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# A Physiological Study of *Pranvaha Srotas* W.S.R. to Cardiopulmonary System

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## ABSTRACT

*Srotas*, intricate conduits within the body, serve as the vital passageways for the transport of various substances from one location to another. These channels are numerous and play a pivotal role in governing both physiological and pathological processes within the body. Among the diverse *Srotas*, the *Pranvaha Srotas* stands out as the most crucial, serving as the conduit for *Pran swarop Vayu*, which we can equate to oxygen. *Pranvaha Srotas* are responsible for distributing oxygen throughout the entire body and our very existence relies on this life-sustaining element. Analogous to *Pranvaha Srotas* in *Ayurveda*, contemporary science recognizes the cardiopulmonary system as the facilitator of oxygen transport. This system comprises two closely interlinked subsystems. The first is the Respiratory System, primarily tasked with the oxygenation of blood through the transfer of oxygen, while the second is the Cardiovascular System, responsible for disseminating oxygen-rich blood throughout the entire body. Notably, the heart and lungs play pivotal roles as the central organs of the cardiopulmonary system. Intriguingly, the functions, signs, and symptoms of *Pranvaha Srotas* and the cardiopulmonary system exhibit striking similarities. Therefore, the objective of this study is to conduct a comprehensive exploration of the anatomical characteristics of *Pranvaha Srotas mool* in *Ayurveda*, drawing parallels with the cardiopulmonary system in contemporary science. Through this investigation, we aim to shed light on the intricate connections between traditional *Ayurvedic* wisdom and modern medical knowledge, ultimately enhancing our understanding of the vital role played by these vital pathways in sustaining human life.

***KEYWORDS:*** *Pranvah Srotas, Hriday, MahaSrotas,* Cardiopulmonary system.

## INTRODUCTION

Ayurveda, the ancient science of well-being, elucidates the intricate concept of the *Sharir*, a complex entity composed of countless *Srotas*. These *Srotas* represent the structural pathways within the body that play a pivotal role in the transportation of essential elements. They can be envisioned as channels facilitating the seamless movement of vital substances from one location to another. The

term "*Srotas*" finds its origins in the Sanskrit root "*Srugatau*," which conveys meanings such as oozing, flowing, and permeating, aptly describing the functions of these channels[1]. In essence, *Srotas* serve as conduits through which the processes of flowing, moving, oozing, and permeation, collectively known as *Sarana* Karma, unfold, enabling the conveyance of specific elements to their designated destinations[2].

These intricate channels bear immense significance in carrying out the transformation of *Dhatus*, the fundamental tissues of the body. They contribute to a continuous and unidirectional progression in the creation of successive *Dhatus*, thereby maintaining the body's physiological equilibrium. *Srotas* are intimately involved in numerous physiological and pathological processes within the body. Any form of stagnation within these channels can give rise to the manifestation of various diseases. According to *Acharya Sushrut*[3], there exist eleven pairs or twenty two of *Yogvahi Srotas*, while *Acharya Charak*[4] identifies thirteen *Srotas*. Among these *Srotas*, *Pranavaha Srotas* holds a paramount position. *Pranavaha Srotas*, often referred to as the channel of *Pran*, derives its name from its role in carrying vital air or energy responsible for the orchestration of every aspect of life within the body. Notably, it shares similarities with the cardiopulmonary system, particularly in their functions related to oxygen transport. The signs and symptoms associated with the derangement of *Pranvaha Srotas* indirectly correlate with conditions affecting the cardiopulmonary system. In cases where an individual is unable to perform the natural act of breathing, artificial life support becomes necessary, exemplified by the use of a ventilator machine. This underscores the critical importance of *Pranvaha Srotas* in sustaining human life, as it plays a fundamental role in the respiratory process, akin to the cardiopulmonary system.

## MATERIAL AND METHOD

Available literature collected from Ayurvedic texts, modern books articles, journals etc.

***Pranvaha Srotas:-***

*Pranvaha Srotas* stands out as the paramount among all the intricate *Srotas* in Ayurveda, for it serves as the conduit for *Pran* or *Pran*a *Vayu*, the vital force essential for sustaining life. Within the realm of Ayurveda, *Pran* is said to reside in ten vital regions known as Dash *Pran*ayatan, encompassing areas like *Sankhau, Marmatrayam* (including the heart, bladder, and navel), *Guda* (anus), *Shukra* (reproductive organs), *Oja* (vital essence), and *Rakta* (blood)[5].

The location of *Pran*vata, where *Pran* predominantly resides, encompasses the regions of *Murdha* (head or cranial area), Urah (chest, the abode of the heart and lungs), *Kantha* (throat), *Jihvanasika* (tongue and nose), and various functions such as spitting, sneezing, burping, respiration (*Swas*), and the intake of nourishment (*Aahar*) are under the influence of *Pran*vat[6].

The significance of *Pran*vat is expounded upon by Acharya Charak, who elucidates that *Vayu*, or the vital air carried by *Pranvaha Srotas*, permeates and sustains the soul, body, and organs[7]. The act of breathing (*Swasn kriya*) fundamentally relies on the presence of *Pran*vayu or oxygen[8]. *Vayu* is not just a physical element; it embodies the strength, life, and health of an individual[9] .

