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Review Article

## Concept of Speech Production in Ayurveda

Sandhya Rani D <sup>1</sup>

Madhusudan B G <sup>2</sup>

### Abstract

Speech is the unique quality of human that distinguishes him from other living beings in this universe. Speech is one of the higher mental functions of brain co-ordinated by different systems of our body. Ayurveda the traditional Hindu system of medicine sprouted in this pristine land 5000 yrs ago is the oldest healthcare system in the world. Acharyas of Ayurveda in their works has elaborately explained the Anatomy, physiology of all most all organs, diseases, their pathology and management and also regarding Śabdopatti. The latest modern science, with its advanced technology is now emerging with same concepts.

Keywords: Speech, Śabdopatti, higher mental function

<sup>1</sup> Associate Professor, Department of Shalakyā Tantra, <sup>2</sup> Assistant Professor, Department of Roganidana, JSS Ayurveda Medical College & Hospital Mysuru.

### CORRESPONDING AUTHOR

Dr. SANDHYA RANI D

Associate Professor,

Department of Shalakyā Tantra,

JSS Ayurveda Medical College & Hospital Mysuru,

Karnataka, (India).

Email: sandhyaranid30@yahoo.in



## INTRODUCTION

Speech is the ability to convey thoughts, ideas or other information by means of articulating sound into meaningful words<sup>[i]</sup>. It is a unique feature of human beings which makes man a special creature on Earth. It is the ability with which humans can communicate with one other.

It is one of the higher functions of brain being co-ordinated by different systems like CNS, Respiratory, psychology, oral cavity structures. The production of speech is a highly complex motor task that involves different parts of Brain, nearly 20-25 major nerves, approximately 100 oro-facial, laryngeal, pharyngeal, and respiratory muscles.<sup>[ii,iii]</sup> Precise and expeditious timing of these muscles is essential for the production of temporally complex speech sounds, which are characterized by transitions as short as 10 ms between frequency bands and an average speaking rate of approximately 15 sounds per second. Speech production requires command from brain, airflow from the lungs (respiration) to be phonated through the vocal folds of the larynx (phonation) and resonated in the vocal cavities shaped by the jaw, soft palate, lips, tongue and other articulators (articulation).

**Speech Physiology:** Based on the physiological aspects speech production process can divide in three different stages. They are:

1. Conceptualisation.
2. Formulation
3. Articulation

### 1. Conceptualization:

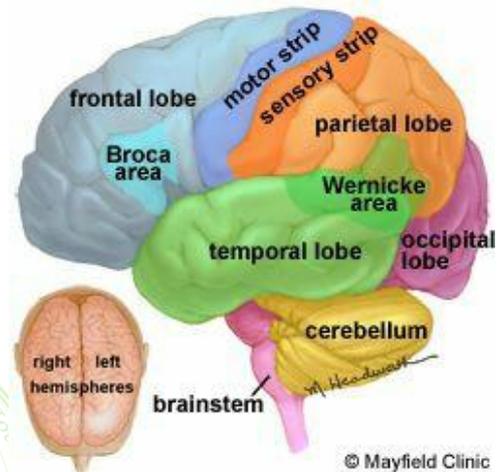
The mechanism of Speech production actually starts from our brain as a thought process. It can be considered as a pre-verbal message. This process is known as conceptualization. This includes the following activities.

- Central speech apparatus which consists of cortical & subcortical areas of brain with integration of 3 important areas of Cerebral cortex. They are:
  - Wernicke's Area
  - Broca's Area
  - Motor areas of dominant hemisphere.
- Peripheral speech apparatus includes larynx, Pharynx, oral cavity. These work in co-ordination with respiration and respiratory system.

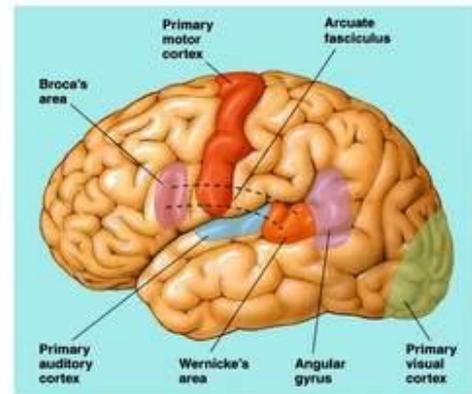
**Wernicke's area:** Situated in upper part of Temporal lobe, it is responsible for understanding the visual & auditory information required for the production of words. After understanding, it sends the information to Broca's area.

