describes the human body as an integrated biological system regulated by the *Tridoshas*—*Vata*, *Pitta*, and *Kapha*. These three fundamental physiological principles govern movement, transformation, and structural stability, thereby maintaining normal body functions and physiological homeostasis.

The circulation of nutrients and blood is explained through the concept of *Rasa-Rakta Samvahana*. *Rasa Dhatu*, formed after digestion, nourishes all tissues and is subsequently transformed into *Rakta Dhatu*, which sustains life by delivering nourishment throughout the body. The continuous movement of *Rasa* and *Rakta* through the *Hridaya*, *Dhamanis*, and *Srotas* ensures tissue nutrition and maintains physiological balance. [1]

Classical Ayurvedic texts emphasize the *Hridaya* as the central organ of circulation. Acharya Charaka describes *Hridaya* as the seat of *Chetana*, while Acharya Sushruta identifies it as the *Mula* of the *Rasavaha* and *Raktavaha Srotas*, highlighting its pivotal role in the distribution of *Rasa* and *Rakta* throughout the body. [2]

Among the *Tridoshas*, each contributes uniquely to cardiovascular physiology. *Vyana Vata* regulates the movement and distribution of circulating fluids, *Ranjaka Pitta* is responsible for the formation and functional competence of *Rakta*, *Sadhaka Pitta* links cognitive and emotional functions with cardiovascular regulation, and *Avalambaka Kapha* provides structural support and nourishment to the *Hridaya*. Together, these coordinated actions maintain effective circulation and cardiovascular homeostasis.

Modern cardiovascular physiology likewise recognizes that efficient circulation depends on the integrated function of the heart, blood vessels, autonomic nervous system, and metabolic processes. Cardiac output, vascular tone, tissue perfusion, and neurohumoral regulation work together to preserve cardiovascular homeostasis. These mechanisms show notable functional similarities with the Ayurvedic concept of *Rasa-Rakta Samvahana* governed by the coordinated actions of the *Tridoshas*.

Although these conceptual similarities have been discussed individually, a comprehensive review integrating the Ayurvedic concept of *Rasa-Rakta Samvahana* with contemporary cardiovascular physiology remains limited. Therefore, the present review examines the role of the *Tridoshas* in cardiovascular physiology and correlates classical Ayurvedic concepts with current scientific evidence to provide an integrative understanding of cardiovascular regulation.

2. Materials and Methods

Study Design

This study was conducted as a narrative review integrating classical Ayurvedic literature with contemporary biomedical evidence to evaluate the concept of *Rasa-Rakta Samvahana* and the role of the *Tridoshas* in cardiovascular physiology.

Literature Sources

Classical information was collected from authoritative Ayurvedic texts, including the *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, and *Bhela Samhita*, along with their standard commentaries. Contemporary literature was retrieved from PubMed, Scopus, Google Scholar, Web of Science, and ScienceDirect using keywords related to cardiovascular physiology, blood circulation, autonomic nervous system, cardiac function, vascular physiology, tissue perfusion, and neurocardiology.

Data Analysis

Relevant classical descriptions were critically analyzed and functionally correlated with current concepts of cardiovascular physiology. The proposed correlations are interpretative and based on similarities in physiological functions rather than direct anatomical or biochemical equivalence.

3. Results

3.1 Classical Concept of *Rasa-Rakta Samvahana*

Rasa-Rakta Samvahana refers to the continuous formation, circulation, and distribution of *Rasa* and *Rakta* to maintain tissue nourishment, metabolism, and physiological homeostasis. Although classical Ayurvedic texts do not describe the circulatory system in modern anatomical terms, they explain a dynamic process in which the *Hridaya*, *Dhamanis*, *Siras*, and *Tridoshas* collectively regulate the transport of nutrients and blood throughout the body.

Acharya Bhela describes the circulation of *Rasa* by comparing it with the flow of water through irrigation channels:

यथा क्षेत्रमुपसिञ्चन्ति कूल्याभिः सलिलं कृषकाः।

एवं शरीरमुपसिञ्चति हृदयं चेतसा सह ॥

Bhela Samhita, Sharirasthana 7 [3]

This analogy illustrates that just as water is distributed from a central source to irrigate an entire field, the *Hridaya* continuously distributes *Rasa* throughout the body to nourish all tissues. Acharya Bhela further explains that the *Rasa-Rakta* complex is propelled from the *Hridaya* through the ten *Dhamanis* and returns to the heart through the *Siras*, indicating a continuous circulatory process.

Similarly, Acharya Charaka emphasizes the central role of the *Hridaya* by describing it as the origin of the *Dhamanis*:

दश धमन्यो हृदयात् प्रसृताः।

Charaka Samhita, Sharirasthana 7/10

This description establishes the *Hridaya* as the central organ responsible for distributing *Rasa* throughout the body via the vascular channels. According to Ayurveda, *Ahara Rasa* is first converted into *Rasa Dhātu*, reaches the *Hridaya* through the action of *Samana Vata*, and is subsequently distributed by *Vyana Vata* to nourish all tissues. Functionally, this concept resembles the modern cardiovascular system, in which the heart continuously pumps blood through an extensive network of blood vessels to deliver oxygen and nutrients while maintaining tissue perfusion and physiological homeostasis.

