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"ROLE OF AUDIOMETRY IN ASSESSING THE DEVELOPMENT OF RETRACTION POCKETS IN CASES OF CHRONIC SUPPURATIVE OTITIS MEDIA"

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ABSTRACT

Background:- Aim is to study the role of audiometry in assessing the development of retraction pockets in cases of squamosal type of chronic otitis media. **Methods:-** This is a cross-sectional study of 100 patients with retraction pockets in squamosal chronic otitis media at the Department of ENT, Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi. All the patients were subjected to audiometric tests and p-value and sensitivity, specificity, positive and negative predictive values were calculated. Main outcome measures:- pre-operative audiogram and impedance audiometry and otoendoscopic grading of the retraction pockets. **Results:** In our study, we found that the maximum number of patients had a moderate conductive hearing loss amounting to 39 patients, while 8 patients had a normal hearing. **Conclusion:** Majority of the patients in our study presented with moderate conductive hearing loss and while studying the correlation between the grading of the retraction pockets with hearing loss , we found it to be significant (p-value <0.001). Hence, we can conclude that grade of retraction has a positive association with hearing loss.

KEYWORDS

Chronic Otitis Media, Retraction Pockets, Pure Tone Audiometry, Impedance, Eustachian Function Tests

INTRODUCTION:

One of the most common encountered disease in ENT OPD today is chronic otitis media (COM).

Tympanic membrane retraction is a common finding in both children and adults. Retraction pockets are result of negative middle ear pressure that ranges from shallow non progressive pockets which are managed by self cleaning to deep, adhesive retractions which can be problematic retractions into mastoid and attic. These can cause progressive hearing loss due to erosion of scutum and ear ossicles. Attic retractions can remain asymptomatic which can eventually develop into extensive cholesteatoma. It has also been established in some studies that it may act as a precursor to cholesteatoma, and may require surgical intervention. The clinical judgement as in whether prophylactic intervention is justifiable or not ,may be refined by studies regarding the natural behaviour of pars tensa retraction.

Tympanic membrane retraction pockets, also termed synonymously as atelectasis of the middle ear [derived from Greek ateleˆs (incomplete) and ektasis (extension)], is a common clinical condition that is regularly encountered by the ENT surgeons in daily out-patient department. It can be defined as inward displacement of the TM from its normal position. It is characterized by partial inwarding of the mesotympanic or epitympanic cavities which corresponds clinically to a retraction of a fragile portion of the tympanic membrane in its pars tensa or pars flaccida portion. Retraction Pockets are of highly clinical importance in understanding the pathophysiology of cholesteatoma formation.

Therefore, correct diagnosis and management of retraction pockets are important in the prevention of cholesteatoma.Eustachian tube dysfunction is the regarded as a primary cause of atelectasis which results in negative middle ear pressure which further leads to retraction of the tympanic membrane.[1] The posterosuperior quadrant of pars tensa and pars flaccida which is thinner and also sparsely collagen distributed makes it prone to tympanic membrane retraction.

When there is negative middle ear pressure, first the convexity disappears, and then the tympanic membrane becomes flat, and the tympanic membrane is stretched further creating tympanic membrane concave , ultimately leading to retraction. Eustachian tube closure failure which was proposed by Magnuson and group is now of the the most important risk factors for the pathogenesis of retraction pockets.[2]

Till date, not many studies have been conducted to know the correlation between the impedance audiometry and development of the retraction pockets in cases of both squamosal type and mucosal type of chronic suppurative otitis media, hence in this study we try to know the correlation.

MATERIAL AND METHODS:

The cross sectional study was undertaken at Department of ENT, Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi among patients who came to ENT OPD during the period of august 2018 to June 2020 with typical history of inactive squamosal type chronic otitis media.after obtaining IEC approval, people who were willing to participate in the study were included after obtaining an informed and written consent.

RESULTS:

The youngest patient in our study was 11 years and the oldest was 60 years. The mean age of the patients in our study was 27.24± 12.35 and the median age was 24 years.

