



Unique Journal of Medical and Dental Sciences

Available online: www.ujconline.net

Review Article

PHYSIOLOGY OF DEGLUTITION – A PANCHABHOUTHIK UNDERSTANDING

Patel Yashesh^{1*}, Kamath Nagaraj²

¹Asst. Professor, Department of Kriya Shareera, Shree RMD Ayurvedic College & Hospital, Valsad, India

²Asst. Professor, Department of Kriya Shareera, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan, Karnataka, India

Received: 14-07-2017; Revised: 12-08-2017; Accepted: 10-09-2017

*Corresponding Author: **Patel Yashesh**

Asst. Professor, Department of Kriya Shareera, Shree RMD Ayurvedic College & Hospital, Valsad, India

ABSTRACT

The individual is an epitome of the universe. All the material & spiritual phenomenon of the universe are present in the individual. Similarly all those present in the individual are also contained in the universe. The body is described as the modified form of *Mahabhutas* hence the description of the identity of the individual & the universe relates to *Mahabhutic* composition only. The multitudes of the human features are ascribed to the proportion of different *Bhutas* each of different nature.

The major function of *Prithvi Mahabhuta* is it improves the size by solidifying the body parts, *Jala Mahabhuta* confluences the body tissues, *Agni Mahabhuta* is responsible for metabolic activities, *Vayu Mahabhuta* divides and differentiates the cell and tissues, *Akasha Mahabhuta* increases the quantity by forming cavities.

The solid and tough structures like organs and at microscopic level and other cellular components are the attributes of *Prithvi Mahabhuta*. The liquid portion present inside the systems i.e. intracellular fluid, secretions from structures including saliva, mucosal secretion which helps in lubrication & moistening of food can be considered as the attributes of *Jala Mahabhuta*. The *Agni Mahabhuta* can be considered as neurotransmitters that are secreted for the initiation & continuation of deglutition process. The process of movement of food bolus from oral cavity to oesophagus, systemic control of deglutition, transmission of nerve impulse & food can be considered as the function because of *Vayu Mahabhuta* since the function of *Vayu Mahabhuta* is differentiation & movement. The space present inside various organs and various channels present for the secretions can be attributed to *Akasha Mahabhuta*.

Keywords: Panchamahabhuta, deglutition, *Shareera*, *Kriya*, *Physiology*.

INTRODUCTION

The individual is an epitome of the universe. All the material & spiritual phenomenon of the universe are present in the individual. Similarly all those present in the individual are also contained in the universe¹.

Originating in cosmic consciousness, this wisdom was intuitively received in the hearts of the ancient scholars. They perceived that consciousness was energy manifested into the five basic principles or elements. Man is microcosm of the nature and so the five basic elements present in all matter also exists within each individual. Thus out of the womb of the five elements, all matter is born. The five basic elements exist in all matter. Water provides the classic example: - the solids of iced water are manifestation of the *Prithvi Mahabhuta* (earth principle). Latent heat in the ice (*Agni*) liquefies it, manifesting into *Jala Mahabhuta* (water principle). And then eventually it turns into steam expressing the *Vayu Mahabhuta* (air principle) the steam disappears into *Akasha* or space². *Bhuta* is that which is not born out of something, but out of

which something is born. It is the material cause of substances in the world. When we say *Bhuta* we mean that subtle level of existence, where as *Mahabhuta* refers to gross level of existence³. *Panchikarana* is the process through which invisible *Bhutas* combine with each other and form the visible *Mahabhutas* in such a way that all *Bhutas* are present together in each *Drisyah Bhuta* in varying degrees of predominance. Thus in the physical world everything is a combination of *Pancha Mahabhutas* & we cannot see them independently⁴. Thus the five basic elements *AkashaVayu*, *Teja*, *Jala* and *Prithvi* are present in one substance. This proves that all five elements are present in all matter in the universe.⁵ Visualization of the identity of the individual with the universe paves the way for salvation. The body is described as the modified form of *Mahabhutas* hence the description of the identity of the individual & the universe relates to *Mahabhutic* composition only. The multitudes of the human features are ascribed to the proportion of different *Bhutas* each of different nature.

