



## OUTCOME OF PEDIATRIC TYPE I TYMPANOPLASTY

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### ABSTRACT

**OBJECTIVE:** The aim of the present study and work is to assess the prognostic value of different variable on the outcome of pediatric type I tympanoplasty.

**DESIGN:** Retrospective To Prospective otological case study

**STUDY SELECTION:** All forty patients age between 06 yrs to 18 yrs were enrolled in our study for pediatric tympanoplasty type first in territory referral center from July 2015 to July 2017. All patients have regular follow up examination from 6 months to 23 months after tympanoplasty and prognostic factor analysis.

**INTERVENTION:** None

**MAIN OUTCOME:** The all data recorded and analysis like pre operative, postoperative pure tone audiometry and otological examination of all patients. The results are reported for graft healing, hearing, middle ear space, and success, which combines hearing and healing and is defined as intact graft with a postoperative air-bone gap of less than 20dB.

**RESULTS:** Pediatric tympanoplasty type first is a safe surgical procedure, when experience surgeon be carefully for selection of patient. All three categories have excellent success rate of tympanoplasty. On the basis of success criteria, the present study show following success rate.

1. Our study revealed that overall 94.22% success rate of graft healing in type first tympanoplasty in pediatric patients.
2. The overall success rate of Conductive hearing loss is 89.17% in pediatric age group in type first tympanoplasty.
3. 94.6% (35) of the 37 healed ears with an available postoperative pure tone audiogram had an ABG of no greater than 20dB.

### KEYWORDS

Pediatric, Tympanoplasty, Otitis Media, and Pure Tone Audiometry

### INTRODUCTION:-

India is a developing country. It is ridden with illiteracy, poverty and sociopolitical problem. Chronic suppurative otitis media (CSOM) is one of the most common ear diseases in South East Asia having a prevalence of 5.2% in the general population and in India its is 4.75%.

Middle ear disease is the primary cause of hearing loss in children and has a significant impact on language development and academic performance. Multiple prognostic factors have previously been examined, but there is little published data regarding frequency-specific hearing outcomes. Tympanoplasty is a common surgical procedure in children. The timing of pediatric tympanoplasty is controversial despite many studies reporting on the relationship between patient age and results of surgery. Otologic surgery in children is regarded by many as being less successful than adult patients. Poor success rate was due to higher incidence of otitis media, eustachian tube dysfunction, chronic rhinosinusitis, adenoid hypertrophy and other factors. Many studies have attempted to address the impact of a number of variables on the outcome of tympanic membrane perforation repair in a child. Among other variable, age, status of the contra lateral ear, size and etiology of the perforation have been examined in this article with conflicting conclusions.

However, the management of patients was done with persistent perforation of tympanic membrane with or without intermittent otorrhea. Incites considerable controversies, some advocate early surgery to correct anatomical defects and improving, other maintained elective surgery should be deferred until the peak incidence of acute otitis media has resolved.

The aim of the present study and work is to assess the prognostic value of different variable on the outcome of pediatric type I tympanoplasty.

### MATERIAL AND METHODS:-

The prospective study was conducted from July 2015 to July 2017, which included 40 patients in Department of Otorhinolaryngology and Head & Neck Surgery, Rama Medical College and Research center, Rama City, NH-24 ,District - Hapur, Uttar Pradesh. Those patients

who were presented with diminished hearing loss and ear symptoms were enrolled in study. The complete Clinical examination, Otoscopic, tuning forks test, and radiological evaluation were done in all patients. Hearing assessments were done by manual pure- tone audiometry for all patients. Those patients who suffered from rhinosinusitis, adenoid hypertrophy, Furunculosis, Otitis media, cholesteatoma ear, craniofacial dysmorphism and suspicious malignancy of external and middle ear are excluded from study. All patients were managed by surgical as well as medical intervention. Nature and prognosis of ear diseases were explained to all patients in rural community.

