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Study of Moolsthan of Sushrutokta Pranavaha Strotas w.s.r to Modern Anatomy: A Literary Review

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Abstract:

The concept of strotas is described in Ayurvedic Literature. One among the strotas is 'Pranvaha Strotas'. Hridaya & Rasavahi Dhamini are considered as root place of Pranvaha Strotas as per Sushrut Samhita¹. Similarly, heart and related blood vessels are considered to be the basic anatomical structures of cardio vascular system. In the present work, a comparative study is done between Sushrutokta pranvaha Strotas and anatomy of heart and related blood vessels, and its applied aspect. Hridaya as described in Sushrut Sutra Sthana. Thus, from this study we can conclude that the pranvaha strotas described in Sushrut Samhita can be correlated to CVS of modern anatomy. Hence there is need to study the anatomy of Hridaya (Heart) and Rasavahi Dhamani (blood vessels of heart), and the diseases related to heart.

KEY-WORDS: Moolsthan, Pranvaha Strotas, Hridaya, Rasavahi Dhamani.

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INTRODUCTION:

Ayurveda is the most ancient medical science. Various concepts of anatomy, physiology, medicine, surgery etc are described in classical literature thousands of years ago. With the development of technology in medical field, most of the concept described by ancient scholar of Ayurveda is proved to be practical & scientific. One among these concepts is Pranvaha strotas. Hridaya and Rasavahi Dhamani are considered as Moolsthan i.e., root place of Pranvaha strotas by Sushrutacharya. Heart can be co-related to Hridya. If we study the description of Rasavahi Dhamani in Sushrut Samhita then we will come to know that it has similarity with blood vessels of heart. Due to changing life style, lack of exercise, fast food, consumption of tobacco etc, there is great increase in cardiac diseases in the entire world. Ischemic heart diseases is one among the highest cause of death not only in India but also in the rest of the globe. Hence there is need to study the anatomy of Hridaya (Heart) and Rasavahi Dhamani (blood vessels of heart), and the diseases related to heart. An effort is made by this work to study the anatomy of heart and blood vessels, symptoms, and the procedures done in treatment of coronary artery disease.

Material & Methods:

Sushruta Samhita and are considered as basic Ayurvedic literature for this study. Similarly for modern anatomy, Human anatomy of B.D. Chaurasia and Gray's anatomy are considered as basic for modern anatomy literature.

Ayurvedic View:**Definition of Strotas:**

Strotas is defined as hollow organ of body which is responsible for circulation of 'Rasa dhatu'².

Types of Strotas:

The word Strotas' means a channel or canal. Strotas are of two types:

- I. Bahirmukh
- II. Antarmukh³

In males there are nine and in females there are 12 Bahirmukh Strotas.

There are 11 pairs of Antarmukha Strotas. They are listed below.

- I. Pranavaha.
- II. Annavaha
- III. Udakavaha
- IV. Rasavaha
- V. Raktavaha
- VI. Mansavaha
- VII. Medovaha
- VIII. Mutravaha
- IX. Purishavaha
- X. Shukravaha
- XI. Aartavavaha⁴

ranvaha Strotas: Pranvaha Strotas is described in Sharir Sthana. They are two in number. Its Mool Sthan is Hridaya and Rasavahi Dhamani or Pranvahi Dhamani.

Hridaya: Location: Hridaya is located between the two Stan⁵. Hridaya is very close to Amashaya hence it is also called as Amashaya Dwara¹.

Characteristics: Externally hridaya looks similar to pundareek⁶ i.e., lotus flower, placed in upside down position.

Rasavahi Dhamani: The origin of Rasavahi Dhamani is Hridaya⁷. There are 24 Rasavahi Dhamani in human body which provide nourishment to entire body.

Viddha Lakshana: If there is obstruction or injury (Viddha) in pranvaha Strotas, then following symptoms are seen⁸:

- i. Aakrosh - To scream
- ii. Vinama - Act of bending down
- iii. Mohanam - Delusion, syncope
- iv. Bhrama - To spin, griddiness.
- v. Vepana - Tremor
- vi. Marana - Death

Modern View:

Anatomy of Heart: The heart is conical hollow muscular organ situated in the middle mediastinum⁹. Heart is enclosed within the pericardium. The heart is placed obliquely behind the body of the sternum and adjoining parts of the costal cartilages. The heart measure about 12 cm in length and 9 cm in breadth. It weighs about 300 gm in males and 250 gm in females.

External features:The human heart has four chambers. These are the right and left atria and the right and left ventricles. The atria lie above and behind the ventricles¹⁰.