In our study, amongst 100 patients, 72 (72.00%) patients were having ear discharge and 28(28.00%) patients had no history of ear discharge. Hard of hearing and tinnitus were reported from 76(76.00%) and 41(41.00%) ears respectively. Amongst the patients who were enrolled in our study, most common complaint was hard of hearing with or without ear discharge.

According to the otoscopic examination , out of 100 patients, maximum number of retraction pockets was found in the posterosuperior quadrant of pars tensa i.e., 49 (49.00%) followed by attic 27 (27.00 %), thereafter followed by ASQ and PSQ 12 (12%).The least common location for the retraction pockets was the Posteroinferior quadrant. Amongst 100 patients, 36 patients (36.00%) presented with retraction pocket with perforation and 64(64.00%) presented with just retraction pockets. And cholesteatoma was present in 22 (22.00%) patients out of 100.

In comparison with the otoscopic findings above, otoendoscopic examination was carried following it wherein, Out of 100 patients, maximum number of retraction pockets was found in the posterosuperior quadrant of pars tensa i.e., 49 (49.00%) followed by attic 27 (27.00 %), thereafter followed by ASQ and PSQ 20 (20.00%).The least common location for the retraction pockets was the Posteroinferior quadrant. Amongst 100 patients, 36 patients (36.00%) presented with retraction pocket with perforation and 64(64.00%) presented with just retraction pockets. And cholesteatoma was present in 25 (25.00%) patients out of 100. The findings of otoscopy were confirmed with otoendoscopy and the retraction pockets present in

anterosuperior quadrant which was missed by otoscopy was later confirmed by otoendoscopy Amongst the retraction pockets present in pars flaccid (n=27), in comparison with the both investigative procedures with otoscopy and otoendoscopy, we found that grade III and grade IV were underdetected in otoscopy and findings were confirmed in otoendoscopy.Grade I was detected in 1 patient (3.70) in both otoscopy and otoendoscopy, Grade II was detected in 7 patients (25.92%) in otoscopy and in 8 patients (29.62%) in otoendoscopy. While Grade III was detected in 12 patients (44.44%) in otoscopy which was further confirmed to be present in 9 patients (33.33%) and Grade IV was detected in 7 patients (25.92%) in otoscopy which was further confirmed in otoendoscopy and was found to be present in 9 patients (33.33%)

Amongst the retraction pockets present in pars tensa (n=73), in comparison with the both investigative procedures with otoscopy and otoendoscopy, we found that grade II and grade III were underdetected in otoscopy and findings were confirmed in otoendoscopy.Unhealthy tympanic membraneinclude mild retraction, tympanosclerotic patch, crust and whom normal texture was not seen was confirmed in otoendoscopy.

Whilst studying the pattern of hearing loss in patients with retraction pockets , we observed that the maximum number of patients had a Moderate cdhl amounting to 39.00% of the total number of cases followed by Mild cdhl which constituted 28.00% followed by moderate to severe conductive hearing loss which was in 15.00 % of cases, Severe conductive hearing loss was seen in 9.00 % cases and profound cdhl was found in 1 case and 9 patients had a normal hearing. Among 100 number of cases examined, most cases had C type tympanogram which amounted to 36(36.00%) cases, followed by B type which consisted of 32 cases (32.00%) , followed by As type which consisted of 14 cases(14.00%) and 18(18.00%) cases with Ad type .

Amongst 100 cases examined, most patients i.e., 43(43%) presented with eustachian tube dysfunction followed by 37 (37%) cases with partially dysfunction eustachian tube. 14 cases (14%) had a normal eustachian function. Lastly, in 6 cases (6%), the seal was not obtained for the test to be undergone effectively

In correlating the grading of the retraction pockets with the Eustachian function tube tests, we observed that in case of grade 1 which consists of 7 cases, 3 patients had normal eustachian tube function, 2 patients had partially functioning eustachian tube and 2 patients had dysfunctional Eustachian tube.

