Hearing Loss and Cleft Palate

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There is general agreement among authorities (*5, 13, 19, 23*) that there is a higher incidence of hearing loss in the cleft palate population than in the noncleft palate population; however, reports of the incidence of hearing loss of the cleft palate population vary widely. The reported incidence of hearing loss among cleft palate groups has ranged from 3% (*25*) to 90% (*23*). Table 1 presents the results of some of the investigations and indicates the number and age of subjects and the various criteria used for definition of hearing loss.

There are several possible reasons for these differences among reports. As Hayes (*11*) has suggested, variations in hearing loss incidence data for cleft palate subjects may be due to such deficiencies and inconsistencies in research methodology as: a) inadequate sampling methods; b) different definitions of hearing loss; c) poor testing conditions; and, d) intergroup differences among the cleft palate populations studied with respect to the type of cleft, type of management (surgical or prosthetic), and age of subjects.

Several authorities (*6, 25, 28*) indicate that a relationship exists between the incidence of hearing loss among cleft palate individuals and age. In general, a greater incidence of hearing loss has been found among cleft palate children than among cleft palate adults.

Some studies have yielded data suggesting a possible relationship between the type of cleft and the incidence of hearing losses associated with cleft palate. Masters and others (*17*) and Spriestersbach and others (*25*) report that the highest incidence of hearing loss is found in groups with clefts of the hard and soft palates. Spriestersbach and others (*25*) stated, however, that the differences regarding the incidence of hearing loss and type of cleft defect observed in their study and in the study by Masters and associates were not significant when statistical tests were applied to the data. On the other hand, Drettner (*3*) found that individuals with cleft lip and palate have a higher incidence of hearing loss than do patients with clefts of the palate only. Since the available data appear to be contradictory, the relationship between the incidence of hearing loss and the type of cleft is not clear. There is a need for further investigation in this area.

There is by no means universal agreement among investigators regarding the effect of prosthetic and surgical palatal repair on hearing in cleft

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TABLE 1. Investigations reporting the incidence of hearing loss in cleft palate.

investigator	*N*	*age*	*definition of hearing loss**	*percentage with hearing loss*
Aaron (*1*)	32	5–18	D, J	31
Berry and Eisenson (*2*)	368	3–9	K	60
Drettner (*3*)	63	5–53	D	49
Gannon (*5*)	50	6–16	G	30–44
Goetzinger and associates (*6*)	42	16–75	D	10
Graham and Lierle (*1*)	43	7–26	D	42
Graham and associates (*8*)	54	8–26	D	25
Halfond (*9*)	69	8–21	B	54
Halfond and Ballenger (*10*)	69	8–21	B	54
Holborow (*12*)			L	50
Holmes and Reed (*13*)	26		D	46–62
Lindsay and associates (*14*)	390	4–15	C	58
Linthicum and Body (*15*)	100		M	40
Loeb (*16*)	108	2–42	E	42
Masters and associates (*17*)	172		C	49
Means and Irvin (*18*)	225	3–16	I	31
Miller (*19*)	35	3–23	J	34
Sataloff and Fraser (*23*)	30	5–16	B	90
Skolnik (*24*)	401	1–31	M	39
Spriestersbach and associates (*25*)	163	2–16	D, F, I	3–74
Tangen (*26*)	113	2–19	A	44
Wagner (*27*)	50	5–17	H	30

* Definition of hearing loss:

A. Loss in two frequencies between 250 and 4000 cps.
B. Loss in two frequencies between 250 and 8000 cps.
C. Average loss for frequencies tested.
D. Average loss for the three speech frequencies of 500, 1000, and 2000 cps.
E. Average loss for six frequencies tested between 125 and 6000 cps.
F. Average loss for six frequencies tested between 250 and 8000 cps.
G. Average loss for seven frequencies tested between 125 and 8000 cps.
H. Average loss for eight frequencies tested between 125 and 8000 cps.
I. Loss at any one of six frequencies tested between 250 and 8000 cps.
J. Loss at 8000 and 12000 cps.
K. Recognizable handicap of hearing.
L. Conductive deafness.
M. Demonstrated hearing loss.

palate subjects. According to some (*15, 17, 25*) a greater incidence of hearing loss occurs among individuals in whom rehabilitation has been done prosthetically rather than surgically. Other researchers (*7, 17, 25*), however, have indicated that important variables determining the effect of surgery on hearing include: age of the child at the time of palatal repair, the method of soft palate repair, and the use of a pharyngeal flap to aid in velopharyngeal closure. There is, at present, little data concerning the relation of these variables to hearing in cleft palate children.