Grooves or Sulcii :

- i. Atrio – Ventricular or coronary sulcus.
- ii. Interatrial groove.
- iii. Inter- ventricular groove¹¹.

Apex of the Heart: Apex of the heart is formed entirely by the left ventricle. In the living subject, pulsations may be seen and felt over in this region¹².

Base of the Heart: The base of the heart is also called its posterior surface. It is formed mainly by the left atrium and by a small part of the right atrium¹³.

Border of the Heart:

- i. Upper border
- ii. Right border
- iii. Inferior border
- iv. Left border¹⁴

Surfaces of the Heart:

- i. Anterior or sterno-costal surface
- ii. Inferior or diaphragmatic surface¹⁵.

Valves of the heart: The valves of the heart maintain unidirectional flow of the blood and prevents its regurgitation in the opposite direction. There are 2 pairs of the valves in heart¹⁶: -

Atrio – ventricular valves:-

- i. Tricuspid Valves (right AV valve)
- ii. Bicuspid or Mitral (Left AV valve)

Semilunar Valves:-

- i. Aortic valves
- ii. Pulmonary valves.

Conducting system of Heart: The conducting system is made up of myocardium that is specialized for initiation and conduction of the cardiac impulses¹⁷. The conducting system has the following parts: -

Sinatrial Node (SA node):- It is known as the “Pace maker” of the heart. It generates an impulse of the rate about 70 beats /mins and initiated the heart beat¹⁸.

Atrio-ventricular node: - It is smaller than the SA node and is capable of generating impulses at a rate of about 60 beats/min¹⁹.

Bundle of His: - It is the only muscular connecting between the atrial and ventricular musculatures. At the upper border of the muscular part of the septum it divides into right and left branches²⁰.

The Purkinje fibers:- It forms a sub-endocardial plexus. They are large pale fibers striated only at their margins²¹.

Arteries supplying the Heart:-The heart is supplied by two coronary arteries, arising from the ascending aorta. Both the arteries run in the coronary sulcus²².

RCA :-It arises from the anterior aortic sinus²³.

LCA :- It arises from the left posterior aortic sinus²⁴.

The veins of the Heart :-

Coronary sinus: It is the largest vein of the heart. It is situated in the left posterior coronary sulcus. It is about 3 cm long²⁵.

Anterior Cardiac Veins :-These veins are 3 or 4 small veins which run parallel to each other on the anterior wall of the right ventricle²⁶.

Thebesian Veins :-These are numerous small veins present in all four chambers of the heart which open directly into the cavity²⁷.

Important blood Vessels related to heart:-

- a) **Pulmonary Trunk:-**Pulmonary trunk arises from the conus arteriosus of the right ventricle²⁸. It carries deoxygenated blood for right ventricle to lungs. The pulmonary trunk divides into the :-

- i. Right Pulmonary artery, which passes to the straight, posterior to the ascending aorta and superior vena cava, to enter the right lung²⁹.
 - ii. Left pulmonary artery, which passes inferiorly to the arch of the aorta and anteriorly to the descending aorta to enter the left lung³⁰.
- b) Aorta :-**Aorta originate from left ventricle and carry oxygenated blood to the entire body. Aorta is divided into following parts:-
- I. Ascending aorta:-** The origin of the ascending aorta is the aortic orifice at the base of the ventricle, which is level with the lower edge of the third left costal cartilage, posterior to the left half of the sternum³¹.
 - II. Arch of Aorta:-**Moving superiorly, slightly forward and to the right, the ascending aorta continues to the level of the second right costal cartilage. At this point, it enters the superior mediastinum and is then referred to as the arch of the aorta³².
 - iii. Descending Aorta :-**Descending aorta begins at the aortic arch and abdomen. It is further divided into two parts, the thoracic part and abdominal part.
- c) Pulmonary Veins :-**Pulmonary veins carry oxygenated blood from lungs to left atrium. These veins, usually two from each lung, pass through the fibrous pericardium and enter the superior region of the left atrium on its posterior surface³³.
- Venae Cavae:-** Venae Cavae carry deoxygenated blood from entire body to right atrium. It is divided into 2 parts:-
- Superior Vena Cava:-** Superior vena cava passes through the fibrous pericardium at approximately the level of the second costal cartilage and enters the right atrium at the lower level of the third costal cartilage³⁴.
- Inferior Vena Cava :-**After passing through the diaphragm, at approximately the level of vertebra T8, the inferior vena cava enters the fibrous pericardium. A short portion of this vessel is within the pericardial sac before entering the right atrium³⁵.

