

## OVERVIEW MECHANISM OF SHVAS KRIYA IN AYURVEDIC & CONTEMPORARY SCIENCE

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### ABSTRACT

Description regarding physiology of respiration is available in Ayurvedic and Sanskrit Literature. In Yajurveda it is mentioned that air in the form of Prana and Apana enters the Naasika (*Yaj. 15/12*). Some times Udana has been mentioned in the place of Apana. Conferring to Chandogyanopanishad, one of the supreme ancient Upanishads, a human being can persist without eyes, ears, legs etc. but he cannot do so without breathing and without food, for life originates on these two basics and completely be contingent on them. This is the vital energy (prana) or vital force inside them. Lungs are the organs that benefit in this exchange of gases. The respiratory system is the channel that transmits the gases along with the vital life force, identified as the Prana. The antediluvian Ayurvedic scholars had obviously depicted the method of respiration in parlance of contemporary medical sciences. Maintenance of the respiratory tract is therefore actual significant. Problems in the respiratory tract can retire due to improper diet, seasonal changes, polluted air and lack of exercise. Respiratory health can be enriched through controlled diet. Avoid fried food and, having light breakfast and dinner are the best ways to be followed. Drinking luke warm water comforts to break chest congestion. Herbs resembling pippali, guduchi, shati, pushkarmoolaetc are few of the lung supportive herbs. Warming the body through exercise is another way for sustaining respiratory health. Yoga, meditation and pranayama, in specific, purify the respiratory tract; strengthen the lungs and maintain healthy lung function.

**KEYWORDS:** Shvasa Kriya.

### 1. INTRODUCTION

Description regarding physiology of respiration is available in Ayurvedic and Sanskrit Literature. In Yajurveda it is mentioned that air in the form of Prana and Apana enters the Naasika (*Yaj. 15/12*). Some times Udana has been mentioned in the place of Apana.

#### PRA + ANA - going in UDA + ANA -going out.

In Bhagavatgita, it is mentioned that Prana and Apana moves through Naasika (*Bha. 5/2*). Shridharacharya has interpreted Prana for expiratory air & Apana for inspiratory air.

In some Ayurvedic texts the word Prana has been used for inspiration & Udana for expiration. Acharya Sushruta has mentioned that

*Udanonaam Yasturdhamupaiti Pavanottamah. (Su.Ni.1/14).*

In current era the word Uchchvasa and Nishvasa are used for inspiration and expiration respectively. In one mantra of Atharvaveda (Kand II) it is mentioned that some portion of air remains in body at the end of expiration as it cannot be expelled out. At the time of respiration the sound produced is termed as *Hansa*. Respiration takes place during day and night without any interval. (*AtharvavedaKand II*).

Prana produces different sounds in the body. When it enters *Apastambhait* produces sound *PRA* when it enters the alveoli from *bronchioles* produces the sound *PURO*. The sound *NI* is produced when Prana returns from *alveoli* and at *Apastambha Shvasanali* & at *Swarayantrathe* the sound "*PASCAT*" is produced (*Miskra S.K. et.al. 1958*).

## 2. AIMS AND OBJECTIVES

To know Mechanism of ShvasKriya in Ayurvedic & contemporary Science.

## 3. Respiration

Ayu is considered as a combination of Shaarira and Prana. AcharyaSushruta has stated that BaahyaPrana survives internal Prana. Through processofrespiration Baahya Pranaentersthebody. Acharya Sharngadharahas mentioned the process of respiration in detail. But uptill now no scholar has tried to elaborate this process. An attempt is made to illustrate this process with the help of modern physiology.

