

Original article:

Tympanoplasty with and without cortical mastoidectomy in CSOM:

A comparative study

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Abstract:

Introduction: Chronic suppurative otitis media (CSOM) is a chronic suppurative inflammation of mucoperiosteal lining of middle ear cleft due to suppurative organisms. It leads to ossicular necrosis of bone. Tympanoplasty with or without mastoidectomy is indicated for chronic ear disease process such as tympanic membrane perforations.

Aims & Objectives: Present study is a comparison between Tympanoplasty among selected patients of chronic ear disease with or without cortical mastoidectomy.

Methods: The present study included the 60 cases of chronic suppurative otitis media with central perforation. Cortical mastoidectomy was randomly performed in half of the patients. Among these patients who underwent surgery, 30 were subjected to Tympanoplasty alone and in remaining 30 Tympanoplasty with cortical mastoidectomy were done.

Results: Simple mastoidectomy is considered to be a safe and useful adjunct to Tympanoplasty in cases of chronic otitis media with perforation.

Conclusion: Cortical mastoidectomy is found to be an effective means of re-pneumatizing the sclerotic mastoid and eradicating mastoid sources of infection along with Tympanoplasty.

Key words: CSOM, Tympanoplasty, Mastoidectomy.

1. INTRODUCTION:

Chronic suppurative otitis media (CSOM) is a chronic suppurative inflammation of mucoperiosteal lining of middle ear cleft due to suppurative organisms^[1]. In tubotympanic type of CSOM, where ossicular necrosis of bone is present, most commonly involved ossicle is lenticular process of incus because of its precarious blood supply^[2]. Under aeration of the middle ear and the alteration of the mechanical properties of the drum such as destruction of the architecture of the collagenous process causing a thinning of tympanic membrane are necessary factors

in the development of retraction to cholesteatoma formation^[3].

The fluid and the mild infection irritate the mucosa of the aditus ad antrum and mastoid air cells and the process of organization begins. By the obstruction of the ventilation and drainage of mastoid antrum and air cells, the resultant negative pressure in the mastoid induces a simple mastoid edema with fluid exudation and small hemorrhages. Once the ossicular chain is interrupted by the diseased process then functioning of the middle ear is hampered^[4].

Tympanoplasty is a procedure used to eradicate disease in the middle ear and to reconstruct the hearing mechanism with or without tympanic membrane grafting [5,6]. Tympanoplasty with or without mastoidectomy is indicated for chronic ear disease process such as tympanic membrane perforations resulting from previous middle ear infections [7]. Cortical mastoidectomy is an operation performed to remove disease from the mastoid antrum and the air cell system and aditus ad antrum with preservation of intact bony external auditory canal wall, without disturbing the existing middle ear contents [8]. Present study is a comparison between Tympanoplasty among selected patients of chronic ear disease with or without cortical mastoidectomy. In the present study, evaluation of disease and optimum outcome of both the both the procedures are discussed.

2. AIMS AND OBJECTIVES:

The present study was taken with the following aims and objectives.

1. To know the disease process and the clinical presentation of the chronic disease
2. To study and find out whether the additional mastoidectomy procedure helps in the outcome.
3. To know the condition of middle ear in chronic ear disease

3. MATERIALS AND METHODS:

The present study was carried out in the department of Ear, Nose & Throat, Government Medical College, Aurangabad, between the periods of June 2004 to December 2006. The study was undertaken with prior consent from institute's local ethical committee. The cases of CSOM with safe perforation attending the ENT OPD were selected for the study. All the patients who underwent the surgery were explained about the details of study and they agreed

to take part in the present study. The study comprised of 60 patients of either sex aged between 12 years to 52 years. All these patients underwent surgery, 30 were subjected to tympanoplasty alone and in remaining 30 Tympanoplasty with cortical mastoidectomy was done. Selection of patient for a particular type of surgery was not based on any clinical findings and investigations.

Selection criteria was as follows-

1. Patients with central perforations were selected {small (<50% of total drum area) and large (>50% of total drum area)}
2. Ear selected was dry for 6 weeks or more. Those having discharge were first treated with prior antibiotics after culture and sensitivity to make it dry.

An exclusion criterion was as follows:

1. Patients with complications of otitis media were not selected
2. Systemic illness was ruled out prior to selection of the individual
3. Patients having previous history of ear surgery were excluded
4. Any primary focus of infection in nose, paranasal sinuses, nasopharynx and throat was eliminated
5. Sensori-neural hearing loss was ruled out.
6. Any dysfunction of Eustachian tube was ruled out.

