HEARING LOSS IN PATIENTS OF CLEFT LIP AND PALATE

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Introduction

Congenital deformities of the Ear, Nose, Palate and status of the patient play a significant role in the final analysis of the auditory state.

Since good hearing is essential for learning to speak. It is obvious that any hearing loss due to diseases of the ear will be an obstacle to the patients acquisition of good speech. Such a condition exists in cleft palate cases.

The split in the velum alters physiologically the muscles related to the Eustachian tube, thus rendering the child more vulnerable to frequent attacks of otitis media.

This study was undertaken to know the evidence of hearing loss in cleft lip and palate cases. To judge if the hearing loss is progressive or not and to find out any definite etiological factors.

Anatomy of the Eustachian Tube :

Eustachius in 1563, described this memberano cartilaginous tube. The Eustachian tube connects the nasopharynx to the aircvaties in the mastoid.

The bony portion of the tube should be considered as an extension of tympanic cavity. Activity takes place in the cartilaginous portion only. The tube is normally closed. It opens during swallowing and this allows the air pressure in the middle ear to get equalised with that of atmosphere. If the tube fails to open, the oxygen is slowly absorbed from the middle ear and a conductive deafness develops.

The Eustachian cartilage surrounds the tube and is shaped in cross section, like a Shephred's Crook. Elastic fibres in the concavity of the cartilage maintain this curve and ensure that it regains its normal shape after displacement.

Changes in the Eustachian tube with age :

In infancy, the tube is wider and there is a loss well marked isthmus than in the adults. The tubal opening are lower and are nearly at the level of the soft palate. The most important difference, however, is that in infancy the cartilage lies in a horizontal plane so that the lumen is a slit parallel to the base of the skull (Fig. 1). In later childhood and adult life it becomes more nearly vertical and at right angle to the base of the skull. It will be easily seen that when the tubal cartilage is in the infantile position, the action of the levator palate is minimal and tubal opening will depend largely upon tensor palati.

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Effect of cleft velum on the movement of the Eustachian Tube :

According to Veau (1931) if a cleft is formed the aponeurosis does not develop, because it represents the consequence of the posterior pulling of the muscular sling. The soft palate is, therefore, short and the tendon of the tensor muscle, which has an abnormal oblique and upward direction is inserted mainly on the posterior edge of the hard palate; it pulls the velar tags forwards and outwards, causing the tips of the cleft uvula to point towards the midline. On the other hand, arising partly from the posterior border of the hard palate it should be able to open the Eustachian tube orifice. The activity of the Levator palati becomes insignificant. When present its action, associated with one of the divided pterygo-pharyngeus segment of the superior constrictor, is to open the cleft more widely.

The opening of the Eustachian tube during deglutition appears definitely impaired in cleft palate. The levator palati is unable to elevate the soft palate and the floor of the tube. The swallowing mechanism is disturbed and no reflex opening of the tube by means of the tensor muscle can be elicited. The only active muscle in the mechanism is probably the salpingopharyneus which in some cases stands out like a band of muscular tissue on the lateral pharyngeal wall.

Veau maintains that palatal and pharyngeal muscles have a normal volume in a cleft palate fetus. With age, muscular atrophy develops secondary to the anatomical anomaly and inactivity of the muscles. It is more so after the poor surgical results as atrophy reaches its maximum and the velum is whitish, tight and immobile. Thus the opening of the eustachian tube will become more and more impaired resulting in recurrent infection of the middle ear with progressive hearing loss.

Many suggestions have been made in attempts to account for the deafness and to relate it to other aspects of the deformity.

Clinical Material and observations

The subjects in this study were 40 patients of cleft lip palate who attended the services of the post-graduate department of plastic surgery at K.G.'s Medical College, Lucknow.

Age and Sex and Type of Cleft (Table I)

The age varied between 3 years to 20 years (the patient below 3 years were not included in this study because of poor cooperation). The maximum number of the cases were between 5-14 years of age.