3.2 Functional Role of *Vata Dosha* in Cardiovascular Physiology

Among the *Tridoshas*, *Vata Dosha* is the principal regulator of movement and therefore plays the primary role in *Rasa-Rakta Samvahana*. Among its five subdivisions, *Vyana Vata* is most closely associated with cardiovascular function because it governs the circulation and distribution of *Rasa*, *Rakta*, and other body fluids.

Acharya Vagbhata describes the functions of *Vyana Vata* as:

व्यानो हृदि स्थितः कृत्स्नदेहचारी।

गत्यपक्षेपणोत्क्षेप निमेषोन्मेषणादिकाः ॥

Ashtanga Hridaya, Sutrasthana 12/6

This verse indicates that *Vyana Vata* originates in the *Hridaya* and circulates throughout the body, regulating all forms of movement. In the context of cardiovascular physiology, these functions can be

interpreted as coordinating the propulsion and distribution of blood from the heart to peripheral tissues. [4]

Modern physiology explains that effective circulation depends on rhythmic cardiac contraction, cardiac output, and vascular tone, which together ensure adequate tissue perfusion. Similarly, Ayurveda attributes the movement of *Rasa* and *Rakta* to *Vyana Vata*. Although it cannot be equated with a single anatomical structure, *Vyana Vata* may be understood as the functional principle coordinating cardiovascular dynamics and circulatory homeostasis.

The regulatory role of *Vyana Vata* also resembles that of the autonomic nervous system, which continuously adjusts heart rate, myocardial contractility, vascular resistance, and blood pressure according to physiological demands. Through this coordinated regulation, both systems maintain cardiovascular adaptation during rest and stress. [5]

Disturbance of *Vyana Vata* may impair the movement of *Rasa* and *Rakta*, leading to altered circulation and inadequate tissue perfusion. Functionally, this may be compared with conditions involving reduced cardiac output, autonomic dysfunction, vascular abnormalities, or cardiac rhythm disturbances. [6]

3.3 Functional Role of *Pitta Dosha* in Cardiovascular Physiology

While *Vata Dosha* provides the force for circulation, *Pitta Dosha* maintains the metabolic and functional competence of the cardiovascular system. As the principle of transformation (*Parinama*), *Pitta* regulates tissue metabolism, energy production, and the formation of *Rakta Dhatu*. Among its five subdivisions, *Ranjaka Pitta* and *Sadhaka Pitta* have the greatest relevance to cardiovascular physiology.

Acharya Vagbhata describes *Ranjaka Pitta* as:

रञ्जकः पच्यमानाशयः ॥

Ashtanga Hridaya, Sutrasthana 12/13

Ranjaka Pitta, situated in the *Yakrit* (liver) and *Pliha* (spleen), transforms *Rasa* into *Rakta* by imparting its characteristic colour and functional properties. This transformation is essential because effective circulation depends not only on blood flow but also on the quality and oxygen-carrying capacity of blood. In modern physiology, comparable physiological functions are performed through erythropoiesis, haemoglobin synthesis, and hepatic metabolism. Although *Ranjaka Pitta* cannot be directly equated with these processes, both are responsible for producing functionally competent blood capable of sustaining tissue nutrition. [7]

Another important subdivision, *Sadhaka Pitta*, is located in the *Hridaya* and regulates intellect, emotional balance, motivation, and purposeful actions.

यत् हृदये पित्तं तस्मिन् साधकोऽग्निरिति संज्ञा ।

सोऽभिप्रार्थितमनोरथसाधनकृदुक्तः ॥

Sushruta Samhita, Sutrasthana 21/10

The localisation of *Sadhaka Pitta* in the *Hridaya* reflects the close relationship between mental activity and cardiovascular function described in Ayurveda. Modern physiology similarly recognises that emotional and cognitive states influence cardiac function through autonomic and neuroendocrine pathways. Neurotransmitters and catecholamines continuously regulate heart rate, myocardial

contractility, vascular tone, and cardiovascular responses to stress. These integrated mechanisms closely resemble the coordinating role of *Sadhaka Pitta* in maintaining neurocardiac balance. [8]

Disturbance of *Pitta Dosha* may impair both the metabolic quality of *Rakta* and the neurocardiac regulation of the cardiovascular system. Functionally, such disturbances may be associated with altered blood formation, impaired tissue metabolism, emotional instability, stress-related cardiovascular disorders, and autonomic dysregulation, highlighting the complementary role of *Pitta Dosha* in maintaining cardiovascular homeostasis. [9]

3.4 Functional Role of *Kapha Dosha* in Cardiovascular Physiology

While *Vata* governs movement and *Pitta* regulates transformation, *Kapha Dosha* provides structural stability, nourishment, and protection to the cardiovascular system. Among its five subdivisions, *Avalambaka Kapha* is most closely associated with the *Hridaya*, where it supports the heart and other thoracic organs while maintaining their functional integrity.