### *Nabhistha Prana Pavanah*

Nabhi is considered as Mulasthan of Sira. Meaning of the word Nabhi is Bandhana. AcharyaSushruta described it as—

*SirabhihiAavrittaiNabhiChakranabhievaArakai*  
(Su.Sha. 7/8)

It means that union of Sira takes place around this region. Formation of inferior vena cava takes place at the umbilical region. It is a major vein which drains deoxygenated (impure) blood from periphery which may be considered as Sirabandhana or Union of Sira at Nabhi. Pranapavana is related with functions of PranaVayu. Inhalation i.e. (Nishvasa is a function performed by PranaVayu.) During inhalation movement of abdominal muscle can be visible easily. AcharyaSharangadhara may be described these movements in relation to Nabhi. During this process of Pranavayu i.e. inspiration, negative pressure is created in thoracic cage, movement of ribs takes place in upward and outward direction. Due to negative pressure created in thorax venous blood from inferior vena cava as well as superior vena cava drained in thorax and finally it opens into rightauricle.

### *Sprishtwa Hritkamalantaram*

Aadhmalla while commenting on this opines that.

### *HritkamalantaramitiHritkamalasyaAbhyantaram*

It means that deoxygenated blood from vein reaches inside the right auricle through both thevenacava.(Sha.Pu 5/48)

### *Kanthatbahirviniryati*

This deoxygenated blood travels from right atrium to right ventricle and during systole this blood is given out to pulmonary arteries which distributes blood around the alveoli through fine capillaries for oxygenation. This Deoxygenated blood is having higher concentration of CO<sub>2</sub> than alveolar air.

Both these are separated by alveolar diffusing membrane. According to law of diffusion, gaseous exchange takes place from area of higher concentration to area of lower concentration. Secondly partial pressure of CO<sub>2</sub> in blood is always greater than partial pressure of

CO<sub>2</sub> in alveolar air. Hence net diffusion of CO<sub>2</sub> will occur towards gaseous phase in alveoli. From alveoli it is continuously expels to exterior by ventilation, which is mentioned as *KanthatBahirviniryati*.

### *Pitwa Cha Ambara Piyusham Punah Ayati Vegatah*

Similarly due to same phenomenon of gaseous exchange, diffusion ofO<sub>2</sub>takes place across alveolar membrane. Oxygen concentration in alveoli is greater than that of capillary O<sub>2</sub> hence it continuously gets diffused from alveoli to capillary and new air comes from outside to replace the CO<sub>2</sub>in alveoli. More rapidly the oxygen is absorbed through alveolar membrane lower becomes its concentration in alveoli; conversely more will be the flow of oxygen into alveoli through the atmosphere. Thus process of oxygenation, i.e. From atmosphere to alveoli to capillary may be described as *Pitwa Cha AmbarapiyushamPunaAyatiVegatah* and process of diffusion of CO<sub>2</sub> mainly deals with *KanthatBahirViniryati*.

CO<sub>2</sub> diffuses more rapidly than O<sub>2</sub> through respiratory membrane. Average Pco<sub>2</sub> in pulmonary blood is not much different from Pco<sub>2</sub> in alveoli. Average difference is less than 1 mm of Hg. With the available techniques this difference can not be measured. Diffusing capacity of CO<sub>2</sub> is 20 times that of oxygen. Diffusing capacity of CO<sub>2</sub> under resting condition is about 400-450 ml/min/mm of Hg., During exercise it increases up to 1200-1300 ml/min/mm of Hg. Diffusing capacity of oxygen under resting condition is 21 ml/min/mm of Hg. During normal breathing mean oxygen pressure difference across the respiratory membrane is about 11 mm of Hg. Multiplication of this pressure with diffusing capacity (11 x 21) gives a total of about 280 ml of oxygen which diffuses through the respiratory membranes. Due to this large pressure difference when CO<sub>2</sub> is given out from capillary to alveoli, O<sub>2</sub>enters rapidly from alveoli into capillary which may be quoted as *Pitwa Cha AmbarapiyushamaPunahAyatiVegatah*.