Table I

Age group (Years)	Cleft lip		Cleft lip and palate		Cleft Palate		Total
	M	F	M	F	M	F	
0— 4	1	—	3	1	2	1	8
5— 9	2	—	4	2	6	1	15
10—14	3	3	3	2	1	2	14
15—19	—	1	—	—	—	—	1
20—24	1	—	—	1	—	—	2

E. N. T. Findings :

Positive E.N.T. findings are depicted in table 2 ABC. Majority of these cases belong to Gr. II and Gr. III. It is significant to note that large percentage of cases had no positive Ear findings :

Ear Finding 2A

S. No.	Findings)	Number of cases
1.	Impacted wax	4
2.	Perforation	3
3.	Tympanosclerosis	1
4.	Secretary otitis media	2
5.	Discharging Ear	8
6.	Normal	22

Nose Findings 2B

Sl. No.	Findings	Number of cases
1.	Deviated Nasal Septum	10
2.	Allergic Rhinitis	2

Throat Finding 2C

Sl. No.	Findings	Number of cases
1.	Adenoid Hyperplasia	10
2.	Tonsilitis	5
3.	Pharyngitis	3
4.	Thickened vocal cord	1

Incidence of Hearing Loss

Out of 40 cases, 26 patients had various types of hearing loss. Out of which 14 were males and 12 were females. Rest 14 cases nad normal hearing (Table III).

Table III

Sl. No.	Audiotion	No. of cases		Total
		Male	Female	
1.	Absent	14	12	26
2.	Present	12	2	14

Type of Hearing Loss according to type of Cleft :

Out of 26 cases, 13 (50 percent) had conductive type of hearing loss. 3 out of 13 cases belonged to group I (all females), 4 belonged to group II (all males), and 6 cases were of group III with equal sex distribution (Table IV).

9 cases (34.6 percent) were of mixed hearing loss. 7 out of 9 cases fell in group II (3 males and 4 females), 2 cases were in group III (all males).

4 cases (19.4 percent) were had sensori-neural type of hearing loss. 3 cases belonged to group II (2 males and 1 females), and 1 cases had cleft palate only (Table IV).

Table IV

Sl. No.	Type of hearing loss	Type of cleft						Total	Per cent age
		Cleft lip		Cleft lip and palate		Cleft palate			
		M	F	M	F	M	F		
1	Conductive	—	3	4	—	3	3	13	50.0
2	Mixed	—	—	3	4	2	—	9	34.6
3	Sensori-neural	—	—	2	1	—	1	4	14.5
	Total							26	

Distribution of unilateral and bilateral hearing loss with respect to age, sex and type of cleft :

Out of 26 cases with hearing loss, unilateral deafness was present in 14 cases (53.8 percent) and 12 cases (46.2 percent) had bilateral hearing loss (Table V).

4 cases with unilateral hearing loss belonged to age group of 10—14 years while 7 cases belonged to age group of 5-9 years.

Out of 12 cases of bilateral hearing loss 6 cases belonged to age group of 5-9 years (Table V).

Average Thresholds for Different Frequencies with respect to the type of Cleft (Fig. 2ABC).

The Fig. 2ABC depicts the average frequency responses in different types of the clefts. Here frequencies of 25,500, 6000 and 8000 cps. give maximum thereshold, that is 31.5 db. It is evident that maximum hearing loss in present in cases having cleft palate (2B) only followed by cases with complete cleft 2C).

Magnitude of hearing loss in respect of cleft :

Out of 13 cases 9 cases had, mild (upto 40db) type of conductive loss and those were equally divided in all three groups of cleft, 4 cases had moderate (40-60 db) type of conductive loss, while none had severe (60-110 db) loss (table VI, fig. 3).

4 out of 9 cases had mild type of mixed hearing loss and 4 cases (3 in group II and I in group III) had moderate type of hearing loss.

2 out of 4 cases were of moderate type of sensori-neural hearing loss, while one each had mild and severe type (Table VI, Fig. 3).

Discussion

A correlation between cleft lip palate and hearing loss has been known ot exist since last 100 years. The figures, recorded range between 3 percent (Spriesters back et al 1962) to 90 percent (Staloff and Fraser, 1952). There are several possible reasons or these differences. For instance different difinitions of hearing loss, inadequate sampling method, poor testing conditions, type of management and age of the subject.

Subsequent to the publications both by stool and Randall (1967), these problems became of vital interest. We conducted Otological, Audiological and Radiological exami-

Table V

Sl. No.	Age Group	Unilateral hearing loss						Bilateral hearing loss					
		Cleft lip		Cleft lip and palate		Cleft palate		Cleft lip		Cleft lip and palate		Cleft palate	
		M	F	M	F	M	F	M	F	M	V	M	F
1	0— 4	—	—	2	—	—	—	—	—	2	—	—	—
2	5— 9	—	—	2	2	2	1	—	—	1	2	3	—
3	10—14	—	—	1	2	1	—	—	—	—	1	—	3
4	15—19	—	1	—	—	—	—	—	—	—	—	—	—
5	20—24	—	—	—	—	—	—	—	—	—	—	—	—
	Total				14						12		

nations of our patients. The results obtained are discussed in details.

