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Essentials of Cardiac Physiology – An Ayurved Aspect

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ABSTRACT

Abstract: Heart (Hridaya) has its own significance in biomedical sciences due to its important function of circulation. Ayurveda and western medicinal science have a remarkable difference in understanding the concept of circulation. Where Ayurveda believes it is circulation of the first two dhatus – Rasa and Rakta, thus the term originates – Rasa-Rakta Samvahana; whereas modern science accepts the circulation of a reddish colored, viscous liquid connective tissue with its formed elements – Blood. Functioning of Hridaya is well coordinated mutually between the efficient working of Tridosha supplying nutrient media to dhatus for proper growth and development of the body. The contraction and relaxation movements of Heart, other properties like auto-rhythmicity can be justified using the Ayurvedic physiological aspects. Efforts for the same are done and highlighted in this study.

KEYWORDS

Heart (Hridaya), Blood Circulation, Rasa-Rakta Samvahana, Dhatu



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INTRODUCTION

Ayurveda, when looked from the biological point of view one may understand the uniqueness, versatility and elaborative basic concepts of Sharira and its aspects. The term sharira is also very well explained in the Ayurved streams covering the three important aspects as – the seat of consciousness (Chetanaadhishtana bhutam), well-developed organization of innumerable materialistic structures (Panchamahabhuta vikara samudaya) and last and most important is efficiently planned, programmed coordination (Samayogavahi)¹ in between these structures which is responsible to maintain the static and dynamic equilibrium state of internal environment. So the concept of samayogavahi here is highlighted by taking functioning of Hridaya into consideration. Under the influence of proper stimulus and essential needs with requirements of sharira, the Hridaya works relentlessly to supply essential nutrients for proper growth and nourishment of bodily tissues. Every cell, tissue have to undergo and cope up with the wear and tear process every now and then. This is accomplished after proper supply of Rasa and Rakta dhatu consistently and simultaneously by Vyan vayu.² The heart irrespective of the nervous supply always compensate and runs its

desired function by Auto-rhythmicity. The current topic of the study shows detailed elaboration of concept of Samyogavahi in terms of efficient cardiac functioning of the body.

AIMS AND OBJECTIVES

The present study was aimed for thoughtful discussion post detailed compilation of functioning and mechanics of Hridaya from Ayurved perspective and in-depth evaluation of this concept.

MATERIALS AND METHODS

Classical treatises of Ayurvedic science and modern medical physiology books were scanned for detailed references regarding the same.

These references were then discussed in detail for in-depth understanding of the concept.

Conceptual review –

The literature available in traditional concepts as in Ayurveda could be divided in its anatomical, physiological and psychological aspects.

The word Hridaya is originated from the roots words bearing a typical meaning as mentioned below -

Hri – Harana – receives blood from different parts of body



Da – Daana – supplies blood to different parts of body for nourishment and oxygenation

Ya – Yaana – the one which performs the above two functions continuously and uninterruptedly throughout the life until death

Location

Anatomically located in between two stana and having pleeha, phupussa on left lower side while yakrit and kloma on its right side³

Hridaya Shaarir

It is a hollow muscular organ located in the mediastinum lying 2/3rd on the left side in between two lungs. From Ayurvedic physiological point of view the Hridaya shaarir is classified in two aspects – Rachanatmak (Anatomical) and Kriyatmak (Physiological)

Anatomical aspect of Hridaya –

Origin by inheritance – Being a visceral organ it is maternal in origin and thus included under – Matruj bhava⁴

Embryological origin – Hridaya is said to be developed for the first time during the fourth month of intra-uterine life. The fetus expresses his own desires during this month and thus a pregnant woman in this stage is said to be – Dauhridini⁵ (having two hearts). As Hridaya is seat of consciousness, the developing fetus starts

feeling, experiencing the materialistic world through the pregnant mother.