A prospective study of each patient medical record was undertaken, demographic, perioperative and postoperative information was recorded Manual Pure Tone Audiometric data was recorded according to previously published guideline of the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS). Preoperative and postoperative air-bone gap were calculated by subtracting the 4 tone (500, 1000, 2000 and 3000-Hz) bone conduction pure tone average from the air conduction pure tone average obtained at the same testing session. The resulting data were recorded for further comparison and analysis. For the purpose of this study, success was defined for each patient using the following three criteria:

1. Healed Tympanic Membrane- Indicated a TM that was healed without evidence of perforation at least six month regular follows up.
2. Healed with normal hearing- Indicated a TM that was healed with a post- operative ABG of no greater than 20dB.
3. Healed with an aerated middle ear space- Indicated a TM that was healed in a normal anatomic position with an aerated middle ear space.

Patients identified as having negative middle ear pressure included those with focal retraction pockets, diffuse tympanic membrane retraction, atelectasis and adhesive otitis media. Treatment failure included ears with postoperative chronic OME, negative middle ear pressure, acute otitis media with perforation, granulation in middle ear and cholesteatoma.

**RESULTS:-**

All forty patients had ear diseases and impaired hearing was identified. All patients were age between 06 yrs to 18 yrs. 32 patients out of 40, were operated as mastoidectomy with tympanoplasty by post aural approach and auto temporalis fascia used as graft material. The remaining 8 patients were operated by trans canal approach as tympanoplasty without mastoidectomy and auto tragal perichondrium used as graft material. Medial graft technique was performed in all cases. Our study show females, 22 (55%) were more common than males 18(45%) patients. Ear diseases and hearing loss involved commonly in left ear (22) than the right ear (18). Chronic Suppurative Otitis Media (CSOM) with granulation type diseases were found in 36(90%) cases and 4(10%) patients had atelactasis. Twenty four patients have age group between 15 years to 18 years of age (table no -1).The subtotal perforation found in 19 patients. The co-relation between the age and size of perforation are shown in below table no.-2.

**AGE RELATED EAR DISEASES AND HEARING LOSS PREOPERATIVE: (Table No.1)**

AGE IN YEARS	NO. OF PATIENTS	PERCENTAGE (%)
6-10	06	15
11-14	10	25
15-18	24	60

**CO-RELATION BETWEEN AGE AND SIZE OF PERFORATION (Table No.-2)**

AGE IN YEARS	SIZE OF PERFORATION				
	0-25	26-50	51-75	76-100	TOTAL
6-10	00	01	02	03	06
11-14	00	02	03	05	10
15-18	00	04	09	11	24

**TYAMPANIC MEMBRANE HEALING :-**

The success rate of tyampanic membrane healing was very high in the entire groups in our study. 100 percentages healing of T.M. was found in 06 years to 10 years of age groups. Three patients were treated for post operative ear discharge and could not response by topical antibiotic and paper-patch. Two out of three patients underwent successful revision type first tympanoplasty for reperforation. One patient was underwent modified radical mastoidectomy with type third tympanoplasty and reconstruction of posterior canal wall by conchal cartilage for extensive granulation with osteitis.

We performed an independent analysis of success rate of graft healing in different age groups along with size of perforation (tables 3 &4). Large size of perforation had less success rate in both age groups between 11 years to 18 years. Medium size of perforation of T.M. have high success rate than the subtotal or total perforation.

**SUCCESS RATES OF POSTOPERATIVE GRAFT HEALING AND CO-RELATION WITH AGE : (Table No.3)**

AGE IN YEARS	NO. OF PATIENTS	PERCENTAGE (%)
6-10	06	100
11-14	09	90
15-18	22	91.67

**SUCCESS RATES OF POSTOPERATIVE GRAFT HEALING IN AGE AND SIZE OF PERFORATION : (Table No.4)**

AGE IN YEARS	SIZE OF PERFORATION					PERCENTAGE
	0-25	26-50	51-75	76-100	TOTAL	
6-10	00	01	02	03	06	100
11-14	00	02	02	05	09	90
15-18	00	04	08	10	22	91.67