The maximum number of patients in our study are in age group of 5-9 years (table 1), and maximum number of cases belonged to cleft lip and palate (group II, Table 4) group).

Positive significant ear findings were found in 25 percent of cases in our study (Table 2A). Where as Skolnik (1958) reported abnormal ear pathology in 6 percent of the cleft lip and palate patients under one year of age. This incidence went upto 69 percent by the school going age. But most of the cases in our study were of school going age.

In the literature (Holfond, 1956) various types of ear Pathology have been described. But in our study, 4 cases had impacted Wax, 3 cases had Perforated tympanic membrance two cases had secretary otitis media and one case had tympanosclerosis. Koch et al (1959) reported maximum number of cases who had alteration of lustre followed by impaired mobility of the tympanic membrane whereas impacted wax and perforated tympanic were common findings in our series.

Though only 45 percent of cases (Table 3) had significant ear pathology but the hearing loss was present in 65 percent of cases. This dispartity can be explained by the fact that there are certain abnormalities of the middle ear and inner ear like discontinuity of ossicular chain, fixation of stapes and the middle ear infections etc. which cannot be detected by a simple E.N.T. examination. Another method of defecting hearing loss in early childhood is impedance audio-metry. This method is more objective diagnostically in the case of conductive hearing loss.

Various types of hearing loss as found in lip and palate cases have been described by Rose (1971). They are (1) conductive (2) sensorineurar and (3) mixed type.

The incidence of hearing loss in relation to cleft has not been clearly established. Some investigators have reported a higher incidence of hearing loss in cleft lip and palate (group II, Drettner, 1960). Whereas others found a tendency for a greater incidence of hearing loss in cleft palate (group III, Masters et al 1960 and Sariostersback et al, 1962). While Pannbacker (1969) and Graham (1964) were of the opinion that patients with cleft of the lip and palate or palate only were very similar in the frequency with which they had significant hearing loss. In our study the maximum hearing loss is in cleft lip and palate (group II, 53.4 percent) which conforms with the findings reported by Drettner (1960). We also found that maximum number of patients in our study had conductive hearing loss (50 percent) and the least number of patients had sensori-neural hearing loss.

It is generally reported that the majority of cleft palate children have primarily bilateral hearing loss. Hallawr et al (1970) showed that 48 percent of cleft palate subjects had unilateral ear pathology and approximately 70 percent had significant unilateral air bone-gap.

Cholet and Lounsbury (1966) have pointed out that frequently children with obvious fluid in the middle ear responds by a routine air conduction test with normal or near normal hearing, thus, children with suspected disease have been dismissed for lack of evidence of diffculty, though abnormality was presumably present. It has been suggested by Sweitzer et al (1968) that the air-bone gap appears to be more useful criterion than the more traditional air conduction screening

alone in evaluating medically significant hearing loss among cleft palate individuals.

In our study 34.5 percent cases of ceft lip and palate (group II) and cleft palate (group III) had bilateral ear pathology but the unilateral hearing loss was present in 53.8 percent and bilateral hearing loss in 46.2 percent.

The maximum average hearing loss in our patients is mainly in the frequencies of 250, 500, 6000 and 8000 cps.

Audiometrically the maximum number of cases had hearing theresholds of 30-35 db. While Jarvis (1976) showed hearing loss of 20 db in most of his cases. This can be explained by the fact that the prevailing test conditions in our setup were not ideal.

Such cases who develop loss of hearing due to secondary causes like infection can definitely be minimised by proper regular care with improved community Health Service by a team of paediatricians, otologists, orthodontist, audiologist, and plastic surgeon.

In over all study of a small group of 40 cases in our series shown significant hearing loss i.e. 65 percent. Therefore it make a imperative for a cleft palate team to undertake epidermiological studies and devise proper ways and means by which this higher incidence may be brought down to minmal level. Since these figures are comparable all over the world it would make the plastic surgeon think in retrospect as to analyse and standardise their operative techniques, so as not to further damage the already defective mechanism of closure of eustachian tube by extensive primary or secondary procedures.

Summary

This study showing 65 percent hearing loss in cases of cleft lip and/or palate cases.