While in case of grade 2 retraction pockets which consists of 51 patients, 26 patients had a dysfunctional eustachian tube, 21 patients had a partially functioning eustachian tube and 2 patients had a normal eustachian tube function.

In comparison with the grade 3 retraction pockets, 12 patients had partially functioning eustachian tube, 10 patients had a dysfunctional tube while 5 patients had a normal functioning eustachain tube and in 2 patients seal was not obtained.

In patients with grade 4 retraction pockets, out of 13 patients 5 patients had dysfunctional eustachain tube while 4 patients had a normal eustachain function tube, 2 patients had a partially functioning eustachian tube and in 2 patients, seal was not obtained.

Correlating the findings of hearing loss on the basis of pure tone audiometry with the grading of retraction pockets, we observed that maximum number of patients had moderate conductive hearing loss amounting to 39 % of which grade 3 cases were maximum amounting to 22 cases, followed by mild conductive hearing loss amounting to 28% of the total cases, wherein grade 2 cases were maximum which corresponded to 12 cases and grade 1 corresponded to 11 cases.

This was followed by moderate to severe conductive hearing loss where the number of cases was equal in grade 2 and grade 3 i.e., 7 cases each. In 1 case of profound conductive hearing loss, the grading of the retraction corresponded to grade 4.

Table 1: Correlation of impedance audiometry with grading of the retraction pockets

GRADING	A type	B type	C type	Cs type
I	1	1	3	2
II	4	16	26	5
III	8	11	6	4
IV	5	4	1	3
Total	18	32	36	14

TABLE 2: Correlation of eustachian function tube tests with grading of rraction pockets:

Grading	P.F	S.N.O	DYSFUNCTION	NORMAL	TOTAL
I	2	0	2	3	7
II	21	2	26	2	51
III	12	2	10	5	29
IV	2	2	5	4	13
TOTAL	37	6	43	14	100

TABLE 3: correlation of hearing loss with grading of retraction pockets

Hearing loss	Grading Of Retraction Pockets				Total
	Gr1	GR2	GR3	GR4	
Normal	6	2	0	0	8
Mild cdhl	11	12	4	1	28
Mod cdhl	2	11	22	4	39
Mod to severe cdhl	1	7	7	1	16
Severe cdhl	0	0	4	5	9

DISCUSSION:

Almost every ENT surgeon is faced with a peculiar predicament of whether to wait and watch the tympanic membrane retraction or to intervene it surgically. Many of the mild retractions can be resolved with wait and watch management and the chances of progression and/or cholesteatoma formation are less. However, in certain cases, it is difficult to prognosticate which pocket will deteriorate with time and culminate in cholesteatoma and result in severe retractions. All asymptomatic retraction pockets can be treated with conservative management and periodic surveillance. Surgical management has an important role in the management of grade III and IV retractions where the lamina propria of tympanic membrane has undergone irreversible degeneration.

Amongst the patients who were enrolled in our study, most common complaint was hard of hearing with or without ear discharge with 76 % patients presenting, which was followed by ear discharge 72%.

Grewal et al., (2003) found Otorrhea in all 60 cases i.e. 100%.[3]Mills (1991) [4] had found otorrhea in 31% of the 13 cases of pars tensa retraction pockets in his study. However, otorrhea in all cases is not unusual as in a developing country like India where 2 factors play a major role:

1. Due to Delayed presentation to visit a consultant due to poor access to major hospitals by the rural population.
2. High incidence for superadded bacterial infections due to unhygienic living conditions and hot, humid environmental conditions.

Amongst majority of the studies, it was found that the most common symptoms were ear discharge and hearing loss.

Mehta et al, (2018)[5] in his study on 50 cases who were clinically diagnosed with cholesteatoma of the middle ear reported that the most common complaint was ear discharge (100%) and hearing loss (90%). In our study, we found that the maximum number of patients had a moderate conductive hearing loss amounting to 39 patients while 8 patients had a normal hearing.