From embryological point of view the outer pericardium which is made up fibrous, fatty connective tissue accounts to be derived from Meda dhatu; myocardium from Mamsa dhatu and the inner most endocardium is derived from Rasa, Rakta dhatu of sharira. Where each layer is under the threat to be affected by one or more than one doshas leading to functional impairment.

Elemental make up – Hridaya is physically constituted by the amalgamation of Prasad part of Kapha and Rakta. Anatomically location of Kapha dosha while physiologically performs important function of Rasa-Rakta samvahana.

Expression of first organ – Ayurvedic treatises and ancient scholars are of different opinions for the embryological origin of the very first organ to be expressed and exposed outside during parturition. Scholar Krutviryā were of the opinion that the Hridaya seat of Buddhi (intellect) and Mana (psyche) is expressed and presented firstly during the parturition.

Physiological aspect of Hridaya –

Physiological principles of sharira are – dosha, dhatu and mala. Even a single structure or any organ which is physically having the specific elemental composition, is under the governance of these basic



physiological principles and so is the Hridaya. The cardiac functioning is completely accomplished by the three distinct physiological entities – Tridosha, each one having a different function. According to Ayurveda, Hridaya is said to be the controlling center as well as the working area of subtype of each of the Tridosha.

Prana vayu – Hridaya dhruk⁶

A subtype of vata dosha having direction from outside to inside the sharira – Anuloma gati. Prana vayu principally being located at Murdha is responsible in such a way that the Hridaya should perform its desired function uninterruptedly. Prana vayu is also responsible for stimulating Hridaya to sustain the functional integrity as desired on its own viz. Avalamban⁷.

This may be suggestive of supply of both the divisions of autonomic nervous system – Afferent and Efferent. To perform its own function on its own is conclusive of the conductive system of heart responsible for auto-rhythmicity property of cardiac muscles.

Vyana vayu – Rasa samvahana⁸

Second part of the functional aspect of Hridaya is circulation. In Ayurveda it involves circulation of the first two liquid and mobile dhatus – Rasa and Rakta, thus the term – Rasa-Rakta Samvahana. This subtype of vata dosha is having tiryag gati

responsible for supplying the Rasa Rakta dhatu throughout the body from subtle to gross structures. The continuous supply of these dhatus is the cause for successful accomplishment of different types of movements carried out by the sharira. These movements may be either -

- **Vascular** – Aakunchan (contraction) – Prasaran (relaxation)
- **Musculo-skeletal** – Utkshep (upward), Apashep (downward) direction movements, abduction – adduction
- **Organ specific** – Nimesh (closure) – Unmesh (opening) of eyeballs
- **Sensory** – Anna svadan (gustatory perception)
- **Reflexes** – Jrumbha (yawning)
- **Others** – Stroto vishodhan (percolation to every subtle structure so as to provide nutritive elements)

All the structures of our body performs their functions only after continuous and uninterrupted supply of blood and oxygen. The above functions of Vyana vayu gives an idea about this function obviously performed by Heart.

Saman vayu – Rasastu Hridayam⁹

This subtype of vayu is supposed to be majorly involved in digestion related functions. Some ancient scholars also depicted that post digestion when there is formation of sara bhag it is needed to be



supplied to all the tissues throughout the body and for that the same has to be sent to Hridaya. Once this Ahara rasa is brought to Hridaya, it is then easy to circulate along with the rakta dhatu throughout the body. Samana vayu plays an important role in bringing the ahara rasa towards Hridaya from the field of digestion.

Sadhak pitta – Hrudgat pittam

Hridaya as one of the part of sharira is also a seat of metabolic processes which is responsible for various transformations at physical level and also have an impact over the psychological level. The emotional status of an individual is reflected through transformation of thoughts of psychological level into firmness, stability, verbal reasoning, rationalistic approach, aptitude and overall reflection of personality in social circle.

Focused, ambitious approach, intellect, cognitive abilities and grasping power characteristics of any individual is concerned with the reflection of Sadhak pitta residing at Hridaya¹⁰.

