

# The Physiology of *Pranavaha Srotas* and Its Correlation with the Respiratory System

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## INTRODUCTION

The concept of the *Pranavaha Srotas* is rooted in Ayurveda and understood to be that channel by which *Prana*, or 'the vital life force,' is transported. Modern physiology enunciates the correlation of the *Pranavaha Srotas* with the respiratory system, comprising organs and structures concerned with breathing. This paper deals with the presentation of the physiology of *Pranavaha Srotas* with regard to structure and functions, and its correlation with the respiratory system.

## STRUCTURE AND COMPONENTS OF *PRANAVAHA SROTAS*

Ayurveda literature describes *Pranavaha Srotas* as consisting of the nasal passages, pharynx, larynx, trachea, bronchi, and lungs. These constituents make up the receiving and maintaining current of *Prana* and the eliminating current of *Apana*. This definition roughly corresponds to the more modern, strictly anatomical definition of the respiratory system, divided into upper and lower respiratory tracts.

The upper respiratory tract comprises the nasal cavity, the pharynx, and the larynx. The nasal cavity cleans, warms, and humidifies the incoming air. The pharynx provides a pathway for the respiratory and digestive passages, while the larynx provides for voice production but at the same time prevents food from entering the trachea. Lastly, the lower respiratory tract comprises the trachea, bronchi, bronchioles, and the alveoli. Distally, it bifurcates into the bronchi with their subsequent branches forming bronchioles, which end in alveoli, forming the site for gas exchange (Martini, Nath & Bartholomew, 2018).

## PHYSIOLOGICAL FUNCTIONS OF *PRANAVAHA SROTAS*

*Pranavaha Srotas* is mainly responsible for the respiratory system. It facilitates the intake of oxygen essential in cellular respiration for the production of energy and the expelling of carbon dioxide, which is a metabolic waste product. Basically, there are two main phases: inspiration and expiration.

On inspiration, the diaphragm contracts and moves downward, while the intercostal muscles contract; this shall in turn expand the thoracic cavity. It is this negative pressure that then draws air into the lungs (Guyton & Hall, 2016). On expiration, the diaphragm and intercostal muscles relax, leading to a decrease in thoracic volume, which pushes air out of the lungs. This bidirectional airflow is about paramount to maintaining homeostasis and metabolic functions (West, 2012).

## *PRANA*: THE VITAL FORCE

While it refers to the vital life force in the body, which sustains physical and mental functions in Ayurveda, here *Prana* is much more than ordinary oxygen. It represents the energies that activate and sustain the various life processes. There are five subtypes of *Prana*: *Prana*, *Apana*, *Vyana*, *Udana*, and *Samana*, which control various physiological functions. In the context of *Pranavaha Srotas*, it specifically concerns *Prana Vayu*, which controls breathing or respiratory air intake (Lad, 2002).

## CORRELATION WITH MODERN RESPIRATORY PHYSIOLOGY

One can consider the respiratory system in modern medicine to be parallel to *Pranavaha Srotas*.

According to both systems, intake of air and exchange of gases are the very basics of life and health. Oxygen finds participation in the production of adenosine triphosphate in aerobic respiration. ATP often acts as the energy currency in the cell, running many biochemical processes (Alberts et al., 2015).

Gas exchange in the lungs takes place in small sacks called alveoli. The process involves the diffusion of oxygen through the membrane of the alveoli into the capillaries and carbon dioxide from blood into the alveoli to be exhaled. These exchanges occur due to partial pressure gradients for the gases (West, 2012). Haemoglobin in red blood cells binds to oxygen and transports it to tissues and organs for cellular respiration (Hall, 2015).

