



Critical Evaluation of Ayurvedic Shabda Pariksha (Auscultation) In Diagnosis of Diseases WSR to Computerized Sound Analysis

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Review Article

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Abstract

The various sound produced in the body are used as tools in the diagnosis of disease by Ayurvedic acharyas. Acharya Charaka, in Vimansthana, had asked to examine the bowel sounds, joint crepitation and other peculiar sounds produced in the body such as cough and hiccups to diagnose the particular disease condition of particular system. Apart from this ancient Ayurvedic scholars have described the typical sound produced in various disease conditions such as Tamak shwasa (Bronchial Asthma) causing audible wheeze. Maha Shwasa (Kusmaul's breathing) causing loud audible wheeze. Krukaj Kasa (Whooping cough) causing characteristic Whoop sound, Swarabheda (Laryngeal disease) causing hoarseness of voice. These qualitative acoustic differences of cough could be well picked up by the trained physicians. Attempts to record the cough sound digitally and to analyse it on computer software are being going on across the globe. Examination of waveforms and spectrograms related to coughing as obtained from computerized respiratory sound analysis should hold a future acoustic based laboratory diagnosis of cough. Further Ayurveda is also of the view that every individual has characteristic voice depending upon the doshik predominance of his body constitution.

It is observed and concluded that sound examination can be used as tool to diagnose the disease and body phenotype as mentioned in Ayurveda.

Keywords: Shrawan; Auscultation; Shwasa; Kasa

Introduction

Ayurveda is of the view that every individual has characteristic voice depending upon the doshik predominance of his body constitution. In a book called, Yogaratnakara, the characteristics of voice of Vataj, Pittaj and Kaphaj body constitutions have been mentioned. Acharya Charaka, in Indriyasthan of his treatise 'Charak Samhita' had described the characteristics of normal and abnormal voice based on animal models of sound. As per acharya Kashyapa (Sutrasthan 28), from examination of voice (swara), the

body essence (sara) can also be inferred. This is because particular Sara person has particular voice reflecting the acoustic properties of that Sara. The various sound produced in the body are used as tools in the diagnosis of disease by Ayurvedic acharyas. The Shrawan Pariksha mentioned by acharya Sushruta relates to the surgical disorders. For e.g. sound of bubbling of gas produced in gas gangrene. Acharya Charaka, in Vimansthana, had asked to examine the bowel sounds, joint crepitation and other peculiar sounds produced in the body such as cough and hiccups to diagnose the particular disease condition of particular system. Apart

from this ancient Ayurvedic scholars have described the typical sound produced in various disease conditions such as Tamak shwasa (Bronchial Asthma) causing audible wheeze. Maha Shwasa (Kussmaul's breathing) causing loud audible wheeze.

Krukaj Kasa (Whooping cough) causing characteristic Whoop sound, Swarabheda (Laryngeal disease) causing hoarseness of voice. Vakastambha (Tongue paralysis) causing Minminivta (Nasal speech) and Gadgadatva (Spastic speech), Ardita (Facial Palsy) causing Vaksanga (dysarthria). Sandhivata (Osteoarthritis) causing joint crepitations. Alasaka (Gastroparesis) causing abdominal gurgling, Apatantraka & Apatanaka (Tetanus) causing laryngeal stridor with loud audible wheeze. Sangrahani & Ghati Yantra (IBS) causing abdominal gurgling. Pandu (Anemia) causing tachycardia. These qualitative acoustic differences of cough could be well picked up by the trained physicians.

The concept of sound examination is also used in Percussion examination. And accordingly the dull and resonant percussory note yielding conditions have also been mentioned by ancient acharyas. Attempts to record the cough sound digitally and to analyse it on computer software are being going on across the globe. Examination of waveforms and spectrograms related to coughing as obtained from computerized respiratory sound analysis should hold a future acoustic based laboratory diagnosis of cough.