Avalambaka kapha – Urastha sa trikasya ... Hridayasya annaviryaaacha

The unctuous part of the sharira achieves its own significant value due to the necessary functions associated to it and so is its subtypes also. Avalambaka a subtype of Kapha dosha residing in Ura (chest) region firstly plays an important role to maintain

the erect posture which is possible due to firm support to the bony framework occupying posterior side of the body. It is due to the Trik sandhi – annexing between the vertebral column and extension of two shoulders on the upper side posteriorly while the same is also present on the lower side posteriorly joining pelvis with vertebral column. The nutritious unctuous part coming from the food ingested supports the Avalambaka Kapha in Ura to perform the above mentioned function efficiently.

It is so called as Avalambaka as it inoculates every other part as well as subtype of Kapha dosha a strength to perform their respective functions on their own sustaining the integrity of bodily activities. As this subtype of kapha dosha provides enough strength do functions on their own, Hridaya is also thus under the complete influence of it. Thus the independent contraction and relaxation viz. systole and diastole phases in cardiac functioning associated with the Conductive system of Heart, may be somewhere to be contributed by Avalambaka kapha as per Ayurvedic concepts.

Hridaya, Dhatu & Dhatu Poshan Nyaya

The first of the two dhatus which are motile with liquidity in them are then circulated throughout the body for continuous supply of nutritive elements for proper growth and



development of every dhatu. The continuous, uninterrupted supply of sara part of digested Ahara is solely accomplished by a motor with a driving force in it – Hridaya.

Ayurvedic scholars have proposed three distinct nutritive principles from their own perceptions and deep sense of understanding of subjects. These were – principles of **Kshirdadhi nyaya** (Transformation), **Kedari kulya nyaya** (Transmission) and **Khale kapot nyaya** (Selection). Ancient scholars since their times had a debate over the time span and duration of supply of nutritive elements to each dhatu so as to achieve their complete growth and development. Based on this there are three different opinions regarding duration of supply of nutritive elements and its resultant effects in the form of dhatu upchaya.

As per the first philosophy, every dhatu receives its nutrition and develops fully taking one complete day for whole process. Thus starting Rasa dhatu at 1st day it takes Shukra dhatu to form at 7th day¹¹.

The second philosophers were of the opinion that after receiving nutrition and formation of Rasa dhatu on the day 0, thereafter every dhatu takes nearly 5 complete days for their respective growth and development. From this, Rasa dhatu at

day 0 it takes complete 30 days for formation of Shukra dhatu¹².

Arundatta the commentator of Ashtang Hridayam, was of complete different opinion that after complete digestion, every dhatu receives its respective nutritive elements simultaneously and instantly. Thus there was proposition of **Ek-kala dhatu poshan nyaya**¹³.

Vyana vayu residing in Hridaya, is responsible for the persistent and simultaneous circulation of Rasa and Rakta dhatu so as to make every structure of Sharir to execute its own functions.

Strotasa and Hridaya

Ayurveda believes the concept of existence of micro-circulating channels (Strotamsi) throughout the body at physical as well as psychological levels also. These channels are helpful to carry and supply essential materialistic nutrients for growth and development of physical body and at the same time there are also channels providing sense of satisfaction thus nourishing sattva (psyche) leading to strengthening emotional stability. No any organ or any structure other than Hridaya is capable to sustain the level of integration of bodily dhatus. For this the Hridaya is said to be the moolastahana – origin site of three of the channels having its deep roots hereby. These three Strotas are – **Pranavaha** – **Rasavaha**¹⁴ and **Manovaha**¹⁵.



1. **Pranavaha** – A respiratory channel providing and circulating Prana (vital life force) throughout the body efficiently because of the support of Hridaya.

2. **Rasavaha** – A nutritive channel providing and circulating properly transformed, filtered nutritive elements to dhatus for their respective growth and development.

3. **Manovaha** – A channels feeding experiences, feelings, and variety of shades of emotions to the sattva (psyche) is also having its deep roots in the Hridaya.

