**How to Cite:**
Subashini, P., & Shivakumar, S. (2022). Differential Tympanic membrane retraction: A comprehensive study. *International Journal of Health Sciences*, *6*(S5), 11316–11328. https://doi.org/10.53730/ijhs.v6nS5.11366

# Differential tympanic membrane retraction: A comprehensive study

**Dr. Subashini P**
Post graduate, Department Of ENT, Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem, Tamil Nadu

**Dr. Shivakumar S***
Prof and HOD, Department Of ENT, Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem, Tamil Nadu
*Corresponding author

***Abstract*---**Aims and objectives: Tympanic membrane retraction occurs due to inadequate ventilation of middle ear cavity. The aim is to evaluate the surgical management of TM retractionits effectiveness and analyse the hearing improvement after surgery. Materials and methods: A retrospective study with 100 patients came to ENT OPD vmkvmch Salem in last 2 years with symptoms of hard of hearing, ear ache, ear block sensation. These patients underwent necessary ENT examination, diagnosed as TMwere selected for study and surgery done for these cases depending upon the grades of TM retraction which included Grommet insertion, Cartilage Tympanoplasty, Cortical Mastoidectomy + cartilage tympanoplasty. They were followed up for1, 3 and 6 months post operatively and evaluated based on hearing assessment after surgery and successful graft uptake. Results: Surgical interventionwas donedepending upon the stage of retraction. Grommet insertion done in stage 1, cartilage tympanoplasty in stage 2whereas stage 3 cortical mastoidectomy +cartilage tympanoplasty done. Hearing improvement seen after 1 month 76%,3 and 6months is 84% and 96%. The success rate in stage 1 retraction is 90 %, stage 2 84% and stage 3 81%. Conclusion: TM retraction poses problems i.ehearing loss, ear block sensation and otalgiaappropriate to the stage. Early surgical intervention in stage 1 gives better results compared to subsequent stages. Patient presenting with retraction needs to be intervened surgically as early as possible for good prognosis.

***Keywords*---**Tympanic membrane retraction, Grades of retraction, surgery depends on grade, hearing improvement.

## Introduction

The sound-conducting function of the middle ear necessitates the maintenance of an aerated chamber within the organ. It has a dual ventilation system, the Eustachian tube and transmucosal gas exchange, in order to keep its sound-conduction function at a high level. Any pathogenic processes that disrupt these two systems cause middle ear hypoventilation, which sets in motion a chain of events that culminates in the creation of a Retraction pocket.

A retraction pocket is a localised area of tympanic membrane atelectasis in which the membrane is indrawn generating an edge or margin. A retraction pocket can be found in one or more of the pars tensa's four quadrants, in the pars flaccida, or in both.[1]

Chronic otitis media is an inflammatory condition that affects the middle ear and can cause atelectasis, perforation, tympanosclerosis, retraction pocket formation, and cholesteatoma.[2]The tympanic membrane becomes floppy and forms a retraction pocket when there is a fluctuating or prolonged negative middle ear pressure. Adhesive otitis media develops as a result of retraction and related middle ear inflammation.[3] Desquamation leads to keratin debris accumulation and cholesteatoma formation as the retraction pocket enlarges medially and posteriorly.[4]

The management of TM retraction varies depending upon the grades of retraction which includes grommet insertion to Cartilage Tympanoplasty to Cortical mastoidectomy + Cartilage tympanoplasty.[5,6] The main objectives for conducting present study were to evaluate the surgical management of tympanic membrane retraction and its effectiveness and to analyse the hearing improvement after the surgery.

## Materials and Methods

A retrospective cross sectional study was conducted among 100 patients with tympanic membrane retraction of all ages and gender attended out-patient unit of department of ENT, VMKV MCH, Salem. Patients who were operated previously and did not have regular follow up after the surgery were excluded from the study.

All the patients attending the OPD of ENT for the past 2 years with chief complaints of hearing, ear ache and ear block sensation underwent basic ENT examination, investigations comprising audiometry and who were diagnosed to have tympanic membrane retraction were included in the study. Surgery was done for all the patients according to the grades of TM retraction which include Grommet insertion, Cartilage tympanoplasty, Cortical mastoidectomy + Cartilage tympanoplasty. All the operated patients were followed up for 3 months and 6 months after the surgery and were evaluated based on hearing assessment post-operatively and successful graft uptake.

The study was conducted after the approval from the institutional human ethical committee and informed written consent was obtained from all the study patients

and only those patients willing to sign the informed consent were included in the study. The risks and benefits involved in the study and voluntary nature of participation were explained to the study participants before obtaining consent. Confidentiality of the study participants was maintained. All the data were entered into Microsoft Excel 2013 and analyses was done using SPSS v 16.0. Qualitative data was expressed in frequencies and percentages and quantitative data in mean and standard deviation.