**Broca's Area:** Situated adjacent to motor area of larynx, tongue, lips & other structures necessary for speech production. Speech is synthesized in Broca's area. Here the thoughts are converted into words. It develops the pattern of motor activities required to verbalize the words and is sent to motor area.

**Motor areas of dominant hemisphere:** Situated next to Broca's area, after receiving the patterns of activities from Broca's area, the motor area initiates the movements of larynx, tongue, lips etc. for the Speech along with Respiratory muscles movement.



► Seven Components of the Wernicke-Geschwind Model

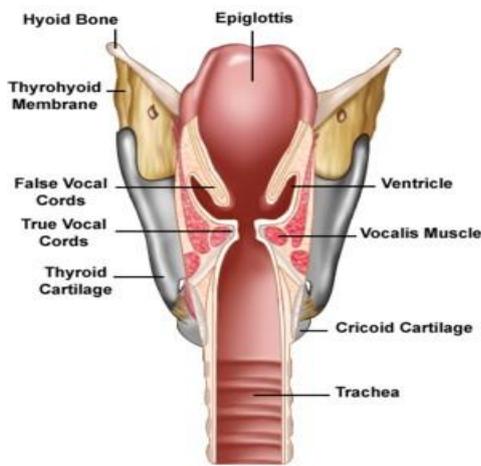
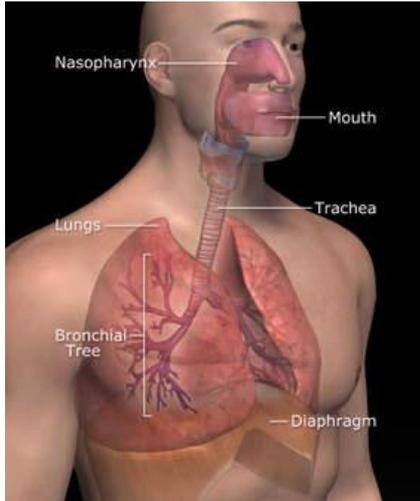


### 2. Formulation:

Second stage of speech production process is speech formulation. In formulation stage, our thoughts (pre-verbal message) are converted into linguistic form. This is known as speech formulation. It is also termed as Phonation.

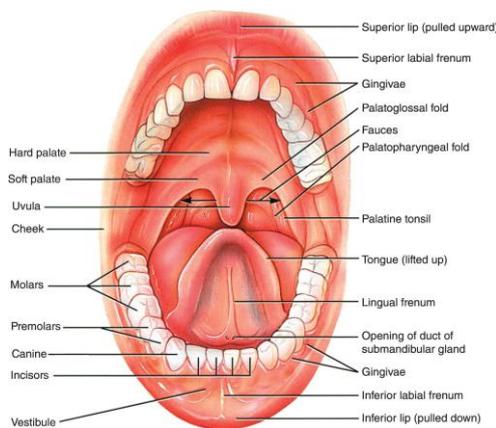
**Phonation:** It is the production of sound waves by vibration of vocal cords, caused due to airflow from lungs. The respiratory system with diaphragm & chest wall co-ordinate accordingly. Diaphragm raises → chest muscles flex → the pressure in the lungs increases which forces the air to exit from lungs. This air moves upwards reaches vocal cords and vibrates accordingly to pro-

duce sound. The pharynx, larynx and muscles of neck take active participation in this process.



### 3. Articulation:

It is the last stage of speech production. Here, the sound will be produced to convey message. Mobile & immobile structures of the face & oral cavity adjust the shape of the lips, tongue, teeth, palate, pharynx and nasal cavity as the vocal cords vibrate. Thus sound is produced with varying resonant frequencies.