Review of Literature

Quality of Voice as per Doshik Variations

Person with Kaphaj body constitution has heavy, sweet and deep voice. In Pittaj body constitution, voice is broken but cracking. In Vataj type of body constitution, voice is neither heavy nor broken but rough and disliked [1].

Characteristic of Normal Voice

Normal voice resembles the voice of swan (Hansa), demoiselle crane (Kraunch), felly of wheel (Nemi), kettle drum (Dundubhi), house sparrow (Kalvink) crow (Kak), pigeon (Kapot), jahrjahra drum (Jarjar) are taken as normal. Other such voice may be known from the experts [2].

Characteristic of Abnormal Voice

Abnormal voice is like that of sheep or goat (Adak) and is feeble (Kal), subdued (Grastaha), indistinct (Avykta), choaked (Gadgad), faint (Ksham), poor (Deen), and stammering (Anukirnaha) and other types of voices which are heard for the first time [3].

Examination of Sound [4-25]

- Fewer than eight fold examinations, Shabda Pariksha (sound examination) should be done.
- Bowel sounds, Joint crepitation and other peculiar sounds produced in the body should be examined through auscultation.
- The other peculiar sounds like hiccups and cough should also be heard.
- The sound produced in infective or gangrenous wound should be noted.
- Disease Condition & Type of sound
- Shwasa vyadhi (Dyspnea), the respiratory sound is harsh like as if blowing the fire in pot. (Bhinna Kansya Tulya Swara).
- In Kasa vyadhi (Cough), the cough sound is like as if striking the bronze pot.
- In Jara Kasa vyadhi (Cough due to old age), the cough sound is like as if striking the bronze pot.
- In Kshataj Kasa (Bronchitis), there is pigeon like sound (Paravat Eva Koojanam).
- In Krukaj Kasa (whooping cough), there is whoop whoop like sound while coughing.
- In Tamak Shwasa there is loud audible wheeze (Kanth ghurghurakam).
- In Maha Shwasam there is noisy respiration like that of angry bull (Matta Vrushabh Eva).
- In Vatajj Swarabheda there is hoarseness of voice.
- In Medoj Swarabheda there is low tone voice.
- In Neela Manya Marmaghat (trauma to laryngeal nerve), there is hoarseness of voice.
- In Pandu (Anemia) the Dhad Dhad sound is noticed with tachycardia.
- In Kaphaj Pandu (Anemia), there could be difficulty in talking (Vakswar Graha).
- In Sangraha Grahani (IBS), there is abdominal gurgling (Antra Koojanam).
- In Ghati Yantra Grahani (IBS), there is abdominal gurgling of greater degree (Gudgud Dhvani).
- In Udaradhman (abdominal distension), there is abdominal gurgling (udar atop Gudgud shabda).
- In Apatantraka/Apatanaka (Tetanus), there is pigeon like sound (Kapot Eva Koojanam).
- In Ardita (Facial Palsy), there is loss of sound (Vak Sanga).
- In Shabdawahini Dhamani Vikruti (glossopharyngeal nerve lesion), there is nasal bleating type of speech (Minimitva) or spastic speech (Gad Gad Wani) or there could be loss of speech.
- In pathological states of lungs, the respiration similar to breath of snake or flute like sound is produced. If there is accumulation of cough, pus or blood in lungs then the crepitation are heard. (sound produced while cleaning the mudded leaf)

- In cardiac enlargement, the sound is not heard at its regular site but at the displaced site. And the pitch of the sound is comparatively slower.
- Disease Condition & Percussionary Note
- In Vatodara (Gaseous abdominal distension), the percussion yield resonant note (Adhmat Drutiwat Shabdamaahatam Prakroti).
- In Jalodara (Ascites), the percussion yield dull note (Akotitam Ashabdama).

Observations and Results (Table 1-4)

Vataj Prakriti	Pittaj Prakriti	Kaphaj Prakriti
Rough and Disliked Voice	Broken and Cracking Voice	Heavy, Sweet and Deep Voice

Table 1: Quality of Voice as Per Doshik Variations.

