

## A REVIEW ARTICLE ON PHYSIOLOGICAL ASPECT OF PRANAVAHA SROTASA

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## ABSTRACT

*Srotasas* are the passages through which functional fundamental end products like- dhatus, malas of body are circulated throughout the body.<sup>[1]</sup> The contents which are circulated through *Srotasas* are constantly under transformation process.<sup>[2]</sup> These contents are continuously changed into simpler form so that they can be accepted by the body. *Doshas*, *Dhatus* and *Malas* perform their functions through their respective *srotasas*. All the vital chief roles of *Pranavayu* are conducted in *Pranavaha srotas* mainly in thorax, head and neck regions. Here *moolasthanas* and functions conducted in *Pranavaha srotas* are correlated with ideas of modern science.

**KEYWORDS:** *Pranavaha srotas*, *Prana vayu*, *Moolasthanas*, *Vishishta Karmani*.

## INTRODUCTION

Acharya *Chakrapani* explained that there is superior *srotas* for functions of *pran vayu*.<sup>[3]</sup> He further adds that all *Vayus* are circulating through all the channels. As *Vayu* is *Sukshma* and *Laghu*<sup>[4]</sup>, it can enter all microscopic areas in our body. Thus *Vata* does its wide-ranging variety of functions in all the *srotasas* in body.

But *Pran Vayu* has a separate *srotas* to perform its vital functions. *Pranvayu* performs its functions to maintain and support life. Hence there is independent *srotas* for *Pran Vayu* called as *Pranavaha Srotas*. All the leading functions (*vishishta Karmani*) are conducted in this *Pranavaha Srotas*.

## AIMS AND OBJECTIVES

1. Physiological aspect of *Moolasthanas* of *Pranavaha Srotas*.
2. Functions conducted in *Pranavaha Srotas* and their correlation with modern science.

## MATERIALS AND METHODS

According to Acharya *Sushrut*, *moolasthanas* of *Pranavaha srotas* is *Hrudaya* and *Rasavahi Dhamani*.<sup>[5]</sup> As per the opinion of Acharya *Sharangadhara*<sup>[6]</sup>, after the digestion of food in *Annavaha srotas*, *Ahararasa* is formed. It is absorbed by the action of *samana Vayu*.

This absorbed *Ahararasa* is transported to *Hrudaya* by *Samana Vayu* itself. From *Hrudaya* this *Ahararasa* is circulated all over in the body by the action of *Vyana vayu*. Thus the nutrients (*Prana*) which are present in *Ahararasa* are transported to each and every cell of the body for their nutrition. This movement takes place through *Rasavahi Dhamani*.

Hence *Hrudaya* and *Rasavahi Dhamanis* are supposed to be *moolasthanas* of *Pranavaha srotas* by Acharya *Sushruta*.

According to Acharya *Charak*, *Moolasthanas* of *Pranavaha srotas* is *Hrudaya* and *Mahasrota*.<sup>[7]</sup> Here the word *Mahasrota* can be considered in two ways as follows.

1. **Mahasrota** – *Annavaha srotas* and *Purishvaha srotas* i.e. alimentary canal.
2. **Mahasrota** – *Swasapath* i.e. Trachea, Bronchus and other air passages in lungs.

If the meaning of the word *Mahasrot* is considered as Alimentary canal, then as explained above, the nutrients in *Ahararasa* are brought to heart by *samana vayu* from alimentary canal (small intestine). Thus there is a connection between *Hrudaya* and *mahasrota* (Alimentary canal). Hence these two organs are considered as *moolasthanas* of *Pranavaha srotas*.

If meaning of *Mahasrota* is considered as Trachea and other air passages in lungs – The Oxygen enters into the lungs through these air passages and enters into the blood from alveoli of lungs. This Oxygen can be considered as *Prana*, because it is essential to maintain vitality.

This Oxygen enters into blood and is brought to heart through Pulmonary veins. From heart it is circulated all over the body through blood circulation. Thus Trachea (*Mahasrot*) and heart are connected with each other. Hence they are considered as *moolasthanas* of *Pranavaha srotasa*.

