PNEUMATIZATION OF MASTOID AIR CELL SYSTEM IN CLEFT LIP AND PLATE CASES

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Introduction

Air cells in the various cranio-facial bones play important part in the normal audition and phonation. Developmentally mastoid air cell system is a part of 1st and 2nd branchial i.e. the bone arches giving rise to the formation of lip, palate, ears and eustachian tube etc.

Gupta (1978) found a significant hearing loss in cleft lip and palate population on audiometric examination. Various causes of deafness as reported in literature are :

I. Infection

A. Anatomical factors :
Lymphoid hyperplasia, tubal stenosis, obstructed nasal air way, A plastic torus of the tube, horizontal position of the tube (referred to Fig. 1, Page 25).

B. Physiological factors :
Malfunction of the eustachian tube, poor development of Tensor Palati, absence of muscle anchorage, poor surgery, poor palatal function (Fig. I).

II. Atypical Tongue Habits

III. Age of Child

IV. Underdeveloped Mastoid Air System

Material/Methods

27 cases were included in the present study. 25 other cases who had come for Plastic Surgery for other problems were included as control subjects.

(*a*) A thorough Ear-Nose-Throat examination was done.

(*b*) Lateral skiagram of the skull was taken to study the pneumatization in the mastoid air system.

(*c*) Audiometry.

Audiometry

Before subjecting the cases for audiometery the ear canals were cleaned for any impacted cerumen. The procedure adopted for obtaining the auidogram of these cases was as follows.

An "Arphy portable audiometer MK III" was made use of for obtaining audiogram. Audiometery was conducted in a quiet room in the hospital away from the traffic where the noise level was comparatively low and tests were conducted after the hospital rush hours.

The subjects were seated comfortably on a chair infront of the tester and the audiometer was placed in between the two, so that the subject was not able to see the dial manipulations on the audiometer. The subject was then informed that he/she is going to hear tone in the ear and on hearing the tone he/she would raise the index finger of right hand if the sound is heard in right ear and the left if the sound heard in left ear. Then the head set was put on the subject, red ear phone to the right ear and blue to the left. The actual threshold was established by the method of ascending limit. Tones were presented in

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the right ear starting from O dB and the the intensity of the tones were increased in 10 dB steps until the subject responds. Once a response was given by the subject, the intensity of the tone was decreased in 5dB steps until the patient fails to respond. From this level the intensity was increased by 10 dB and the tone presented and the response noted. This procedure was repeated thrice.

Thus the threshold was accepted to be that intesity which is the minimum level at which the subject gives at least two positive responses out of the three presetatios.

The tone that was tested first was 1000 cps, and then the procedure was repeated for tones of 2000, 4000, 6000, 8000, 1000, 500 and 250 cps, in that order.

In the case of children on whom the test could not be administered in the above manner, the technique of play audiometry was adopted in arriving at reliable thresholds. Here the subjects were conditioned first for the response of putting a ring into a peg when a sound was heard. For conditioning a sufficiently loud tone was used and when once the subject was conditioned the intensity of the tone was reduced in 5 dB steps until the subject failed to respond. From this level the threshold was established by making use of the "Descending Method of of Limit".

On subjects who showed a significant hearing loss by air conduction, bone conduction thresholds were also tested by using the bone vibrator of the audiometer.

The thresholds thus obtained were charted on the audiogram sheets of each case.

Observation/Discussion

PNEUMATIZATION OF TEMPORAL BONE IN CLEFT AND CONTROL CASES

In this study out of 40 cases, 27 cases could be X-rayed because some of the patients were not co-operative. The skull X-ray were also taken in 25 normal individuals of different age group to serve as control.

The area of pneumatization in temporal bone was measured in square centimeters by plotting on the graph (Fig. 2a, b, c, d, e). The mean area for each group was calculated. It is evident from the table 1 that the area of pneumatization is decreased in all age groups but this is more marked in younger age group.