Methods:

All cases were subjected to a detailed history, particularly with reference to discharge, its duration and relation to upper respiratory tract infection. Previous history about treatment received and any surgery was noted. This was followed by a thorough general examination, physical examination and examination of ear, nose & throat. The site of perforation was noted. The presence of any granulations was looked for and hearing tests were carried out with tuning fork of frequency 256 HZ.

Otomicroscopy was done in every patient. Investigations like routine hematological, bleeding and clotting time were done. Radiological examination of mastoids and paranasal sinuses was carried out. Pure tone audiometry was done in every patient.

Austin/Kartush Classification of ear ossicle affection:

1. M+ I+ S+ All ossicles present
2. M+ I- S+ Incus absent
3. M + I – S- Footplate & malleus present
4. M- I- S+ Stapes present
5. M- I- S- Only footplate present

Surgical Procedure:

1. Pre-operative preparation: The patients selected for operation were admitted one day prior to surgery and were given systemic antibiotics. Lignocaine sensitivity test was carried out in all cases. Shaving of the hair in mastoid region 1.5” below and behind the ear was done as a part of local preparation.
2. Anesthesia: Patients were operated under general as well as local anesthesia
3. Incision: All the cases were operated by giving a Wilde’s post-auricular incision.
4. Operation: Randomly tympanoplasty or tympanoplasty with cortical mastoidectomy was performed in every alternate patient. The ossicular chain was examined under 20X magnification. Depending on ossicular status, type I, II or III tympanoplasty was planned. Ossicular reconstruction was done either by incus transposition or by using composite graft obtained from tragus. The tympanoplasty was performed by Underlay method. In case where ossicular chain was intact, type I

tympanoplasty was done. Type III tympanoplasty was done where suprastructure was present.

Post-operative Management:

The patients were kept on antibiotics for one week. Mastoid dressing was changed on 2nd postoperative day and the pack and sutures were removed on the 7th day. The patient was asked to come for follow up at 15 days interval was cautioned against heavy lifting over, blowing nose and entry of water in the ear. At follow ups, the patients were asked about

1. Hearing improvement
2. Ear discharge
3. Giddiness or any other complaint
4. Upper respiratory infection

Tuning fork tests were done and pure tone audiometry was performed at 6 weeks for assessing hearing improvement.

Criteria for success post-operatively:

1. Non-discharging ear
2. ‘Take-up’ of tympanic membrane graft without perforation
3. Hearing improvement: subjective and closure of air bone gap on Pure Tone Audiometry

4. OBSERVATIONS:

The present study included the 60 cases of chronic suppurative otitis media with central perforation attending the ENT OPD of Department of ENT, Government Medical College, Aurangabad. Many observations were made in this study according to two groups i.e. patients who had undergone Tympanoplasty alone and patient who had undergone Tympanoplasty with cortical mastoidectomy. The following observations were made.

Table No.1: Age wise distribution

Sr. No.	Age (in Years)	Total (%)
1	11-20	30 (50)
2	21-30	21 (35)
3	31-40	06 (10)
4	>41	03 (05)

Table No. 2: Sex wise distribution

Sr. No.	Sex	Total (%)
1	Male	26 (43)
2	Female	34 (57)
3	Total	60 (100)

Table No. 3: Presenting symptoms

Sr. No.	Symptoms	Total (%)
1	Ear discharge	60 (100)
2	Hard of hearing	33 (55)
3	Others (symptoms of URTI, earache, headache)	37 (61.70)

Table No. 4: Size of perforation

Sr. No.	Perforation	Total (%)
1	Small	49 (81.70)
2	Large	11 (18.30)

Perforations involving <50 % of total drum area were considered small whereas those with area >50 % were taken as large. Most of them had small perforations.

Table No. 5: Correlation of radiological and pathological findings

Sr. No.	X-ray mastoid Schuller's view	Total	Middle ear/ Antral pathology (No. of patients)		Total (%)
			Without mastoidectomy	With mastoidectomy	
1	Normal	41	11	11	22 (54)
2	Sclerotic	19	06	05	11 (58)

Eleven (58%) of 19 sclerotic mastoids had antral and/or middle ear pathology. Though 41 patients had normal radiology, 29% of ears were having antral or middle ear pathology. This means radiological findings are not helpful regarding prediction of

middle ear and/or antral pathology in safe CSOM, as irrespective of the x-ray findings only around 50% of ears were found to have pathology on exploration. Probably computed tomography might prove to be better investigation.

