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RETHINKING THE HEART: AYURVEDIC INSIGHTS INTO THE COMPLEXITIES OF UNEXPLORED CARDIOVASCULAR PHYSIOLOGY

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ABSTRACT

Objective: *In Āyurveda, 'Hṛudaya' is much beyond the idea of muscular organ - Heart, established as both physiological and psychological head office, a pivotal functional centre.*

1) *To elucidate the fundamental role of Agni, Tridosha regulation and Mahābhūta interactions in functions of Hṛudaya.*
2) *To interpret unexplored and extended cardiovascular physiology through an Āyurvedic lens.*

Data Source: *Charaka Samhita, Sushruta Samhita, Bhela Samhita, Ashtanga Sangraha, Ashtanga Hrudaya, Shabdakalpadruma.*

Review Methods: *A textual and conceptual synthesis of cardiovascular physiology and classical Āyurvedic principles was undertaken. Stage wise functionality of Hṛudaya were analysed and interpreted for its Agni, Tridosha regulation and Mahābhūta interactions alongside corresponding biomedical mechanisms like electrical conduction and hemodynamic.*

Discussion and Results: *There exists two states Hrudaya Viaksana and Mlanata (metabolically active and inactive states subjectable to diurnal variations). Hṛudaya Dhmana (pumping action of the Heart) is powered predominantly by Agni and Vāyu, supported by Prāṇa, Apana, Samānavāta, and Sadhaka Pitta, while Rasa Vikshepana (circulation of nutrients) involves Avalambaka Kapha enhancing the quality of Ahāra Rasa Gati. The sequential kinetic energy transfer in Srotas, governed by Akasha, Vayu and Agni Mahābhūta modulated by Jala and Pṛthvī circulates the transforming Ahara Rasa is. Disruptions in either of this led to multiple cardiovascular pathologies.*

Conclusion: *Hṛudaya's cardiovascular functions are deeply rooted in the synergistic interaction between Mahābhūtas reflected in functioning of Doṣas and, regulating the life-sustaining circulation and vitality. Thus, integrative model provides a holistic understanding of cardiac physiology, reinforcing the relevance of Āyurvedic insights in cardiovascular care.*

KEYWORDS: *Hṛudaya, Hṛudaya Dhmana, Rasa Vikshepana, Ahāra Rasa Gati, Tridosha, Mahabhuta*

INTRODUCTION

In Ayurveda, *Hrudaya* is not merely a muscular structure but the central seat integrating body, mind, and spirit. It has two aspects—*Uro-Hrudaya* [1] linked with *Rasa*, *Ojas*, and *Shwasaprakriya*,[2] and *Shiro-Hrudaya* [3] connected with sensory, mental, and motor functions. Functions like *Hrudaya-Dhmana* [4] (heartbeat/pulsation), *Ambu-Karma*, *Rasa-Vikshepana*, and *Ahara-Rasa-Gati* sustain total bodily harmony.

The concept of *Hrudayopalakshitapradesha* [5] highlights the unity of heart, breath, and circulation. This expansive Ayurvedic view, embracing structural, physiological, psychological, and spiritual dimensions, suggests that ***Hrudroga*** [6] (cardiovascular diseases) can get a newer perspective to understanding their intricacies for a better management.

OBJECTIVE

1.To elucidate the fundamental role of *Agni, Tridosha* and *Mahābhūta* in functions of *Hṛudaya*
2.To interpret unexplored and extended cardiovascular physiology through an Āyurvedic lens.

MATERIALS AND METHODS

A textual-conceptual synthesis of cardiovascular physiology and Ayurveda was performed, analysing stage-wise functions of *Hṛudaya* in relation to *Agni*, *Tridosha*, and regulation alongside biomedical mechanisms like conduction and haemodynamic.