Clinically it is observed that if among heart, GI system and Respiratory system, any one system is disturbed, and then other systems are also seen to be disturbed.

E.g. In case of heart failure– symptom of respiratory system like breathlessness is seen. In case of Asthma, a symptom Palpitation- associated with heart is seen. Thus these three systems are associated with each other and are vital organs. Hence these are considered as *moolasthanas* of *Pranavaha srotasa*.

## RESULT

*Pranavayu* carries its specific principal functions<sup>[8]</sup> in a special *srotasa* – *Pranavaha srotasa*. The chief functions<sup>[9]</sup> of *Pranavayu* are given in the classic texts of Ayurveda as follows.

### 1. Buddhi

Function of *Buddhi* is *Sarasaar Vivek*. *Buddhi* is capable of analysing good and bad. *Buddhi* can differentiate between thoughts and wishes which can be accepted or rejected.<sup>[10]</sup> *Buddhi* also conducts some intellectual functions like to think, to imagine. *Pranavayu* keeps control on these functions of *Buddhi*.

#### According to modern science

If these functions of *Pranavayu* are correlated with the concepts of modern science, then it can be stated that intellectual functions are carried out in cerebral cortex in head region and *Pranavayu* plays an important role for their conduction.

### 2. Hrudaya

*Hrudaya* is the *moolasthanas* of *Pranavaha srotasa* and hence is the main seat of *Pranavayu*. *Ahararasa* which is brought to *Hrudaya* by *samana vayu*<sup>[11]</sup> is circulated all over the body by the action of *Hrudaya*. For this purpose *Hrudaya gati* should be maintained and regulated. Movements of *Hrudaya* are maintained by *Pranavayu*.

#### According to modern science

Impulses for heart beats are generated at Sino atrial node (SA node). Then they are transferred to Atrio-ventricular node (AV node). After that impulses go to Purkinje's fibres and bundle of His.<sup>[12]</sup> Thus impulses start at atrium and are spread in ventricles.

### 3. Ingriya

*Indriyas* are the basic functional organs of the body. *Indriyas* are classified into two types.

1. *Gyanendriya*
2. *Karmendriya*

Both the types of *Indriyas* are situated in their respective *adhishtan* (Home). *Indriyas* perform their functions to connect our body with surrounding and protect ourselves from getting harmed.

*Indriyas* receive their respective *vishayas* and send them to *Atma*.<sup>[13]</sup> Initially, *vishaya* which is present in our surroundings is received by *Adhishtana* of *Gyanendriya*. This *vishaya* is sent to *Indriya* which is located inside its *adhishtana* in subtle form. From *indriya*, *vishaya* is sent to *mana*. From *mana*, *Atma* receives *vishaya* and gets knowledge about it. After getting knowledge, if necessary, *karmendriya* are activated to make some action for protection of body. Thus there is definite chain of transfer of *vishaya* through *indriya*.

*Vishaya* → *Adhishtan* → *Indriya* → *Mana* → *Atma*.

#### According to modern science

*Gyanendriyas* can be correlated with Sense organs. There are various parts or structures in sense organs which move while receiving the subjects. E.g. Movements of eyeball, movements of iris in eyeball, vibrations of three bones in middle ear. For controlled movements of these structures *pranavayu* plays an important role.

For each and every action in our body, whether sensory or motor, it is essential to conduct impulses through nerves. Impulses are conducted in the form of transportation of ions through neurons. This movement of ions and conduction of impulses can be correlated with above function of *Pranavayu*.

### 4. Chitta

In Ayurveda, it is explained that *mana* or *chitta* conducts various functions.<sup>[14]</sup>

1. *Indriyabhigraha* – To control *Indriyas* to receive their own *vishayas*.
2. *Swasya nigraha* – *Mana* controls itself. It prevents itself to go towards *vishaya* which are harmful for the person.
3. *Uha* – To establish values after proper thinking process.
4. *Vichara* – To accept or deny thoughts.

To perform these functions, *mana* has to connect with *vishaya* and get detached at proper times. This movement of *mana* is controlled and maintained by *Pranavayu*.

