Articulation Patterns and Speech Intelligibility of 54 Vietnamese Children with Unoperated Oral Clefts: Clinical Observations and Impressions

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Introduction

Older persons with unoperated oral clefts have been of interest to surgeons, dentists, and speech pathologists because of the opportunity they provide for the study of uninterrupted development of facial structures, dentition and speech patterns (*2*, *3*, *5*, *7*, *8*, *9*, *11*). However, relatively little data have emerged on the preoperative speech skills of these patients. Davis (*2*) described the speech of one adult with an unrepaired bilateral lip and palate as "no worse than some of the cases who have had surgical failures." A limited number of children with unmanaged palatal clefts were among subjects in studies by Burne & Spriestersbach (*1*, *13*) assessing articulation skills of cleft palate children. However, there is no mention of previous speech training or of the patients' age. In their study of a group of Puerto Rican adults with unoperated oral clefts, Law and Fulton (*7*) described intelligibility and nasality in relationship to the type of cleft. They reported that adults with unrepaired clefts of the lip and palate seemed to have near normal voice quality while patients with unrepaired isolated clefts of the soft palate exhibited greater nasality. Also, adults with unrepaired clefts of the hard and soft palates had consonant articulation superior to many patients with surgical closure of the cleft.

In March, 1972, a pilot speech project was begun at the Children's Medical Relief International Center for Plastic and Reconstructive Surgery in Saigon, South Vietnam, to provide basic diagnostic and remedial speech services for cleft palate patients and to train a Vietnamese counterpart (*6*). During a period of six months, 148 patients with a variety of speech problems were evaluated. Included in the total number were 54 patients with unoperated oral clefts. The purpose of this paper is to describe the articula-

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tion skills, voice quality and speech intelligibility of those 54 patients with unrepaired clefts, and to discuss possible implications for the surgical management of such patients.

Procedures

SUBJECTS. The 54 Vietnamese patients were classified into three groups according to the structures involved in the unoperated clefts. Twenty-one patients (Group I) had unrepaired clefts of the lip and palate. Eighteen (Group II) had repaired cleft lip, with or without overt cleft of the alveolus, and unrepaired clefts of the hard and soft palates. Six patients had repaired bilateral cleft lips and 12 had repaired unilateral cleft lips. The age at time of lip repair ranged from 6 months to 15 years, with a median age of 6 years. Fifteen (Group III) had unrepaired isolated clefts of the palate. The severity of the clefts varied within each group. In some instances it was difficult to determine whether the cleft of the alveolus was partial or complete. The segments were sometimes butted together, giving the appearance of union. (Figures 1 & 2). These patients were included in Group I or II, dependent upon the status of the associated cleft lip. The 54 subjects ranged in age from 3 years to 24 years with a median age of 12 years and a mean age of 11.8 years. There was an equal number of males and females. (Table 1). None had had speech training.

