

Articulation, Voice, and Obturation in Persons with Acquired and Congenital Palate Defects

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Speech appliances are employed in persons with acquired palatal defects as well as in persons having congenital clefts. In each group the hard palate, soft palate, or both may be involved. Frequent mention has been made in the literature to the effect that persons with acquired palatal defects regain speech rather quickly upon obturation without remedial training (3, 4, 6). However, the amount of speech loss associated with the acquired damage and the amount of speech gain with obturation have not been reported in any systematic way. Nor is there apparently any reference in the literature about the relative effect on articulation from acquired palatal damage as compared to congenital palatal damage.

The purposes of this study are to compare the articulation status and the degree of hypernasality of a group of persons with acquired palatal defects with that of a group of persons with congenital palatal defects. The groups will also be compared for amount of improvement in voice quality and articulation skills resulting from obturation.

Results

The subjects of this investigation were adults who were patients either at the Memorial Hospital in New York City or at the Dental Clinic of the National Institutes of Health, or who were from the practice of a private prosthodontist. The two experimental groups and the control group of normal adults were selected on the basis of availability for investigation. The congenital cleft palate group consisted of 11 adults, five men and six women, with an age range of 18 to 77 years and a median age of 41. The acquired palatal defect group consisted of 10 adults, five men and five women, with a median age of 66 and an age range of 20 to 73

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years. The difference in ages of the groups was evaluated by chi square (median test) and was not significant. No hearing test data were available. Three types of acquired defects were included in the study: cancer of the hard palate, cancer of the soft palate, and post-polio. The seven subjects who comprised the control group were utilized for comparative purposes.

The cancer patients with acquired defects of the hard palate varied in the amount of tissue they had lost. Variation ranged from loss of part of the maxilla and hard palate to unilateral loss of maxilla and hard palate as well as the orbit. In the extreme cases, soft palate tissue on the affected side might have been damaged, but these subjects were able to accomplish palatopharyngeal closure, as judged by visual inspection through the orbit. One person in the acquired group had lost much of his soft palate but had a normal hard palate, and one person had paralysis of the palate and pharynx which resulted from polio. Certain subjects in this investigation were among the persons studied in the film, "The Surgically Exposed Pharynx"¹. All subjects in both experimental groups had obturators and had used them several months or longer. However, one subject in the congenital group had recently been fitted with a new appliance and had not worn his older appliance for over a year.

Procedure

Subjects were tape recorded in clinic settings with either an Ampex 600 recorder and 620 amplifier and speaker unit or with a Tandberg, Model 5, tape recorder. The recording included utterances of single words containing all English consonants except /ʒ/ and /h/. Each consonant was evaluated in all test items by one judge (LB). Randomly selected taped protocols of 10 subjects were scored by a second judge (RS). A Pearson correlation of .96 and a percentage of agreement of 86.9 were obtained between the two judges. A response was scored as correct only if the judges were satisfied that the phoneme was present and undistorted. Subjects in each experimental group were recorded with and again without their obturators in place. Some of the subjects read the test words from cards; others, with visual disorders, repeated them after the examiner.

Each experimental subject recorded two sentences with and without the obturator in place. Each control subject recorded the sentences a single time. The sentences were, 'He gave me a beet to eat' and 'Olive, do you want a ball or a doll'. The first sentence, which was constructed with a preponderance of the high-vowel /i/, was expected to be judged more nasal than the second sentence, which was constructed around the low-vowel /ɑ/. The first five seconds of the recordings of each sentence were

¹"The Surgically Exposed Pharynx" is a training film that may be borrowed from the Oral and Pharyngeal Development Section, National Institute of Dental Research, Bethesda, Maryland 20014. The film is described in *Cleft Palate Bull.*, 13, 79, 1963.

spliced together in a random order for assessment of hypernasality by the backward-play method (8, 9). Some of the samples were less than five seconds in duration. The entire tape was then duplicated, and the duplicate was used in judging sessions. Judgments were made by the method of direct magnitude-estimation, using 100 as the value assigned to the standard stimulus indicating moderate hypernasality (5). The judges were instructed in this procedure by written instructions and by 10 practice judgments of taped samples of cleft palate speech. The standard speech sample appeared after every 10 experimental speech samples. A total of 102 experimental speech samples were thus judged for this study.

Results

ARTICULATION. The articulation of the control group ranged from 96% to 100% correct responses with a mean of 98.6 correct responses. The mean and standard deviation of the articulation scores for each of the two experimental groups with and without their obturators in place are shown in Table 1. This table suggests that the congenital group is superior to the acquired group in articulation when the obturators are removed but that the two groups do not differ when the obturators are worn. The table also indicates that each group articulates better with the obturators in place than with them removed. These interpretations were supported by computation of an analysis of variance (Table 2), which shows that one or more differences existed among the possible comparisons and by computation of *t* tests to determine which of the four differences under consideration were statistically significant. A *t* of .51 was obtained for the difference between congenital and acquired groups with the appliances in place, which was not statistically significant. The *ts* for the other three comparisons were significant at the 1% level. The *t* for the two groups with the obturators out was 5.16, the *t* for the congenital group obturator in versus obturator out was 2.88, and the *t* for the acquired group obturator in versus obturator out was 7.01. An interaction between

TABLE 1. The mean percentage of correct articulation responses of the congenital and acquired group with and without the obturator in place.