Bibliography

1. Chalet, M. &. Lounsbury, F., 1966 Laryngoscope, 76, 983.
2. Drettner, B. 1960, Acta Oto-Laryng, 52, 134.
3. Eustachius, 1563, Arch-otolaryng, 79, 472, 1964.
4. Graham, M.D. 1964 Ann. Otolaryng. 73. 34.
5. Halfond, M. M. & Ballenger, J.J. 1956(a) Arch. Oto Karyng, 64, 58, 1956(b) ibid 64, 335.
6. Helle, J. C. et al 1970 Cleft Palate Journal 7, 774.
7. Jaryis, J. F. 1976 Audiology 13(5), 242.
8. Koch, H. F. et al 1969 Cleft Palate J. 7, 187, 1970.
9. Masters, F. W. et al 1970 Plastic and Reconstructive Surg. 25, 503.
10. Panbacker, M. 1979, Cleft Palate J. 6, 50.
11. Rose, D. E. 1971, Audiological assessment.
12. Sataloff, J. & Fraser, M. 1953. Arch. Otolaryng. 55, 61.
13. Skolnik, E. M., 1958 Laryngoscope, 68, 1908.
14. Spriestersback, D. C. et al 1962. Plastic & Reconstructive Surgery 30, 336.
15. Stool, S. F. & P. Pandall 1967, Cleft Palate J, 4, 99, 1967.
16. Sweitzer, R. S. et al 1968 Cleft Palate J. 5, 141.
17. Veau, V. 1931 Division Palatine, Paris Masson et eie.

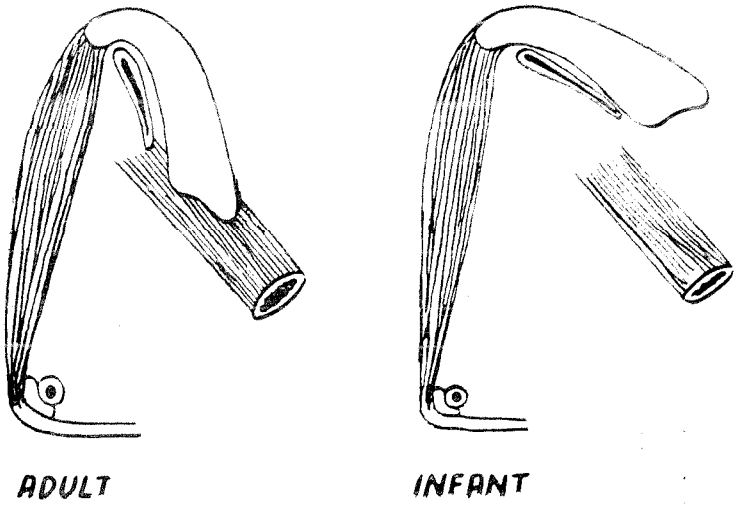

Fig. 1. Eustachian tube showing Horizontal position and changes with age.