Similar findings were observed in a study conducted by Radhika et al(2017) where they reported that most of the cases had moderate hearing loss, 26.9% had mild hearing impairment while profound hearing loss was reported in 1 patient.

Chao et al., (1994) [6] performed a study on hearing impairment in chronic otitis media with cholesteatoma in 94 patients and showed that 49% of the patients had a pure conductive hearing impairment whereas 29.2% had a mixed type and only 6.2% had normal hearing and he concluded that 78% of these patients hearing was improved post surgery. In the study done by Sakagami et al[7], all 87 ears included in his study showed gradual deterioration of hearing on long term observation.

Majority of the findings reviewed in literatures correlated with our study.

In our study, we found that majority of cases had C type tympanogram which amounted to 36 patients followed by B type which consisted of 32 cases.

T Mewes et al[8], conducted a study in 50 epitympanic retraction pockets to exemplify objectively the frequency of patulous eustachian tubes in ears with epitympanic retraction pockets and found that in patients with epitympanic retraction pockets, 27 patulous eustachian tubes were present, 22 of which occurred in affected ears while 2 patulous tubes were found in the group of the controls. They finally concluded that tubal opening pressure (P <0.001) and tubal closing pressure (P <0.01)were significantly lower in ears with epitympanic retraction pockets than in healthy ears.

The study articles on correlation of tympanometry graph studies with retraction pockets were limited.

Majority of cases in our study presented with eustachian tube dysfunction followed by cases with partially dysfunction eustachian tube. In few cases, the seal was not obtained for the test to be undergone effectively.

Bunee et al (2000) [9] conducted a study to explore the short-term and long term variability of tubal opening and closing in ears with retractions and in normal patients and found that there was insignificant difference between the rates of positive response in the equalization and valsalva tests, and implied that single tubal function tests have little prognostic value on the individual level.

Not much research has been done between the correlation between eustachian function tests in retraction pocket ears.

In our study, we studied the correlation between the grading of the retraction with the tympanometry curve and found it to be significant (P- value=0.025).

Also, we studied the correlation between the grading of the retraction pockets with eustachian function tests and found it to be significant (p-value=0.045).

We did not find any relevant article related to the correlation of retraction pocket and eustachian function tests and tympanometry curve. Li et al (1999)[10] observed that for mild PT retraction, hearing thresholds were significantly worse than thosewith no retraction,

Static admittance (peak of the tympanogram minus the baseline at the lowest value) at 226 Hz was statistically insignificant among the retraction severity groups in study conducted by Li et al, between The OM group and the retraction groups.

This finding did not correlate with the findings we observed in our study. There were very less reliable literatures available in this context.

CONCLUSION:

Majority of the patients in our study presented with moderate conductive hearing loss and while studying the correlation between the grading of the retraction pockets with hearing loss , we found it to be significant (p-value <0.001). Hence, we can conclude that grade of retraction has a positive association with hearing loss.

Among 100 number of cases examined, most cases had C type tympanogram which amounted to 36(36.00%) cases, followed by B type which consisted of 32 cases(32.00%) , followed by Cs type which consisted of 14 cases(14.00%) and 18(18.00%) cases with A type and we found a significant correlation between the grading of the retraction and tympanometry curve . (p- value=0.025).

Amongst 100 cases examined , majority patients i.e., 43(43.00%) presented with eustachian tube dysfunction followed by 37 (37.00%) cases with partially dysfunction eustachian tube. 14 cases(14.00%) had a normal eustachian function. Lastly, in 6 cases (6.00%), the seal was not obtained for the test to be undergone effectively. In our study we observed that there is a positive association between the grades of retraction and tympanometry curve (p-value=0.025). Majority of the patients belonged to grade II in which C type graph was seen in majority of the patients which is usually seen in negative middle ear pressure due to mostly eustachian tube dysfunction.

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