**Discussion**

The retraction pockets of tympanic membrane which majority produce minor symptoms. Whereas its documented as a convinced precursor of cholesteatoma development. Henceforth active treatment of retraction pockets during the early phase is now the statement of excellence.[7,8]

The mean age of the patients in the study was 33.25 ± 11.96 years with majority of patients belong to age group of 31 to 40 years (33%). Majority of patients were males (M:F = 51:49). Kasbekar et al[9] reported that Between 2001 and 2010, a total of 42 ears (41 patients) were identified of which five were children and 36 adults. The age ranged from 8 to 66 years (mean 38), which is similar to the present study. RCT by Barbara et al.[10] consisted of 30 patients, aged between 29 and 63 years old. Dispenza et al[11] reported that he mean age of the patients was 29.3 years (range 17–57).

The most common presenting complaints among the patients was hard of hearing (79%) followed by tinnitus (54%), ear blockade (41%) and otalgia (28%).Bayoumy et al[12] reported that, 28 patients (35%) presented with subjective hearing loss; 21 patients (26%) presented with otalgia; 18 patients (21%) presented with otorrhea; 8 patients (10%) presented with aural fullness, and 6 patients (7%) presented with other complaints. In total, 76 ears (94%) had improved or stable course (48%) of clinical symptoms. Forty-one ears (46%) had complete remission (34%) or reduction of symptoms (12%). The remaining four patients (6%) had worsened symptoms.

At the time of presentation, majority of patients (53%) had grade III tympanic membrane retraction followed by 47% of patients had grade II tympanic membrane retraction. Majority of patients (46%) had 31 to 40dB mean air bone gap in pure tone audiometry followed by 42% of patients had 21 to 30dB and 12% of patients had 41 to 50dB mean air borne gap. 71% of patients had C curve and 29% of patients had B curve in impedance audiometry. 42% of patients had sclerosed, 36% of patients had diploic and 22% of patients had cellular type of pnuematisation of mastoid. Dispenza et al[11] reported In 24 cases, retraction occurred in the posterior half of the eardrum, with adhesion to the promontory, and, in 19 patients, there was clinical evidence of ossicular chain interruption.Bayoumy et al[12] reported that the mean air bone gap at first and last visits in all patients was respectively 17.9 dB (SD 11.3) and 15.5 dB (SD 12.1). The difference between the air bone gap at first and last visits was +2.4 dB (SD 12.1). This difference was not considered statistically significant

After the surgery, during 1st month of follow up patients with grade I retraction of tympanic membrane, there was reversal of retraction in 16 patients, change is no change retraction among 1 patients and progression of retraction in 1 patients.In grade II retraction of tympanic membrane, there was reversal of retraction in 30 patients, no change in retraction among 5 patients and progression of retraction in 4 patients whereas among patients with grade III tympanic membrane retraction 20 patients had reversal of retraction, 6 patients had no change in retraction and 3 patients showed progression of retraction. 76% of patients had improved hearing in pure tone audiometry whereas 24% of patients had worsened hearing.

During 3rd month follow up period, patients withgrade I retraction of tympanic membrane, there was reversal of retraction in 18 patients, no change in retraction among 1 patients and progression of retraction in 1patients. In grade II retraction of tympanic membrane, there was reversal of retraction in 35 patients, no change in retraction among 3 patients and progression of retraction in 3 patients whereas among patients with grade III tympanic membrane retraction 23 patients had reversal of retraction, 5 patients had no change in retraction and 2 patients showed progression of retraction. 84% of patients had improved hearing in pure tone audiometry whereas 16% of patients had worsened hearing.

During 6th month follow up period,patients with grade I retraction of tympanic membrane is 22, there was reversal of retraction in 20 patients, no change in retraction among 1 patients and progression of retraction in 1,wheareas patientpatients with grade II retraction of tympanic membrane is 46, there was reversal of retraction in 39 patients, no change in retraction among 4 patients and progression of retraction in 3 patientwhereas among patients with grade III tympanic membrane retraction 32 patients had reversal of retraction, 26 patients reversal of retraction had 4 no change in retraction and 2 patients showed progression of retraction. 96% of patients had improved hearing in pure tone audiometry whereas 4% of patients had worsened hearing.