Nerves responsible for Speech production: Cranial nerves such as Trigeminal, Facial, Vestibulocochlear, Glossopharyngeal, Vagus, Accessory and Hypoglossal

Nerves in co-ordination helps for speech production. Recurrent laryngeal nerve, a branch of Vagus nerve is important in sound production<sup>[iv,v,vi]</sup>.

**Ayurveda** – It is the combination of profound thought of medicine and philosophy. 5000 years back Acharya Charaka, Susruta, Vagbhata, Panini have elaborately explained the anatomy, physiology, pathology of various systems of our body. They have even explained the processes of Speech production and it is almost similar to modern physiology or even more accurate.

Ayurveda is a life science which deals with Tridośa sidhanta. Dośa, dhātu and malās are the basic elements which maintain the health of a person. The 5 types of Vāta, 5 types of Pitta and 5 types of Kapha in normalcy does nourishment of the body and helps to maintain normal functions of the body.

Acharya Charaka in Chikitsa sthana, while explaining the functions of various types of vāta, quotes that Udāna vāta located in nābhi, uras, kantha is responsible for Vākpravruti, prayatna, bala(strength), varna<sup>[vii]</sup>. Acharya Susruta in his Nidana Sthana specified that the production of speech-bhāṣita, gāyana (singing), and other functions related to speech are the main function of Udāna vāta and this Udāna vāta located in nabhi, uras, kanta, nasika. The vitiation of this vāta is responsible for the diseases of upper part of clavicle (jatrurd-wagata rogas) of the body<sup>[viii]</sup>. Acharya Vagbhata mentions, all types of vāta moves downwards, except Udāna vāta. It arises in Nābhi pradesha moves upwards to Uras, Kantha helps in vākpravruti, then moves to nāsika and mukha to produce all types of sound including singing<sup>[ix]</sup>.

Except Udāna vāta, other 4 types are said to have Adho gati chalatwa. With its functions related to Speech production and of ūrdhva jatru, Udāna vāta is the only type which is supposed to have Ūrdhva gati chalanta – Upward movement.

Panini in his book called Paaniniya Shiksha has narrated the entire processes of speech production as – Ātma with buddhi (intellect) takes decision whether to speak or not, and what to speak. Once the policy of what & how to speak is decided, manas (mind) is stimulated to induce Kāyāgni. This in turn motivates vāyu (udāna vāta). The udāna vāta which is situated in nābhi pradesha, uras (chest), kanta (throat), nāsika (nasal cavity) moves in upward direction to produce sound. Thus the udāna vāta stimulates the movement of the

structures of oral cavity to produce different words like anunāsika (words from nose), tāluja (words from palate), khantam (words from kantha) etc<sup>[10,11]</sup>

Śabda is basically classified into 3 types as Bhāṣita, Gīta and Upānśu japa. Bhāṣita is general talk, Gīta is singing and Upānśu is whisper. Another classification classifies śabda into four types as Drushtārtha, Adruštārtha, Satya and Anruta. Tarka sangraha classifies śabda into two as Dhvanyātmaka śabda – inarticulate sounds and Varnātmaka śabda – alphabetical sounds<sup>[x,xi]</sup>.

## DISCUSSION

Concept of production of speech and its related disorders have been explained in detail in Ayurveda and other ancient literatures of India. The concepts which were explained even then hold good and are in consensus with the Modern physiological explanation of Speech production which is rather much detail and elaborative. Udāna vāta with its pradhāna sthāna as Uras and sanchāra sthāna as Nāsa, Nābhi and gala, is in accordance with its function of Śabda utpatti. Sound production also needs muscles like Diaphragm, Abdominal and Chest wall muscles which come under the sanchāra sthāna of Udāna vāta itself. And also its functions can be correlated with that of Recurrent Laryngeal Nerve which has the primary function of Speech production by supplying the Larynx, Vocal cords and muscles related to it.

## CONCLUSION

The purpose of this paper is to give an overview of the speech production in Ayurveda in conjunction with the Modern Physiology. The concept of Śabdotpatti which was explained based on the Udāna vāta and its functions and is in accordance with the modern physiological explanation of Speech production at brain and phonation. In brief it can be concluded that it's very easy for a normal person to speak, but there is a very complex mechanism involved behind its production.

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