Average Functional Residual Capacity of lungs at the end of normal expiration measures about 2300 ml/lit. Only 350 ml of new air brought into alveoli with each inspiration and same amount of alveolar air is given out. Volume of alveolar air replaced by new atmospheric air with each normal breath is only 1/7<sup>th</sup> of total hence multiple breaths are required to exchange most of the alveolar air. Respiration process prominently deals with alveolar air and not with atmospheric air. There is much variation in concentration of various gases in alveoli, atmosphere and capillary as shown in below chart.

**Table 1: Partial pressures of respiratory gases as they enter and leave the lungs.**

<i>Gases</i>	<i>Atmospheric air</i>		<i>Humidified Air</i>		<i>Alveolar Air</i>		<i>Expired Air</i>	
	<i>mm of Hg</i>	<i>%</i>	<i>mm of Hg</i>	<i>%</i>	<i>mm of Hg</i>	<i>%</i>	<i>mm of Hg</i>	<i>%</i>
N <sub>2</sub>	597	78.62%	563.4	74.09%	569	74.95	566	74.5%
O <sub>2</sub>	159	20.84%	149.3	19.67%	104	13.6%	120	15.7%
CO <sub>2</sub>	3	0.04%	.3	0.04%	40	5.3%	27	3.6%
H <sub>2</sub> O	3.7	0.50%	47	6.2%	47	6.2%	47	6.2%
Total	760	100%	760	100%	760	100%	760	100%

Thus the process of respiration mentioned by Sharnagadhara should be considered at alveolar level & not with atmospheric air. Uptill now it is explained that it deals with atmospheric air but from above discussion it is proved that this process supervenes at alveolar level.

#### ***PrinayantiAkhilamDeham***

After oxygenation through Pulmonary veins this oxygenated blood is transferred to left atrium & then to left ventricle. During systole this oxygenated blood is circulated all over the body through arterial system. ThroughcirculationthisO<sub>2</sub>isdeliveredtoeveryminute structures of body which is essential to carry out metabolic activities of every cell, lack of this oxygen result into cellular death.

#### ***Jivayan Cha Jatharanalam***

Respiration is also helpful in maintenance of Agni. To understand the role of respiration in maintenance of Agni, it is essential to understand role of Vayu in maintenance of Agni i.e. the process of metabolism.

AcharyaSushruta has opined that among different types of VayuPrana, Apana & Samana have prime importance for normal function of Agni. Agni is related with Parinaman of Aahara which is nothing but process of metabolism. This is governed by various digestive enzymes & hormones. AcharyaDalhana while commenting on this explained that Prana & Apana are mainly concerned with Dhmapana i.e. stimulation of Agni & Samana is concerned with Palana i.e. maintainance of Agni. This Samanavayu resides lateral to Agnisthana. When the status of these three Vayu is normal, Agni functions normally. For normal functioning of this Vayu there mentioned three basic requirements –

- ✓ Vayu should have unobstructed freemovement
- ✓ It should be in its own naturalhabitat
- ✓ It should be normal qualitatively as well asquantitatively.

While going through Samhita numbers of references are available which shows importance of these Vayu.

#### **4. Role of apanavayu in ShwasaPrakriya**

While describing pathogenesis of SahajaArshaCharaka has explained that when Apanavayu gets vitiated due to Gudavaliavarodha, Apana leaves its own place & traverses in opposite direction. It involves sequentially vitiation ofSamana, Vyana, Prana & Udana. Symptoms are also developed accordingly. Vitiation of Apana leads

to obstruction in the natural gati of Mutra, Purisha, Vayu & produces Sharkara, Ashmari etc. Further when Apana involves Samanavayu symptoms produced are Kaasa, Shvasa, Tamaka, Trishna, Hrillasa, Chardi, Arochakaetc Here vitiated Apanadetoriate the functions of Agni which explains role of Apana in maintenance of Agni. Also Kaasa, Shvasa & Tamaka occurs in relation with vitiation of Samana.