Bayoumy et al[12] reported that In 10 ears (12%) the hearing level (air-bone gap) deteriorated with 10 dB or more. Patients who presented with a TMR Sade grade I at first visit had significantly better audiometric outcomes than patients presenting with Sade grade III ($p = 0.001$). The indication for treating tympanic membrane retractions is mixed, and it hinge on a variety of circumstances, including the patient population, the location and grade of the TMR, and the occurrence of other ear diseases (e.g., perforation, cholesteatoma and serous otitis media). In terms of clinical results, therapies for modest retractions may not trump the wait-and-see approach. This has to be confirmed through prospective investigations.[12,14]

26 patients with stage II and 16 patients with grade III tympanic membrane retraction were included in the study with 85% of patients had ossicular erosion and 31% of patients had cholesteatoma.[9] The duration of follow-up ranged from 12 to 102 months. The air-bone gap (ABG) enhanced among 29 cases (76%), whereas it worsened in 19% of patients. ABG improved more in ears that did not have cholesteatoma.

Sade et al.[6] described 308 ears (215 patients) with different types of tympanic membrane retractions who were followed up for average 37 months (range: 12–108 mo). Sixty-eight retractions were found in pars tensa, of which 50 were described as large. Only 1 of the 50 large retractions (2%) progressed into cholesteatoma (average follow-up 34 mo).

Parkes et al.[13] described a prospective cohort study reported that median duration of follow-up was 6.4 years (range: 0.75–7.6 yr). They found that 28 of 37 (76%) retractions had either stable (n = 16) or better (n = 12) outcomes. The incidence of cholesteatoma was 2.6% in an 8.5-year period.

The outcomes of modified cartilage tympanoplasty approach are comparable to those reported in the literature, indicating that it is a safe and effective procedure. The high percentage of cholesteatoma discovered preoperatively in stage III retractions suggests that surgery should be done as soon as possible.[9] In the present study, The ABG for all patients improved from 22.1 dB preoperatively to 5 dB postoperatively, a 12.5 dB improvement on average. The lowest ABG improvement was 5 dB, and the highest was 30 dB.[11]

Kasbekar et al[9] reported that the ABG for all patients changed from a preoperative average of 24 dB to a postoperative average of 17.3 dB, an improvement of 6.7 dB. Stage II retractions improved from 24 to 17.3 dB on average (8.6 dB change) and Stage III retractions from 23 to 20 dB (3 dB change). Bayoumy et al[12] reported that patients aged 18 years old or younger, an average air-bone gap improvement of +8.0 dB from an initial hearing loss of 19.7 dB (air-bone gap) was found. When comparing these results to the results of Borgstein et al.[15] the audiometric results are similar.

Table 1: Age distribution

| | Frequency | Percentage |
|---|---|---|
| 10 – 20 | 16 | 16% |
| 21 – 30 | 25 | 25% |
| 31 – 40 | 33 | 33% |
| 41 – 50 | 13 | 13% |
| 51 – 60 | 13 | 13% |
| Total | 100 | 100% |
| Mean ± SD | 33.25 ± 11.96 | |

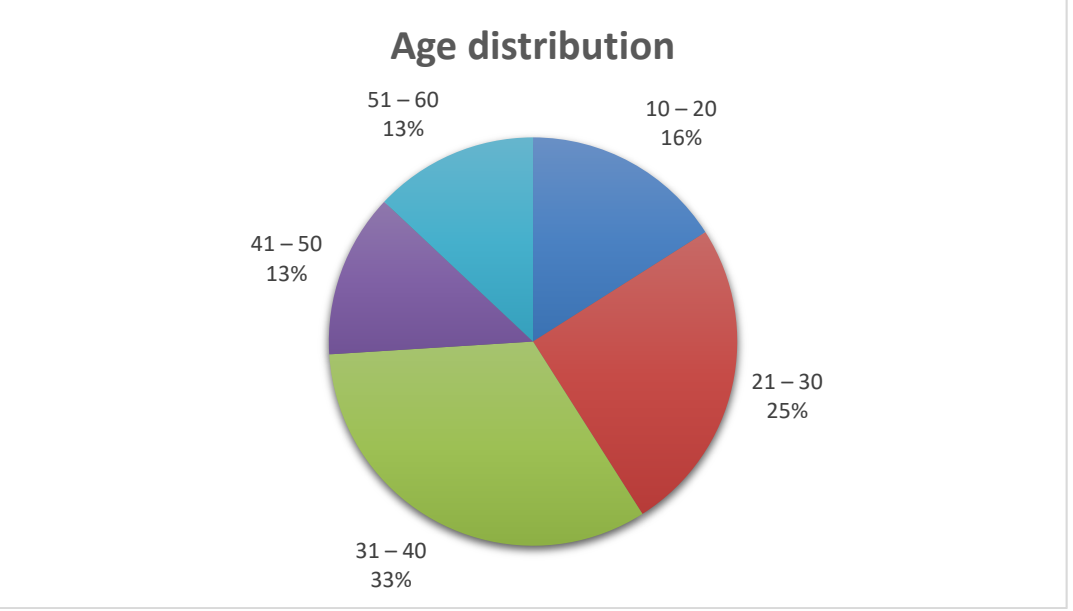



Table 2: Gender distribution

| | Frequency | Percentage |
|---|---|---|
| Male | 51 | 51% |
| Female | 49 | 49% |
| Total | 100 | 100% |