CARDIOVASCULAR PHYSIOLOGY

The cardiovascular system delivers blood, adapting to stimuli. Comprising the heart, arteries, veins, and capillaries, it's regulated by blood volume, hormones, and the autonomic

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nervous system. The heart pumps blood through systemic and pulmonary circuits. Arteries distribute high-pressure blood, capillaries facilitate exchange, and veins return it. Cardiac output and vascular tone are crucial for flow and pressure, while reflexes and renal systems maintain homeostasis. Disruptions cause many conditions like hypertension, heart failure etc. [7]

In Ayurveda, bodily systems emerge from the interplay of *Dosha*, *Dhatu*, *Srotas*, and *Agni*, inherently linking *Rachana* (structure) and *Kriya* (function). The term *Hrudaya* (heart) embodies this by signifying "to take", "to give" and "to transport" [8] reflecting its continuous, vital activities and promoting a deeply interconnected, contextual understanding of its structure and function.

HRUDAYA* – ITS *RACHANAATMKA* AND *KRIYAATMAKA SANGHATANA

Sl no	Specificity	Details
1	*Koshthanga*	*Hrudaya* [9]
2	*Avayava*	*Hrudaya* [10]
3	*Utpatti*	originates from the most essential part of ***Shonita*** and ***Kapha*** [11]
4	*Asthi*	3 - *Mandala*
5	*Sandhi*	3 - *Mandala*
6	*Khandara*	1
7	*Peshi*	2
8	*Marma*	1 in number *Urahpradeshastitha* *Sadhyapranahara – Agni mahabhuta Pradhana* *Sira Marma* [12]
9	Anatomical site	It is situated between the two *Stana* (breasts) and at the door of *Uras* to *Amashaya* (Diaphragmatic opening from cardiac region to Abdominal region).
10	Relations	*Dakshinatah – Kloma* [*?* Right lung] *Vaamatah – Phuppusa* [? Left lung] *Dakshintah Adhobhaga – Yakrut* *Vaamatah Adhobhaga – Pleeha* [13]
11	Originator of	*Chaturvimshati Dhamani* [14] – *Urdhwaga Dasha* – 10 in upward direction *Adhoga Dasha* -10 in lower direction *Tiryak Chatasra* - 4 in lower direction, extends up to more than 1000 branches
12	*Pranayatana*	Yes – *Marmatraya* [15]
13	*Drushtanta* - Simile	*Nabhyaamara Iva* - meaning that it is likened to the axle (Aksha) of a wheel, serving as the central hub around which the entire body functions revolve, emphasizing its role as the seat of control and coordination for vital physiological processes
14	*Hrudaya is Srotomula* for	*Pranavaha* and *Rasavaha Srotas* [16]
15	*Hrudaya* is the beholder of	*Dhamanis, Mana, Buddhi, Chetana, Mahabhuta* etc. [encompassing structural, physiological, psychological, meta-physical components]. [17]
16	*Hrudaya* is the abode of	*Ahara Rasa, Sthayi Rasadhatu* and *Ojas.*
17	*Hrudaya* is the head office for	mechanisms of *Sattva-Rajas-Tamas*
18	Primary functions	*Hrudaya Dhmana, Rasa Vikshepana, Ahara Rasa Gati* - (Circulation)
19	Secondary functions	• *Shwasaprakriya* (Respiration), [18] • Formation of *Rasadhatu* – Starting point of *Kleda* formation • Coordinates with *Shiras* for sensory and motor function. • Coordinates with *Amashaya* for consumption of food and proper digestion. • Coordinates with *Basti* for regulation of *Kleda*
20	*Rogamarga*	*Madhyama (Marmasthisandhi)* [19]

Table 1: Details on *Rachanaatmka* and *Kriyaatmaka Sanghatana* of *Hrudaya*

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DISCUSSION

The functional dynamics of *Hrudaya* can be studied under three primary headings:

1. *Hrudaya* as a *Srotas* – as the focal channel through which *Ahara rasa flows* and where *Ahara Rasa receives* the *Ambukarma.*
2. Substance which is flowing - *Ahara rasa* and *Shwasa Kriya.*
3. Process which facilitates the flow of the substance – *Hrudaya Dhmana*

1.Hrudaya* as a *Srotas / Avayava

Srotas are vital channels reflecting the body's elemental diversity, ensuring metabolic transport and circulation influenced by daily rhythms and the *Hrudaya*. During the day, *Hrudaya Bodhana* [20] (*Vikasana* - heart awakening) activates all *Srotas*, boosted by activity, preventing sluggishness. Conversely, at night, *Hrudaya Mlānata* (heart contraction) slows both gross and subtle *Srotas*, including digestion, under *Soma Bhāva*, softening bodily elements. Since both digestion and heart function rely on *Jatharāgni*, they diminish nocturnally. Therefore, proper *Nidrā* (sleep) is essential to restore *Jatharāgni*, [21] optimizing metabolic and circulatory activity for health.