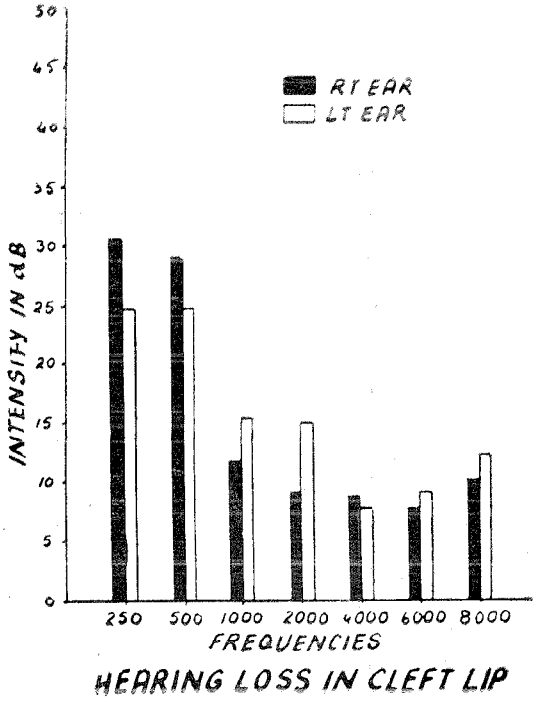

Fig. 2a

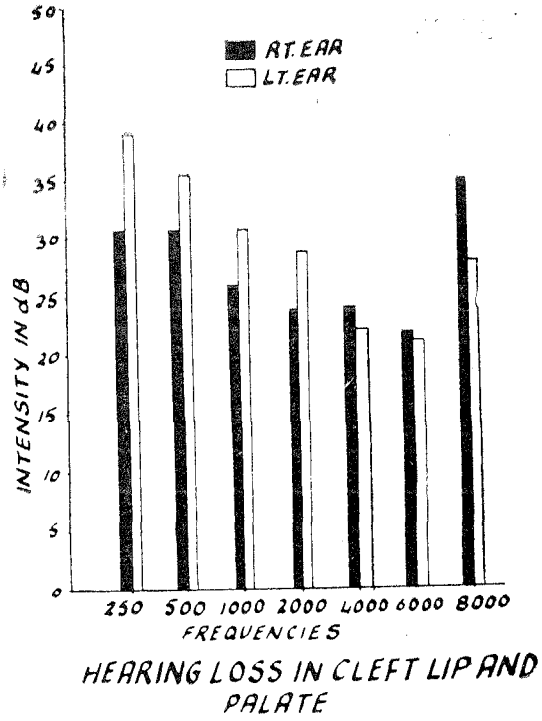

Fig. 2b

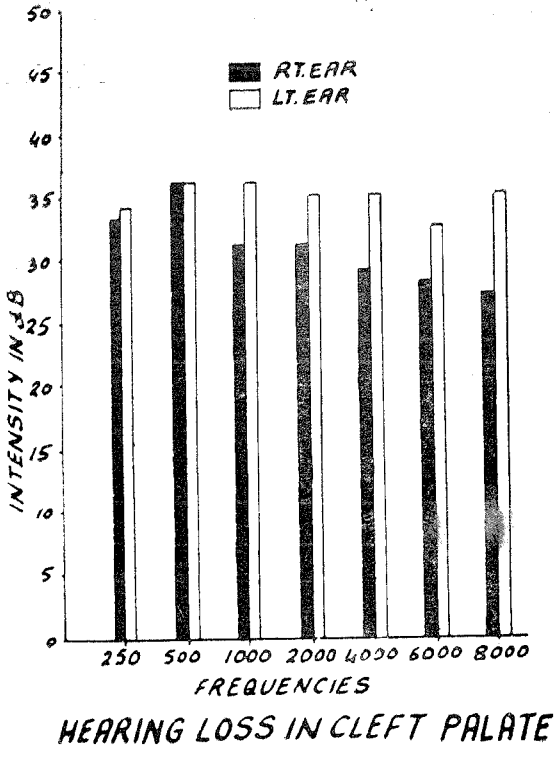

Fig. 2c

Fig. 2. a, b, c, Hearing loss with respect to frequency.

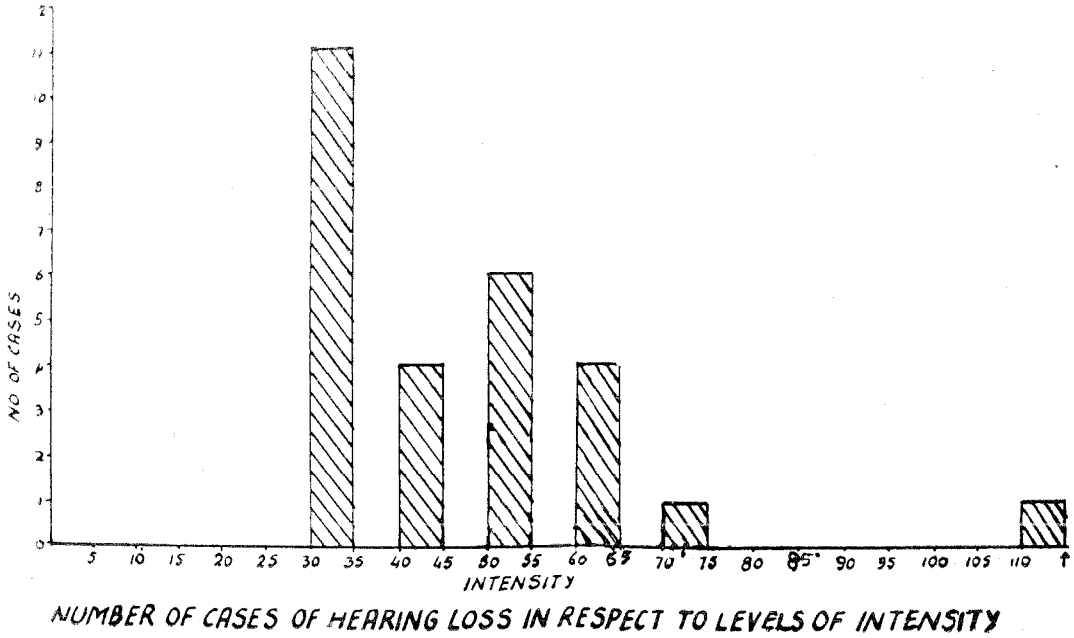

Fig. 3. Magnitude of hearing loss.