**Mool of Pranvaha Srtoas:-**

In understanding the foundation of *Pranvaha Srotas*, *Acharya Sushrut* identifies its two *Mool* or root locations as the *Hriday* (heart) and *RasvahiniDhamni* (large arterial vessels)[10] . Conversely, *Acharya Charak* highlights *Hriday* and *Maha Srotas* (great channels) as the *Mool* of *Pran*vah *Srotas*[11] These *Mool sthan*, or root sites, are pivotal in comprehending the origin of diseases resulting from the vitiation of *Srotas*. The causes of *Pranvaha Srotas* vitiation are multifaceted and include factors such as

*Dhatu Kshay* (tissue depletion), *Sandharanat* (withholding natural urges), *Roukshyata* (consumption of dry foods), *Kshuditasya* (excessive exercise during starvation), and *Vyayamat* (strenuous physical exertion)[12] . When *Pranvaha Srotas* is injured or disrupted, it manifests through symptoms like *Akrosh* (screaming or anger), *Vinaman* (bending of the body), Mohan (unconsciousness), *Bhram* (dizziness), *Vepanan* (palpitations), and, in severe cases, *Marnam* (death)[13] . Symptoms of *Pranvaha Srotas* vitiation include *Atishrustamswas* (prolonged breathing), *Atibaddhamswas* (obstructive breathing), *Kupitswas* (labored breathing), *Alpaalpamswas* (Cheyne-Stokes respiration), *Abheekshanamswas* (frequent breathing), *Sasabdswas* (abnormal breathing sounds), and *Sashoolaswas* (painful breathing)[14] .

The management of *Pran*vah*Srotas* vitiation aligns with the treatment approaches for Swasrog (breathing disorders), *Hriday*rog (heart diseases), and Kas (cough)[15] . These holistic strategies aim to restore balance and vitality to this vital channel, ensuring the harmonious flow of *Pran* for overall well-being.

***Hriday***

*Hriday*, known as the seat of *Pran*, occupies a pivotal role among the Moolsthan (root sites) of *Pranvaha Srotas*[16]. It is within the *Hriday* that *Pran*, the vital life force, predominantly resides, making it the primary location for *Pran* among the ten vital regions known as Dash *Pran*ayatan. *Hriday* is often synonymous with the terms "*Mahat*" and "*Arth*," signifying its significance in the body's functioning, and it is associated with ten major *Dhamni* (vessels)[17]. In *Bhel samhita's* 20th chapter, *Artha* (essence) related to *Hriday* is elaborated upon, emphasizing the presence of ten *Dhamni*[18] .

*Aacharya Charak's* perspective further underscores *Hriday*'s importance, comparing it to the axial point of a wheel. Much like spokes of a wheel, Dash *Dhamni* (ten vessels), *Pran*, *Apan* (excretion), *Buddhi* (intellect), *Chetana* (consciousness), and *Mahabhoot* (fundamental elements) are oriented around *Hriday*, forming a vital network within the body[19] . During the embryonic development stage, *Hriday* originates from *Rakta* (blood) and a portion of *Kapha Sara* (tissue), solidifying its foundational role[20]. Positioned between the two Stan (breasts) in the thoracic region, injury to this region is often fatal[21].

***Hriday*** is often likened to the downward-facing petals of a lotus flower. In the awakened state, it functions actively with an open posture, while during sleep; it adopts a closed position and operates at a slower pace[22] . Its approximate size is equivalent to that of a human fist[23] . *Hriday* is not only included in the category of *Sadhya Pranharmarma* but also holds a place in *Sira marma*, marking it as a natural seat of *Pran* within the body[24].

**Hridrog, or heart diseases,** can be triggered by various factors such as *Dukha* (grief), *Upwas* (starvation), *Vyayam* (exercise), *Ruksha-bhojan* (dry diet), *Alpa bhojan* (small meals), excessive alcohol consumption, and emotional factors like anger. These factors can lead to an increase in *Vata Dosha*, which, in turn, may reach the heart and cause severe pain[25].

**Characteristic symptoms of *Hriday*rog** include *Vepathu* (palpitation), *Veshtan*, *Stambh* (obstruction in heart rate), *Pramoh* (unconsciousness), *Shunyata* (lightheadedness), *Darh* (murmur sounds), *Trishna* (thirst or dry mouth), *Bhram* (dizziness), and *Swed* (sweating)[26].

In cases of *Hriday*aghat (heart injury), symptoms may manifest as *Kaas* (cough), *Swas* (breathlessness), *Bala kshay* (fatigue), *Kanthashosh* (dryness in the throat), *Klomakarshan* (pulling pressure on *Kloma*), *Mukhtalushosh* (dryness in the mouth and palate), *Pralap* (irrelevant talk), and

*Sangyanash* (unconsciousness)[27].

