

# Physio-Pathological Concept of Respiration *vis-a-vis Shwasana Kriya*

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## ABSTRACT

The process of respiration is mandatory for the living beings so as to provide oxygen for carrying out their metabolic activities and elimination of toxins from the body. The whole concept is elaborated in Ayurveda as the *shwasana kriya* which involves *prana vayu* and *pranavaha srotasa*. Also for the management of any respiratory disorders, the treatment regimen stated includes therapies, medicaments and practice of *pranayama* or breathing exercises. In today's world, lung diseases are a major reason for disabilities and fatalities. We are currently witnessing the era of COVID-19 pandemic, which has hampered the homoeostasis of the body involving various organ systems, the prime target being the respiratory system. Therefore, the knowledge imparted by our Ayurvedic science to improve the physiological functioning of this system and to manage the associated pathologies, which has been illustrated exquisitely, can be utilized. Through this article, an attempt is being made to understand the concept of respiration and co-relate it with the Ayurvedic counterpart.

**KEYWORDS:** Prana, Prana vayu, Pranavaha srotasa, Phupphusa, Shwasana

## INTRODUCTION

### Respiration-

Respiration is a process taking place in a living being in which gaseous exchange i.e., intake of oxygen and release of carbon dioxide takes place via inhalation and exhalation. It is a continuous process initiating since birth and continuing throughout the lifetime, the irreversible cessation of which indicates death.

## MATERIALS AND METHODS

Literature and references related to the proposed title are collected from classical texts of Ayurveda and contemporary literature. Various publications, research papers, references from internet related to topic have been considered.

## LITERATURE REVIEW

### Respiratory tract-

It is the anatomical structure through which movement of air occurs through and outside the body. It continues from the nose to lungs. Lungs are the main organs of respiration, which develop from laryngotracheal groove on 22nd day of intrauterine life and are endodermal in origin<sup>[1]</sup>.

In Ayurveda, the *vayu* or air which enters the body is called *prana* or life. The tract responsible for conduction of *prana* throughout the body is the *pranavaha srotasa*. The sites of origin of *pranavaha srotasa* are *hridaya* (heart) & *mahasrota* (central cavity or alimentary canal) and *hridaya* & *rasavahi dhamani* (channels circulating fluids in body) as per Acharya Charaka and Sushruta respectively<sup>[2,3]</sup>. The

main organ of respiration as per Ayurveda is the phupphusa or the lung. It is one of the eight kostha or organs stated by Acharya Sushruta<sup>[4]</sup>. The phupphusa originates from shonita fena i.e., the froth of blood which can be considered so due to the presence of air-filled cavities. The position of phupphusa is described by Sushruta as below the heart in the left lateral position along with pleeha, later rectified by Gananatha Sena in Pratyaksha Sharira as in both left & right lateral positions<sup>[5]</sup>.

### Types of Respiration-

There are two types of respiration viz. External respiration i.e., gaseous exchange between lungs & blood and Internal respiration i.e., gaseous exchange between blood & tissues<sup>[6]</sup>.

In Ayurveda, it is stated that the *prana* (air) in the body of living beings is supplemented by the *prana* in the environment and thus assists in the maintenance of the *panchbhautika sharira* i.e. body made up of the five basic elements<sup>[7]</sup> which correlates with the procedure of gaseous exchange.

### Mechanism of Respiration-

The two phases of respiration are inspiration and expiration, former being an active process requiring energy while the latter being a passive one. Muscles involved in the process are Inspiratory & Expiratory muscles both consisting of their primary and accessory types.

Exchange of gases-

Gaseous exchange takes place at two levels, lung and tissue. In the lungs exchange takes place between the alveoli and pulmonary capillaries. The pressure of atmospheric O<sub>2</sub> in alveoli is 104 mm Hg and that in capillary

blood is 40 mm Hg, while pressure of CO<sub>2</sub> in alveoli is 40 mm Hg and that in capillary blood is 46 mm Hg; therefore, oxygen moves into the capillaries while carbon-dioxide moves into the alveoli and simultaneously out of the body.

In a similar manner, the pressure of O<sub>2</sub> in capillaries is 95 mm Hg and that in tissues is 40 mm Hg, while pressure of CO<sub>2</sub> in capillaries is 40 mm Hg and that in tissues is 46 mm Hg; therefore, oxygen moves into the tissues while carbon-di-oxide moves into the capillary blood. Thus, the exchange of gases at tissue level takes place<sup>6</sup>.

According to Ayurveda, out of the five types of *Vayu*, *Prana Vayu* is the chief factor responsible for the process of respiration. The process is described as "The *prana vayu* inhabiting the umbilical region moves along the heart and simultaneously out of the body via the respiratory tract. It is exchanged with the pure air containing oxygen from the external surroundings and then re-enters the body. And thus, it boosts the digestive fire and nourishes the body lifelong"<sup>[8]</sup>.

### Control of Respiration-

Respiration is controlled via nervous and chemical mechanisms<sup>[6]</sup>.

Nervous Mechanism- it includes respiratory centers, afferent & efferent nerves. The respiratory centers are present in Pons varolii and Medulla oblongata of brain, Pneumotaxic and Apneustic centers in the former group while Dorsal and Ventral group of neurons in the latter. The situation and functions of respiratory centres involved in nervous mechanism have been summarized in Table 1.

