Original article:

Study on role of mastoid air cell system in maintaining the middle ear pressure

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Abstract:

Introduction: A simple mastoidectomy is an effective means of repneumatizing the mastoid air cell system as well as eradicating the mastoid source of infection.

Methodology: The patients were selected consecutively as and when they present during the study period considering the inclusion and exclusion criteria. And the outcome of results of tympanoplasty with cortical mastoidectomy will be compared with tympanoplasty without cortical mastoidectomy.

Results: Pre operatively the mean air bone gap in Group I was 35.20 db and at 3rd month it was 15.60 db and 6th month 13.20 Db . There was a significant improvement from 3rd month to 6th month (<0.0001)

Conclusion: Our study proves that tympanic membrane reconstruction need not always be combined with cortical mastoidectomy and should only be done in cases where mastoid source of infection is suspected and supported by the above factors.

Introduction:

The efficiency of the middle ear (ME) for coupling tympanic membrane vibrations to mechanical pressures acting on the oval window is inversely related to the absolute value of the ME-ambient pressure deviation.[1] Because the ME is a relatively fixed-volume, temperature-stable, biological gas pocket, its pressure is proportional to the contained gas moles. A simple mastoidectomy is an effective means of repneumatizing the mastoid air cell system as well as eradicating the mastoid source of infection.[2]

The mastoid air cell system (MACS) is a multiply partitioned airspace located within the petrousal bone posterior to and in communication with the airspace of the tympanum. [3]

Material and methods:

Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. The study was carried out on 50 patients, who were divided into two groups of 25 patients respectively.

Group A to consist of patients undergoing only tympanoplasty and Group B to consist of patients undergoing tympanoplasty surgery with mastoidectomy.

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The segregation of patients into the two groups was randomized.

Inclusion and Exclusion criteria

Inclusion criteria :

- Age 15-60 years
- Patient with inactive mucosal chronic otitis media
- Isolated conductive hearing loss
- X ray mastoid Schuller's view showing sclerotic mastoid

Exclusion criteria :

- Age less than 15 years and more than 60 years.
- Patients having Attico-antral disease of the ear.
- Patient with active mucosal chronic otitis media
- X ray mastoid Schuller's view showing pneumatic mastoid
- Patient with sensory neural hearing loss and mixed hearing loss
- Immunocompromised patients.
- Medical contraindications to undergo surgery.

Sampling procedure: A predesigned proforma will be used to record the relevant information (patient's data, clinical findings, investigation reports) from the individual patient selected with the above inclusion and exclusion criteria.

Methodology:

The patients were selected consecutively as and when they present during the study period considering the inclusion and exclusion criteria. And the outcome of results of tympanoplasty with cortical mastoidectomy will be compared with tympanoplasty without cortical mastoidectomy.

Observation and results:

Table 1: Comparison of audiological assessment in Group I and Group II

Audiological assessment (db)	Group I (n=25)		Group II (n=25)		**t Value**	**P Value**
	Mean	**SD**	**Mean**	**SD**		
At Pre op	35.20	6.690	36.20	6.338	0.54	>0.05
At 3 months	15.60	5.831	14.20	6.403	0.81	>0.05
At 6 months	13.20	5.930	12.20	6.137	0.59	>0.05

- The mean air bone gap at pre op in Group I was 35.20 db and in Group II 36.20db
- Post operative assessment at 3rd month revealed mean air bone gap of 15.60 db in Group I and 14.20 db in Group II
- At 6th month mean air bone gap of 13.20 db in Group I and 12.20 db in Group II

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Table 2: Comparison of audiological assessment in Group I

Parameter	Audiological assessment (db)		t Value	P Value
	Mean	SD		
At Pre op	35.20	6.690	-	-
At 3 month	15.60	5.831	11.83	<0.0001
At 6 month	13.20	5.930	13.27	<0.0001

- Pre operatively the mean air bone gap in Group I was 35.20 db and at 3rd month it was 15.60 db and 6th month 13.20 Db
- There was a significant improvement from 3rd month to 6th month (<0.0001)

Table 3: Comparison of audiological assessment in Group II

Parameter	Audiological assessment (db)		t Value	P Value
	Mean	SD		
At Pre op	36.20	6.338	-	-
At 3 month	14.20	6.403	13.47	<0.0001
At 6 month	12.20	6.137	14.70	<0.0001

- Pre operatively the mean air bone gap in Group II was 36.20 db and at 3rd month 14.20db and 6th month 12.20db
- There was a significant improvement from 3rd month to 6th month (<0.0001)

Table 4: Comparison of audiological assessment change at pre op and at 6 months Group I and Group II

Audiological assessment (db)	Group I (n=25)		Group II (n=25)		t Value	P Value
	Mean	SD	Mean	SD		
Change	22	8.292	24	8.165	0.86	>0.05

- The mean Air bone gap in pre op in Group I was 35.20db and in 3rd month was 15.60db to 6th month in 13.20db the audiological improvement was 22db
- In Group II was 24db Pre operatively the mean air bone gap was 36.20 db and at 3rd month 14.20db and 6th month 12.20db the audiological improvement was 24db

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Discussion

Preoperatively Air bone Gap ranged from 15 to 45dB. Majority of cases in both the groups had AB gap of 25dB or above. Mean AB gap in Groups A and B was 35.20db and 36.20db respectively

Hearing improvement after the surgery was assessed in terms of closure of air- bone gap based on the pure tone audiometry done at 3rd month and 6th month. The hearing improvement was considered successful if the air bone gap closure was better than or equal to 10dB.

In Group A, an air bone gap closure > or equal to 10dB was noted in 22 patients (88%) and in Group B 23 patients (92%). In the remaining 3 patients of Group A the graft was not taken up in 2 patients while 1 had an improvement which was <10db.

In Group B, a successful improvement was noted in 23 (92%) cases. In the remaining 2 patients the graft was not taken up in 1 patient and the other patient did not show any significant hearing improvement . In our study the difference in hearing improvement between the two groups were not statistically significant.In a study by Toros et al[4] evaluated tympanoplasty with or without mastoidectomy performed in patients with sclerotic mastoid bone, as for hearing results and graft success and couldn't find any statistically significant difference between both groups. They indicated that simple mastoidectomy is an effective intervention in establishing re pneumatization of sclerotic mastoid cells and eradication of infection within mastoid bones. However they also asserted that especially in cases scheduled for myringoplasty only, its added benefits, potential risks and cost effectiveness should be meticulously evaluated. Appropriate sample size will be more clearly explained and proved this fact . [5]

Conclusion

A simple mastoidectomy is an effective means of repneumatizing the mastoid air cell system as well as eradicating the mastoid source of infection. Our study proves that tympanic membrane reconstruction need not always be combined with cortical mastoidectomy and should only be done in cases where mastoid source of infection is suspected and supported by the above factors.

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