Age of Surgery for Cleft Palate Patients and Speech Proficiency

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For years professional workers with cleft palate children have attempted to isolate factors that govern the surgeon's decision about the best age for cleft palate repair (*1, 2, 6, 8, 11*). In a classical statement, Morley (*9*) indicated that there were three factors to be considered in deciding the best age for surgery: survival, oral-facial growth, and speech development. The present study was designed to provide information about the question: What is the correlation between the age of surgery and the resultant speech of the patient? A secondary purpose of the reseach was to obtain data about type of cleft, degree of hearing loss and to report relationships, if any, between these two variables.

Procedure

SUBJECTS. Fifty-three subjects (34 males and 19 females) were chosen from a list of surgical patients of one surgeon during an eight-year period of time. Patients of a single surgeon were used in order to control variance in surgical procedure. The variability of one surgeon, even over an eight-year period, seems less than that between individual surgeons over a shorter period of time. When the speech samples were collected (in 1966), no subjects were younger than 5 years of age. This minimum age restriction was used to insure that subjects were beyond their primary articulation and language learning stages. Some children age 5 years, or even older, may still have maturational speech problems which could influence their speech ratings. However, it was felt that for the purposes of this study the level of maturation for these subjects was sufficiently advanced. All the patients had had surgery prior to March 1962. The mean age at the time of surgery was 3 years, 2 months; the range was from 9 months to 12 years, 8

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TABLE 1. Interjudge reliability as represented by the correlation coefficients between each judge and the other seven: Sum 1, nasality, Sum 3, articulation proficiency.

judge	*reliability of judges*	
	sum 1	*sum 3*
1	.7598	.5956
2	.8418	.6591
3	.8454	.6540
4	.6739	.7650
5	.8458	.3378
6	.8607	.7488
7	.9060	.7699
8	.8752	.6591

months. It should be noted that the data as obtained from the surgeon's files did not indicate why surgery was done at any particular age for a given patient. Age of surgery therefore is not truly randomly selected. In dealing with age of surgery statistically, however, the range of this variable spanned a 12-year period.

TYPE OF CLEFT. Subjects were categorized by the surgeon for type of cleft into four groups: Type I, cleft of the soft palate only, 21 subjects; Type II, complete cleft of the soft palate, hard palate, and alveolar ridge on the left side, 14 subjects; Type III, the same but on the right side, 8 subjects; and Type IV, complete bilateral cleft, 10 subjects.

JUDGMENTS OF SPEECH. During their regular appointments, subjects were given hearing tests and speech samples were taken and recorded. In addition, the parent was questioned in detail about any speech therapy which the child had had, and about his general health and well-being. The speech sample consisted of isolated consonants and vowels, sentences read by the child, and conversational speech. Each recording lasted approximately 1½ to 2 minutes.

Eight judges were used to judge the speech variables. All the judges were staff members at the Cincinnati Speech & Hearing Center[1] with professional degrees in speech pathology and audiology. Each judge independently rated each subject on three variables: a) hypernasality—the judgment being from *zero* (normal), to *five* (severe nasality); b) nasal emission—*one* (emission present), or *two* (emission absent); and c) articulation proficiency, using the scale of *zero* (normal articulation) to *five* (severe articulation problem). Table 1 presents the correlation between each judge and the total of all judges for the two variables of hypernasality and articulation proficiency. Correlations for the variable of nasal

[1] The Cincinnati Speech & Hearing Center is registered by the Professional Services Board of the American Board of Examiners in Speech Pathology and Audiology, the American Speech and Hearing Association.

emission were not obtained since it was only a two-point judgment. The potential range of scores for each variable was from eight to forty. Sum 1 represents hypernasality; and Sum 3, articulation proficiency. The correlations are quite high with one exception (Sum 3 and judge 5: .3378). However, in reviewing the raw data, that judge was considered to have little effect on the total scores.

Results

SPEECH VARIABLES. Each judge's score on each speech variable was computed separately according to its correlation with the two criterion variables, age of surgery and age at the time of the study. The correlation coefficient between age of surgery and the two speech variables, and between age of study and the speech variables, appears in Table 2. Table 2 also contains the partial correlations between each of the speech variables with one of the dependent variables while the other is controlled. In other words, the column labeled "partial" under hypernasality contains the correlation between hypernasality and age of surgery with age at study controlled (.04). By looking at this information on a scattergram, one can see more clearly the lack of correlation between these variables. Figure 1 is a plot of nasality (Score 1) versus age at surgery. If there was a significant relationship between age at surgery and judged nasality, the 53 data points (subjects) would line up in a straight line, stretching diagonally across the graph (*13*). The scattergram (Figure 1) shows no such relationship between these two variables. Figure 2 is a scattergram of judged articulation proficiency and age at surgery. Here again these visual representations of the data presented in Table 2 show no significant correlations and no trends. Rather than present the scattergrams of each speech variable and age of the patient at the time of the study, Figure 3 represents the one variable that showed some slight though nonsignificant trend: age at time of study versus articulation proficiency. The older the child at the age of study, the better his articulation.