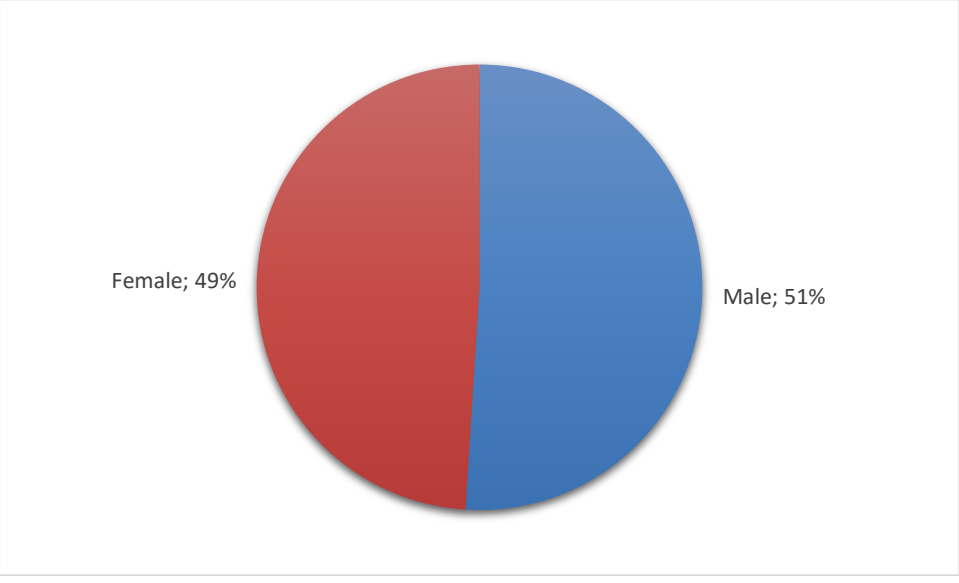


Table 3: Presenting complaints

| | Frequency | Percentage |
|---|---|---|
| Hard of hearing | 79 | 79% |
| Ear blockage | 41 | 41% |
| Tinnitus | 54 | 54% |
| Otalgia | 28 | 28% |

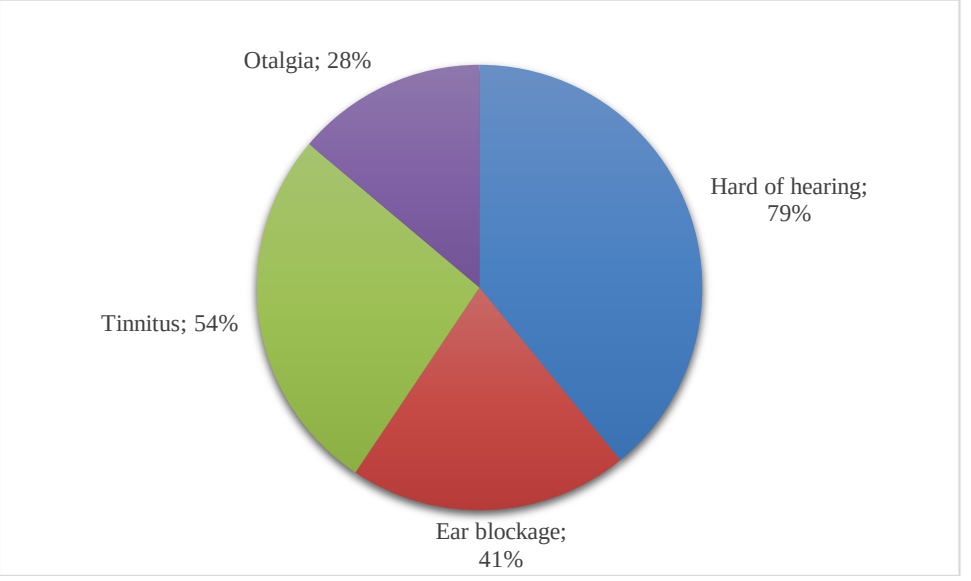



Table 4: Grade of tympanic membrane retraction at the time of presentation (According to Sade's classification)

| | Frequency | Percentage |
|---|---|---|
| Grade 1 | 22 | 22% |
| Grade II | 46 | 46% |
| Grade III | 32 | 32% |
| Total | 100 | 100% |