Table No. 6: Surgical procedure done

Sr. No.	Tympanoplasty	Without mastoidectomy (No. of patients out of 30)	With mastoidectomy (No. of patients out of 30)
1	Type I	25	21
2	Type II	04	07
3	Type III	01	02

Most commonly performed surgery in our study was type I- Tympanoplasty as these patients had intact and mobile ossicular chain. No type IV surgery was performed as no patient with stapes involvement came across.

Table No. 7: Ossicular status

Sr. No.	Ossicular status	Without mastoidectomy (No. of patients out of 30)	With mastoidectomy (No. of patients out of 30)	Total (No. of patients out of 60)
1	M+ I+ S+	16	14	30
2	M+ I- S+	06	08	14
3	M+ I- S-	01	04	05
4	M+ I- S-	07	04	11

Table No. 8: Relationship between duration of discharge and ossicular distribution found intraoperatively

Duration (months)	Ossicular distribution			
	Without mastoidectomy (No. of patients out of 30)		With mastoidectomy (No. of patients out of 30)	
1-12	M- I+ S+	--	M- I+ S+	--
	M+ I- S+	--	M+ I- S+	--
	M- I- S+	--	M- I- S+	--
13-48	M- I+ S+	1	M- I+ S+	1
	M+ I- S+	2	M+ I- S+	4
	M- I- S+	--	M- I- S+	3
>48	M- I+ S+	0	M- I+ S+	3
	M+ I- S+	4	M+ I- S+	4
	M- I- S+	5	M- I- S+	3

Malleus and incus was found to be involved early. Long process of incus was found to be eroded alone in 14 cases. Handle of malleus alone was seen eroded in 5 patients and overall erosion of handle of malleus was seen in 16 cases. Eleven cases had erosion of both the ossicles. No involvement of Stapes suprastructure was seen.

Table No. 9: Hearing status

Hearing Loss	Without mastoidectomy		With mastoidectomy	
	No. of patients (Preoperative)	No. of patients (Postoperative)	No. of patients (Preoperative)	No. of patients (Postoperative)
Mild	07	22	04	30
Moderate	17	05	18	--
Severe	06	03	08	--

For the purpose of present study, we have categorized conductive hearing loss of our patients into mild, moderate and severe grade as follows-

- Mild = 16 to 30 dB
- Moderate = 31 to 45 dB
- Severe = 46 to 60 dB

All 30 patients who underwent tympanoplasty with mastoidectomy had good improvement in hearing and came in the category of mild hearing loss at the end of 6 weeks.

Table No. 10: Mean air conduction threshold and improvement

	No. of ears	PTA		Improvement
		Pre-op	Post-op	
Tympanoplasty with mastoidectomy	30	37.5 ± 7.16	20.2 ± 2.30	16.93 ± 5.52
Tympanoplasty alone	30	36.5 ± 7.32	26.2 ± 10.5	10.26 ± 7.57

Involvement in hearing was found in patients who underwent tympanoplasty with mastoidectomy with average upward shifting of air conduction curve by 16.93 ± 5.52.

Table No. 11: Comparison of success rate of surgery with middle ear and mastoid pathology

Sr. No.	Middle ear mucosa	Without mastoidectomy		With mastoidectomy	
		No.	Success (Failure)	No.	Success (Failure)
1	Granulation	09	07 (02)	09	All (none)
2	Polypoidal	07	02 (05)	05	All (none)
3	Ganulation + Glue	--	--	03	02 (1)
4	Normal	14	11 (03)	13	12 (1)
	Total	30	20 (10)	30	28 (2)

Table No. 12: Intra-operative middle ear and mastoid antral findings

Sr. No.	Pathology	Middle ear findings (without mastoidectomy) Out of 30 (%)	Middle ear findings (with mastoidectomy) Out of 30 (%)	Total No. of patients Out of 30 (%)
1	Granulation	09 (30)	09 (30)	18 (30)
2	Polypoidal	07 (23)	05 (17)	12 (20)
3	Ganulation + Glue	--	03 (10)	03 (05)
4	Normal	14 (47)	13 (43)	27 (45)