**CONDUCTIVE HEARING LOSS:-**

Twenty (50%) patients have moderate conductive hearing loss and seventeen (42.5%) patients have mild degree conductive hearing loss. Only three (7.5%) patients have moderate to severe degree hearing loss. (Table no.-5)

Preoperative and postoperative pure tone audiometric data were available in all patients and correlate the age of patients. The Air- Bone Gap results were stratified according to AAA-HNS criteria. The success rate of the conductive hearing was very high in all patients. 35 (94.6%) of the 37 healed ear with an available postoperative pure tone audiogram had an ABG of no greater than 20 dB. Normal hearing

(below 25dB) was observed in all age groups between 06 years to 10 years in our study. Five out of forty patients were improving hearing from 50dB-80dB to 30 dB and 35 dB. The overall success rate of the conductive hearing was about 89.17 percentages. One out of five patients develops post operative early otospongiosis after one year of surgery but with hearing improvement (35dB postoperative). We performed analysis of the predictive variables according to the success criteria of the healing with the normal hearing. (Table no.-6)

AGE IN YEARS	PREOPERATIVE CONDUCTIVE HEARING LOSS					
	NORMAL (BELOW 25dB)	MILD 26-40dB	MODERATE 41-55dB	MODERATE TO SEVERE 56-70dB	SEVERE 71-90dB	PROFOUND MORE THAN 90dB
6-10	00	02	04	00	00	00
11-14	00	05	04	01	00	00
15-18	00	10	12	02	00	00

**CO-RELATION BETWEEN AGE AND PREOPERATIVE CONDUCTIVE HEARING LOSS (TABLE NO.-5)**

**SUCCESS RATE OF POSTOPERATIVE CONDUCTIVE HEARING LOSS AND CORELATION WITH AGE (TABLE NO.-6)**

AGE IN YEARS	POSTOPERATIVE CONDUCTIVE HEARING LOSS						PERCENTAGE
	NORMAL (BELOW 25dB)	MILD 26-40dB	Moderate 41-55dB	MODERATE TO SEVERE 56-70dB	SEVERE 71-90dB	PROFOUND MORE THAN 90dB	
6-10	06	00	00	00	00	00	100
11-14	08	02	00	00	00	00	80
15-18	21	03	00	00	00	00	87.5

**COMPLICATION:-**

Four (10%) patients develop post operative complications. One out of four develops ear discharging, granulation tissue and post aural wound infection after three weeks of surgery. A patient treated primarily on medical management but not responded for ear discharge and so planned for surgery. One patient developed atelactasis after one and half year of surgery. Two out of four developed reperforation after 6 months of surgery. Most of the complication were minor and were managed conservatively. No other complications were noticed during the whole postoperative follow up from 6 months to 2 years. (Table no.-7)

In our study was also analysis of the predictive variable according to the success criteria for the healing with an aerated middle ear space. 94% (35) of the 37 healed tyampanic membrane was in normal position, lateral to an aerated middle ear space. No statistically significant difference was found in healing with an aerated middle ear space with correlation with patients age and size of perforation. (Table no.-8)

Contralateral ear (non treated ear) have been examined all patients. It is a possible prognostic indicator of tympanoplasty success. Abnormal contralateral ear like perforation, atelactasis, negative middle ear pressure, otitis media with effusion, tympanostomy and cholesteatoma were identified and its significant affects the graft healing and with an aerated middle ear space. In our study, no significant difference were found in contralateral ear correlation with healing with an aerated middle ear space (operated ear).