S. no	Normal Voice	Abnormal Voice
1	Swan (Hansa) like	Goat like Nasal bleating (Adak)
2	Demoiselle crane (Kraunch) like	Feeble (Kal)
3	felly of wheel (Nemi) like	Subdued (Grastaha)
4	Kettle drum (Dundubhi) like	Indistinct (Avykta)
5	House sparrow (Kalvink) like	Spastic (Gadgad)
6	Crow (Kak) like	Faint (Ksham)
7	Pigeon (Kapot) like	Poor (Deena)
8	Jahrjahra drum (Jarjar) like	Stammering (Anukirnaha)

Table 2: Characteristic of Normal and Abnormal Voice as Per Ayurveda.

S.no	Disease Condition	Type of Sound
1	Shwasa (Tachypnea)	Bhastrika Dhmanwat (like blowing in fire pot)
2	Kasa (Cough)	Bhinna Kansya Tulya (like striking on bronze pot)
3	Hikka (Hiccup)	Hik Hik
4	Tamak shwasa (Bronchial Asthma)	Kapot Eva Koojanam (Loud wheezing resembling the sound of pigeons)
5	Apatantraka and Apatanaka (Tetanus)	Kapot Eva Koojanam (Loud wheezing resembling the sound of pigeons)
6	Maha Shwasa (Kussmaul's breathing)	Matta Vrushabh Eva (Noisy respiration like that of angry bull)
7	Krukkaj Kasa (whooping cough)	Whoop whoop like sound
8	Swarabheda (Laryngeal Disease)	Gardabha wat swara (Donkey like hoarseness of voice)
9	Pandu (Anemia)	Hritdrava - Eti Dad Dadika (Palpitations)
10	Sandhivata (Osteoarthritis)	Sandhi Aatopa (joint crepitation)
11	Alasaka (Gastroparesis)	Udara Koojana (Abdominal gurgling)
12	Sangrahani & Ghati Yantra (IBS)	Antra Koojana (Abdominal gurgling)
13	Vakastambha (Tongue paralysis)	Minminitva (Nasal speech) and Gadgadatva (Spastic speech)
14	Ardita (Facial Palsy)	Vaksanga (dysarthria)
15	Swar upghat karak asadhya galganda (myxoedema)	Swarabheda (change of voice)
16	Vrudhhasya Swarbheda (chronic atrophic laryngitis)	Swarbheda (Change of voice in old peoples)
17	Swaraghna (Laryngeal Malignancy)	Gardabha wat swara (Donkey hoarseness of voice)

Table 3: Disease Condition and Type of Sound.

	Dull Note	Resonant Note
Ayurvedokta Condition	Jalodara (Ascites)	Vatodara (Gaseous Abdominal Distension)
Condition In Modern Science	Ascites, Hydrothorax, Pleural effusion, Consolidation and fibrosis of lungs	Abdominal obstruction, Gaseous Abdominal Distension, Pneumothorax, Emphysema

Table 4: Disease Condition and Percussionary Note.

Discussion

Ayurveda is of the view that every individual has characteristic voice depending upon the doshik predominance of his body constitution. In a book called, Yogaratnakara, the characteristics of voice of Vataj, Pittaj and Kaphaj body constitutions have been mentioned. Acharya Charaka, in Indriyasthanana of his treatise 'Charaka Samhita' had described the characteristics of normal and abnormal voice based on animal models of sound. As per acharya Kashyapa (Sutrasthanana 28), from examination of voice (swara), the body essence (sara) can also be inferred. This is because particular Sara person has particular voice reflecting the acoustic properties of that Sara.