In summary, the data indicate that there was no relationship between age of surgery and the speech variables. One conclusion from these data is that decisions about optimal age for palatal surgery have to be made on factors other than developed speech.

TABLE 2. Judgments of hypernasality and articulation proficiency correlated with age at surgery and age at time of study.

	hypernasality		*articulation proficiency*	
	r	*partial*	*r*	*partial*
age at surgery	.21	.00	.13	.06
age at study	−.04	.04	−.24	.02

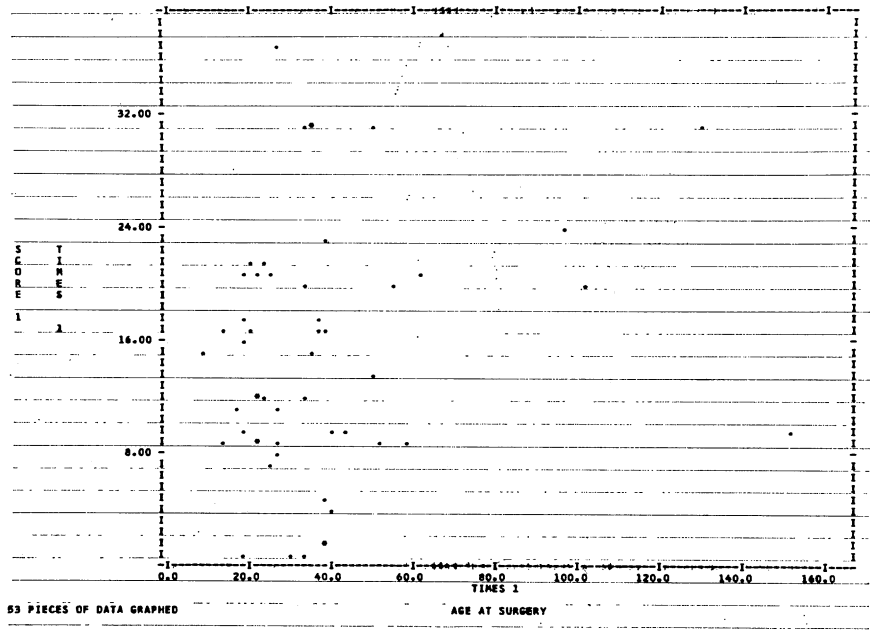

FIGURE 1. Scattergram of the relationship between hypernasality (Score 1) and age at surgery for 53 subjects.

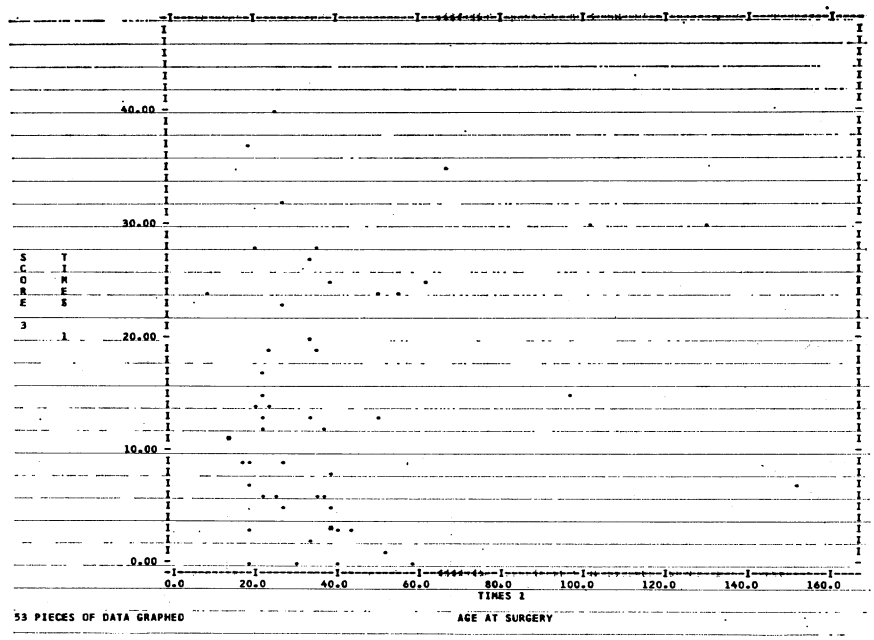

FIGURE 2. Scattergram of the relationship between articulation proficiency (Score 3) and age at surgery for 53 subjects.