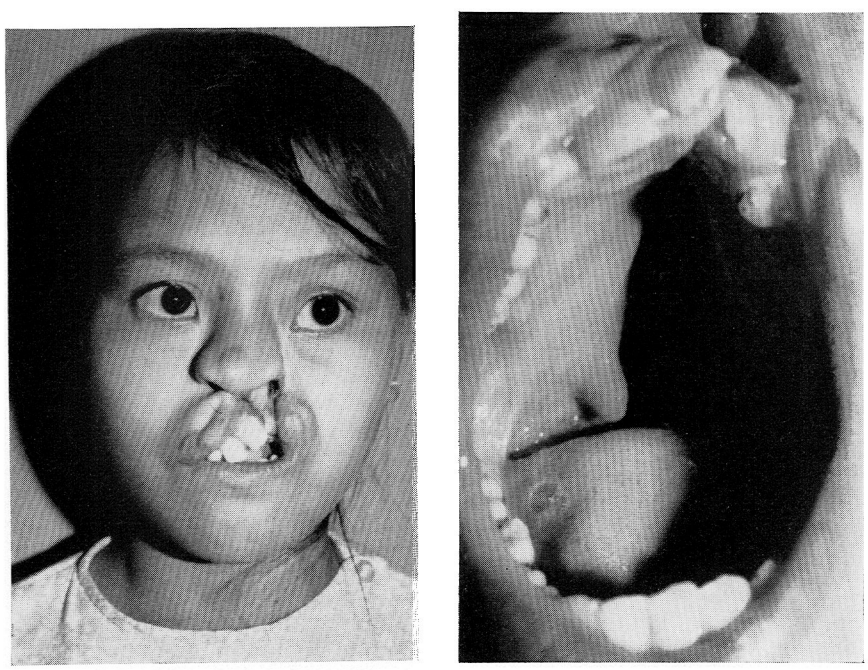

FIGURE 1. (left) A 14 year old female with an unrepaired cleft left lip and palate, and an incomplete oblique facial cleft. (right) This patient's alveolar segments are butted together giving the appearance of union.

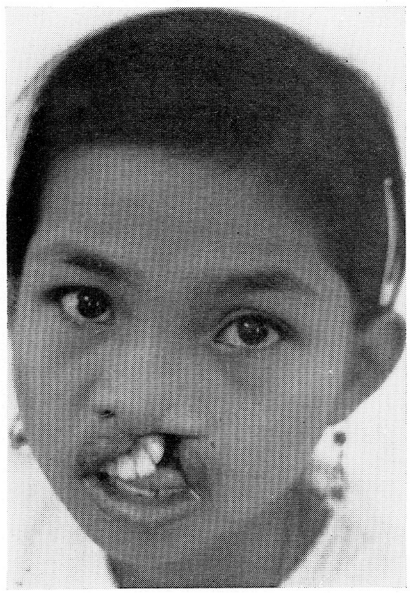

FIGURE 2. Another female teenager with an unrepaired cleft left lip and palate. In this instance, there is an opening between the alveolar segments.

SPEECH EVALUATION. Each patient was seen jointly by the American speech consultant and the Vietnamese counterpart. The evaluation was done in Vietnamese. It consisted of (1) an assessment of the articulation of 20 of the 23 Vietnamese consonant sounds in 30 single words; (2) a tape recording including counting in Vietnamese from 1 to 10, the 30 words from the articulation test, C-V syllables (/S/, /K/, /T/, /M/, /B/, + /i/ and /u/), 4 short Vietnamese sentences and repetition of one sentence in English; (3) a rating of intelligibility on a 10 point scale; (4) a rating of nasality on a 4 point scale from normal to severe; (5) a visual assessment of the amount of movement of the unrepaired segments of the soft palate during sustained phonation; and (6) 35 mm color slides of the face and of the palate at rest and during phonation. The 10 point rating scale for intelligibility was patterned after the common Vietnamese practice of grading people and things on a scale from 1 to 10. Thus, intelligibility was rated as Normal (1–3), Passable (4–6) and Poor (7–10). Intelligibility was judged solely by the Vietnamese counterpart and based on all the speech samples obtained during the evaluation. Nasality ratings, also based on all speech samples, were done jointly by the authors.

For the purposes of this study, only 8 Vietnamese consonants from the 20 tested were analyzed. These were selected because they are similar to English consonants, they represent a range of phonemic placement, and all but one require intraoral air pressure. They consist of /B/, /M/, C (a voiced /K/), G (produced as a voiced fricative), Đ /D/, PH /F/, S (produced as /ʃ/ with lips retracted) and X /S/. Consonants produced with correct phonemic placement and lacking only adequate intraoral air pressure were designated as correct approximations. Distortions consisted of

TABLE 1. The composition of the three groups of patients with unrepaired oral clefts.

Type of Unrepaired Oral Cleft	Number of Patients	Sex	Age Range	Median Age
GROUP I Cleft of Lip, Alveolus, and Hard & Soft Palate Bilateral (6) Unilateral (15)	21	F - 9 M - 12	6 yrs. - 18 yrs.	12 yrs.
GROUP II Repaired Cleft Lip, With or Without Overt Cleft of Alveolus, Cleft Hard and Soft Palate Bilateral (6) Unilateral (12)	18	F - 5 M - 13	3½ yrs. - 24 yrs.	11½ yrs.
GROUP III Isolated Cleft Palate	15	F - 13 M - 2	5 yrs. - 21 yrs.	12 yrs.

test sounds that were lateralized, interdentalized or produced with compensatory phonemic placement such as plugging the tongue in the cleft lip to produce /B/ and /M/. Glottal stops and pharyngeal fricatives were included in substitutions. Vietnamese is primarily a monosyllabic language with few final consonants. Thus, consonant production was assessed in the initial position of single words.