DISCUSSION:

Applied anatomy:-

I] Valve diseases: -

Valve problems consists of 2 basic type:

- ❖ Incomplete (insufficiency) which results from poorly functioning valves.
- ❖ Stenosis, a narrowing of the orifice, caused by the valve's inability to open fully³⁶.

i. Mitral Valve diseases:- It is usually a mixed pattern of stenosis and incompetence, one of which predominates both stenosis & incompetence lead to a poorly functioning valve and subsequently heart changes.

ii. Aortic Valve diseases :-Both aortic stenosis and aortic regurgitation (backflow) can produce marked heart failure. Valve disease in the right side of heart (affecting the tricuspid or pulmonary valve) is most likely caused by infection. The resulting valve dysfunction produces abnormal pressure changes in the right atrium and right ventricle and these can induce cardiac failure.

II] Common congenital heart defect:- The most common abnormalities that occur during development are those produced by a defect in the atrial & ventricular septa.

Atrial Septal Defect (ASD) :- A defect in the inter-atrial septum allows blood to pass from one side of the heart to the other from the chamber with the higher pressure, this is clinically referred to as a shunt. An ASD allows oxygenated blood to flow from the left atrium (high pressure) across the ASD into the right atrium (lower pressure). Many patients with ASD are asymptomatic, but in some cases the ASD may need to be closed surgically or by endovascular devices.

Ventricular Septal Defect:-The most common of all congenital heart defects are those that occur in the ventricular septum i.e.VSD. The lesions are most frequent in the membranous portion of the septum and they allow blood to move from the left ventricle (higher pressure) to the right ventricle (lower pressure), this leads to right ventricular

hypertrophy and pulmonary arterial hypertension. If large enough and left untreated, VSDs can produce marked clinical problems that might requires surgery.

Patent Ductus Arteriosus :-Occasionally, the ductus arteriosus, which connects the left branch of the pulmonary artery to the inferior aspect of the aortic, fails to close at birth. When this occurs, the oxygenated blood in the aortic arch (higher pressure) passes into the left branch of the pulmonary artery (lower pressure)and produces pulmonary hypertension³⁷.

Following are the cardiac causes of chest pain:-

Angina pectoris (Myocardial ischemia) :-

- ❖ Pain is usually retro-sternal in location and brought by exertion.
- ❖ It is relieved by rest and sublingual nitrates.
- ❖ Pain seldom lasts more than 20 min.
- ❖ Character of the pain is squeezing, crushing or aching.
- ❖ Pain commonly radiates to left arm and less commonly to right arm, throat, back, chin and epigastrium³⁸.

Myocardial infarction :-

- ❖ The pain of infraction is similar in character and distribution to angina pain. But it is more severe, prolonged(last more than 20 min)'
- ❖ Persisting at rest and not responding to nitrates.
- ❖ There may be vomiting, anxiety and a feeling of impending death.
- ❖ Other common physical signs include pallor, sweating, cyanosis, hypotension, arrhythmias, pericardial friction rub, signs of CCF and cardiogenic shock³⁹.

Coronary Artery Disease:-Occlusion of a major coronary artery leads to an inadequate oxygenation of an area of myocardium and cell death (i.e .MI). The severity depends on the size and location of the artery involved and whether or not the blockage is complete.

Partial blockages may produce pain (angina) during or after exercise. Typically, cardiac pain is a deep central sterna pain radiating into the left arm and the lower neck. Several procedure are now available to improve blood flow in partially or completely occluded coronary arteries:-

Coronary angioplasty :-It is a technique in which a long fine tube (a catheter) is interested into the femoral artery in the thigh, passed through external & common iliac arteries and into the aorta to the origins of the coronary arteries. A fine wire is then passed into the coronary artery and is used to cross the stenosis. A fine balloon is passed over the wire and inflated at the level of the obstruction, thus widening it⁴⁰.

Coronary Artery Bypass Grafting (CABG): If the coronary artery disease is too severe to be treated by coronary angioplasty, surgical coronary artery bypass grafting may be necessary. The great saphenous vein in the lower limb is harvested and used as an autologous graft. It is divided into several pieces, each of which is used to bypass blocked sections of the coronary arteries. The internal thoracic or radial arteries can also be used for this purpose⁴¹.

CONCLUSION

In the above study we have seen that the location of Hridya described in Sushrut Samhita is same as that of heart in modern anatomy. The Rasavahi Dhamini originate from Hridaya as described in Sushrut Sutra Sthana. Thus from this study we can conclude that the pranvaha strotas described in Sushrut Samhita can be correlated to CVS of modern anatomy.

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