It has been well established that the majority of individuals with cleft palate who have a hearing loss have a bilateral, conductive type of loss (*1, 2, 8, 9, 10, 12, 15, 24, 26, 27*). Although there is agreement regarding the most frequently occurring type of hearing loss in cleft palate persons, there is little unanimity regarding the usual severity of cleft-associated hearing losses. The literature dealing with this aspect of hearing loss in cleft palate is sparse.

Some authorities (*21, 22, 23, 27*) indicate that cleft-associated hearing losses are usually mild. Skolnik (*24*) reports that the hearing loss was mild in more than one-half of 401 cases, moderate in about one-fourth of the cases, and severe in only about four cases in a hundred. Aaron (*1*) found moderate hearing losses in 9% of his twenty-nine cleft palate cases. Linthicum (*15*) and Halfond and Ballenger (*10*) have reported that the hearing loss in cleft palate individuals ranges from mild to moderate. Holborow (*12*), however, contends that in the majority of cases the loss is moderate.

Gaines (*4*) found that there was lessened perception for both the high and low frequencies in cleft-associated hearing loss. According to Sataloff and Fraser (*23*), the predominant hearing loss found in cleft palate persons is in the low frequencies. To the contrary, Miller (*20*) reported that, characteristically, the very high frequencies are affected.

In summary, it has been well established that the incidence of hearing loss is substantially greater among cleft palate individuals than among persons without cleft palate. When present, the hearing loss is most often bilateral and conductive. Few positive statements can be made concerning the differences in the reported incidence of hearing loss in various cleft palate samples; however, they may be attributable to differences in a) the age of the subjects, b) types of clefts presented by the subjects, and c) the procedures employed in their rehabilitation. Further, differences exist with respect to the severity of the hearing losses found in cleft palate populations and the frequencies which are affected. The results of these studies do, however, indicate that cleft palate individuals frequently have an auditory handicap.

The purpose of this survey was to determine if a group of Oklahoma cleft palate individuals conformed to the previously reported high incidence of hearing loss in cleft palate for air conduction only. Information was compiled from case records of 103 patients seen at the University of Oklahoma Medical Center, Cleft Palate Team, between September, 1963, and March, 1964. Subjects were classified according to age, sex, type of cleft palate, and hearing levels for the speech frequencies. Subjects ranged in age from 3 to 41 years.

Results

A summary of the various types of cleft defects is shown in Table 2. Cleft of the lip alone occurred in only eight cases (7.8%) and cleft of

TABLE 2. Distribution of the subjects according to type of cleft and age.

age (years and months)	*type of cleft*				
	congenital insufficiency of the palate	*cleft lip only*	*cleft palate only*	*cleft lip and palate*	*total*
3–0 to 5–11	0	2	2	16	20
6–0 to 8–11	1	3	10	11	25
9–0 to 11–11	3	0	4	10	17
12–0 to 14–11	3	0	3	11	17
15–0 or more	1	3	9	11	24
totals	8	8	28	59	103

the palate in only 28 cases (27.2%). Eight cases (7.8%) presented congenital insufficiencies of the palate. Clefts affecting both the lip and palate were found in 59 cases (57.2%).

Of the 103 subjects studied, 60 (58.25%) were males, and 43 (41.75%) were females. There were only slight sex differences in the occurrence of cleft lip and congenital palate insufficiency. More males then females, however, exhibited cleft palate alone and cleft lip and palate. There were almost three times as many males in the sample with bilateral cleft lip and palate.

Table 3 presents data indicating, for the total subject group, the frequency of occurrence of specified levels of hearing loss through the speech

TABLE 3. Number of subjects, classified by age and type of cleft, who evidenced the indicated levels of hearing loss (the threshold for each ear is averaged over 500, 1000, and 2000 cps).