2.Shwasa Kriya* and *Ahara Rasa Gati

Ahara Rasa, [22] formed by *Jatharagni* in *Grahani,* reaches *Hrudaya* via the *Adhogami Dhamani*. As a *Srotomula*, *Hrudaya*, aided by the lungs for gas exchange (*Nabhisthah Pranapavanha…. Jeevayan Jatharanalam)*, transforms *Ahara Rasa* into *Rasadhatu.* After mixing with *Prana* enters circulation through *Rasavaha Dhamani*. Being fluid (*Sara, Drava Guna*), it flows naturally, though *Hrudaya's* central position in the body challenges its uniform distribution in all directions. While downward flow of ***Ahara Rasa*** uses gravity, active force is needed for transverse and upward movement. ***Hrudaya Dhmana*** (cardiac pulsation) sets the uniform rate and rhythm, ensuring continuous circulation. The term ***Visheshena Anudhavati*** emphasizes that *Hrudaya Dhmana* actively initiates and sustains this vital process without interruption after its brief origination. Thus, ***Ahara Rasa Gati*** [23] (nutrient essence movement) originates in the ***Hrudaya***. *[table 2]*

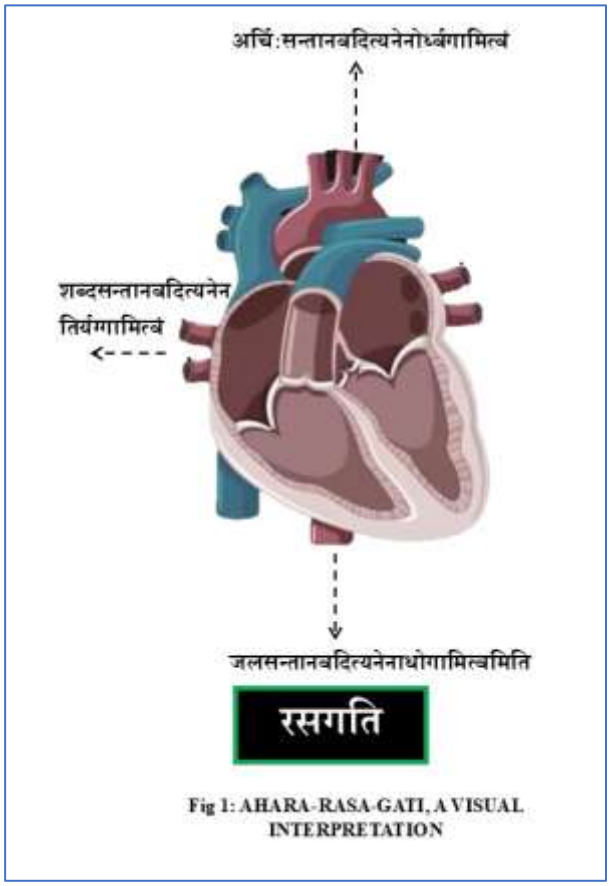


Fig 1: AHARA-RASA-GATI, A VISUAL INTERPRETATION

3.Hrudaya Dhmana

Hrudaya, a *Koṣṭhāṅga*, embodies *Agni Mahābhūta* for its life-sustaining role. *Samāna Vāta* in the *Koṣṭhabhāga* sustains *Jatharāgni* (***Pālana***), while *Prāṇa* and *Apāna* enable ***Dhmāna*** [24] (blowing/powering - vital propulsion). *Udāna* governs ***Ūrdhvagati*** (upward flow) and *Vyāna* ensures ***Sarvashareeragati***. (systemic circulation), maintaining dynamic equilibrium within the body's central system.