Findings

A comparison of the articulation skills, speech intelligibility and voice quality of the three groups of subjects is summarized in Table 2. Only two patients in Group I, both males, aged 15 and 10, achieved intelligibility ratings of 6 within the Passable range. The intelligibility of the remaining 19 ranged from 7 to 10, classifying them as Poor. The age range of these patients was 6 to 18 years with a median age of 12 years. Group I was the least successful of the 3 groups in approximating correct phonemic placement for the consonants tested. In addition, 16 of the 21 subjects in the group were judged to have severe nasality.

TABLE 2. A summary of the results of the evaluation of the speech skills and voice quality of the subjects.

GROUP	Rating of Intelligibility	% of Correct Approximation of Consonants Tested	Rating of Nasality
GROUP I (N=21)	Passable (#6) - 2 Median Age - 12.5 yrs. Poor (#7-10) - 19 Median Age - 12 yrs.	17.86%	Severe - 16 Moderate - 4 Slight - 1
GROUP II (N=18)	Passable (#5-6) - 5 Median Age - 15 yrs. Poor (#7-10) - 13 Median Age - 11 yrs.	28.47%	Severe - 9 Moderate - 8 Slight - 1
GROUP III (N=15)	Passable (#4-6) - 10 Median Age - 12.5 yrs. Poor (#7-8) - 5 Median Age - 6 yrs.	60.83%	Severe - 8 Moderate - 7

The articulation skills of Group II appeared to be slightly better than Group I. Three males and two females in Group II, with a median age of 15 years, were judged to have Passable speech intelligibility with ratings of 5 and 6. The remaining 13, with a median age of 11, had Poor intelligibility with ratings of 7 to 10. Patients in this group demonstrated a higher percentage of correct approximations of the test consonants. This may have been due partly to their greater success in the approximation of /B/ and /M/ made possible by the repair of their cleft lip. One half of the patients had severe nasality, 8 had moderate nasality, and 1 had slight nasality.

The 15 patients in Group III, all of whom had unrepaired post alveolar clefts of the palate, seemed to demonstrate articulation skills and intelligibility superior to those of either Groups I and II. Ten, with a median age of 12.5 had Passable speech intelligibility with ratings from 4 to 6. The remaining 5 patients with a median age of 6 years were judged to have Poor intelligibility with ratings from 7 to 8. None was given a rating of Poor 9 or 10 as was true with Groups I and II and yet the median age was lower. The patients in Group III achieved correct approximations of 60 % of the test consonants; far more than patients in either of the other two groups. However, the ratio of nasality ratings was similar to Group II. Eight of the 15 patients in Group III were judged to have severe nasality and none had slight.

Table 3 provides a comparison of the articulation skills of the three groups based on the numbers and kinds of errors noted on the 8 test sounds.

TABLE 3. A comparison of the number, types of errors and percentage of correct approximations demonstrated by Groups I, II, and III on the 8 Vietnamese consonants analyzed.

GROUP	Type of Production Achieved	VIETNAMESE CONSONANTS								Total	%
		B	M	C	G	-D	PH	S	X		
GROUP I (N - 21)	No. of Correct Approximations	1	2	6	4	9	6	1	1	30	17.86
	No. of Omissions	1	1	9	2	2	2	2	3	22	13.10
	No. of Substitutions and Distortions	19	18	6	15	10	13	18	17	116	69.05
									TOTAL	168	
GROUP II (N - 18)	No. of Correct Approximations	8	13	2	0	8	7	1	1	41	28.47
	No. of Omissions	2	1	12	0	1	2	1	2	21	14.58
	No. of Substitutions and Distortions	8	4	3	18	9	9	16	15	82	56.94
									TOTAL	144	
GROUP III (N - 15)	No. of Correct Approximations	15	14	5	5	7	11	8	8	73	60.83
	No. of Omissions	0	1	7	0	1	1	1	1	12	10.00
	No. of Substitutions and Distortions	0	0	3	10	7	3	6	6	35	29.17
									TOTAL	120	