Table 1

Sl. No.	Age groups (years)	Mean area in square centimeters	
		Control	Cleft cases
1.	0— 4	8.08	2.79
2.	5— 9	9.44	3.73
3.	10—14	11.35	5.95
4.	15—19	11.70	11.46
5.	20—24	16.25	12.96

COMPARATIVE PNEUMATIZATION AND HEARING LOSS IN CLEFT LIP, CLEFT PALATE AND CLEFT LIP & PALATE CASES

The interesting finding observed were that area of pneumatization in cleft palate alone cases were less than as compared to lip and cleft palate cases (Table 2).

Table 2

Mean area of pneumatization in square cms.

Sl. No.	Age	Cleft lip	Cleft Lip & palate	Palate
1.	10 yrs	12.75	11.36	8.48
2.	10 yrs	14.40	12.46	9.76

However, the value of these findings are difficult to predict there are various theories about the pneumatization of the temporal bone. Diamont (1940) considered that the size of the air cell system is affected by the

genetic fsctors. While others investigators thought that the environmental factors play a decisive role in the pneumatization.

Ruedi (1937), Bast and Forester (1939) and Ijala (1950) showed that the development of the mastoid air cell system begins during the last few weeks of the fetal period. This is confirmed radiologically by Welm (1941) and Rossmann (1950). So it may be a developmental defect of pneumatization in patients having cleft of lip and/or palate. But only the time will tell that how much will it affect on the hearing in patients of cleft lip and/or palate.

Summary :

27 cases of cleft cases have undertaken in this study. Pneumatization of the mastoid air cell system has been studied in a case of cleft lip & palate. The area of pneumatization is less in cleft lip and palate populations as compared to control subject.

References

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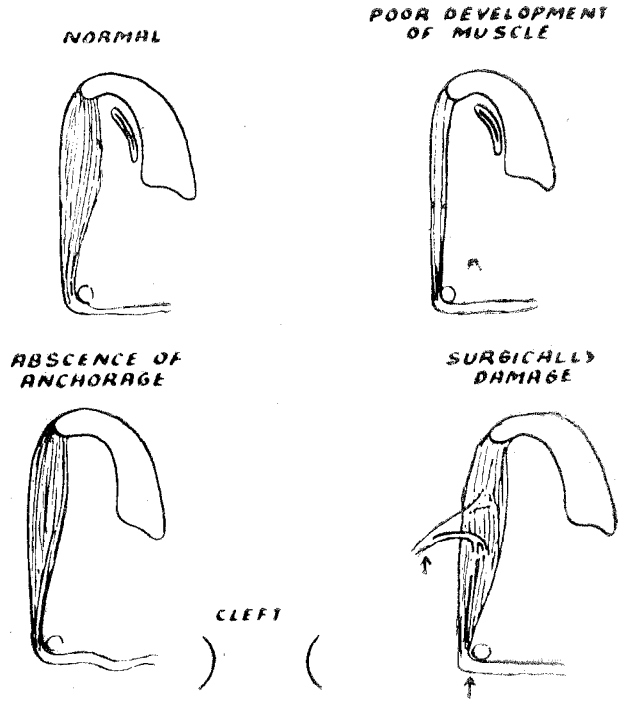

Fig. I. Showing poor development, abscenen of firm anchorage and damage of tensor tympani during operation.

