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Speech Intelligibility in Patients with T1 and T2 Cancers of the Oral Tongue Treated by Wide Excision and Primary Closure

Dr. Swapna Sebastian, Anto Suresh B., and Dr. Achamma Ballraj

Abstract

Aim: Glossectomy can affect tongue mobility and impairment of speech. Aim of the study was to measure speech intelligibility preoperatively and post operatively in patients with T1 and T2 cancers of oral tongue who have undergone wide excision and primary closure.

Materials and Methods: Twelve patients with T1 and T2 cancers of the oral tongue treated by wide excision and primary closure between the ages of 50 to 70 years were taken up for the study. Two of the patients were females and 10 of them were males. All of them had Malayalam as their mother tongue. Speech samples were recorded preoperatively (2-3 days before surgery) and four weeks post operatively.

Results: The results revealed that though there was a difference between preoperative and post-operative perceptual analysis of both vowels, consonants, words and passage, the differences were significant only for the passage.

Conclusion: Patients with T1 and T2 cancers of oral tongue who have undergone wide excision and primary closure showed better intelligibility scores at phoneme level and word level even

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after surgery and the intelligibility deteriorated at sentence level. This could be due to the failure to meet the demand on the articulators to move faster for the continuous flow of speech at sentence level.

Key words: Speech intelligibility, Glossectomy, Wide excision and primary closure

Oral Cancer

Oral cancer comprises about 2.5% of total cancer (Parkin , Bray, Ferlay & Pisani 2005). Oral cancer which involves lips, salivary glands, tongue, oral cavity and pharynx are treated mainly by surgery and /or radiation therapy or chemotherapy. Chemotherapy (CT) alone is not curative (Mendenhall , Riggs & Cassisi 2005). The staging system for cancer classification (TNM) (Sobin & Wittekind 2002) is used for selecting the treatment modality.

After the excision of the tumour, intraoral reconstruction is done which may range from primary closure, reconstruction with local flaps (mucous membrane and tongue), skin graft, distant flaps (eg., myocutaneous and osteomyocutaneous flaps), and microvascular free tissue transfer. (Louie, Duncan & Glasson 1984, Weda, et al. 1985, Leonard & Kolhe 1987, Yang, Chan & Gau, 1981, Muhlbauer, Herndl & Stock 1982)

Consequences of Glossectomy

Glossectomy can cause severe consequences on tongue mobility and impairments of speaking and swallowing. The speech of a person is an indication of his/her personality and has distinctive characteristic feature. Poor speech production can affect the quality of life. Aim of the treatment should be to spare organs and functions while trying to improve the survival rate. Measurements of speech intelligibility provide an index of the severity of the disorder and to quantify the changes that have occurred to the normal structures. Speech intelligibility refers to perceptual judgment made by a listener of how well he can understand it. It is further defined as the degree to which the speaker's intended message is recovered by the listener (Kent, Weismer, Kent &

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Rosenbek 1989) Intelligibility is typically based on the percentage of words, or sounds (i.e., vowels and or consonants) in a speech sample that are understood by the listener.

The present study is designed to compare the speech intelligibility preoperatively and post operatively in patients with oral cancer and has undergone wide excision and primary closure.

Methodology

Aim

Aim of the study was to measure speech intelligibility preoperatively and post operatively in patients with T1 and T2 cancers of oral tongue who have undergone wide excision and primary closure.

Subjects

Twelve patients with T1 and T2 cancers of the oral tongue treated by wide excision and primary closure between the age of 50 to 70 years were taken up for the study. Two of the patients were females and 10 of them were males. All of them had Malayalam as their mother tongue. Speech samples were recorded preoperatively (2-3 days before surgery) and four weeks post operatively.

Inclusion Criteria

1. The tumor excision had to necessitate removal of at least $\frac{1}{4}$ of the tongue and not more than $\frac{1}{2}$ of the tongue.

Exclusion Criteria

1. Patients with tumor extending to any other parts of the oral cavity / larynx
2. Patients with premorbid speech abnormalities.

Test Protocol

1. Consent for participation in the study was obtained prior to the testing.

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2. Digital recording of subject's speech using Sony UX-71F Digital Voice Recorder with ECM DS 30 P Electret condenser microphone was held at a mouth to microphone distance of 15 centimeters, at an angle of 45 degrees.

Test material

Test material consisted of four subsections:

i) 13 vowels, (ii) 36 consonants of Malayalam, (iii) 100 words with target consonants at the initial, middle and final position (all the consonants does not occur in all the three word positions in Malayalam) and (d) passage with all the consonants in Malayalam (which consisted of 54 words with 200 consonants). A score of one was given for understandable production of vowels and consonants. The scores were then converted into percentage for all the subsections.

The intra judge reliability and inter judge agreement was found out. Intra-judge reliability was evaluated by randomly replaying speech samples 3 times to the same judge. Inter-judge reliability was evaluated by comparing the rating obtained from the 3 listeners.

Statistical Analyses

Paired - t- test was done using the SPSS statistical software package to compare the preoperative scores with post-operative scores. Pearson's product moment correlation was done to find out the reliability of inter-judge scoring and intra judge scoring.

Results

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Table 1 showing the comparison between preoperative scores and post-operative scores obtained for the perceptual analysis of vowels, consonants, words and passage.

Stimulus	Preoperative		Post-operative		P value
	Mean	S.D	Mean	S.D	
Vowels	98.91	1.71	96.62	4.76	0.58
Consonants	98.85	1.90	95.77	5.37	0.56
Words	97.92	3.27	88.54	13.31	0.26
Passage	98.46	2.93	87.54	14.08	0.015

Table 2. Showing reliability of judgments made by the listeners.(Pearson's product moment correlation coefficients- $p < 0.001$)

Attribute	Reliability	
	Inter-judge	Intra-judge
vowels	0.97	0.95
consonant	0.92	0.98
word	0.94	0.94
passage	0.96	0.97

Discussion

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In this study we compared the preoperative speech intelligibility assessed perceptually with post-operative speech intelligibility of patients with cancer of tongue treated with surgical wide excision followed by primary closure. Intrajudge reliability was evaluated by randomly replaying speech samples 3 times to the same judge. Interjudge reliability was evaluated by comparing the rating obtained from the 3 listeners. Observed reliability coefficients were high and positive ($P < .001$) for all speech intelligibility attributes (Table 2).

The results revealed that though there was a difference between preoperative and post-operative perceptual analysis of both vowels, consonants, words and passage, the differences were significant only for the passage (Table 1). This indicates that the speech sounds were more intelligible at phoneme level and word level even after surgery and the intelligibility deteriorated at sentence level. This could be attributed to the fact that the articulators need to move faster for the continuous flow of speech compared to phonemes and words. When the demand on the articulators increases the performance is found to deteriorate. The study gives an insight about the functional outcome to maxillofacial surgeons and the tasks that need to be targeted in glossectomy rehabilitation by the speech pathologist. A comparative study of speech intelligibility using other treatment options will be done in the second phase of the study which would substantiate the superiority of one treatment over the other.

Conclusion

Speech intelligibility measured preoperatively and post operatively in patients with T1 and T2 cancers of oral tongue who have undergone wide excision and primary closure revealed that there were no significant difference in the intelligibility scores for consonants and words. However there was a reduction in scores for reading passage post operatively. This could be due to the failure to meet the demand on the articulators to move faster for the continuous flow of speech at sentence level.

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