Patients in Group I used substitutions and distortions for 69 % of the consonants, the most common of which were /H/, /Y/, and /N/. Differentiation in production of the test words resulted primarily from vowel and tonal approximations rather than from consonant variations. Of particular interest was the compensatory plugging of the tongue tip into the unrepaired cleft lip exhibited by 9 of the 21 subjects when producing /M/ and /B/. Often there was little differentiation between production of /M/ and /N/. Glottal stops were noted only with Group I, while pharyngeal fricatives were used as substitutions for the Vietnamese S and X by both Groups I and II. If the test sounds /B/ and /M/ are excluded, the articulation skills of Groups I and II were fairly similar in their ratio of correct approximations, omissions, and substitutions and distortions. Patients in Group III achieved the highest percentage of correct approximations on the 8 test sounds and had fewer omissions than the other subjects. Eight children used weak production of S /ʃ/ and X /S/, and none were observed to use pharyngeal fricatives. Although the Vietnamese C and G were the most difficult consonants for this group, their most frequent substitutions for them was /NG/, rather than /N/ or /Y/ as Groups I and II exhibited.

The visual assessment of the movement of the unrepaired segments of the soft palate during phonation revealed differences that seemed to have no obvious relationship either to the age of the patient or the extent of the cleft. Some patients evidenced contraction of the levators while others lacked even a gag reflex. There was no opportunity to see an ample sampling

of these patients post-operatively to determine whether movement was present after surgical repair, or to assess what changes occurred in speech skills.

Discussion

The value of the study of articulation patterns of older patients with unrepaired oral clefts may be questioned because such patients are limited in number in nations where early surgical management is readily available. In addition, it is agreed that it is impossible to develop 'normal' speech without an adequate velopharyngeal valving mechanism. Furthermore, it may be argued that basic differences in phonemic and grammatical structure of languages make it impossible to generalize information from one group of patients to another. However, the findings of this study suggest several aspects for consideration.

By and large the speech of the older children with unrepaired complete clefts of the lip and palate was limited in intelligibility because of failure to achieve approximations of consonants. In contrast, the children with unrepaired isolated clefts of the palate demonstrated fairly intelligible speech which seemed to improve through maturation. (Table 4). A comparison of the speech skills of the 4 youngest children (median age 6 years) and the 4 oldest (median age 18.5) in Group III indicates that maturation resulted in fewer omissions and substitutions and a marked increase in

TABLE 4. The differences in the kinds of articulation errors demonstrated by the four youngest and four oldest subjects in each group.

GROUP	% of Correct Approximations of Consonants	% of Omissions	% of Substitutions
GROUP I			
4 Youngest (6-8 yrs.) Median age - 7 yrs.	18.75%	43.75%	37.50%
4 Oldest (15-18 yrs.) Median age - 15 yrs.	21.87%	9.37%	68.75%
GROUP II			
4 Youngest ($3\frac{1}{2}$-7 yrs.) Median age - 6 yrs.	12.50%	46.88%	40.63%
4 Oldest (16-24 yrs.) Median age - $17\frac{1}{4}$ yrs.	34.38%	6.25%	59.38%
GROUP III			
4 Youngest (5-6 yrs.) Median age - 6 yrs.	31.25%	15.63%	53.13%
4 Oldest (15-21 yrs.) Median age - $18\frac{1}{2}$ yrs.	71.88%	6.25%	21.88%

correct approximations. This apparent maturation did not occur in the speech skills of the 4 youngest (median age 7 years) and 4 oldest children (median age 15 years) in Group I. With the latter group, omissions decreased and substitutions increased with maturation; but approximations of consonants and speech intelligibility remained essentially unchanged. Thus, children with incomplete clefts fared better over time than did those with complete clefts.