Deglutition or swallowing is the process by which food moves from mouth into stomach.

Deglutition occurs in three stages: I. Oral stage, when food moves from mouth to Pharynx II. Pharyngeal stage, when food moves from pharynx to esophagus III. Esophageal stage, when food moves from esophagus to stomach.

Oral stage of deglutition is a voluntary stage. In this stage, the bolus from mouth passes into pharynx by means of series of actions. Bolus is placed over postero-dorsal surface of the tongue. It is called the preparatory position Anterior part of tongue is retracted and depressed. Posterior part of tongue is elevated and retracted against the hard palate. This pushes the bolus backwards into the pharynx. Forceful contraction of tongue against the palate produces a positive pressure in the posterior part of oral cavity. This also pushes the food into pharynx.

Pharyngeal stage is an involuntary stage. In this stage, the bolus is pushed from pharynx into the esophagus. Pharynx is a common passage for food and air. It divides into larynx and esophagus. Larynx lies anteriorly and continues as respiratory passage. Esophagus lies behind the larynx and continues as GI tract. Since pharynx communicates with mouth, nose, larynx and esophagus, during this stage of deglutition, bolus from the pharynx can enter into four paths:

1. Back into mouth
2. Upward into nasopharynx
3. Forward into larynx
4. Downward into esophagus.

Entrance of bolus through other paths is prevented as follows:

1. Back into Mouth Return of bolus back into the mouth is prevented by:

- i. Position of tongue against the soft palate (roof of the mouth)
- ii. High intraoral pressure, developed by the movement of tongue.

2. Upward into Nasopharynx Movement of bolus into the nasopharynx from pharynx is prevented by elevation of soft palate along with its extension called uvula.

3. Forward into Larynx - Movement of bolus into the larynx is prevented by the following actions: i. Approximation of the vocal cords ii. Forward and upward movement of larynx iii. Backward movement of epiglottis to seal the opening of the larynx (glottis).

iv. All these movements arrest respiration for a few seconds. It is called deglutition apnea⁶.

Deglutition apnea refers to temporary arrest of breathing. Deglutition apnea or swallowing apnea is the arrest of breathing during pharyngeal stage of deglutition.

4. Entrance of Bolus into Esophagus - As the other three paths are closed, the bolus has to pass only through the esophagus.

This occurs by the combined effects of various factors:

- i. Upward movement of larynx stretches the opening of esophagus
- ii. Simultaneously, upper 3 to 4 cm of esophagus relaxes. This part of esophagus is formed by the cricopharyngeal muscle and it is called upper esophageal sphincter or pharyngo esophageal sphincter

- iii. At the same time, peristaltic contractions start in the pharynx due to the contraction of pharyngeal muscles
- iv. Elevation of larynx also lifts the glottis away from the food passage.

All the factors mentioned above act together so that, bolus moves easily into the esophagus. The whole process takes place within 1 to 2 seconds and this process is purely involuntary.

Esophageal stage is also an involuntary stage. In this stage, food from esophagus enters the stomach. Esophagus forms the passage for movement of bolus from pharynx to the stomach. Movements of esophagus are specifically organized for this function and the movements are called peristaltic waves. Peristalsis means a wave of contraction, followed by the wave of relaxation of muscle fibers of GI tract, which travel in aboral direction (away from mouth). By this type of movement, the contents are propelled down along the GI tract. When bolus reaches the esophagus, the peristaltic waves are initiated. Usually, two types of peristaltic contractions are produced in esophagus.

1. Primary Peristaltic Contractions - When bolus reaches the upper part of esophagus, the peristalsis starts. This is known as primary peristalsis. After origin, the peristaltic contractions pass down through the rest of the esophagus, propelling the bolus towards stomach. Pressure developed during the primary peristaltic contractions is important to propel the bolus. Initially, the pressure becomes negative in the upper part of esophagus. This is due to the stretching of the closed esophagus by the elevation of larynx. But immediately, the pressure becomes positive and increases up to 10 to 15 cm of H₂O.