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Sl no	Simile	Resemblance	Interpretation 1	Interpretation 2	Interpretation 3
			Opinion of *Acharya Dalhana*	*Acharya Dalhana* discussed another familiar opinion during his time	
			direction of movement of *Ahara Rasa*	**rate of flow of *Ahara Rasa***	**rate of transformation of *Ahara Rasa* from *Rasadhatu* to *Shukradhatu***
1	*Shabdavat Santana*	sound waves	*Tiryak Gamana* - transverse movement	suggests movement like '*Tikshnagni*' i.e., rapid movement	In '*Tikshnagni*' individual, the 'rate of transformation of *Ahara Rasa* from *Rasadhatu* to *Shukradhatu*' is rapid.
2	*Archivat Santana*	the fire	*Urdhwa Gamana* - upward movement	suggests movement like '*Madhyamagni*' i.e., moderate movement	In '*Madhyamagni'* individual, the 'rate of transformation of *Ahara Rasa* from *Rasadhatu* to *Shukradhatu*' is moderate.
3	*Jalavat Santana*	the water	*Adho Gamana*i - downward movement	suggests movement like '*Mandagni*' i.e., slow movement	In '*Mandagni'* individual, the 'rate of transformation of *Ahara Rasa* from *Rasadhatu* to *Shukradhatu*' is slow.

Table 2: *Ahara Rasa Gati* and its interpretations

This ***Hrudaya Dhmana*** (fig 2) signifies life and optimal cardiac function. This cardiac pulsation initiates numerous bodily mechanisms, primarily the circulation of ***Ahara Rasa*** and ***Ojas***. The state of *Jatharagni* [25] directly influences

Hrudaya Dhmana: If ***Sandhukshita*** (balanced/kindled) leads to optimal *Dhmana*, ***Manda*** (depressed) decelerates it, and ***Teekshna*** (intense) accelerates it. This interplay lays the groundwork for the heart's neuronal and electrical control. However, *Jatharagni* alone doesn't entirely modulate *Hrudaya Dhmana*; physical activity, for instance, demonstrably alters its rate, increasing during exertion and stabilizing during rest or sleep.

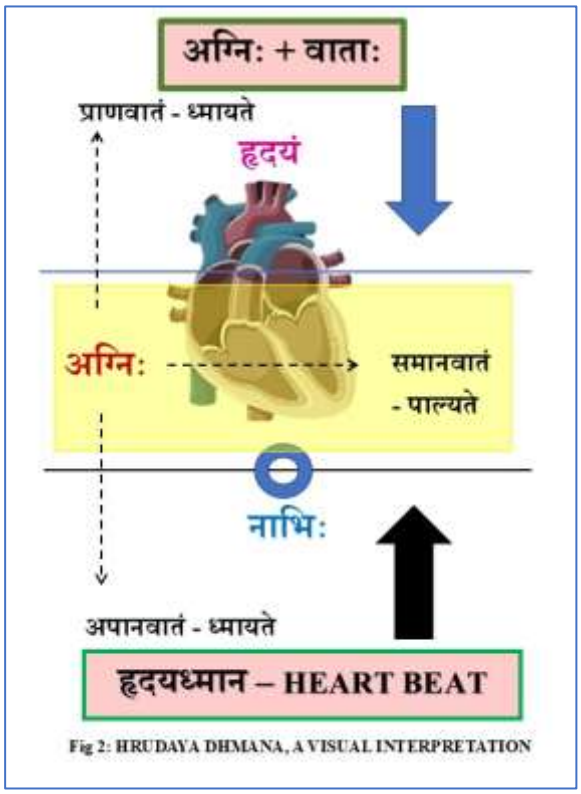


Fig 2: HRUDAYA DHMANA, A VISUAL INTERPRETATION

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3.1. Ahara Rasa Gati dependent on *Hrudaya Dhmana*

Following could be enlisted as the dependant factors for '*Hrudaya Dhmana*'.