#### **5. Role of samanavayu in Shvasaprakriya**

In Avarana chapter, AcharyaCharaka has mentioned two conditions of SamanaVayu- (i) PittavritaSamana & (ii) KaphavritaSamana

In PittavritaSamana symptoms are Atisweda, Trishna, Daha, Aruchi & Agnimandya. While in Kaphavrita Samana Asweda, Lomaharsha, Coldness of extremities are observed. Agnimandya is mentioned in both these conditions. It occurs due to hampered function of Samanavayu. AcharyaChakrapani has opined that though in this condition Pitta dominates Samana, Mandagni occurs due to dysfunction of Samanavayu which is stimulating factor for Agni. This quotation explains importance of Samanavayu rather than Pitta.

#### **6. Role of pranaVayu in ShvasaPrakriya**

##### ***Annapraveshkruta (A.H.Su.12)***

To maintain the normal status of Agni, Aahara should be consumed at proper time (*KalbhojanamArogyakaranam*) Intake of food is function of Pranavayu. In deteriorated condition of pranavayu consumption of food get reduced. So in this condition due to lack of proper quantity of food, Agni get hampered. As Charaka says - *NabhojanenaKayagnidipyate[cha chi 15/41]*

Food is essential for normal function of Agni in sufficient quantity, which is under control of PranaVayu. From above discussion it can be concluded that any disturbance in functions of Prana, Samana & Apana leads to vitiation of Agni. ApanaVayu is mainly concerned with excretory system of body while Samanavayu is concerned with metabolism &Prana mainly concerned with respiration.

According to modern science there is specific relationship is present in functional systems of respiration, metabolism & excretion. Metabolism mainly includes anabolic & catabolic process which is carried out in our body. It is well known that all enzymes & hormones in the body are secreted at proper pH only.

Pepsin acts only in acidic medium, its maximum activity occurs at pH-3. Pancreatic enzymes acts only in alkaline medium, release of hormone secretion occurs at pH less than 4.5. Maintenance of this pH is due to hydrogen & bicarbonate ions. Any abnormality in their concentration results into metabolic acidosis/alkalosis resulting in various abnormalities. These are mainly concerned with functions of SamanaVayu. Respiratory & Excretory these two buffer systems are present in body to maintain pH. If metabolic acidosis occurs due to depletion of bicarbonates ions, ultimately increases H ion concentration is present. This is balanced by increased ventilation which gives out CO<sub>2</sub> in large quantity. If metabolic alkalosis occurs opposite phenomenon takes place which compensate this ionic imbalance, thus maintenance of proper pH is essential for normal function of hormones & enzymes. In the same way by active reabsorption of bicarbonate in renal tubule as well as excretion of this bicarbonate ion through stool (excretory system) also helps in maintaining this proper pH. It is under control of Apanavayu.

Thus body is nothing but bio-chemical lab where series of chemical reactions are going on continuously. These reactions are carried out at proper pH only; all these functions are controlled by Vayu.

### 7. Functional anatomy of the Respiratory System

The organs of the respiratory system contain the nose, the nasal cavity, the pharynx, the larynx, the trachea, the bronchi & their smaller branches & the lungs which comprehend the terminal air sacs or alveoli. The places of PranaVayu for respiration as designated in Ayurveda were also same as Murdha (head), nasik (nose & nasal cavity), Kantha (trachea & larynx) & Uras (thorax) Nose: The only outwardly detectable part of the respiratory system, the nose deceits in the middle of the cranium & mouth. Posterior it connects with the pharynx. It is the sense organ of smell / olfactory receptors (ghranendriya). Pharynx: Pharynx is a funnel shaped structure which attaches the nasal cavity & mouth to the larynx & esophagus inferiorly. It is a conjoint passage for air (through Pharynx & Trachea, the canal for air) & food (through oesophagus).

**Larynx:** Larynx is located between Pharynx & trachea. It actions as a passage of air to the respiratory system & food to the oesophagus. Besides this, it theatres a very important role in the production of voice. During swallowing its inlet is closed by epiglottis. Trachea: It is 10-12 cm long. Trachea is the maintenance of larynx and ends in getting divided into 2 principle bronchii in the mid thorax.