Acharya Vagbhata describes the functions of *Avalambaka Kapha* as:

उरःस्थः स त्रिकस्य स्ववीर्यतः।
हृदयस्य च तदत्रस्थाम्बुकर्मणा।
कफधाम्नां च शेषाणां यत्करोत्यवलम्बनम्॥
Ashtanga Hridaya, Sutrasthana 12/15

This verse indicates that *Avalambaka Kapha*, located in the *Uras* and *Hridaya*, provides support and nourishment to the heart while serving as the foundation for the proper functioning of the other subtypes of *Kapha*. In cardiovascular physiology, these functions can be correlated with the structural integrity of the myocardium, connective tissue, pericardium, and blood vessel walls.

Modern physiology recognises that efficient cardiac function depends not only on effective pumping but also on the structural stability of the heart and vasculature. The myocardium, extracellular matrix, connective tissue framework, and pericardial fluid preserve cardiac strength, elasticity, and mechanical efficiency. Likewise, *Avalambaka Kapha* may be interpreted as the functional principle responsible for maintaining structural support, lubrication, and maintenance of myocardial and vascular integrity. [10]

Disturbance of *Kapha Dosha* may compromise myocardial nutrition, vascular elasticity, and structural integrity, leading to impaired cardiovascular function. Although these correlations are functional rather than direct, they highlight the supportive role of *Kapha Dosha* in maintaining long-term cardiovascular stability and efficient *Rasa-Rakta Samvahana*. [11]

Table 1. Functional Role of Tridoshas in Cardiovascular Physiology

Dosha	Subtype	Classical Function	Modern Physiological Correlation
Vata	Vyana Vata	Circulation of Rasa and Rakta	Cardiac output, blood circulation, vascular regulation
Pitta	Ranjaka Pitta	Formation of Rakta	Erythropoiesis, haemoglobin synthesis, hepatic metabolism
Pitta	Sadhaka Pitta	Mental and emotional regulation	Neurocardiac integration, autonomic regulation

Dosha	Subtype	Classical Function	Modern Physiological Correlation
Kapha	Avalambaka Kapha	Support and nourishment of Hridaya	Myocardial integrity, connective tissue support, pericardial function

4. Discussion

The present review demonstrates that the Ayurvedic concept of *Rasa-Rakta Samvahana* shows close functional similarities with the integrated mechanisms governing cardiovascular physiology. Rather than describing blood circulation alone, *Rasa-Rakta Samvahana* encompasses the formation, distribution, and nourishment of tissues through the coordinated actions of the *Tridoshas*. This holistic perspective reflects the integrated regulation of circulation, metabolism, and structural integrity required for cardiovascular homeostasis.

Among the *Tridoshas*, *Vyana Vata* serves as the principal regulator of circulatory dynamics by governing the movement of *Rasa* and *Rakta*. *Pitta Dosha*, through *Ranjaka Pitta* and *Sadhaka Pitta*, maintains the metabolic competence of blood and coordinates neurocardiac regulation, while *Avalambaka Kapha* preserves the structural integrity and nourishment of the *Hridaya*. Together, these functions resemble the coordinated actions of the cardiovascular, autonomic, metabolic, and connective tissue systems recognised in modern physiology.

Although these correlations are functional rather than direct anatomical or biochemical equivalences, they provide a rational framework for interpreting classical Ayurvedic concepts in the context of contemporary cardiovascular science. Further experimental and clinical studies integrating Ayurvedic principles with modern physiological biomarkers are required to validate these concepts and explore their therapeutic relevance in cardiovascular health and disease.

5. Conclusion

Rasa-Rakta Samvahana represents a comprehensive Ayurvedic concept of cardiovascular physiology that includes the formation, circulation, distribution, and functional regulation of *Rasa* and *Rakta*. The coordinated actions of the *Tridoshas* provide a logical framework for understanding these processes, with *Vyana Vata* regulating circulation, *Ranjaka Pitta* and *Sadhaka Pitta* maintaining blood formation, metabolism, and neurocardiac regulation, and *Avalambaka Kapha* preserving the structural integrity of the *Hridaya*.

Although these concepts cannot be directly equated with specific anatomical structures or physiological mechanisms, their functional similarities with contemporary cardiovascular physiology highlight the enduring relevance of Ayurvedic principles. Integrating these classical concepts with modern cardiovascular science may provide a broader understanding of cardiovascular regulation and serve as a foundation for future interdisciplinary research in integrative medicine.

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Author Contributions

Kapil Shrivastava conceived the study, performed the literature review, analysed the classical and contemporary literature, and drafted the manuscript. Manu Sharma supervised the study, critically reviewed the manuscript, and provided intellectual guidance. Both authors read and approved the final manuscript.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this review.

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