3.1.1. Tridosha

1. ***SHAKTIRUPI VATA*** has the following functions:
   - In Ayurveda, ***Samyukta Purusha*** (the living being) is the union of ***Sharira*** - (body) and ***Atman*** (soul), characterized by ***Jeevanam*** (life). The onset of ***Hrudaya Dhmana*** signals the *Atman*'s entry into the body, while its cessation is an ominous sign.
   - Beyond initiation, ***Vata***, the body's controller and impeller, sustains this cardiac pulsation throughout the body, maintaining connections between cardia and distant receptors (*Vayustantrayantradharah* and *Pravartakah Cheshtanam)*. [26]
   - It also unifies ***Mamsa*** (muscle), ***Sira*** (vessels), ***Snayu*** (ligaments/tendons), and ***Yogavaha Srotas*** [27] for coordinated heart and vessels (***Dashadhamani)*** function.
   - ***Sameerano Agnehe*** function is crucial in cold environments or with stagnant lifestyles to prevent ***Hrudaya*** deceleration and maintain continuous cardiac physiology.
2. ***PANCHAVATA*** - *Vata* is singular, yet has five functional form which govern the initiation, conduction, regulation, and cessation of all organ functions, including *Hrudaya*. [28],[29],[30],[31] They can be analysed as follows: [table 3]
3. *Vata Dosha Guna* are *Ruksha* (Dry), *Laghu* (light), *Shita* (not warm), *Khara* (rough), *Sukshma* (minute), *Chala* (movement). [32] With these *Gunas* in play,
   - When *Srotas* is *Vivruta* (open channels) then smooth functioning of *Sira/Dhamani/Srotas* relating to

Sl no	***Panchavata***	***Karma* - Functions**
1	*Pranavata*	
	• *'Hrudayendriyachittadhruk'*. This indicates all the components which are housed in the *'Hrudaya'* i.e., the *Sharirika* component of *Hrudaya,* then the *Manasika* components namely - *Indriya and Chitta.* The *Dharana* (continued establishment and regulation) all of the above components are achieved by *Pranavata*. • The head office of *Pranavata* although is *Hrudaya*, the working site of it is *'Shiras'* (CNS) and hence the neuronal and electrical activity initiated at two levels and are interconnected. Additionally, it also does '*Buddhi-Indriya-Hrudaya-Dhamani-Dharana'*, this gives much more clarity on involvement of *Pranavata* at different levels of physiology, namely – o Cellular intelligence [*Buddhi Dharana]* o Sensory and the motor faculty [*Indriya Dharana]* o Both of the above in relation to *Hrudaya* and *Shiras [Hrudaya Dharana]* o The establishment, regulation and maintenance of the functions of *Dhamani*, be it related to *Hrudayastha Dhamani* or throughout the body [*Dhamani-Dharana]* • All of these activities are initiated by *Hrudaya Dhmana* (the moment life begins at embryological stage) and stops only at death. Hence Acharya Sushruta proclaims the function of *Pranavata* as '*Praanaamscha Avalambate'* where '*Praana*' is '*Agnisomaadi' Dwaadasha Prana.*	
2	*Udanavata*	
	• '*Urja-Bala-Srotopreenana-Manobhodhanadi Kriya'* are some of the important functions in the capacity of *Udanavata*. *Hrudaya* and *Dasha-Dhamani Srotomula* of *Pranavaha Srotas* and hence of this *PranavahaSrotas* and its *Srotomula* is because of *Udanavata*. The transactions that need to be done are: - Phase 1: within the *Hrudaya*, - phase 2: with the *Hrudaya* and *Dasha-Dhamani* [*Avasthita Srotas]* - phase 3: *Dasha-Dhamani* and *Srotas* [*Vaahya Srotas]* - phase 4: Other *Srotas* and back to *Hrudaya [Aavaahya Srotas]* • At all these stages '*Srotopreenana*' is essential and only then co-ordination is possible amongst the different '*Samsthanas*' [the essential function of *Pranavata*]. '*Srotopreenana*' largely means the '*Tarpana*' (essential nutrition) delivered to the respective *Srotas*. Out of all these the most essential '*Tarpana*' is for *Pranavaha Srotomula* the *Hrudaya* (in comparison to carotid arteries supplying the cardia) itself which is the main function of *Udanavata*.	
3	*Samanavata*	
	• Functional area is mainly *Koshtha* always in association of *Jatharagni*. Additionally, it disperses the *Jatharagni Janita Archi* (specks of energy / minute particles of fiery nature) into the entire *Sharira,* extending its functional area into entire body. • This maintains regularity in the temperature throughout the body and keeps every cell alive to do its individual function without any halt.	
4	*Vyanavata*	
	• Functional area starts at *Hrudaya* and covers entire *Sharira*. In contrary to *Samanavata*, this *Vata* doesn't transport the *Jatharagni Janita Archi*, rather does the '*Yugapat Vikshepana*' of '*Ahara Rasa'*	
5	*Apanavata*	
	• Functional area starts from the *Nabhi Pradesha* and further downwards. Eases the functioning of '*Adhogami Dhamani*' which serve as part of '*Ahara Rasa Gati*'. • Does A*nulomana* of *Vata*, balancing the *Vata* inside the *Sharira*. Avoids undue pressure on *Hrudaya*.	

