

# EAR FINDINGS IN POST SURGICAL CLEFT PALATE PATIENTS

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## ABSTRACT

### Introduction

Cleft lip and palate is one of the most common congenital anomaly, which contributes to eustachian tube dysfunction leading to impaired middle ear ventilation and middle ear pathology. It has been stated that the timely repair of cleft palate reduce the incidence of otitis media with effusion.

### Objective

To describe the ear findings in cleft palate patients who have undergone repair of cleft palate.

### Methodology

36 (20 male and 16 female) post cleft repair patients underwent Otoscopy and Tympanometry between January to December 2018. Cases with isolated cleft lip, ears with perforation of tympanic membrane and attico-antral disease were excluded.

### Results

The age range was from 4 years to 24 years, with a mean of 11.34 years. Maximum patients were of the age group of 10-20 years (18, 50%) followed by that of 5-10 years range (15, 41.66%). Total number of ears examined were 72. Out of a total of 72 ears, 70 (97.2%) had abnormal otoscopic finding with dull tympanic membrane in 37 (51.39%) ears, retracted in 31 (43.05%) and bulging tympanic membrane in 2 (2.78%) cases. Type B curve was the commonest (36, 50%), followed by Type As (24, 33.3%). Type C curve was found in 11(15.3%) ears. Type A curve was found only in 1 ear. The duration of post-repair of cleft palate ranged from 6 months to upto 16 years with a mean of 8.52 . 11 cases(30.56%) had history of repair of cleft palate of more than 10 years duration.16 cases (44.44%) had that of more than 5 years and 9 cases (25%) had less than 5 years history of duration of repair. When correlation was done statistically, the tympanometry findings and duration of repair had a very low correlation (Table 5). The time period of repair had no significant effect on tympanometric ear findings.

### Conclusion

Abnormal otoscopic findings and tympanometric findings were common in post cleft palate repaired patients. The duration of cleft palate repair had low correlation to the tympanometric ear findings.

## KEYWORDS

*Cleft palate, middle ear, otoscopy, tympanometry*

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## INTRODUCTION

Cleft lip and palate are common congenital anomaly with a birth prevalence rate ranging from 1/1000 to 2.69/ 1000.<sup>1</sup> There is a high association of middle ear pathology and cleft palate, when left unrepaired. Basic pathophysiology that contributes to deafness in these children is eustachian tube dysfunction leading to impaired middle ear ventilation. This can progress to otitis media with effusion (OME), acute suppurative otitis media, and chronic suppurative otitis media.

It has been stated that the children with cleft palate who have not being repaired up to the advanced age, will have otitis media with effusion or its further complications, more frequently in comparison to those having normal palate.<sup>2,3</sup> Timely repair of cleft palate has been proposed to improve middle ear physiology and reduce the incidence of otitis media with effusion.<sup>4</sup> However, this opinion has been challenged in some literature.<sup>5,6</sup>

Otoscopy is a basic primary modality of evaluation of external auditory meatus and the tympanic membrane (TM). This also helps in diagnosing the middle ear pathology. Tympanometry is an objective test to assess middle ear function. It is the gold standard investigation in detecting otitis media with effusion. The type of tympanometric curve obtained is classified according to the Lidén and Jerger's classification.<sup>7,8</sup> The classification of these curves is: a. Type A: Suggestive of normal middle ear function b. Type AS: Suggestive of a less compliant middle ear system c. Type Ad: Suggestive of highly compliant middle ear system d. Type B (low and high): Low – suggestive of middle ear dysfunction, high – suggestive of grommet or perforation e. Type C: Suggestive of eustachian tube dysfunction. Type A curve is considered normal and all others (Types B, C, As, and Ad) as abnormal.

This study was conducted on patients of cleft palate, with or without cleft lip who have underwent repair, to evaluate the middle ear function in postoperative period.

## METHODOLOGY

The patients included in the study were the postoperative cases of cleft palate, with or without cleft lip, attending ENT OPD for check up from 1 January to 31 December 2018. These cases were evaluated in the OPD, after ethical approval and informed consent. A total of 36 cases were included in the study group (20 male and 16 female) after fulfilling the criteria. For the purpose of analysis, the results obtained were expressed as number of ears. Otoscopy and tympanometry was done in all patients. Otoscope examination was done with Welch Allyn Otoscope. Ears with perforation of tympanic membrane and attico antral disease were excluded.

Tympanometry was done with Impedance audiometer AT235 Interacoustic A/S Assens (Denmark) with universal probe system ATP-AT235U. Probe tone frequency was 226 Hz and probe tone intensity was 85dB SPL. The results were tabulated and analysed. Spearman's correlation was done to that of the duration of repair of cleft palate and the tympanometric finding of ear, using IBM SPSS statistics 21.0 version.