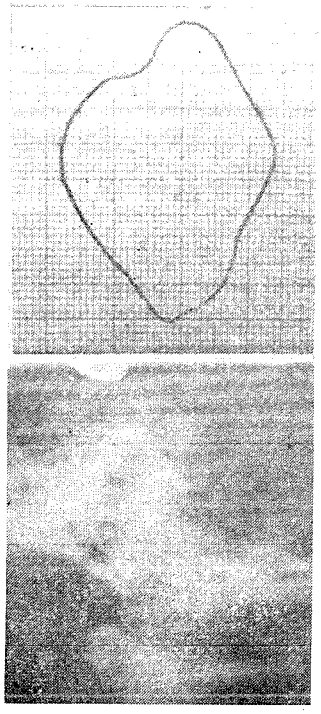

Fig. IIa

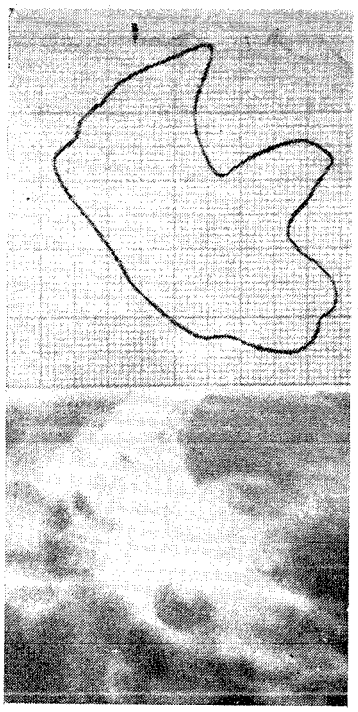

Fig. IIb

Fig. IIc

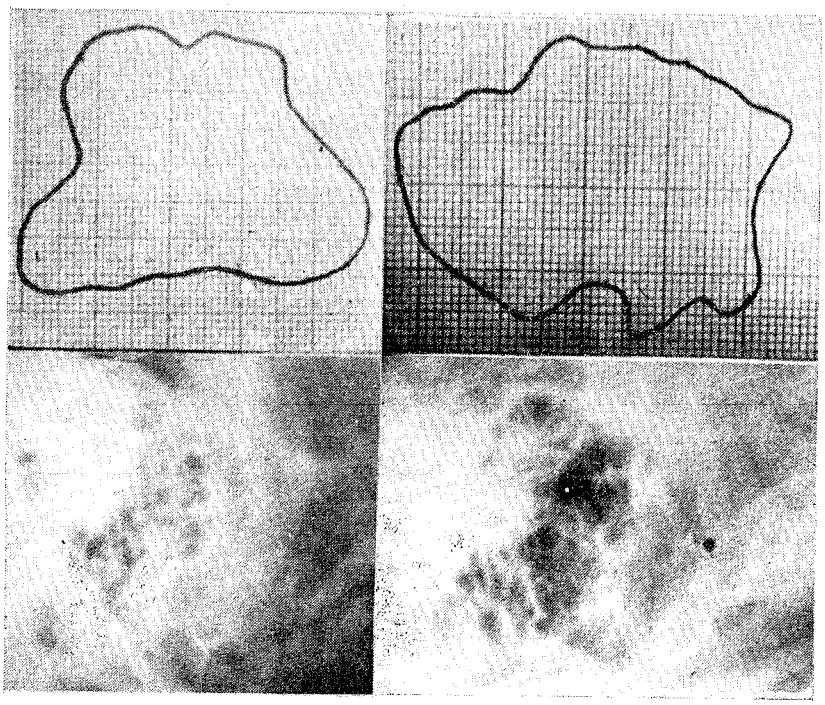

Fig. IId

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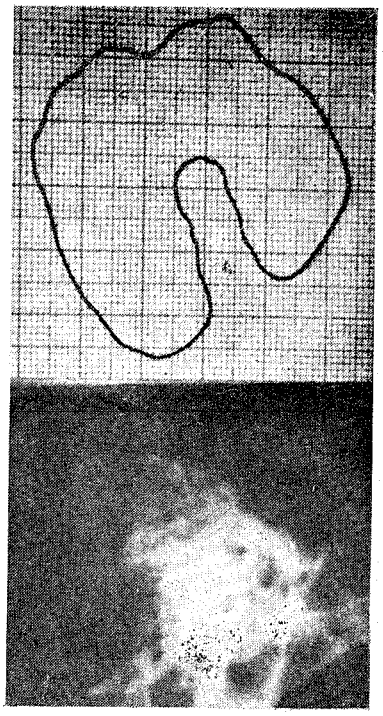