**Bronchii:** The trachea is alienated into 2 parts – viz. left & right bronchi at about at the level of 5th vertebra of the thorax in the mediastinum. Both the primary bronchi arrive each site of the lung; differ in shape according to the location of the lung. After ingoing the lung each

primary bronchus splits into secondary, tertiary bronchi and bronchioles and terminal bronchioles.

**The alveoli:** The distant small ends of bronchioles are further split into the minute cavities called alveoli which end again at alveolar sac in the lungs. This percentage of the lung is directly responsible for exchange of inhaled gases. Lungs: In Ayurveda, AcharyaSushrutadesignates the lungs to be produced from the foam of the blood, whereas in the modern medicine it is defined as two lungs one lying on each side of the mid line of the thoracic cavity. They are cone shaped and pronounced as having an apex, a base, costal surface and medial surface. The pleura: the pleura is thin, double layered membrane which shelters the lungs it produces pleural fluid, a greasing serous secretion which residues between the two layers and the lungs simply glided at respiration.

### 8. Regulation of Respiration

The basic controller of breathing is directed by the accomplishments of neurons of medulla & pons. The respiratory centers in the Medulla & Pons are sensitive to both excitatory & inhibitory stimuli. The Pneumotaxic center encouragements the activity of medullary inspiratory centre. The PranaVayu stated at murdha (head) or brain control swasa (respiration) & other amendment of it for eg Ksavathu (sneezing) etc activities. According to CharakaSamhita the amplified & declines number of Swasana (respiration) is found in the internal covering (avarana) of VayuDosa. Thus the PranaVayu seated at murdha (brain) controls the swasana karma in life. Health (Swasthya) belongs to the haemostatic interrelationship (Dhatusamya) in all the systems of the body. PranaVayuplays very important role in its maintenance. The word Swasana is resulting from the root verb swasjvane with ghanj suffix meaning the life of air movement or business (activity). In fact the swasana is a well-known carrier of PranaVayu (Nabhisthapranapawanah) which is the key point of life & without the proper supply of air the O<sub>2</sub> cannot be absorbed by the blood.<sup>[1]</sup>

### 8. CONCLUSION

Conferring to Chandogyopanishad, one of the supreme ancient Upanishads, a human being can persist without eyes, ears, legs etc. but he cannot do so without breathing and without food, for life originates on these two basics and completely be contingent on them. This is the vital energy (prana) or vital force inside them. Lungs are the organs that benefit in this exchange of gases. The respiratory system is the channel that transmits the gases along with the vital life force, identified as the Prana. The antediluvian Ayurvedic scholars had obviously depicted the method of respiration in parlance of contemporary medical sciences. Maintenance of the respiratory tract is therefore actualsignificant. Problems in the respiratory tract can retire due to improper diet, seasonal changes, polluted air and lack of exercise Respiratory health can be enriched through controlled diet. Avoid fried food and, having light breakfast and

dinner are the best ways to be followed. Drinking luke warm water comforts to break chest congestion. Herbs resembling pippali, guduchi, shati, pushkarmoola etc are few of the lung supportive herbs. Warming the body through exercise is another way for sustaining respiratory health. Yoga, meditation and pranayama, in specific, purify the respiratory tract; strengthen the lungs and maintain healthy lung function.<sup>[2,3]</sup>

## REFERENCES

1. Ayurvediya Kriya Sharira, Mishra Y.C, editors Varanasi: Chaukambha Sanskrit Sansthan; 1<sup>st</sup> edition, 2008; 175-176.
2. <http://www.traditional-ayurvedic-center.com/ayurvedic-center/ayurveda-respiration-breathings.php>.
3. <http://www.ayurvedaacademy.com/blogs/respiratory-health#sthash.33lzCb60.dpuf>.