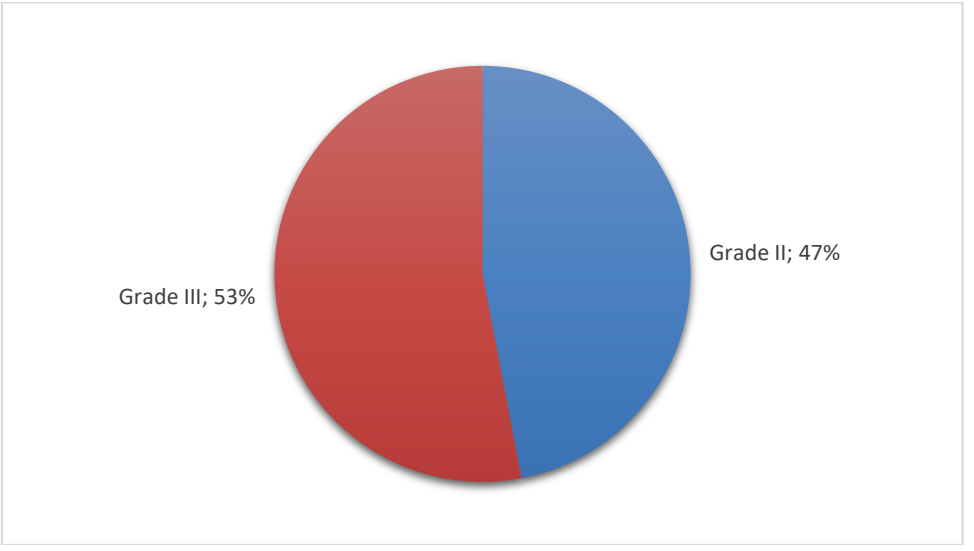



Table 5: Mean Air-Bone gap in Pure tone audiometry at presentation

| Mean Air-Bone gap | Frequency | Percentage |
|---|---|---|
| 21 – 30 dB | 42 | 42% |
| 31 – 40 dB | 46 | 46% |
| 41 – 50 dB | 12 | 12% |
| Total | 100 | 100% |

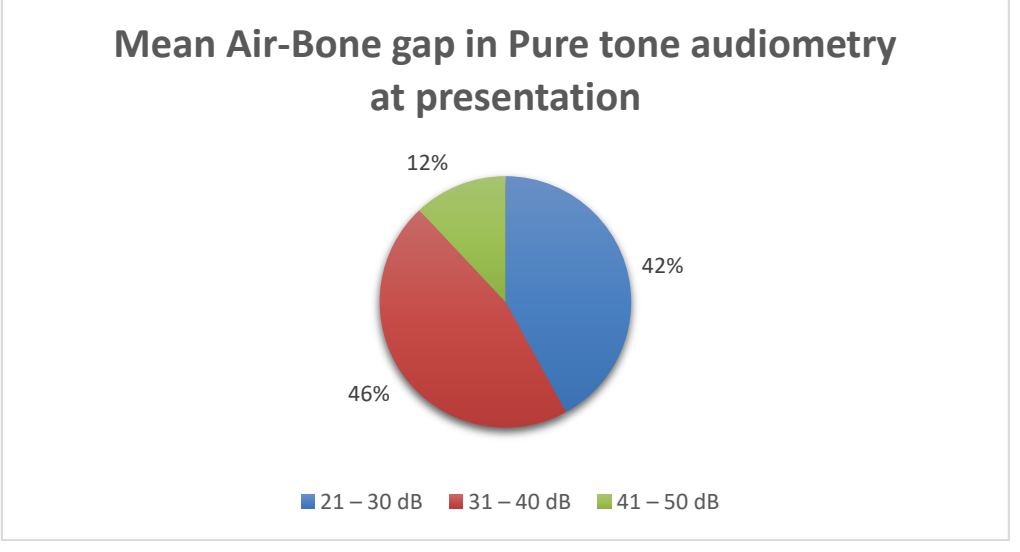


Table 6: Impedance audiometry at Presentation

| Type of Curve | Frequency | Percentage |
|---|---|---|
| B Curve | 29 | 29% |
| C Curve | 71 | 71% |
| Total | 100 | 100% |