None of the 54 children had had remedial speech help, but some members of all three groups had attended school. The possible effect of a greater social stigma associated with a repaired or unrepaired cleft lip as opposed to a normal facial structure was recognized but could not be measured. Thus, the primary variable between the three groups was the degree of clefting. The open or irregular alveolar surface for tongue tip placement combined with anterior dental anomalies seemed to compound the task of approximating consonant production in the absence of separation of the oral and nasal cavities. This is not surprising; however, examination of the frequency and type of articulation errors exhibited by the three groups raises several questions. The articulation errors of Group III did not include the glottal stops and pharyngeal fricatives observed with children with repaired posterior clefts in the United States. Was this due to differences in language, the effect of unrealistic therapy goals for the USA children, differences in compensatory efforts of marginal vs. total absence of velopharyngeal closure, or to the presence and/or absence of a normal alveolar and prealveolar structure? Such compensatory sounds were heard in the children with complete clefts of the lip and palate.

The articulation skills and speech intelligibility attained by the three groups present interesting phenomena when viewed in relationship to current philosophies of early surgical management. There are those who advocate repair of the soft palate first. Group III demonstrated close to normal phonemic placement for consonants with unrepaired post alveolar clefts. Groups I and II achieved poor phonemic placement, yet careful and early repair of alveolar clefts was considered of little importance by the surgeons at the Center in Saigon based on their instruction from numerous plastic surgery consultants from around the world.

Several authors (*4, 9, 10, 11, 12*) have commented on the speech results achieved by older patients following surgical management. But none specify whether there is a relationship between the type of cleft and the degree of speech improvement attained. The general consensus seems to be that the post-operative speech results are consistently poor in older cleft patients, although incorporation of a primary pharyngeal flap may increase the chances for speech improvement. (*4, 11, 12*). The variability in the speech skills of the three groups in this study suggests that careful assessment of pre-operative articulation patterns may be of value in the planning of the habilitation of the older patient with an unrepaired oral cleft. A patient from Group III is likely to have a better prognosis for improved speech

post-operatively than is a patient from Groups I and II, without the need for extensive remedial speech training. This was evidenced by assessment of the speech skills of two groups of older Vietnamese children with repaired oral clefts similar to Groups I and III who were evaluated with the same procedures and materials. None had had any remedial speech training. The average age at the time of surgical repair was 11½ years for the 15 patients with repaired isolated palatal clefts. The speech evaluation was completed on the average of 1.8 years after surgery. They approximated 70 % of the test consonants and omitted less than 2 % of the sounds. None were judged to have Poor speech intelligibility. The 22 patients with repaired clefts of the lip and palate had reached an average age of 7½ years at the time of the surgical repair of the palate and were evaluated on the average of 2.5 years post-operatively. In contrast, they correctly approximated only 32 % of the consonants, omitted 8 %, and used substitutions and distortions for 60 %. Seven were noted to have Poor speech intelligibility.

Movement in the segments of the unrepaired soft palate during sustained phonation was observed in some patients and not in others. There seemed to be no relationship between the age of the patient and the amount of movement noted. This raises the question of whether the absent or limited movement is due to atrophy associated with delay in surgical repair, or is it a phenomenon observable in infants with unrepaired postalveolar clefts? Furthermore, if palatal movement is absent pre-operatively, will functional movement be present for speech production post-operatively? The answers to these questions might have implications in the surgical management of oral clefts of older patients.

The clinical impressions and observations reported in this study are too limited to answer the questions posed. However, if further study of the speech of other groups of older patients with unrepaired oral clefts is judged to be of value, the work should commence before such populations are no longer available in sizable numbers.

Summary

Evaluations of the articulation patterns and speech intelligibility of 54 Vietnamese children with unrepaired oral clefts indicate a relationship between the type of oral cleft and the proficiency of speech skills attained. The results of the study suggest that consideration of the type of oral cleft and the specific kinds of articulation errors exhibited by the patient may be of value in planning the surgical habilitation of older children and adults with unrepaired clefts of the lip and palate.

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