Acoustic and Temporal Aspects of Oesophageal Speech

Sanyogeetha J. N.
Student, A.I.I.S.H, Mysore

Speech is a multidimensional signal that elicits a linguistic association (Flanagan 1972). It is believed that human beings are specialized for speech communication, most evidently for speech production.

Surgical removal of larynx - LARYNGECTOMY - leaves the operated individual - LARYNGECTOMEE - handicapped in speech production. The speech clinician helps in the rehabilitation of the laryngectomee by developing some means of functional communication. The '**oesophageal speech'** has been traditionally considered as the method of choice.

Once the laryngectomee has acquired oesophageal phonation, the aim will be to bring the oesophageal speech more towards normal, making it more intelligible and acceptable. Hence identifying the parameters of oesophageal speech derriating from normal speech is very important. The present study is one such effort at identifying the deviation psychoacoustic, acoustic, temporal and spectral parameters of oesophageal speech.

The voice and speech samples from 5 Marathi speaking oesophageal speakers and 5 Marathi speaking normal subjects matched for age, sex and education were collected. These were analysed using computer programs and judges to obtaining the following parameters

Psychoacoustic measures

1. Acceptability of speech
2. Intelligibility of speech

Acoustic measures

3. Fundamental frequency in speech
4. Frequency range in speech
5. Intonation contours for specific types of sentences i.e., declaratives and interrogatives.

Temporal measures

6. Vowel duration
7. Burst duration
8. Voice onset time for voiceless stops
9. Mean pause duration
10. Rate of speech

Spectral measures

11. First three formant frequencies (F1, F2, F3)for the vowel */e/, /il, /a/,* /o,/u/

The results were subjected to statistical analysis using Wilcoxon matched pairs test. The following conclusions were drawn based on the statistical analysis.

1. Oesophageal speech was less acceptable and intelligible than the normal laryngeal speech.

2. The oesophageal speakers did not differ significantly from the normal speakers on the following parameters:

a. Fundamental frequency in speech
b. Frequency range in speech
c. Vowel duration
d. Mean pause duration.

3. Significantly higher burst durations than normals were seen in the oesophageal speakers.

4. Voice onset time for the voiceless aspirated stops /p^h/ and /k^h/ were significantly reduced in oesophageal speakers compared to normals.

5. Higher formant frequencies than in normals were seen in oesophageal speakers.

Comparison of intonation contours used by oesophageal and normal speakers revealed that oesophageal speakers do use the same intonation contours as normal speakers, but the change in frequency in case of oesophageal speakers is discontinuous and produces a scatter.

Thus the results indicate that in oesophageal speakers, the phonatory as well as articulatory behavior is altered. Analysis of voice/speech of laryngectomees can help in planning and monitoring the therapy programs and assessing the gains of therapy.