## RESULTS

A total of 36 ( 20 male, 16 female) patients of cleft palate,

with or without cleft lip were included. The age range was from 4 years to 24 years, with a mean of 11.34 years +/- 4.34 (Table 1). Maximum patients were of the age group of 10-20 years (18, 50%) followed by that of 5-10 years range (15, 41.66%). Total number of ears examined were 72. 70 ears had abnormal otoscopic finding with dull tympanic membrane in 37 (51.39%) ears, retracted in 31 (43.05%) and bulging tympanic membrane in 2 (2.78%) cases (Table 2). 2 (2.78%) ears were absolutely normal. Type B curve was the commonest (36, 50%), followed by Type As (24, 33.3%) Table 3. Type C curve was found in 11(15.3%) ears. Type A curve was found only in 1 ear. The duration of post-repair of cleft palate ranged from 6 months to upto 16 years with a mean of 8.52 +/- 4.25 (Table 4). 11 cases(30.56%) had history of repair of cleft palate of more than 10 years duration. 16 cases (44.44%) had that of more than 5 years and 9 cases (25%) had less than 5 years history of duration of repair. When correlation and association was done statistically, the tympanometry findings and duration of repair had no significant correlation or association (Table 5).

**Table 1: Age Distribution**

AGE GROUP (years)	NUMBER	PERCENTAGE
≤5	2	5.56
>5 – 10	15	41.66
>10-20	18	50
>20	1	2.78
TOTAL	36	100

**Table 2: Otoscopic findings**

Otosopic findings (n=72)	Number	Percentage
Normal	2	2.78
Dull Tympanic membrane (TM)	37	51.39
Bulging of TM	2	2.78
Retraction of TM	31	43.05
Total	72	100

**Table 3: Type of Tympanometry curve**

Type of Curve	Right ear (Number)	Left ear (Number)	Total	Percentage
A	1	0	1	1.4
As	12	12	24	33.3
B	16	20	36	50
C	7	4	11	15.3
Total	36	36	72	100

**Table 4: Duration of Repair**

DURATION OF REPAIR (years)	NUMBER	PERCENTAGE
≤5	9	25
>5-10	16	44.44
>10-20	11	30.56
TOTAL	36	100

**Table 5: Duration of repair of cleft palate to Tympanometry findings (Correlation and association)**

n=72	Right tympanometry	Left Tympanometry
Spearman's Correlation coefficient (rho value)	r= -0.005	r= -0.139
Chi-Square value	0.977	0.433



## DISCUSSION

Cleft lip and palate are congenital deformity caused by abnormal facial development during gestational period. Cleft palate is a condition in which two plates of skull that forms the hard palate (roof of mouth) are not completely formed. Cleft palate can be of two types: complete (hard palate and soft palate) or incomplete (a hole in the roof of mouth). The basic defect is failure of fusion of the lateral palatine processes, the nasal septum and/or the median palatine processes.

The mean age of 36 (20 male, 16 female) patients of study group was 11.34 years. The mean duration of cleft repair was 8.52 years. 70 (97.22%) ears had abnormal otoscopic finding (dull TM 51.39%, retraction 43.05%, bulging TM 2.78%). Abnormal tympanometric finding was found in 71(98.6%) ears (Type B 50%, Type As 33.3%, Type C 15.3%). Feniman et al. observed 84% of alterations in otoscopy (opacification - 83.4%, visible fluid in the middle ear-1.5%, the eardrum does not move during inflation-1.8, and retraction - 0.7) and 65% in tympanometric curves (B/38%, A/36.5%, As/21%, C/4%, and Ad/0.5%) in their study.<sup>9</sup> Zheng et al. had abnormal tympanometry in 52% of the ears examined and eardrum retraction was found to be the most common otoscopic abnormality (50%).<sup>10</sup>

Similar was the observation of Gautam et al. who found abnormal otoscopy in 66.6% and Type B tympanogram in 72.7% of the ears they evaluated.<sup>11</sup>

In developing and underdeveloped countries, children with cleft palate are ignored till a later age. The various reasons for this could be poverty, illiteracy, and most importantly ignorance on the part of parents about its effect on speech and middle ear function. The other reason could be their apprehension about anesthesia and surgery. This is evident from the study involving elderly patients having unrepaired cleft palate.<sup>10</sup>

The management of cleft lip and palate have focused more in the direction of palatal reconstruction and lip repair to achieve cosmetic acceptability and palatal function for speech and deglutition. However, these patients are at risk of several other problems along with the conductive hearing loss also. The highly significant association of hearing loss and cleft palate highlights the importance of the role of the otolaryngologists in the management of these patients. There are less reports on the comparative study of middle ear status of cleft palate patients operated at an early age and those not operated till an advanced age. Tuncbilek found the prevalence of middle ear disease in post repair cleft palate children to be much lower than the no palatoplasty group.<sup>4</sup> Too-Chung also concluded that early closure (before 4 months of age) of the palatal defect reduced middle ear complications significantly.<sup>12</sup> Dhillon suggested that the incidence of otitis media with effusion is marginally reduced by palatal surgery and Goode T tube provides a satisfactory method for long term middle ear ventilation.<sup>3</sup>

More than 75% of cases had history of repair of more than 5 years duration in our study. However, on statistical analysis, the duration of repair had no significant effect on middle ear status as revealed by the tympanometric findings, and there was no correlation and association.