Fig. IIe

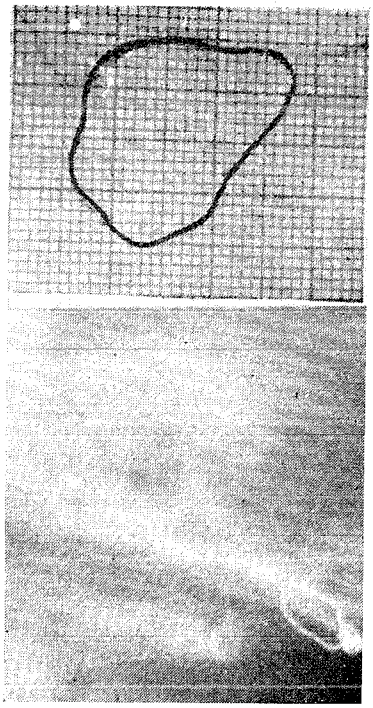

Fig. IIa′

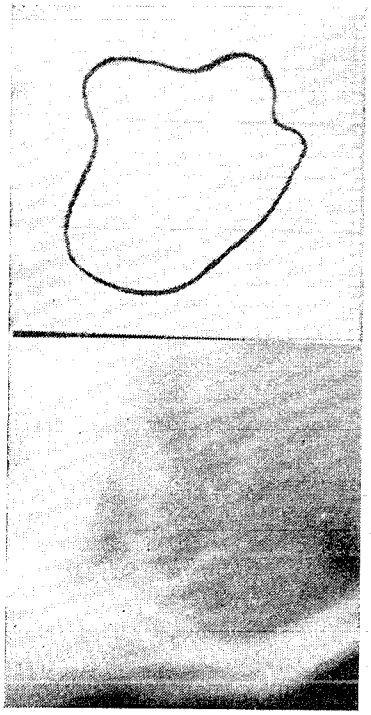

Fig. IIb′

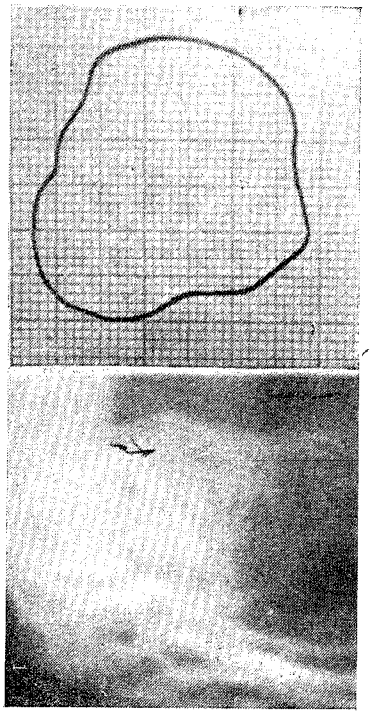

Fig. IIc′

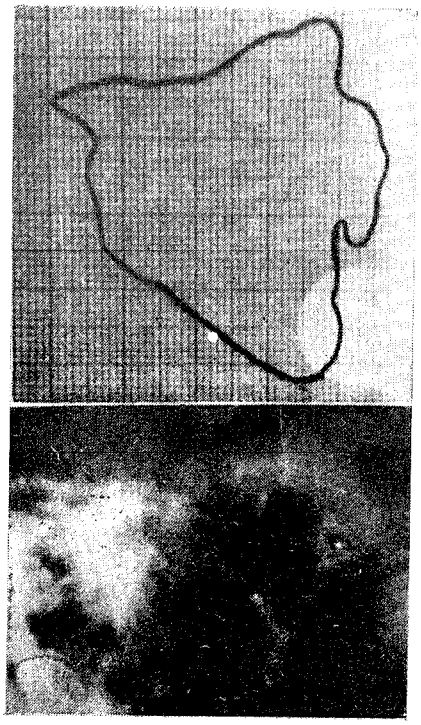

Fig. IIe′

Fig. II. (abcde) Showing area of Pneumatization in control and cleft cases in different age groups as shown in table No. 1).