group	*N*	*better ear*		*poorer ear*	
		mean loss of 15–30 dB	*mean loss of 30 dB or more*	*mean loss of 15–30 dB*	*mean loss of 30 dB or more*
Age (years and months)					
3–0 to 5–11	20	1	2	2	3
6–0 to 8–11	25	5	0	5	5
9–0 to 11–11	17	0	2	2	4
12–0 to 14–11	17	1	1	0	5
15–0 or more	24	5	3	5	4
Cleft type					
congenital insufficiency of the palate	8	0	0	0	2
cleft lip	8	0	0	0	0
cleft palate	28	5	5	6	7
cleft lip and palate	59	7	3	8	12
total	103	12	8	14	21

frequencies; the subjects are classified according to age and type of cleft presented. These data were obtained by averaging the pure tone losses for each ear separately. When the better ear is considered, it will be noted that 12 had a 15-to-30 dB hearing loss and eight had a loss greater than 30 dB. When the poorer ear is considered, 14 had a 15-to-30 dB loss, while 21 had a hearing loss greater than 30 dB. Thus of the total group, 55 had a hearing loss of 15 dB or more in either ear. Eight had a hearing loss that would be expected to be socially handicapping (that is, 30 dB or more in the better ear). However, if a socially significant hearing loss had been defined as an average loss of 15 dB or more over the speech frequencies (500, 1000, 2000 cps), 20 of the total group so qualify. Certainly the number of losses of medical significance exceeds, by far, the number of socially significant losses.

When the incidence of hearing loss is considered according to the age at which the subjects were tested, 17 of the 24 subjects who were 15 years old or older had a hearing loss of 15 dB or more in either ear, while 15 of the 25 subjects who were ages 6-0 to 8-11 had hearing losses. Eight of the 20 subjects who were 3-0 to 5-11 in age had a hearing loss and eight of the 17 in the age group 9-0 to 11-11 had hearing losses. In the 17 subjects who were 12-0 to 14-11, seven had hearing losses.

When cleft type is considered, none of the subjects with cleft of the lip only had a hearing loss of 15 dB or more in either ear, but two of the eight subjects with congenital palatal insufficiency had hearing losses. Twenty-three of the 28 subjects with cleft palate only had a hearing loss of 15 dB or more, and 30 of the 59 subjects with a cleft involving both lip and palate had hearing losses.

Discussion

In this study, of 103 patients seen during a 6-month period at the University of Oklahoma Medical Center Cleft Palate Team, 55 (53.3%) of the subjects had a hearing loss of 15 dB or more in one ear. Subjects with cleft lip only and congenital palatal insufficiency were not found to have socially significant audiological deficits. It was found, however, that individuals with cleft of the lip and palate or with cleft palate only were similar in the frequency with which they had hearing loss. Approximately two-thirds of the subjects in these two groups showed a hearing loss of 15 dB or more in either ear when tested audiometrically. Some subjects in all categories except cleft lip alone presented medically significant losses.

This survey indicates need for further study of hearing loss in cleft palate. However, a prerequisite to further investigation would be an agreement as to what constitutes a significant hearing loss. Specifically, further research is indicated regarding the incidence, including interpopulation differences and severity of hearing loss in cleft palate. In addition there is need for further data concerning the etiological factors important in

cleft-associated hearing loss. Possibly in further research, it would be good to investigate the effect of medical treatment on these hearing losses and what type of treatment seems to be most effective.

Perhaps more important than further research concerning hearing loss and cleft palate are the current clinical implications. Any professional person engaged in cleft palate rehabilitation should be aware of the frequent coexistence of hearing loss and cleft palate. Specifically, hearing conservation including early education of the parent and routine otological and audiological follow-up are mandatory. With regard to the practice of clinical speech pathology, the effect of hearing loss upon speech acquisition and development must necessarily be considered. Medical and surgical treatment and amplification are other pertinent rehabilitatory considerations.

Summary

Information was complied from case records of 103 patients seen at the University of Oklahoma Cleft Palate Center between September 5, 1963, and March 26, 1964. Subjects were classified according to age, sex, type of cleft palate defect, and hearing levels for the speech frequencies. Subjects ranged in age from 3 to 41 years. Sixty (58.25%) were males, and 43 (41.75%) were females. Fifty-five (53.3%) of the subjects had a hearing loss of 15 dB or more in either ear. Subjects with cleft lip only (7.8%) and congenital palatal insufficiency (7.8%) were not found to have socially significant audiologic deficits. It was found, however, that individuals with clefts of the lip and palate (57.2%) and of palate only (27.2%) were very similar in the frequency with which they had hearing losses. Approximately two-thirds of the subjects in these two groups showed a hearing loss of 15 dB or more in either ear when tested audiometrically. At least some of the subjects in all cleft categories, except cleft lip alone, presented medically significant hearing losses.

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