Gopalakrishna et al. found cleft palate repair to have no significant effect on the high incidence of serous otitis media in this subset of patients, similar to our study.<sup>13</sup> However, they included a third subgroup of children having normal palate and observed them to have a lower incidence of serous otitis media in comparison to the children having cleft palate. Similar observation was also made by Lokman et al. who found no significant difference between the incidence of middle ear effusion in unrepaired and repaired cleft palates.<sup>14</sup> Lima et al. also compared three groups of children - those with cleft palate and low birth weight, cleft palate and normal weight, and the third with normal palate and normal weight.<sup>15</sup> They found no significant difference among these three groups in terms of tympanometry.

Holborow was of the opinion that the tensor palatine muscle is ineffective in its role of opening the nasopharyngeal end of the Eustachian tube in causation of middle ear abnormalities.<sup>16</sup> This defect in mechanism resulted in inadequate ventilation of the middle ear and the resulting otitis media with effusion. Bluestone *et al*, supported this hypothesis by roentgenographic study.<sup>17</sup> Shprintzen conducted fiber-optic nasopharyngoscopy in patients of cleft palate. He suggested hypoplasia of cartilage at pharyngeal end of eustachian tube, small size of opening, and inability to maintain patency during deglutition as the causes of eustachian tube dysfunction.<sup>18</sup>

Mechanical cause like the abnormal reflux of food and fluid into the nasal cavity can possibly set up chronic inflammatory changes around the Eustachian orifices with oedema, hypertrophy of adenoid pads, low-grade obstruction, and secondary middle ear disease. The break in the mechanical barrier between the mouth and nasopharynx with its concomitant chronic inflammatory change could alter the bacterial flora of the region to permit overgrowth of predominately pathogenic bacteria. The dynamic factor of Eustachian tube and middle ear physiology depends upon an intact Eustachian apparatus and related extrinsic musculature. In the normal resting phase, the Eustachian orifices are closed which opens widely with yawning and swallowing, and also opens slightly with normal speech. This opening of the Eustachian orifice permits pressure equalization through aeration and is dependent upon the action of the intact tensor and levator palatini muscles. The rapid motion of these muscles, particularly during speech, may produce a milking action in the cartilaginous portion of the Eustachian tube. Thus, the dilation of the orifices depends upon muscles which are not intact in those children with a cleft palate. This dynamic function of the tensor and levator muscles is well known in speech as velopharyngeal closure that largely depends upon their contraction, but the secondary opening and closing of the eustachian orifices may be of equal importance in the prevention of hearing loss and middle ear pathology.

At rest the eustachian tube remains closed. When open, it ventilates the middle ear, releases mucus and equalizes pressure differentials that are created by gaseous absorption and environmental pressure changes. In children with an unrepaired cleft palate, the tensor muscle fibres do not have a normal course and midline palatal insertion and,

therefore, lack the anchorage to effectively open the eustachian tube. In this situation, when gases are absorbed by the mucous membrane of the middle ear they are not replaced, resulting in negative pressure. Sustained negative pressure results in a retracted tympanic membrane and eventual secretion of fluid into the middle ear space from the mucous membrane.<sup>19</sup>

Kemaloglu *et al.* have analyzed the craniofacial skeleton and have suggested that there are many factors in the skeleton that predispose these children to Otitis Media with Effusion (OME). They concluded that the small dimensions of the posterior cranial base (spheno-occipital bone) and backward and upward position of the maxilla were associated with tendency to OME in clefts. In addition, mastoid depth and height were also shorter in cleft cases than normal subjects. On the other hand, a small tendency to recurrent upper airway infection (RUI) was observed in cleft cases with OME. Further, it was found that the following differences in the mastoid-middle ear-Eustachian tube (M-ME-ET) system were associated with a tendency to OME in unilateral cleft lip and palate UCLP cases: more horizontal ET in relation to the posterior cranial base; short bony ET; short height and antero-posterior depth of the mastoid air cell system.<sup>20</sup>

## CONCLUSION

Abnormal otoscopic findings and tympanometric findings were common in post cleft palate repaired patients. The duration of cleft palate repair had low correlation to the tympanometric ear findings. Small study sample could have influenced the outcome of this study. There could also be

other possible factors affecting eustachian tube function apart from cleft palate and tensor veli palatini muscle abnormality in cleft palate patients. Further detailed research has to be undertaken in this direction.

## RECOMMENDATION

Preoperative as well as postoperative ENT check up and audiological assessment should be done regularly in patients with cleft palate. Cases with otitis media with effusion should be identified and myringotomy and grommet insertion done before palatal surgery. Team approach would definitely lead to a favorable outcome in the management of these patients.

## LIMITATION OF THE STUDY

This study was done in a small sample of cases. Further exploration in to different causes of Eustachian tube dysfunction should have been analysed.

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## CONFLICT OF INTEREST

None

## FINANCIAL DISCLOSURE

None

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