### 5. Shtheevana Kshavathu Udgaara

*Shtheevana* – Coughing Reflex, *Kshavathu* – Sneezing Reflex, *Udgaara* – Belching

Reflexes are carried out in the body as protective mechanisms to protect *Abhhyantara Prana*.

*Shtheevana* – Coughing Reflex is carried out to expel out food particle when it enters Trachea. Thus respiratory path is kept safe from getting damaged.

*Kshavathu* – Sneezing Reflex is carried out when foreign particles, insects or dust particles enter nose and pharynx – to expel out these harmful substances. Thus these organs are kept safe.

*Udgaara* – Belching is carried out to expel air entered in stomach while swallowing food.

## 6. Nishwasa

*Pranavayu* plays an important role in Respiration process which is conducted in *Pranavaha srotasa*. Acharya Sharangadhara<sup>[15]</sup> has quoted *Hrudaya* as site of *Pranavayu*. But he adds further that *Pranavayu* has extended its effect up to *Nabhi Pradesh*<sup>[16]</sup> (Umbilical region)

This *Pranavayu* touches lotus shaped *Hrudaya*, and exits out of body through *Kantha* region to bring *Amrut* (Oxygen) from *Vishnu pada*. After receiving this *Amber Piyush*, *Pranavayu* returns back inside the body to rejuvenate *Jatharagni*.

## According to modern science

The process of Respiration includes various events which show major role of *Pranavayu*. These events are as follows –

### A. Movements of various muscles<sup>[17]</sup>

In the Process of Respiration, contraction and relaxation of various muscles take place during inhalation and exhalation.

1. Diaphragm – Contracts during inhalation and relaxes during exhalation. Due to contraction it is pushed downwards by about 2 inches. Thus vertical volume of thorax increases and outer air rushed inside the chest cavity.
2. External intercostal muscles – Contract during inhalation. Due to contraction of these muscles ribs are pulled forwards and lifted upwards. Thus inner volume of thorax increases creating negative pressure inside. So air rushes into the chest cavity.
3. Internal intercostal muscles – Contract during exhalation. Due to contraction of these muscles, the ribs are pulled inwards and downwards reducing the diameter of the chest. Due to this air filled in the chest is compressed and expelled out through nose.

For movements of these muscles, *chala guna* of *Pranavayu* is responsible.

### B. Nervous Regulation<sup>[18]</sup>

Different nerves and centers in brain are responsible for regulation of process of respiration.

1. Centers in medulla oblongata and pons – Impulses

generated from these centers control rate and rhythm of respiration.

2. Phrenic Nerve – Impulses from this nerve are responsible for the contraction and relaxation of diaphragm. Due to action of the phrenic nerve Acharya Sharangadhara might have used the words – '*Nabhista Pranapavan*'
3. Vagus Nerve – It controls the actions of Lungs, Heart and Trachea. These are the *moolasthana* of *Pranavaha srotasa*. Hence place for *Pranavayu* is said to be *Shir* and *Moordha*. Thus *Pranavayu* is responsible for generation of impulses in the above centers and nerves.

## C. Gaseous exchanges<sup>[19]</sup>

The process of Respiration is executed in two stages.

1. External Respiration and 2. Internal Respiration (cellular Respiration).

1. External Respiration – During this stage, exchanges of gases take place in alveolar sacs of lungs and capillary blood. CO<sub>2</sub> in the blood of capillaries is transported into alveolar sac and is expelled out during exhalation. O<sub>2</sub> in alveolar sac is transported into blood. It combines with hemoglobin to form oxy-hemoglobin.

2. Cellular Respiration – During this stage, exchanges of gases take place between blood and body cell. While circulating in the blood, oxy-hemoglobin enters into cells and oxygen is released into the cells for energy production. CO<sub>2</sub> formed in the cell during metabolism is transported into blood. Here CO<sub>2</sub> combines with H<sub>2</sub>O to form Carbonic acid – H<sub>2</sub>CO<sub>3</sub>.

