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Scientific approach to Panini's Uchharasthanani (site of phonation) W. S. R. to lower cranial nerves examination

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Abstract

Acharya Panini the pioneer in the development of Sanskrit grammar who has written Ashtadhyayi in Siddhanta kaumudhi. Under the heading of Samjna prakarana he explained the Uchharasthanas (Site of phonation). This part can be considered as an Ayurvedic and modern approach towards lower cranial nerve examination with respect to origin of letters.

Keywords: Uchharasthanani, cranial nerve

Introduction

Human being is distinguished from other animals by superior mental development, power of articulate speech, and upright stance. In the ancient era, our Acharyas have given very good tools to know the function of brain and cranial nerves. The work of great scholar Acharya Panini known to be developer of Sanskrit grammar, has given his huge contribution in the field of Linguistic description through Ashtadhyayi. He shared his knowledge to the world about the formation of speech and parts of the oral cavity involved in the formation of particular syllable. This part can be considered as an Ayurvedic approach towards lower cranial nerve examination with respect to origin of letters.

The cranial nerves innervate the muscle of the jaw, face, tongue, neck, pharynx and larynx. Some of them are motor, some are sensory and some are mixed nerves, containing both motor and sensory nerve fibres. Six of them are involved in speech and swallowing and are therefore very important to the speech.

The motor nuclei and processes of the cranial nerves are lower motor neurons as they form a final common pathway for information descending from the cerebrum to the periphery. Because the motor routes of the cranial nerves are located in the brain stem, messages from the pre-central and post-central gyri reach the cranial nerves on the corticobulbar portion of the pyramidal tract. With the exception of part of Cranial Nerve VII (Facial Nerve) and parts of Cranial Nerve XII (Hypoglossal Nerve), these innervations are bilateral. Along with the spinal nerves, the cranial nerves are part of the peripheral nervous system.

Henceforth an attempt is made to correlate the concept of Uchharasthana (origin of letters) in the examination of lower cranial nerves (V, VII, IX, X, and XI, XII). Acharya Panini has explained the formation of speech from different parts of the oral cavity.

Speech Production

It is the process by which thoughts are translated in to speech. This includes the selection of words, organization of relevant grammatical forms, and the articulation of the resulting sounds by the motor system using the vocal apparatus.

Normally speech is created with pulmonary pressure provided by the lungs that generates sounds by phonation through the glottis in the larynx that then is modified by the vocal track into different vowels and consonants.

Places of Articulation

The physical structure of the human nose, throat, and vocal cords allows for the production of many unique sounds, these areas can be broken down in to places of articulation. Different sounds produce in the different areas, and with different muscles and breathing techniques [1]. Difficulties in manner of articulation can contribute to speech difficulties and impediments [2].

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Neuroscience

The motor control for speech production in right handed people depends mostly upon areas in the left cerebral hemisphere. These areas include the bilateral supplementary motor area, the left posterior inferior frontal gyrus, the left insula, the left primary motor cortex and temporal cortex [3].

There are also subcortical areas involved such as the basal ganglia and cerebellum [4,5]. The cerebellum aids the sequencing of speech syllables in to fast, smooth and rhythmically organized words and longer utterances.

Cranial Nerves Involved In The Speech

1. Cranial Nerve V – The Trigeminal nerve
2. Cranial Nerve VII – The Facial nerve
3. Cranial Nerve IX – The Glossopharyngeal nerve
4. Cranial Nerve X – The Vagus nerve
5. Cranial Nerve XI – The Spinal accessory nerve
6. Cranial Nerve XII – The Hypoglossal nerve

Panini's Uchharsthanani and Cranial Nerves

a) Cranial Nerve V – Trigeminal nerve (Mixed)

Motor nucleus of this nerve originates in the pons.

Motor innervations are muscles of mastication, the tensor veli palatine part of the velum (soft palate), Tensor tympani muscle of the middle ear, mylohyoid and anterior belly of digastrics muscle.

Sensory innervations (ophthalmic and maxillary branch) are head, jaw, face and anterior 2/3rd of the tongue.

Motor examination

Mandibular branch –

Eg- उप् पध्मानीयानां औष्ठौ I

Letters- प, फ, ब, भ, म

When we try to pronounce Labial letters with loudly then there is wide opening of jaw with lip movement is present which is innervated by two branches of the trigeminal nerve. So if any difficulty in Uchharas (Pronounce) of Labial letters then it suggest Mandibular branch lesion in trigeminal nerve.

Sensory examination

Eg – लुतुलसानां दन्ताः।

Letters - त, थ, द, ध, न. (Dental letters)

Examination - The patient should be asked to speak these dental letters. If he is not able to sense over palate, upper teeth and gums, it suggests of lesion in the maxillary branch of trigeminal nerve.

b) CN VII (facial nerve) – Mixed nerve

Motor root supplies the stapedius, facial muscles, scalp and platysma.

Sensory root supplies Chorda tympani nerve carries the taste sensation from the anterior 2/3rd of the tongue to the facial nerve.

Eg- उप् पध्मानीयानां औष्ठौ I

Letters- प, फ, ब, भ, म

Examination - When Labial letters are tried by patient if the letters are not phonated properly (low pitch and unclear) with deviation of lips and cheeks towards unaffected side with

escaping of air from mouth indicates lesion of Facial Nerve.

c) CN IX (glossopharyngeal nerve) – mixed nerve

Eg: इच्युशानांतालुःI

Letters - च, छ, ज, झ, ञ

Examination - When patient try palatial letters then there is low phonation with formation of guttural letters instead of palatial letters and air will escape from nose. These signs (Dysarthria, slurred speech) can be observed mostly in pharyngeal involvement because pharynx is innervated by the Cranial Nerve IX.

d) Cranial Nerve X (vagus nerve) - mixed

Eg- अकुह विसर्जनीयानां कण्ठः I

Letters - क, ख, ग, घ, ङ, ह

Examination - When patient utters the Gutturals letters then in pathological condition of the Vagus nerve there will be less phonation and low pitch sound or no letters formation. This is due to the inadequate pressure for phonation as well as laryngeal insufficiency leading to absence of phonation.

e) Cranial Nerve XI (spinal accessory nerve)

Eg - ए, ऐ

For the letters ए, ऐ origins are the expressions in mouth are – throat and palate

Examination - Ask the patient to speak loudly these two letters, if the patient is not able to speak ऐ letter then there is lesion in the spinal accessory nerve. Because of this there is no elevation of the palate.

f) Cranial Nerve XII (Hypoglossal nerve)

Eg – ऋटुरषाणां मूर्धा।

Letters - ट, ठ, ड, ढ, ण

Examination – The patient is asked to pronounce the cerebral letters. If there is difficulty in speaking these letters, it confirms the lesion in hypoglossal nerve. Because of this tongue will not twist and so unable to pronounce cerebral letters.

Discussion

Articulation is the movement of tongue, lips, jaw, teeth, palate, larynx, and pharynx in order to make speech sounds. These organs involved in speech are mainly supplied by the lower cranial nerves. Acharya Panini⁶ has explained origin of letters during articulation along with specific organ involved in production of that particular letter. This concept can be used to examine the particular cranial nerve involvement in the neurological condition.

Conclusion

Based on uchharsthanani (Site of Phonation) of Panini's letters we can examine the lower cranial nerves very quickly and also we can differentiate the mixed pathology also.

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