### REGULATORY MECHANISMS

Here, the *Pranavaha Srotas* are being controlled with respect to the respiratory system so as to meet the metabolic demands of the body. According to Ayurveda, breathing is controlled by the heart and the brain-controlled *Prana Vayu*. Modern physiology describes brain regions such as the medulla oblongata and the pons as controlling the rate and rhythm of respiration (Ganong, 2019). Chemoreceptors in the medulla and peripheral arteries sense changes in blood pH, carbon dioxide, and oxygen levels and send this information to help in adjusting respiration (West, 2012).

*Pranavaha Srotas* and respiratory system functioning is influenced by stress, physical activity, and environmental factors. For instance, increased physical activity triggers a demand for oxygen. Thus, respiratory rate and depth increase accordingly. Therefore, as carbon dioxide levels become too high or oxygen levels drop, respiratory functioning changes to reestablish balance (Guyton & Hall, 2016).

### PATHOPHYSIOLOGY

The disorders of the *Pranavaha Srotas*, therefore, fall under respiratory disorders in the current medical practice. The prevailing conditions are asthma, chronic obstructive pulmonary disease, COPD, bronchitis, pneumonia, and cancer of the lungs. Gas exchange may get impaired, and there is a decrease in the quantity of oxygen, supplied at tissue levels, leading to

symptoms like shortness of breath, cough, and wheeze (Mannino & Buist, 2007).

Asthma, for example, is an instance of chronic inflammation of the airways, leading to bronchoconstriction and limitation of airflow. Allergens, pollution, or stress may be provocative factors that instigate such conditions. COPD—mostly due to smoking—degenerates the walls of the alveoli and creates a loss in elasticity of the lungs; this affects both the passage of air and gas exchange (Celli et al., 2004).

### AYURVEDIC PERSPECTIVE ON RESPIRATORY HEALTH

Ayurveda has a holistic concept of maintaining the health of *Pranavaha Srotas* through diet, lifestyle, and therapeutic practices. Dietary advice includes the intake of warm, easily digestible foods and avoidance of cold, heavy, and mucus-producing foods. Herbs such as *Tulsi* (*Ocimum sanctum*), *Vasaka* (*Adhatoda vasica*), *Yashtimadhu* (*Glycyrrhiza glabra*), etc are utilized for respiratory health (Dash, 2002).

*Pranayama*, or controlled breathing exercises, is practiced to increase lung capacity, improve oxygenation, and bring balance in the *Prana Vayu*. Here, one carries out different techniques called *Anulom-Vilom* (Alternate nostril breathing) and *Kapalabhati* (Skull-shining breath). This clears nasal passages, strengthens respiratory muscles, and calms the mind too (Singh, 2011).

### INTEGRATIVE APPROACHES

The integration of Ayurveda with modern respiratory care will bring in an all-round approach to respiratory health. For instance, conventional treatments for asthma or COPD can be integrated with Ayurvedic practices of *Pranayama* and herbal supplements for better results and improvement in the quality of life (Patwardhan, 2010).

It is supported by some available studies that Ayurvedic herbs may have value in respiratory care. *Tulsi* is said to have anti-inflammatory, antioxidant, and immune-modulatory properties and therefore may be useful in the management of respiratory disorders, as has been shown in the study (Mondal et al., 2009). Similarly, *Pranayama* practices were found to

improve pulmonary function and symptoms in asthma patients (McCaffrey et al., 2004).

#### CONCLUSION

Ayurvedically, the *Pranavaha Srotas* very closely correlates with the concept of the respiratory system in modern thinking. Respiration plays a critical role in both systems in air intake and gas exchange for the sustenance of life processes and maintenance of health. Translation of the physiological functions, regulatory mechanisms, and conditions related to disorders of *Pranavaha Srotas* into practice may be helpful in respiratory care by putting Ayurvedic wisdom into practice with the amalgamation of modern medicine.

This, therefore, forms part that an integrative approach would have not only toward the physical dimensions of respiratory health but also to other energetic and holistic parameters of well-being, thus going in line with Ayurveda and modern medicine. Further studies and clinical research in this direction are required if the full benefits and applications of the integrative approach in respiratory care are to be realized.

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