If the primary peristaltic contractions are unable to propel the bolus into the stomach, the secondary peristaltic contractions appear and push the bolus into stomach. Secondary peristaltic contractions are induced by the distention of upper esophagus by the bolus. After origin, these contractions pass down like the primary contractions, producing a positive pressure.

Distal 2 to 5 cm of esophagus acts like a sphincter and it is called lower esophageal sphincter. It is constricted always. When bolus enters this part of the esophagus, this sphincter relaxes so that the contents enter the stomach. After the entry of bolus into the stomach, the sphincter constricts and closes the lower end of esophagus. The relaxation and constriction of sphincter occur in sequence with the arrival of peristaltic contractions of esophagus.

Though the beginning of swallowing is a voluntary act, later it becomes involuntary and is carried out by a reflex action called deglutition reflex. It occurs during the pharyngeal and esophageal stages.

When the bolus enters the oropharyngeal region, the receptors present in this region are stimulated. Afferent impulses from the oropharyngeal receptors pass via the glossopharyngeal nerve fibers to the deglutition center. Deglutition center is at the floor of the fourth ventricle in medulla oblongata of brain. Impulses from deglutition center travel through glossopharyngeal and vagus nerves (parasympathetic motor fibers) and reach soft palate, pharynx and esophagus. The glossopharyngeal nerve is concerned with pharyngeal stage of

swallowing. The vagus nerve is concerned with esophageal stage.

The reflex causes upward movement of soft palate, to close nasopharynx and upward movement of larynx, to close respiratory passage so that bolus enters the esophagus. Now the peristalsis occurs in esophagus, pushing the bolus into stomach⁷.

AIMS & OBJECTIVES

To critically analyze the *Panchabhauthik* understanding of physiology of deglutition.

MATERIALS AND METHODS

The *Bruhat Trayi* were scrutinised regarding the references for the *Guna* and *Karma* of the *Panchamahabhuta*. Later, physiologico-anatomical aspects of the physiology of deglutition were studied from modern physiology books. Later, supportive correlation was done between *Ayurvedic* and modern views to build valid and reliable hypothesis regarding the *Panchabhauthika* relation to the various anatomical and physiological aspects of deglutition.

DISCUSSION

The individual *Mahabhutas* will be having *Bhavas*. The *Bhavas* of *Akasha Mahabhuta* is audition, auditory apparatus, lightness, minuteness, separation, face, neck and lips. The *Bhavas* of *Vayu Mahabhuta* are touch, touch senses, dryness, inspiration, tissue configuration, vitality, apana region, motor function of body. *Tejah Mahabhuta Bhavas* are vision, visual apparatus, splendor, pitta, digestive power and heat and growth of body. The *Bhavas* of *Jala Mahabhuta* are taste, taste organ, coldness, softness, confluence, viscous, humidity, kapha, meda, rakta, mamsa, shukra. The *Bhavas* of *Pritvi Mahabhuta* are smell, olfactory organ, heaviness, stability and statuette.⁸

The major function of *Prithvi Mahabhuta* is it improves the size by solidifying the body parts, *Jala Mahabhuta* confluences the body tissues, *Agni Mahabhuta* is responsible for metabolic activities, *Vayu Mahabhuta* divides and differentiates the cell and tissues, *Akasha Mahabhuta* increases the quantity by forming cavities. These result in complexity, delightedness or richness, energy, movement, cavitations/perforations in the body.⁹