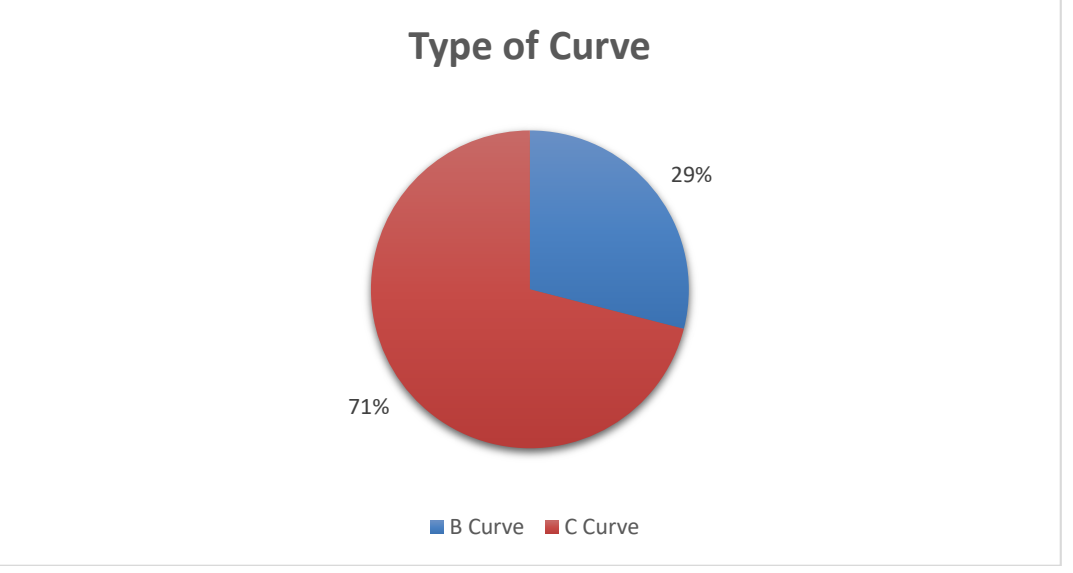



Table 7: Type of Pneumatisation of mastoid

| | Frequency | Percentage |
|---|---|---|
| Cellular | 22 | 22% |
| Sclerosed | 42 | 42% |
| Diploic | 36 | 36% |

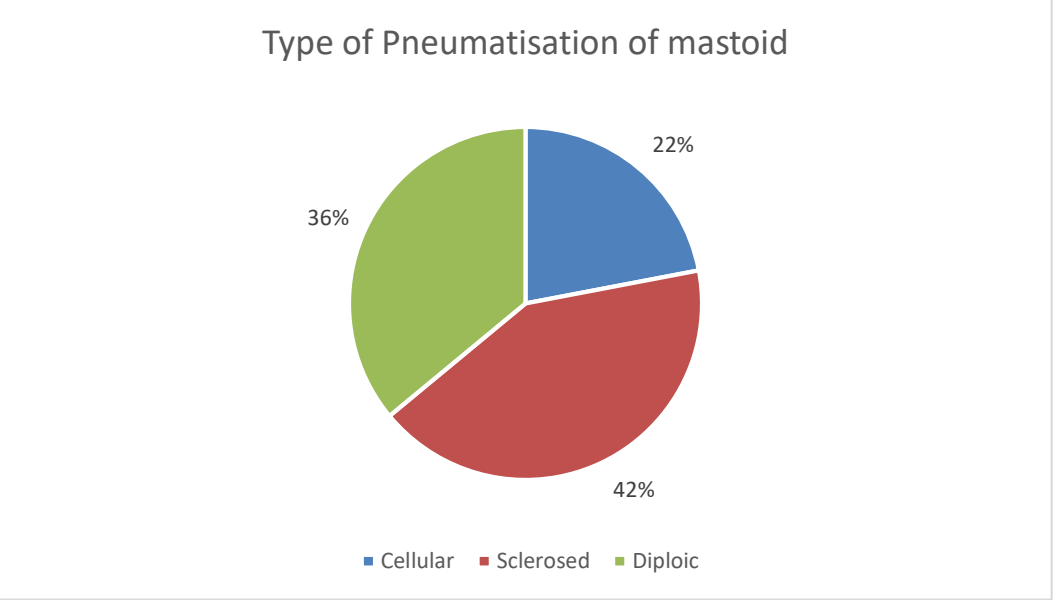



Table 8: Videootoscopic appearance of the status of retraction pockets during follow up

| Status of retraction | 1st month | | | 3rd month | | | 6th month | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grade 1 | Grade II | Grade III | Grade 1 | Grade II | Grade III | Grade 1 | Grade II | Grade III |
| Reversal of retraction | 16 | 30 | 20 | 18 | 35 | 23 | 20 | 39 | 26 |
| Retraction remaining static | 1 | 5 | 6 | 1 | 3 | 5 | 1 | 4 | 4 |
| Progression of retraction | 1 | 4 | 3 | 1 | 3 | 2 | 1 | 3 | 2 |