Table 3: *Panchavata* and its interpretations

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Hrudaya allowing the circulation of *Ahara Rasa,* is definite. ***Ruksha*** (Dry), and ***Khara*** (rough) ***Gunas*** help in propelling the *Ahara Rasa* into the next phase or stream by detaching it with the wall / outer lining of the *Srotas*.

- ***Chala Guna*** (mobility) of *Vata* facilitates the movement of *Ahara Rasa* (nutrient fluid) through the heart and hence the *Ahara Rasa Gati*.
- Appropriately formed *Ahara Rasa* is *Sukshma* (subtle), enabling easier circulation through minute channels due to *Sukshma Guna of Vata*.
- *Vivruta Srotas* ensure unimpeded flow of *Ahara Rasa* in heart-related vessels. *Ruksha* (dry) and *Khara* (rough) *Gunas* aid propulsion by detaching *Ahara Rasa* from channel walls.
- ***Laghu*** (light) *Ahara Rasa*, without heaviness from *Ama* (improper digestion), circulates smoothly through the heart and its vessels, supported by *Laghu Guna* of *Vata*.
- *Shita Guna* (coolness) of *Vata* implies *Anushnashita* (not excessively hot), where Vata is influenced by the heat of *Jatharagni* (digestive fire), not necessarily causing stagnation.

4. ***SHAKTIRUPI PITTA*** - The universally present *Agnitattva* works in the form of *Pitta* in the *Sharira*. [33]
   - ***JATHARAGNI*** - *Jatharagni* is the primary metabolizer that initiates the digestion process and energizes the other twelve *Agni*. It transforms food into Ahara Rasa and this is progressively transformed into *Kapha*, *Pitta*, and *Vata* through *Madhura*, *Amla*, and *Katu Avastha Paka* stages.[34]
   - The five *Bhutagnis,* [35] triggered by *Jatharagni,* then act on the elemental components of *Ahara Rasa* to form various structural elements including the *Indriya* and *Manas*.
   - The seven *Dhatvagnis* subsequently convert this into the seven *Dhatu* (tissues). The 'rate of transformation of *Ahara Rasa* from *Rasadhatu* to *Shukradhatu*' i.e., *Ahara Rasa Gati* is hence dependent on *Dhatvagnis* [36] supported by the *Jatharagni*
5. ***SHARIRA CHARA PITTA***– *Pachaka Pitta* working in conjunction of *Jatharagni* and *Sadhaka Pitta* takes abode in *Hrudaya*. [37]
6. ***PITTA DOSHA GUNA***– *Sasneha* (moderately unctuous), *Tikshna* (penetrating), *Ushna* (hot), *Laghu* (light), *Visra, Sara* (spreadable), *Drava* (fluid) – the *Guna* of *Pitta Dosha* serve as the necessary chemical messengers to activate the *Peshi* in the *Hrudaya* to cause *Hrudaya Dhmana.* [38]
7. ***SHAKTIRUPI KAPHA*** – Imparts the *Hrudaya* with necessary '*Dardhya, Upachaya, Utsaha'* to provide the '*Jnana* and *Buddhi*' to perform its functions of '*Hrudaya Dhmana*' followed by '*Ahara Rasa Vikshepana*'. '*Soma Eva Shareere Shelshmaantargatah',* meaning the universally present *Somatattva* works in the form of *Shleshma* in the *Sharira*, recognized as ***SHARIRAJA KLEDA*** in *Prakruta Avastha*. [39]
8. ***SHARIRA CHARARUPI KAPHA***– Mainly *Avalambaka Kapha* situated at *Hrudaya* [*Hrudayopalakshita Pradesha*] and *Trika Pradesha.* Due to its *Swaveeryata, Ambukarma* is resulted in at the *Hrudaya* to *Ahara Rasa*. [40]
9. ***KAPHA DOSHA GUNA*** – *Kaphadoshaguna* are *Guru* (heavy), *Snigdha* (highly unctuous), *Sheeta* (cold), *Shlkshna, Mrudu* (soft/mild), *Picchila* (sticky). They work in combination with *Guna* of *Vatadosha*. Ex. More *Guruta* in *Ahara Rasa,* slower the rate of flow and hence demand more *Hrudaya Dhmana.* [41]
10. ***Sneha, Ojas –*** The *Kapha* in its *Prakruta Avastha* is called '*Bala*' and also the '*Ojas*' While this utmost essence, the nectar is also referred to as '*Sneha'*. [42] This *Ojas* are in two functional forms - '*Para*' and '*Apara Oja*'. *Para Ojas* is placed in the *Hrudaya* while *Apara Ojas* [43] is in continuous circulation as part of *Ahara Rasa*. Thus, both are vital to the functioning of *Hrudaya*. Once there is *Ojokshaya, Hrudaya Dhmana* varies, and any further loss definitely results in death i.e., permanent cessation of *Hrudaya Dhmana (death).*