The characteristic normal and abnormal human sounds resembling the sounds of different animals mentioned by acharya Charaka in Indriyasthanana, may now be fed to the computer software and could be analysed with respect to waveforms and spectrograms. The various sound produced in the body are used as tools in the diagnosis of disease by Ayurvedic acharyas. Acharya Charaka, in Vimansthana, had asked to examine the bowel sounds, joint crepitation and other peculiar sounds produced in the body such as cough and hiccups to diagnose the particular disease condition of particular system. Apart from this ancient Ayurvedic scholars have described the typical sound produced in various disease conditions such as Tamak shwasa (Bronchial Asthma) causing audible wheeze. Maha Shwasa (Kussmaul's breathing) causing loud audible wheeze.

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Coughing is characterized by the sudden expulsion of air from the airways with typical sound. The quality of cough sound may provide some clue about the underlying disease. Dog barking cough with and breathing with whistling

is observed in viral cough. Rattling cough is observed in bronchitis. Long bouts of cough are observed in COPD due to collapse of lower lung alveoli. Whereas wheezing cough is observed in Asthma. These qualitative acoustic differences of cough could be well picked up by the trained physicians. Attempts to record the cough sound digitally and to analyse it on computer software are being going on across the globe. Examination of waveforms and spectrograms related to coughing as obtained from computerized respiratory sound analysis should hold a future acoustic based laboratory diagnosis of cough [26, 27].

Swarbheda refers to change of voice (Bhinna swar) which is unpleasant (udweg janak) and may resemble the rough sound of donkey (Gardhbh wat khar) or crow (Kak wat) due to invasion of sound tract by morbid doshas. Strenuous shouting and reading (Ati uchha Bhashan / Adhyayan) can lead to acute submucosal hemorrhage in the vocal cord. This type of hoarseness of limited duration is generally due to overuse of the voice and is commonly found in teachers and singers as mentioned by acharya Sushruta.

Persistent hoarseness may result due to chronic irritation of the larynx which in turn can be caused by smoking or excessive alcoholism (Madyam) as mentioned by Madhava. Irritation can also be caused by mucus constantly dripping on the larynx as may occur in nasal polyp (Nasarsh), allergic rhinitis, sinusitis, deviated nasal septum (Pratinaha). Asthi-Majjagat Kushtha mentioned by acharya Sushruta in Nidansthana, which produces hoarseness of voice refers to deep spreading of Leprosy with laryngeal cartilages & nerve involvement along with other systemic neuro-osteo involvement.

Vrudhhasya Swarbheda (Change of voice in old people) mentioned by acharya Sushruta in Uttartantra, indicate chronic atrophic laryngitis. Sahaj Swarabheda mentioned by acharya Sushruta in Uttartantra, refers to congenital hoarseness of voice. Chirothha Swarabheda mentioned by acharya Sushruta in Uttartantra refers to chronic laryngitis. Swar upghat karak asadhya galganda mentioned by acharya Sushruta in Nidansthana may refer to myxoedematous swelling compressing trachea externally.

Neela Manya Marmaghat mentioned by acharya Sushruta in Sharisthana six could be trauma to laryngeal nerve resulting in hoarseness of voice. Kshayaj Swarbheda

and Kshinasya Swarbheda indicate tubercular hoarseness of voice. Here, the word 'kshina' refers to urah kshinata (chest emaciation or chest retraction due to lung fibrosis as may occur in pulmonary tuberculosis). As per Chakrapani, Kshinata results due to oja-kshaya. Krushasya Swarbheda indicates malignant hoarseness of voice. Here, the word 'Krushata' refers to gross emaciation of the body which can occur in malignant involvement of larynx.

Kshinata and Krushata in Swarabheda may occur because of tubercular or malignant involvement of larynx. But to differentiate them from each other specific word has been used by acharyas. Swaraghna is a disease invading entire throat and laryngeal apparatus resulting in change of voice, tachypnoea, and altered consciousness. As it is incurable; it appears as laryngeal malignancy. Ultimately there is loss of voice (Swara = sound, ghna = loss). Medoj Swarabheda mentioned by acharya Sushruta in Uttartantra, may occur in obese peoples but as it has been mentioned as incurable; this could most likely be fatty infiltration of larynx as may occur in laryngeal lipoma.