Thus during gaseous exchange in Respiration, movement of gases has to be done from alveolar sac to blood or from blood to cells. This movement of gases is promoted by *Chala guna* of *Pranavayu* in *Pranavaha srotasa*.

## 7. Annapravesh Krut

For digestion process to start, entry of food in the place of Agni is necessary. It is called as *Annapravesh krut* or *Aadana*<sup>[20]</sup> of food or *Nigirana* process. Following events take place during this function of *Pranavayu*.

1. *Charvana* – Food is chewed by teeth before swallowing.
2. *Vilodana* – Due to specific movements of tongue during chewing, food is pushed between the teeth.
3. *Rasagrahana* – With the help of *Bodhak kaph*, taste of food is identified and food is liquefied.
4. *Nigirana* – swallowing of liquefied food.
5. *ग्रहण* – Food is received in Stomach by *Samana Vayu*. All these events are controlled by *Pranavayu*.

## According to Modern Science

This function of *Pranavayu* can be correlated with deglutition. The process of deglutition is conducted in three stages.<sup>[21]</sup> During these three stages, systematic movements of different muscles and organs take place and food in the oral cavity is swallowed. These

movements are as follows.

#### 1. 1st stage – Oral preparatory stage.

##### Movements

1. Anterior part of tongue is retracted and depressed.
2. Posterior part of tongue is elevated and retracted against hard palate.
3. Hard palate is lifted upwards and food is pushed into the pharynx.

#### 2. 2nd stage – Pharyngeal stage

##### Movements

1. Due to entry of food in oropharynx, impulses are generated in deglutition center in medulla and pons.
2. Soft palate and uvula move upwards to close nasopharynx.
3. Opening of larynx is closed by epiglottis and bolus enters into esophagus.

#### 3. 3rd stage – esophageal stage.

##### Movements

1. As food enters esophagus, upper esophageal sphincter closes.
2. Peristalsis – Circular muscles from superior part of the bolus contract and longitudinal muscles inferior to bolus contract to shorten the inferior section of bolus. The food is pushed forwards.
3. Lower esophageal sphincter relaxes as food approaches near it. Food enters the stomach.

It can be stated that for above movements of muscles and organs during deglutition, *Pranavayu* is responsible in *Pranavaha srotasa*.

## DISCUSSION

The intellectual functions like learning, memory, logical thinking and analytical thinking are governed by *Pranavayu*. These functions are conducted in the Head region which is the main seat of *Pranavayu*. Due to *Chala Guna* of *Pranavayu*, the impulses for heart beat are forwarded and regularly controlled and rhythmic contractions of atrium and ventricles take place. Thus *ahararasa* is forcefully propelled from heart and circulated all over the body.

For proper functioning of *Indriyas*, it is essential to transfer *vishaya* from *adhishthan* to *atma*. This *Gati* is given to *vishaya* due to *chala guna* of *Pranavayu*.

*Hrudaya* and *Mastishk* are said to be the sites of *mana* and these are the sites of *Pranavayu*. Hence this function (*Chitta dhruk*) is carried out in *Pranavaha srotasa* by *Pranavayu*.

The three reflexes (Coughing, Sneezing and Belching) are conducted in the body for protection of various systems and to protect life. These reflexes are carried out in head and chest region which are said to be the sites of *pravavayu*; hence are conducted by *Pranavayu* in *Pranavaha srotasa*.

*Pranavayu* controls action of Respiratory muscles, conduction of impulses through respiratory center and gaseous exchanges during respiration process.

During *Annapraveshakrut* or deglutition, *pranavayu* controls movements of muscles in oral cavity, pharynx and esophagus.

## CONCLUSION

From above explanation it can be concluded that *Pranavayu* helps in gaseous exchanges during respiration and oxygen is reached up to each and every cell of body. It helps heart to pump *Ahararasa* up to each and every cell of body. Thus body is rejuvenated and '*pran*' is supplied to body cells. *Pranavayu* runs reflex mechanisms in the body to protect it. It also controls sensory and motor actions again for protection of the body.

Thus *Pranavayu* performs vital functions in *Pranavaha srotasa* to maintain life. Hence the name given to this *vayu* is "*Prana*".

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