Oja and Hridaya

Hridaya as per Ayurveda is the seat for the most refined, subtle state inoculated thereby after getting filtered while passing through each dhatu viz. Oja. Since ancient times this concept of Oja landed up in most controversies regarding its existence and presence. Oja being located in Hridaya performs functions throughout the sharira and most importantly is responsible for muscular strength, stamina, activeness, voice, complexion, external and internal gratification of senses of an individual.

Physical properties of Oja¹⁶ –

- **Color or Appearance** – Like Sarpi (clarified butter), Shukla (whitish), raktam ishat pitakam (slightly reddish yellowish)
- **Smell** – Laaja (pori or puffed rice)
- **Taste** – Madhur (sweet)

- **Volume** – Para Oja – 8 bindu; Apra Oja – Half Anjali

Origin of Oja - Even after having above mentioned specific properties, its origin is cornered since ancient times. Some scholars believes that Oja is the first entity¹⁷ to be originated in the newly formed individual.

“*Ojas* along with its manifesto in body is having controversies about its formation also. Some scholars say that *ojas* is formed after digestion of *rasa dhatu* and before formation of *rakta dhatu* in *saumya* form.”

“*The prime most definition of ojus itself states that it is the essence present in every dhatu (tissue) and is the collective sara (nectar) of all the dhatus from rasa to shukra which is mainly responsible for strength, vigor and vitality of life.*”
Shilwant A (2016)¹⁸

Functional importance of Oja –

Quantitative depletion or qualitative impairment in the Oja may lead to variable clinical abnormal symptoms at physical and psychological level. Physically the detriment of Oja may lead to lack of immunity leading to susceptibility and surrenderance towards diseases. At psychological level the loss of Oja impairs badly on the emotional status of an individual creating lack of self-confidence, fearfulness, depressiveness and many other anxious disorders.



Abnormality in Oja¹⁹ is also classified in ancient texts in 3 different categories as –

- ❖ **Vyapat** – Immunity suppressed symptoms
- ❖ **Vistramsa** – Immunity compromised disorders
- ❖ **Kshaya** – Immune deficiency related symptoms

Psychological aspect of Hridaya –

As per ancient Ayurvedic treatises, Hridaya stands to be the principal seat of consciousness inside the sharira. The physical structures are constantly under the influence of psychological tendencies – Sattva, Raja and Tamas, as per ancient philosophy. These psychological attributes dominates the Hridaya²⁰ as it is their seat and ultimately reflects the overall behavioural tendency of a particular individual in its expressions. The Sattva guna when superimpose Hridaya, one is open for and reflects harmony, goodness, purity, positivity, openness and agreeableness towards learning²¹, receiving, experiencing the materialistic world. Hridaya when under influence of Rajas guna, one is always being driven, unstable, moving, passionate, active and dynamic in nature. The tama guna which means darkness, lethargy, inertia have an unwholesome impact over the seat of consciousness Hridaya. It is responsible for detachment of Indriya from being

connected with their respective subjects leading to pacification of senses inducing sleep²². The tama guna superimposes the physiological functioning of Hridaya but for continuous supply of vital force – Prana, even in resting or sleeping conditions the Hridaya performs its sub-minimal functions.

Importance of Hridaya –

Resembling inverted lotus-bud in shape and hanging with its apex downwards, Hridaya is the main seat of consciousness of sharira. It has gained more significance as it is beholder of roots of vital channels of sharira – Pranavaha and Rasavaha. Hridaya being seat of supreme essence as para oja, is also named as – Mahat and Artha²³.

Physiological phenomenon of sleep is also directly associated with the functional status of – Hridaya. Strength of the body is manifested due to normal and unaltered state of Kapha dosha and thus Hridaya is also one of the location of Kapha dosha²⁴.