The solid and tough structures present in deglutition process like oral cavity, salivary gland, pharynx till the oesophagus can be considered as the attributes of *Prithvi Mahabhuta* at the level of physiology of deglutition. The liquid portion present inside the cells lining the gastro intestinal system i.e. intracellular fluid and also secretions from mucosal cells, salivary secretion can be considered as the attributes of *Jala Mahabhuta*. The fluid portion secreted which helps in lubrication, movement & moistening of food can be considered as the attributes of *Jala Mahabhuta* at the level deglutition physiology. The *Agni Mahabhuta* at level of Deglutition physiology can be considered as the various neurotransmitters that are secreted for the systemic control of initiation, continuation & stoppage of deglutition process. The process of movement of food from oral cavity to oesophagus

can be considered as the function because of *Vayu Mahabhuta* since the function of *Vayu Mahabhuta* is movement. The movement of various secretions from their respective organs is due to the influence of *Vayu Mahabhuta* since the movement is the function of *Vayu Mahabhuta*. The process of cell division, breakage of food from complex to simpler substance can be considered as the function because of *Vayu Mahabhuta* since the function of *Vayu Mahabhuta* is differentiation. The space present inside various organs and various channels present for the secretions, food bolus to flow can be attributed to *Akasha Mahabhuta*.

CONCLUSION

Man is microcosm of the nature and so the five basic elements present in all matter also exists within each individual. Thus out of the womb of the five elements, all matter is born. The five basic elements exist in all matter. Water provides the classic example: - the solids of iced water are manifestation of the *Prithvi Mahabhuta* (earth principle). Latent heat in the ice (*Agni*) liquefies it, manifesting into *Jala Mahabhuta* (water principle). And then eventually it turns into steam expressing the *Vayu Mahabhuta* (air principle) the steam disappears into *Akasha* or space.

The solid and tough structures like organs and at microscopic level and other cellular components are the attributes of *Prithvi Mahabhuta*. The liquid portion present inside the systems i.e. intracellular fluid, secretions from structures including saliva, mucosal secretion which helps in lubrication & moistening of food can be considered as the attributes of *Jala Mahabhuta*. The *Agni Mahabhuta* can be considered as neurotransmitters that are secreted for the initiation & continuation of deglutition process. The process of movement of food bolus from oral cavity to oesophagus, systemic control of deglutition, transmission of nerve impulse & food, breakdown of complex into simpler food substance can be considered as the function because of *Vayu Mahabhuta* since the function of *Vayu Mahabhuta* is movement & differentiation. The space present inside various organs and various channels present for the secretions can be attributed to *Akasha Mahabhuta*.

REFERENCES

1. Acharya JT. Charaka Samhita with Ayurveda Dipika commentary of Chakrapani Datta. Reprint ed. Varanasi (India): Chaukambha Orientalia; 2007. p. 325.
2. Acharya JT. Charaka Samhita with Ayurveda Dipika commentary of Chakrapani Datta. Reprint ed. Varanasi (India): Chaukambha Orientalia; 2007. p. 326.
3. Acharya JT. Charaka Samhita with Ayurveda Dipika commentary of Chakrapani Datta. Reprint ed. Varanasi (India): Chaukambha Orientalia; 2007. p. 325.
4. Acharya JT. Charaka Samhita with Ayurveda Dipika commentary of Chakrapani Datta. Reprint ed. Varanasi (India): Chaukambha Orientalia; 2007. p. 326.

5. Acharya JT. Charaka Samhita with Ayurveda Dipika commentary of Chakrapani Datta. Reprint ed. Varanasi (India): Chaukambha Orientalia; 2007. p. 138.
6. Sembulingam K, Essentials of medical physiology.6th edi. New Delhi: Jaypee publications; 2012, 270-2.
7. Sembulingam K, Essentials of medical physiology.6th edi. New Delhi: Jaypee publications; 2012, 270-2.
8. Acharya JT. Susruta Samhita with Nibandha sangraha commentary of Dalhana. Reprint ed. Varanasi (India): Chaukambha Sanskrit Sansthan; 2009. p. 364.
9. Acharya JT. Susruta Samhita with Nibandha sangraha commentary of Dalhana. Reprint ed. Varanasi (India): Chaukambha Sanskrit Sansthan; 2009. p. 363.

Source of support: Nil, Conflict of interest: None Declared