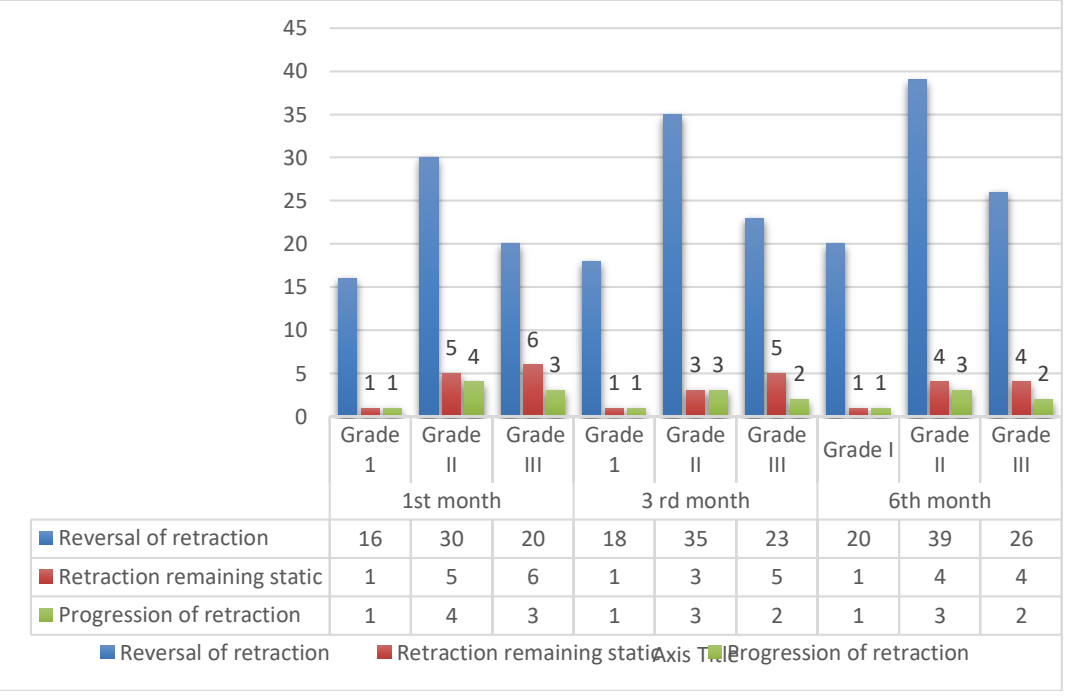
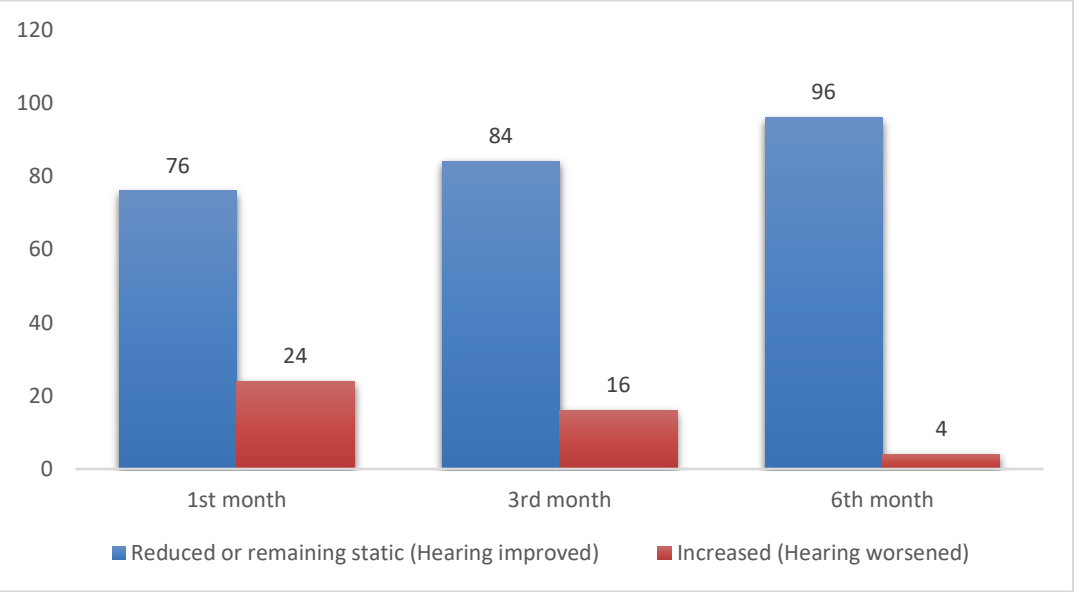