**COMPLICATIONS AND ADVERSE POSTOPERATIVE (TABLE NO.-7)**

TYPE OF COMPLICATION	NO. OF EARS	PERCENTAGE (%)
Reperforation	03	7.5
Granulation tissue	01	2.5
Atelactasis	01	2.5
Wound infection	01	2.5
Middle ear effusion	00	00
Tympanosclerosis	00	00
Acute otitis media	00	00
Chronic otitis media	00	00
Hearing loss	00	00
Cholesteatoma	00	00

### SUCCESS RATES OF POSTOPERATIVE GRAFT HEALING WITH MIDDLE EAR AERATION IN AGE AND SIZE OF PERFORATION : (Table No.8)

AGE IN YEARS	SIZE OF PERFORATION					PERCENTAGE
	0-25	26-50	51-75	76-100	TOTAL	
6-10	00	01	02	03	06	100
11-14	00	02	02	05	09	90
15-18	00	04	08	10	22	91.67

**Discussion:-** Tympanoplasty is a common surgical procedure in childhood. The timing of pediatric tympanoplasty is controversial despite many studies reporting on the relationship between patient age and results of surgery. The different variable factor influences the outcome of pediatric tympanoplasty because the tympanic membrane must heal by secondary intention. The age of patient less than 6 years, prior adenoidectomy, the cause of perforation, size of perforation, state of middle ear mucosa, the state of contralateral ear and the absence of craniofacial dysmorphias are the predictive variables for the success of tympanoplasty. Bluestone et al<sup>12</sup> published a success rate of only 35% but defined success only in those ear in which the graft took and was maintained, with no evidence of negative middle ear pressure, OME, or cholesteatoma. Manning et al<sup>13</sup> reported 78% success for integration of the graft, but only 52% showed adequate function of the Eustachian tube. Many study show higher success rate (89%-95%) in pediatric tympanoplasty. The study reveals that the criteria for success rate often includes only healing of the graft, with or without hearing the outcome. In our study show 94.22% success rate of graft healing.

The main aims for pediatric tympanoplasty operation are as follows, first to create an intact tympanic membrane to prevent middle ear contamination and allow unrestricted water activities. Second, the intact tympanic membrane should allow good, serviceable hearing. Finally, an aerated, sound conductive middle ear space should be achieved. In our study follows all above mentioned aim and objective. The overall success rates in the present study compare quite favorably with those previously reported study. 94.6% (35) of the 37 healed ears had a postoperative ABG of no greater than 20dB, whereas 94% of the healed ear had an aerated middle ear space. The success rate of conductive hearing loss is 89.17% in pediatric tympanoplasty.

Age is a key prognostic factor in evaluation for tympanoplasty in children because eustachian tube function is to be normalized with the advancing age. Many authors recommended minimum age 6 years or 8 years for pediatric tympanoplasty. Some authors have performed successful tympanoplasty in age of 2 years<sup>14</sup>. In present study show minimum age 06 years for performed successfully pediatric tympanoplasty.

Contralateral ear status is a predicts success rate of pediatric tympanoplasty, because Eustachian tube function affects the contralateral ear. Many studies show that nearly 60% of patients had abnormal contralateral ear. Koch et al<sup>15</sup> could find no correlation between an abnormal contralateral and surgical success. In our study show that contralateral ear not correlation with the operated ear in relation to success rate. Healing and healing rate were not adversely affected by the presence of an abnormal contralateral ear.

More thorough analysis of results may lead to the identification of preoperative factors that, alone or in combination, greatly affects the outcome. Refinement of the indications for surgery is a potential benefit to the surgeon. Before to surgery, experienced surgeon should evaluated preoperative factors, which affects the success rate of surgery and suggest alternate surgical technique. The selection of patients for surgery is done on a case by case. Each patient has a unique combination of anatomical deficits, impaired hearing, unrelenting infection and expectations for improvement. The goal of the surgeon is to produce the best possible result for each patient. In our study have only 40 patients, some variable factors affect the success rate and need for further study.

#### Conclusion:-

Pediatric tympanoplasty type first is a safe surgical procedure, when experience surgeon is carefully for selection of patient. All three categories have excellent success rate of tympanoplasty. On the basis of success criteria the present study show following success rate.

1. Our study revealed that overall 94.22% success rate of graft healing in type first tympanoplasty in pediatric patients.

2. The overall success rate of Conductive hearing loss is 89.17% in pediatric age group in type first tympanoplasty.
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