3.1.2 Panchamahabhuta - micro functioning within *Srotas*

Ayurveda emphasizes *Jatharāgni* as the core regulator of all physiological and metabolic functions, governing *Bhūtāgni*, *Pañcamahābhūta*, [44],[45] and vital energy flow essential for cardiovascular rhythm, biotransformation, and systemic homeostasis.

Sound is caused by the rapid to and fro movement of an object. The object set to vibration disturbs the equilibrium state of the particles in the medium and keeps transmitting from one particle to another. *Hrudaya Dhmana* is although a sound created, it is not limited to sound production due to vibration of particles constructing the *Hrudaya* or the particles circulating through it or the vacuum column (air column) formed by the contents inside it and the walls of *Srotas* which forms *Hrudaya*.

- Any *Srotas* is vacant space, hence synonymously referred to as '*KHA'* (~ ***Akasha Mahabhuta)*** providing the required space and platform for '*Dahtu Parinamana*' (biotransformation) to occur. *Akasha Mahabhuta* has predominant features of '*Shabda'* (sound production) and '*Viviktata'* (openness of channels or Patency). But if channels are just Patent, then no function further occurs. Hence need the involvement of further *Mahabhuta*.
- If in a vacant space, for movement to occur between the particles, *Vayu Mahabhuta* (air/wind principle) is needed. But if only ***Vayu Mahabhuta*** is there in conjunction with *Akasha Mahabhuta*, then the movement is bound to be erratic, rigorous and hastened. There has to be a conductor. This conductor is something which is charged.
- This charged conductor is nothing but the '***Agni Mahabhuta'*** (energy field) which in association with previous two, regulates the direction, speed, intensity, quality and quantity of movement within the *Srotas*. Not that particle 1 at the 'start end' of *Srotas* directly transfers the kinetic energy to particle 'z' at the 'end of the *Srotas'*. Else, it is a process of conduction of energy while the previous particle '*Anu'* once transferring the kinetic energy to the next attains a brief period of potential energy, but in the next second is charged by another particle '*Anu'* transferring the necessary kinetic energy. The whole process looks so lucid that the observer fails to differentiate the time intervals between the shift in the energy of each particle. Thus, it is the *Ushna, Teekshna,* and *Laghu Guna*

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of *Agni Mahabhuta* facilitating the regulated conduction or circulation of contents within *Srotas*. For this a proper initiation is done by the combination of *Vayu Mahabhuta*, *Akasha Mahabhuta* and *Agni Mahabhuta.* For conduction, there needs to be a checkpoint for deaccelerating the process or to shift when necessary. The checkpoint comes in the form of