With proper functioning of Hridaya, the nutrient pool Rasa is circulated throughout the body efficiently and uninterruptedly. This efficient functioning results in delivering the best results in the form of phenomenal properties like – **Vardhayati** (responsible for proper and appropriate growth and development), **Dharayati** (Inoculates enough strength in every structure to perform its own function and



sustain the integrity), **Yapayati** (responsible to arrest and slower down the ageing process) and **Tarpayati** (necessary for maintaining the optimum nutrition).

The vitality of Hridaya can also be understood by the symptoms seen in deviation of dosha and dhatus.

Kapha kshaya – Hrida-drava²⁵

Rasa kshaya – Hridayam tamyati²⁶

Rasa vruddhi – Hridaya utkleda²⁷

DISCUSSION –

Ayurveda considers Hridaya as one of the vital organ of the body and included under trimarma where any injury to it proves to be fatal. Deviation in normal functioning of doshas may lead the subject landing in many cardiac diseases. Cardiovascular diseases are among the non-communicable variety but for proper therapeutics there is need to better understand the dosha and dushya involved. The above concept clears the view of functional responsibility of each dosha, dhatu and its subordinates.

Practicing hetu for vitiation of dosha and Agni may lead to formation of Ama altering the state of Sama dosha pillar of health prospect. Further this creates opportunity to form strotovaigunyata where the vitiated doshas gets lodged in Hridaya as per the sthan samshraya stage of Kriyakala. The strotorodha in Hridaya results in disturbed functioning in other vital organs and

systems, such as – In **Nervous system** – Murcha (syncope); **Respiratory system** – Shwas kashtata (dyspnea); **Integumentary system** – Hrid drava (palpitation), Atisweda (excessive perspiration), Tvak vaivarnya (cyanotic changes); **Musculo skeletal system** – Sandhi shula-shofa (joint pain and Rheumatic changes); **Immune system** – Vyapat (Immunity suppressed symptoms), Vistramsa (Immunity compromised disorders), Kshaya (Immune deficiency related symptoms).

In a nutshell the assumption of the cardiac functional aspect according to Ayurved can be stated as – the cardiac movements are controlled by vyana vayu while the functional integrity of Hridaya is sustained by the virtue of prana vayu. The intracellular enzymatic activity in the myocardial cells accomplishing metabolic processes are assisted by the sadhak pitta which at the same time utilizes prana (oxygen), rasa and rakta (nutrients). Whereas the avalambaka kapha represents the pericardial fluid as well as the intracellular and interstitial fluid providing enough strength to the vital organ – Hridaya. Rasa kshaya symptoms are dealt as dehydration or a state of hypovolemic shock, increased rasa dhatu may lead to increased fluid quantity in chambers resulting into incomplete closure of valves viz. regurgitations. Further, circulation also



becomes sluggish thereafter, where there may be chances of thrombosis at cardiac or coronary level. Mamsa kshaya reflects the poor contraction of ventricles leading to decreased cardiac output affecting the circulation as well. This may further lead to anemia, congestive cardiac failure.

CONCLUSION –

Origin of Hridaya as an organ is significant in such a way that the emotional aspects are expressed even before birth of a complete living body. From physiological point of view Hridaya which acts like a motor, creating a driving force throughout the body is seat of many vital biophysical (Dosha, Oja), psychological (Sattva) and spiritual (Atma) aspects. Performs the most important function of persistent circulation of nutrient pool (Rasa-Rakta samvahana) thereby leading to appropriate growth and development of bodily structures. From clinical point of view is constantly under a threat of collapsing or dysfunctioning as it is easily affected by the dosha vitiating hetu. Being an important seat of Oja, Hridaya is also more prone to face immunity suppressed, compromised and immunity deficiency related symptoms and diseases. The biological pattern of sleep is also somehow manifested through Hridaya as per Ayurvedic principle. Any deviation in the normal routine disturbing the

biological clock, altered dietary habits, practicing principles leading to vitiation of dosha may ultimately lead to many cardiovascular diseases. Keeping the functions of every dosha – dhatu – mala in mind one needs to act accordingly to get wholesome benefit, protect Hridaya and live a healthy life.



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