***Rasvahi Dhamni*** are considered as one of the Mool (root) of *Pran*vah *Srotas* by *Acharya Sushruta*. These *Dhamni*, responsible for carrying *Rasa* (continuously flowing elements in the body), are aptly named *Rasvahi Dhamni*, with "*Rasa*" derived from "*Rasagatoudhatu*." Ensuring the preservation of *Rasa* through a proper diet and *Aacharpalan* (code of conduct from *Samhita*) is crucial, as it forms the foundation for the creation of *Uttrotardhatu*[28]. As per *Acharya Charak's* assertion, any channel related to "*Dhamn*" (pulsation) is named a *Dhamni*[29], and *Dash Dhamni*, *Pran*, *Apan*, *Buddhi*, *Chetana*, and *Mahabhoot* are centered around *Hriday* like spokes of a wheel.

**Maha *Srotas*:-** Maha *Srotas*, another integral component of *Pranvaha Srotas*, is described by *Acharya Charak* as a large structure or tube with a substantial diameter. It is synonymous with terms such as *Kostha*, *Sharirmadhya*, *Mahanimna*, and *Pakvashay*. In *Acharya Sushruta's* perspective, *Maha Srotas* encompasses structures like *Mansa* (muscles), *Agnyshya* (digestive fire), *Hriday* (heart), *Unduka* (intestines), and *Phupusa* (lungs). These structures highlight the substantial nature of *Maha Srotas*[30] .

**Lungs:-** *Phupusa*, often equated with the lungs, has an origin rooted in the foam of *Shonhit* (blood). The presence of air bubbles within this foam gives the lungs a cluster-like appearance. *Phupusa* resides on the left side of *Hriday*, while *Kloma* (diaphragm) is located on the right side within the *Vakshasthal* (thoracic cavity)[31] .

**Lungs Diseases**:-

While *Ayurveda* may not explicitly mention *Phupusa Rog* (lung diseases), the involvement of *Phupusa*, *Vakshasthala*, or *Urah* (thoracic cavity) is described in the pathophysiology of *Pran*vah *Srotas*-related conditions such as *Swas Rog* (respiratory disorders), *Kas Rog* (cough), *Parshvshool* (side pain), *Rajayakshma* (tuberculosis), and *Kshatsheena* (chest injuries). These conditions, rooted in *Pran*vah*Srotas*, can be considered as the ailments affecting *Phupusa* due to their involvement in these diseases[32].

In the modern medical context, the cardiopulmonary system encompasses two crucial systems: the cardiovascular system and the pulmonary system. The cardiovascular system functions to transport blood throughout the body, while the pulmonary system facilitates the exchange of gases between the environment and the body, allowing for the intake of oxygen and the expulsion of carbon dioxide. These systems are interdependent and closely linked, with pathogenesis in one system often affecting the other, underscoring their crucial role in maintaining overall health[33].

**Disease of Cardiovascular System:-** Cardiovascular diseases can arise from various causes, including infections, congenital conditions, and structural abnormalities, leading to reduced oxygen supply and acute circulatory failure. Symptoms of heart disease encompass chest pain, orthopnea, fatigue, syncope, palpitations, and signs such as anemia, pyrexia, clubbing, edema, raised jugular venous pressure, blood pressure variations, murmurs, and rhythm disorders[34].

**Respiratory System**:- The lungs, a pair of respiratory organs located within the thoracic cavity, play a crucial role in breathing. They invaginate corresponding pleural cavities and occupy a significant portion of the thoracic cavity, with the right lung being slightly heavier than the left. Lungs feature three borders and two surfaces, and they contain millions of alveoli and an extensive network of airways. In lung diseases, symptoms may include pyrexia, dyspnea, tachypnea, cyanosis, abnormal breath sounds, and signs of heart failure[35].

## DISCUSSION

The heart's positioning and functioning, as

described in *Ayurvedic* texts, align with modern medical knowledge. *Hriday*'s characteristics, such as its shape, location, and open-close mechanism, closely resemble the structure and rhythmic contraction of the heart. Any disruption in the heart's conduction, leading to ventricular fibrillation, can result in cardiac failure and fatality. The alignment of blood vessels with the heart, as described by *Acharya Charak*, reflects their interconnectness within the cardiovascular system. The heart's role in pumping oxygen-rich blood and nourishing body tissues is similar to the function of *Rasvah Dhamni*, which carries oxygen throughout the body.

The respiratory system, particularly the lungs, is essential for oxygen exchange. *Ayurvedic* descriptions of *Phupusa* and contemporary scientific knowledge of the lungs show remarkable similarities in structure and function. The respiratory tract's role in facilitating gas exchange aligns with *Pran*vah *Srotas* and its connection to oxygen. The relationship between the heart, lungs, and blood vessels is vital for the transportation of oxygen and nutrients throughout the body. Furthermore, the symptoms of heart diseases closely parallel the signs and symptoms of vitiation and disorders of *Pran*vah *Srotas*. This suggests that *Pran*vah *Srotas* could be considered a comprehensive system encompassing both the cardiovascular and pulmonary systems.

## CONCLUSION

The study reveals significant parallels between *Ayurvedic* concepts of *Pran*vah *Srotas* and modern cardiovascular and pulmonary systems. These insights emphasize the interconnectedness of the heart, lungs, blood vessels, and blood in maintaining the body's vital functions.

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