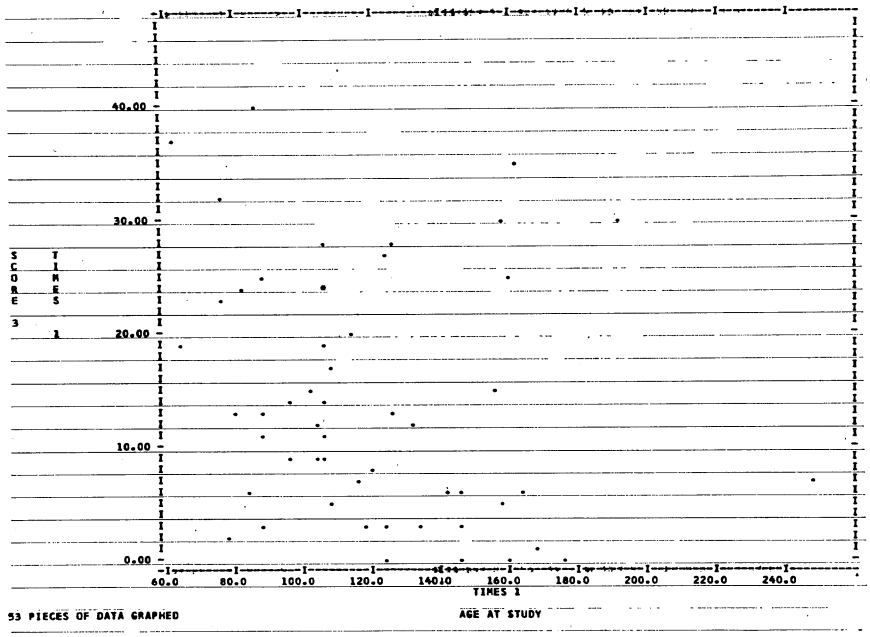

FIGURE 3. Scattergram of the relationship between articulation proficiency (Score 3) and age at time of study for 53 subjects.

HEARING LOSS AND CLEFT PALATE TYPES. Table 3 summarizes the data on the relationships between hearing loss (column 5) and the four cleft palate types (types described earlier). *N* in column 5 refers to the number with no hearing loss in each type. In defining hearing loss, age of the patient (certainly a very young child would be very difficult to

TABLE 3. Numbers of subjects according to sex and presence of hearing loss.

type of cleft	*variables*				
	no. of subjects	*sex*	*%*	*hearing loss*	*%*
1	21	M-10	39.7	Y-10	47.6
		F-11		N-11	34.4
2	14	M-11	26.4	Y-4	19.0
		F-3		N-10	31.3
3	8	M-6	15.1	Y-2	9.5
		F-2		N-6	18.8
4	10	M-7	18.8	Y-5	23.8
		F-3		N-5	15.6
total	53	M-34	100.0	Y-21	100.0
		F-19		N-32	100.0

test) and the completeness of the test are two critical variables (*5*). Subjects in this study were considered to have a hearing loss if they failed two or more frequencies at 10 dB hearing level in either ear.[2] The frequencies from 250 through 8000 H_2 at each octave frequency were used. Using these standards, there were 32 subjects with no hearing loss, and 21 with a hearing loss, which is high in comparison to normal populations but apparently not so very high with regard to the cleft palate population (*3, 4, 5, 7, 10*). Twenty-four per cent of the patients with hearing losses had unilateral air conduction losses with normal or near normal bone conduction; 10% had either two or three high frequencies down to 10–20 dB in only one ear; 63% had bilateral losses with relatively normal bone conduction responses; and 5% had some combination of the above. These percentages are not unlike those reported by Spriestersbach for a cleft palate population, for which he found the majority of the losses to be conductive and bilateral (*12*). Table 3, column 6, shows the percentage of hearing loss for each of the four categories. One would expect Type IV (bilateral) to have the highest percentage of hearing loss (if we are to assume the majority of losses come from upper respiratory infections) and Type I (soft palate only) to have the least. The data do not show this. Type I has the largest percentage (47.6%). The data indicate that hearing loss in a cleft palate population may not at all be related to type of cleft and/or the hearing loss may be more related to other variables not looked at in this study, such as genetic factors. Spriestersbach's data on a similar cleft palate population did not support the hypothesis that hearing loss is related to type of cleft. An examination of the specific audiograms indicated that the losses were not significantly related to the two speech variables. In other words, the subjects who were rated poor in speech were not necessarily the subjects with hearing losses. Although the incidence of hearing loss was a larger percentage than in normal populations, and although as clinicians we must deal with the relationships between cleft palate and hearing loss, the losses were nonsignificant as they affected the speech production of the children in this study.

Conclusion

In conclusion, the results of this study are reported in terms of correlations and comparisons of means. The study was undertaken in order to examine the relations between early or late surgical procedures and various speech characteristics as well as other variables and their effect on speech. Since the surgery was performed by only one surgeon, the conclusions must be limited. However, for these data it is clear that there is no relationship between age of surgery and the speech variables of nasality and articulation proficiency.

[2] At the time of the study, the equipment was calibrated on ASA standards.

Summary

The purpose of this study was to investigate the relationship between age of palate surgery and speech adequacy. Fifty-three patients from the clinical practice of a single surgeon were used as subjects. Age at surgery ranged from 9 months to 12 years, 8 months. The data indicated that there was no relationship between age of surgery and the speech variables studied.

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