

Closed Quotient as a Glottal Efficiency Indicator

M.N. Balakrishna

Student, A.I.I.S.H, Mysore

The study of the vibratory patterns of vocal folds has drawn attention of researchers. Recently several methods have been developed for objectively studying the movements of vocal folds. One of them is electroglottography. E.G.G. has many advantages over other techniques mainly because it is a non-invasive technique and permits quantification of vocal fold vibration.

As there are not many studies in relating the parameters of EGG to perceived voice quality, this study was undertaken. Also the newly developed automatic method of extraction was validated and was used for obtaining various parameters of EGG.

30 normal subjects (15 males and 15 females) in the age range of 18 to 31 years and 6 trained singers (3 males and 3 females) in the age range of 22 to 38 years were studied using Laryngograph (Kay Elemetrics corporation) and PC/AT with speech interphase unit (Wipro and voice & speech systems). The following parameters were obtained for low pitch, habitual pitch & high pitch phonation keeping pitch and intensity constant.

1. Closed quotient
2. Fundamental frequency
3. Open quotient
4. Speed quotient
5. Speed index

The data thus obtained were subjected to statistical analysis to find out the mean, standard deviation, range, significance of difference and correlation across the different pitches for all the parameters.

The following conclusions were drawn on the results :

1. The automatic extraction method using positive and negative cut off points as 7% and 10% respectively is valid in extracting all the glottal parameters studied.
2. There is no significant difference in the value of these parameters either by using 10 or 100 cycles of sample in the automatic extraction method, in case of normals.
3. There is no effect of sex on the CQ values in normals.
4. There is considerable change in CQ values of normals by changing the fundamental frequency of phonation. The CQ value decreases as the Fundamental frequency of phonation increases.
5. There is considerable effect of training on the CQ values as singers show a higher value of CQ.
6. CQ can be used as an indicator of glottal efficiency (higher value of CQ is associated with good voice quality).
7. There is significant difference between males and females in terms of fundamental frequency.
8. There is considerable effect of fundamental frequency on the perceived voice quality.

9. Fundamental frequency can also be used as cue for estimating the glottal efficiency as the quality of voice goes down with increase in fundamental frequency from habitual pitch to high pitch.
10. There is no effect of sex on the OQ values of normals.
11. There is considerable effect of Fo on OQ in normals (OQ decreases as the fundamental frequency increases).
12. OQ can be used as an indication of glottal efficiency (higher value of OQ is associated reduced voice quality).
13. There is considerable effect of sex on The SQ values of normals.
14. There is no effect of fundamental frequency on the SQ values of normals.
15. SQ is related to glottal efficiency (lower SQ value is associated with good voice quality).
16. SQ is related to glottal efficiency (lower SQ value is associated with good voice quality).
17. There is an effect of sex on SI values of normals.
18. There is no effect of fundamental frequency on the SI values.
19. SI is related to fo glottal efficiency.

Thus the parameter CQ, OQ, SQ, SI & Fo gives valuable information in the estimation of glottal efficiency by descending the vocal fold vibratory patterns of normals. It is hoped that the programme for automatic extraction of the parameters would be useful in describing the vibratory patterns even in case of abnormal voice.