Table 9: Follow up pure tone audiogram

| | 1st month | 3rd month | 6th month |
|---|---|---|---|
| Reduced or remaining static (Hearing improved) | 76 | 84 | 96 |
| Increased (Hearing worsened) | 24 | 16 | 4 |




## Conclusion

TM retraction poses problems i.ehearing loss, ear block sensation and otalgiaappropriate to the stage .Early surgical intervention in stage 1 gives better results compared to subsequent stages .Patient presenting with retraction needs to be intervened surgically as early as possible for good prognosis.

## References

1. Barbara M. Lateral attic reconstruction technique: preventive surgery for epitympanic retraction pockets. Otology & Neurotology. 2008 Jun 1;29(4):522-5.
2. Bayoumy AB, Veugen CC, van der Veen EL, Bok JW, de Ru JA, Thomeer HG. Management of tympanic membrane retractions: a systematic review. European Archives of Oto-Rhino-Laryngology. 2021 Mar 10:1-5.
3. Borgstein J, Gerritsma T, Bruce I, Feenstra L. Atelectasis of the middle ear in pediatric patients: safety of surgical intervention. International Journal of Pediatric Otorhinolaryngology. 2009 Feb 1;73(2):257-61.
4. Charachon R, Barthez M, Lejeune JM. Spontaneous retraction pockets in chronic otitis media medical and surgical therapy. Ear, nose & throat journal. 1992 Nov;71(11):578-83.
5. Charles D.Bluestone, Eustachian tube Structure , Function, Role in Otitis media , 1st edition 2005;10:188.
6. Dewi, L. K. C., Kawiana, I. G. P., & Martini, L. K. B. (2018). Integrative model of performance improvement. International Journal of Social Sciences and Humanities, 2(2), 26–39. https://doi.org/10.29332/ijssh.v2n2.116
7. Dispenza F, Mistretta A, Gullo F, Riggio F, Martines F. Surgical management of retraction pockets: does mastoidectomy have a role?. International Archives of Otorhinolaryngology. 2021 Mar 12;25:12-7.

8. Harold Ludman , Tony Wright, Diseases of Ear , 6th edition 2006;10:388.
9. Julianna Gulya, Lloyd B.Minor,, Dennis S.Poe, Glasscock-Shambaugh, Surgery of Ear, 6th edition 2010;25: 427-428.
10. Kasbekar AV, Patel V, Rubasinghe M, Srinivasan V. The surgical management of tympanic membrane retraction pockets using cartilage tympanoplasty. Indian Journal of Otolaryngology and Head & Neck Surgery. 2014 Dec;66(4):449-54.
11. Mills RP. Management of retraction pockets of the pars tensa. The Journal of Laryngology & Otology. 1991 Jul;105(7):525-8.
12. Nankivell PC, Pothier DD. Surgery for tympanic membrane retraction pockets. Cochrane database of systematic reviews. 2010(7).
13. Page C, Charlet L, Strunski V. Cartilage tympanoplasty: postoperative functional results. European archives of oto-rhino-laryngology. 2008 Oct;265(10):1195-8.
14. Parkes W, Vilchez-Madrigal L, Cushing S, Papsin B, James A. Natural history of tympanic membrane retraction in children with cleft palate. The Journal of International Advanced Otology. 2018 Aug;14(2):250.
15. Sade J. The atelectatic ear. In: Sade J, editor. Monograms in clinical otolaryngology, secretort otitis media and its sequelae. New York: Churchill-Livingstone; 1979. pp. 64–88.
16. Sembiring, T. B., Maruf, I. R., Susilo, C. B., Hidayatulloh, A. N., & Bangkara, B. M. A. S. A. (2022). Health literacy study on approaching forest and boosting immune system strategy. International Journal of Health Sciences, 6(1), 40–49. https://doi.org/10.53730/ijhs.v6n1.3145
17. Srinivasan V, Banhegyi G, O'Sullivan G, Sherman IW. Pars tensa retraction pockets in children: treatment by excision and ventilation tube insertion. Clinical Otolaryngology & Allied Sciences. 2000 Aug;25(4):253-6.
18. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. International Journal of Health Sciences, 5(3), x-xv. https://doi.org/10.53730/ijhs.v5n3.2938