- Either mechanical pressure [*Vayu* + *Prthvi*]
- Or chemical messengers [*Agni* + *Jala*]
- Or majorly the *Jala Mahabhuta*

- ***Jala Mahabhuta*** [46] with its *Drava, Sara, Manda, Snigdha, Mrudu, Picchila Guna* controls the excessively charged particles and put them in place. Thus, controlling the flow rate of contents inside a *Srotas*. The interaction of charged particles with matter concerns the transfer of energy from the charged particles to the material through which they travel. Charged particles passing through matter continuously interact with the electrons and nuclei of the surrounding atoms. In other words, alpha and beta particles are continually slowing down as they travel through matter. This helps in optimum conduction of particles within a *Srotas.* The human body's basic circulation occurs this water medium only i.e., through '*Ahara Rasa*' which is '*Drava*' by nature.
- Then finally is ***Prthvi Mahabhuta***. One way, it is the molecular structure forming the surrounding layers (*Kalaa*) of *Srotas*, it need not always be a structural entity but could also be a functional entity. But in both case particles travel through some '*Murtabhava*' only.

Thus, every *Mahabhuta* interact among themselves endlessly to carry out the basic functionality of living system – i.e., *Hrudaya Dhmana* (indicates living state) and *Ahara Rasa Gati* (indicates continuity of life).

CONCLUSION

Hṛdaya Dhmana (cardiac pulsation/heart beat) and ***Ahāra Rasa Gati*** (nutrient essence movement) are processes dependent on ***Jatharāgni*** (digestive fire), ***Tridoṣha*** coordination, and optimally functioning ***Srotas***. This reflects Ayurvedic view that life thrives on balanced biotransformation and rhythmic internal synergy. ***Jatharāgni*** is to the ***Hrudaya,*** how electricity is to the motor: the primary energy source. Like a motor pumps water, similarly the ***Hrudaya*** pumps ***Drava Aṃśa of Āhāra Rasa*** (nourishing fluid essence from digested food). The heart's efficiency depends on adequate *Ahāra Rasa* and strong *Jatharāgni,* ensuring optimal ***Hrdaya Dhmana***, circulation, and systemic nourishment facilitated by *Shwasakriya*.

The ***Hrdaya Vikasana*** (cardiac awakening), ***Hrdaya Dhmana***, and ***Hrdayāshrita Āhārarasa Gati*** are deeply interconnected and governed by diurnal rhythms and openness of Sotas. Disregarding these natural timings through improper diet and lifestyle disrupts ***Pachanakriya*** and systemic coordination, compromising cardiac and channel efficiency. This increases susceptibility to cardiovascular disorders. The efficiency of circulation hinges on *Hrudaya Dhmana's* proper electrical impulse induction (i.e. conduction via the SA node, AV node, bundle branches, and Purkinje fibers. Disturbances here cause arrhythmias, bradycardia, tachycardia, atrial fibrillation, or heart block. Structural issues like valvular stenosis or malfunction also impact *Hrudaya Dhmana*, altering heart sounds and rhythms). ***Rasa Gati***, conversely, depends on the circulating fluid's volume and quality (viscosity, fluidity, temperature). Compromised flow results in several diseases [like hypertension, atherosclerosis, arterial wall stenosis, and cardiac congestion. Conditions like ischemic heart disease (IHD) and coronary artery disease (CAD) stem from disturbances in both heartbeat and fluid flow, progressing to severe manifestations like myocardial infarction (MI) if unchecked].

Hence, respecting the natural physiology and circulatory pathways of *Hrudaya* is crucial for maintaining especially the Cardiovascular health**.** [47] *Hṛudaya's* cardiovascular functions are deeply rooted in the synergistic interaction between *Mahābhūtas* reflected in functioning of *Doṣas*, regulating the life-sustaining circulation and vitality. Disruptions in this form the basis of cardiovascular disorders. Thus, integrative model provides a holistic understanding of cardiac physiology, reinforcing the relevance of Āyurvedic insights in cardiovascular care.

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