<i>Group</i>	<i>Obturator</i>	
	<i>In</i>	<i>Out</i>
Congenital		
Mean81	.65
SD15	.16
Acquired		
Mean78	.35
SD19	.23

TABLE 2. Summary of analysis of variance of the articulation scores for the congenital and acquired groups and assessment of the effects of having the obturator in or out during articulation. F values with single asterisk are significant at 1% level; those with double asterisks are significant at 5% level.

<i>Source</i>	<i>df</i>	<i>ms</i>	<i>F</i>
Between			
Congenital-Acquired (C-A).....	1	2763.94	5.00*
Subjects in same group.....	18	552.45	
Total between subjects.....	19		
Between			
Obturator In-Out (I-O).....	1	7896.71	46.18**
I-O × C-A.....	1	1870.42	10.94**
Pooled subjects × I-O.....	18	170.99	
Total Within.....	20		
Total.....	39		

conditions and groups was also found to be significant at the 1% level. This probably can be interpreted as meaning that all persons with acquired defects articulated much better with their appliances in place than with them removed, whereas some of the persons with congenital defects spoke as well or better with their appliances removed than with them in place. Such an interpretation is consistent with inspection of the raw data.

HYPERNASALITY. The mean nasality ratings are presented in Table 3. An analysis of variance was computed to determine whether the acquired and congenital groups, the conditions (obturator and unobturator), or the sentences differed in mean assigned hypernasality ratings (1, Pp. 219-225). Ratings for the normal subjects were not used in this analysis. The results of this analysis are presented in Table 4. The ratings assigned to the two groups, congenital and acquired, differed significantly at the 5% level. In almost every comparison, the subjects in the congenital group were judged to be more nasal than were the subjects in the acquired group. The high-vowel sentence, 'He gave me a beet to eat' appeared to contribute more to the group differences than did the other sentence (Table 3).

TABLE 3. The mean nasality ratings on the two sentences for subject groups by sentence and obturation.

	<i>Obturator In</i>		<i>Obturator Out</i>	
	<i>'He....'</i>	<i>'Olive....'</i>	<i>'He....'</i>	<i>'Olive....'</i>
Acquired.....	93.15	100.52	120.84	128.62
Congenital.....	125.31	103.36	156.84	126.54
Normal.....			79.10	87.93

TABLE 4. Summary of analysis of variance of the hypernasality between the Groups (G) of congenital and acquired subjects, and assessing the effects of obturation (C) and sentences (S). F values with single asterisk are significant at 1% level; those with double asterisks are significant at 5% level.

<i>Source</i>	<i>df</i>	<i>ms</i>	<i>F</i>
Between			
Groups (G)	1	2,505,950	6.11*
Subject in same group	20	410,197	
Total between subjects	21	509,994	
Between			
Conditions (C)	1	6,856,147	20.63**
G \times C	1	3	
Pooled interaction	65	332,318	
Between			
Sentences (S)	1	774,373	2.33

The difference between conditions was significant at the 1% level. Thus, each group was judged to be more defective in voice with obturator removed than with it in place. The two sentences, 'He gave me a beet to eat' and 'Olive, do you want a ball or a doll' did not differ significantly for the ratings assigned.

Discussion

The congenital group had significantly better articulation than the acquired group when the obturators were removed whereas for hypernasality the acquired group was generally superior to the congenital group. The voice quality of the acquired group may have been less nasal because in several of the subjects the nasopharynx on one side was not enclosed by orbit or nose and the mechanism approximated normality on the other side. The acquired group had a majority of hard palatal defects whereas all the members of the congenital group had involvement of the soft palate. Thus, in the acquired group there may have been less physical possibility for establishment of hypernasal resonance. Nevertheless, the fact that the acquired group had voice problems is suggested by the difference between their nasality ratings and those of the control subjects. This difference should be studied further, and perhaps the voices of the acquired subjects should be analyzed further to ascertain that the voice problem was definitely one of hypernasality. We would note that the data reported reflect both the effect of the obturators regarding velopharyngeal competence and the subjects' ability to use the obturators. Age and related changes may also be factors influencing the results reported.

Mean nasality scores for both experimental groups approximated the standard stimulus when the obturators were in place but exceeded the standard when the obturators were removed. The control subjects were

assigned smaller mean nasality scores than that of the standard stimulus. These findings seem consistent with the fact that the standard stimulus was selected to represent a moderate amount of hypernasality. However, this does suggest that the experimental subjects may have presented some hypernasality even with the appliances in place. It is interesting to note at this point that Falter and Shelton (2) found by cinefluorography that 16 of 21 obturated cleft palate subjects had continuous contact between speech bulb and posterior pharyngeal wall throughout a varied speech sample. Such obturation would seem to be inconsistent with a finding of hypernasality. However, their sample may have differed from the one under current study, or passages lateral to midline may exist.

Several of the subjects in the congenital group articulated as well with their obturators out as with them in. One of the subjects was advised of this fact but did not care to give up the obturator. The authors believe that in persons with borderline adequacy of the speech mechanism, further physical restoration facilitates speaking ease (7). Responsiveness of persons with borderline speech mechanism adequacy to speech instruction should be studied on a longitudinal basis. A review of the literature also suggests that some persons who make speech gains with obturation may be able to maintain them without further use of the appliance (6). This concept should be put to an experimental test.

Summary

The articulation and voice of 21 adults with acquired or congenital palatal defects were evaluated with and without their obturators in place. The congenital group had the better articulation, whereas the acquired group had more acceptable voice quality. Both groups made significant articulation and voice gains with obturation. The effects of obturation for both acquired and congenital palate defective adults is demonstrated by the findings of this study.

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