Table 1

S.No.	Respiratory Center	Situation	Function
1	Pneumotaxic center	Dorso-lateral part of reticular formation in upper pons	Inhibits dorsal group of neurons by inhibiting apneustic center Increases respiratory rate by reducing duration of respiration
2	Apneustic center	Reticular formation of lower pons	Increases depth of inspiration
3	Dorsal group of neurons	Nucleus of tractus solitarius	Control rhythm of respiration
4	Ventral group of neurons	Nucleus ambiguus & nucleus retroambiguus	Activated during forced breathing Stimulate inspiratory & expiratory muscles

Chemical Mechanism- it is regulated by chemoreceptors (Central and Peripheral) which are the sensory nerve endings which respond to alteration in chemical constitution of blood viz. Hypoxia,

Hypercapnia and increased hydrogen ion concentration. The situation and functions of respiratory centres involved in chemical mechanism have been summarized in Table 2.

Table 2

S.No.	Chemoreceptor	Situation	Function
1	Central	Deeper part of Medulla oblongata	Responsible for 70-80% of increased ventilation by chemical mechanism Main stimulant is increased hydrogen ion concentration Excitatory impulses from receptor are sent to dorsal group of neurons causing increased rate & force of breathing resulting in expulsion of excess CO <sub>2</sub> from the body & normalizing respiration Hypoxia doesn't cause the stimulation of receptor
2	Peripheral	Carotid & Aortic region	Main stimulant is decreased partial pressure of Oxygen Hypoxia excites dorsal group of neurons and sends excitatory impulses leading to increased ventilation & rectifying lack of oxygen in the body. Also stimulated by Hypercapnea & increased hydrogen ion concentration (mild action).

As per our classical texts, the vayu or air is considered as prana and prana vayu is the chief controller of all functions of the body. The Prana Vayu plays a crucial role in the process of ksthivana (spitting), kshavathu (sneezing), udgara (burping), shwasa (inhaling-exhaling) and ahara karma (intake of food) [9] corresponding to functions of respiratory system mentioned in modern texts which are gaseous exchange, olfaction, vocalization, defense mechanism, regulation of body temperature, protective reflexes which include cough, sneezing, swallowing (deglutition) reflexes [6].

## RESULT AND DISCUSSION

In the present era of COVID-19 pandemic, each and every human being has been affected by the disease in some way or the other and are still facing the complications associated with it. It has adversely affected the various bodily systems, majorly the respiratory system [10].

This viral infection damages the walls and linings of alveoli and capillaries of the respiratory tract and the debris produced in the process cause thickening of the respiratory membranes thus hampering the gaseous exchange.

In Ayurvedic literature, COVID-19 can be included in *Janapaddodhwansa* which is an Agantuja vyadhi or Bhutaja vyadhi caused by microbes (bacteria, viruses and microorganism) [11].

The virus invades the Pranavaha srotasa (respiratory tract) developing Shopha (inflammation) which subsequently progresses to Urahkshata (pulmonary tissue injury) [12].

The imbalance of the doshas viz. Kapha Prakopa along with Pitta Dushti in prior stage of disease cause Srotorodha (blockage of respiratory channels) and preliminary vitiation of Pranavaha Sroto Mulasthanas (the sites of origin of the pranavaha srotasa), thereby reversing the course of Prana Vayu resulting in irregular breathing, Kasa (cough), Shwasa (dyspnoea), etc. [13]

As the upper respiratory tract is the portal of entry for the virus, the health of respiratory system is very important to prevent fatality.

- I. The pranavaha srotasa on vitiation, can be treated by following the regimen prescribed for the management of shwasa or dyspnoea which includes,
  - Snehana (intake of medicated ghee or oil)
  - Swedana (sudation)
  - Vamana (therapeutic emesis)
  - Dhuma pana (inhaling of medicated fumes)
  - Virechana (therapeutic purgation) [14]
- II. Many herbal drugs and medicinal combinations have been mentioned to be administered in patients of Shwasa like,
  - Single drugs- Vasa, Pushkarmoola, Brihati, Kantakari, Karkatshringi, Talishapatra, Bharangi

- Combinations- Vasavaleha, Kantakari avaleha, Kushmanda rasayana, Talishadi churna, Sitopaladi churna, Eladi gutika, Shwasa kuthara rasa, Kasa shwasa chintamani rasa, Shringa bhasma etc. [14]

III. The procedure of pranayama improves the overall respiratory health; therefore, it can also be used for the benefit. Pranayama consists three stages, Pooraka (inhalation of air), Kumbhaka (retention of breath) and Rechaka (exhalation of air) which have to be maintained in the ratio of 1:4:2<sup>[15]</sup>. Pranayama can be indicated as a prehabilitative procedure for the vulnerable as well as healthy population to avert the infection and also as a part of management regime for the patients so as to provide a broad-spectrum immune buildup in the body so that the virulence can be reduced.

## CONCLUSION

Though the *Pranavaha srotasa* in our texts relates with the cardio-pulmonary parameters, the respiratory system can be considered majorly as its counterpart. As, it is a vital system for maintenance of a healthy living status, special measures should to taken to maintain it's physiological functioning and in case of any pathology, proper treatment should be prescribed as per the management of *Shwasa* disease prior mentioned.

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