Although, in the other possible conditions of Kanthagat rogas mentioned in Ayurveda such as Balas (Chronic Laryngitis), Shataghni (Laryngeal Papilloma), Rohini (Diphtheric laryngitis), Kantha shaluk (Laryngeal Cyst) etc. the word 'Swarbheda' is not mentioned directly as a sign but as these are the throat diseases involving larynx, the associated change of voice can very well be understood. The stridor (Kantha Koojan) in tetanus could be due to upper airway obstruction. The noisy respiration with wheeze (Kante Ghurghurakam) in Asthma is due to rattling of secretions in respiratory tract and bronchoconstriction. The barking type cough may indicate the infective pathology.

Vakastambha (Dysarthria) refers to difficulty or inability to speak or indistinct speech due to impaired coordination of orolingual muscles and the tongue required for speech. It can be reflected as:

- Spastic speech (Gad Gadatwa): Difficulty in pronouncing 'b''p''t' [UMNL] (Lupta Vyanjan).
- Ataxic Speech: Slurred and irregular [Cerebellar lesions].
- LMNL speech (Min Minitwa): Nasal speech (Sanunasik Vachan) ['egg' as 'eng'].
- Monotonous: Slow speech lacking style of pronunciation [Extra Pyramidal lesion]

The 'Vak Stambha' (stiffness of tongue) mentioned in Pakshwadha (hemiplegia) by Charaka in chikitsasthana 28/53, characterized by spastic or slurred speech as the patient attempts to speak. While describing 'Ardha Sharir Ardit', Charaka in chikitsasthana 28/38-42, mentioned constriction of the tongue (Jivha snakoch) and the resultant dysarthria (Bhidya Swara).

Charaka in 'Siddhithana 9/6 also mentioned that 'Gadagadatwa' (spastic speech) could result due to brain trauma [Indicating upper motor neuron lesion]. Myasthenia gravis is a neuromuscular disorder characterized by weakness and fatigability of skeletal muscles. Diplopia and ptosis are common initial complaints. Facial weakness produces a "snarling" expression when the patient attempts to smile. Weakness in chewing, Speech may have a nasal or dysarthria quality due to tongue weakness.

The concept of sound examination is also used in Percussion examination. And accordingly the dull and resonant percussory note yielding conditions have also been mentioned by ancient acharya. In ancient times auscultation was done purely through ears and no any reference to stethoscope like devices is found in the ancient books. The ancient Indian physicians used to directly apply the ear to the chest to hear the heart and lung sounds. The heart sounds, lung sounds and bowel sounds, were auscultated by keeping the ear in close contact with chest and abdomen respectively. With the advent of stethoscope by French Physician Rinne Lennec (1781-1836), auscultation has occupied the prime position as physical examination method in the diagnosis of the chest diseases to such an extent that it has become the symbol of modern day physician. However, the first prototype of stethoscope was invented by Chinese and probably the Indian sage Kashyapa. We find a sculpture of sage Kashyapa depicting the auscultation of the chest of a child with the hollow branch of pappya at Kaneri matha museum, kolahapur (Maharashtra, India). However, the antiquity of the original sculpture from where this is designed could not be authenticated.

The stethoscope is an instrument that does not significantly amplify sound, but, more important, acts as a selective filter of sound. Briefly, the bell filters high-frequency sounds greater than 1500 cycles per second and therefore should be used to detect low-frequency sounds. On the other hand, the diaphragm selectively filters low-frequency sounds. Since sounds produced by breathing tend to be of relatively high pitch, the chest is auscultated with the diaphragm.

Summary and Conclusion

- The concept of sound examination is very well documented in ancient Indian medical science
- The sound examination can be done by naked ears and through amplifying instruments like stethoscope.
- The computerized analysis of sound examination through waveforms and spectrograms is the new development in sound analysis for diagnosis.
- The sound examination is helpful in making the diagnosis of some of the diseases.

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