Thirty three patients of 60 were found to have pathology in middle ear and/or antrum. All the patients with granulation and polypoidal mucosa in whom mastoidectomy was done along with tympanoplasty were having success rate of 100% (14 patients). Three patients were with granulation and Glue in who mastoidectomy was done, 1 failure case with no hearing improvement was noticed. However, 7 patients of failure were noted when no mastoidectomy was done. When middle ear was found with granulation and polypoidal mucosa. Out of those 14 patients, who had no middle ear pathology and underwent tympanoplasty alone showed failure rate of 21.43% (3 patients out of 14)

Table No. 13: Postoperative status

Sr. No.	Postoperative status	Without mastoidectomy (No. of patients out of 30)		With mastoidectomy (No. of patients out of 30)	
		Present	Absent	Present	Absent
1	Graft uptake 100%	26	04	30	00
2	Dry ear	26	04	30	00
3	Improved hearing	28	02	28	02

Table No. 14: Condition of the other ear

Sr. No.	Condition of the other ear	without mastoidectomy (No. of patients Out of 30)	with mastoidectomy (No. of patients Out of 30)	Total (No. of patients Out of 60)
1	Normal	18	18	36
2	Retracted TM	03	03	06
3	Perforation-safe	06	06	12
4	Tympano-sclerosis	03	03	06

40% of cases were with altered ear findings in opposite ear which suggests occurrence of bilateral disease is fairly common.

5. DISCUSSION:

The present study comprises of 60 patients of CSOM with central perforation, who were subsequently treated. Cortical mastoidectomy was randomly performed in half of the patients. Suppurative otitis media was found to be more common in teenage, followed by third decade of life. It was found to be more common in females than males. Symptomatically ear discharge was a constant feature in all the cases, whereas hard of hearing was associated with duration of discharge. It was found that more the duration of discharge, more was the hearing loss.

Radiology of mastoid revealed sclerosis in 19 patients on affected side. The middle ear mucosa was found to be inflamed in 30 cases of which 18 patients had granulations and 12 had polypoidal mucosa. Pathology in mastoid antrum was found in 17 out of 30 (58%) patients subjected to Tympanoplasty with mastoidectomy of which 9 had only granulations, 5 had polypoidal mucosa and 3 had granulations along with glue.

Out of 30 cases subjected to Tympanoplasty with mastoidectomy, 17 cases were found to have altered middle ear pathology like polypoidal mucosa or granulations and 13 patients had no pathology. 16 of these 17 cases were successful. There was no discharge postoperatively and significant hearing improvement was observed in these patients. Out of 13 patients who had no pathology in middle ear and mastoid antrum, 12 patients (92%) had good results postoperatively. In other group in which only Tympanoplasty was done, 16 patients had middle ear pathology and 14 patients had no pathology in middle ear. Success rate in patients having middle ear pathology was found to be 56.25% (9 patients), while in patients having normal middle ear success rate was 79% (11 patients).

Failure rate was very high (43.75%) inpatients having middle ear pathology where only Tympanoplasty was done. Also failure rate in patients having no middle ear pathology where only Tympanoplasty was done was more than 21%. Though his is less than the other group, still it is

significant. On the contrary, patients in whom Tympanoplasty was done along with mastoidectomy, success rate was higher irrespective of presence or absence of middle ear or mastoid pathology. Hence, we conclude that it is wise to do mastoidectomy with Tympanoplasty in safe type of chronic otitis media.

Important role of mastoid on tympanic membrane repair is its effect upon hearing results. Present study has shown a gain of 16.93 dB compared to 10.2 dB gain in cases without cortical mastoidectomy. Robert K. Jackson showed results of 3 tone average gain of 13.1 dB. Considering all cases, malleus was found to be eroded in 16 out of 60 cases of which 5 were isolated handle of malleus erosion cases, whereas rest were found to be associated with long process of Incus erosion. Long process of Incus were found eroded in 25 cases of which 14 were isolated cases of erosion and 11 were associated with erosion of handle of malleus. Postoperatively, 35 patients had hearing range of 31-40 dB and 11 had hearing range 16-30 dB.

Mastoidectomy was done along with Tympanoplasty in 50% of patients of which 21 were Type I, 7 with Type II and 2 with Type II. Rest of 30 patients comprised of Type I Tympanoplasty (25), Type II (4) and Type III (1) in whom mastoid cavity was not opened. Out of 30 patients who had undergone Tympanoplasty with mastoidectomy 28 had hearing improvement with average hearing threshold of <20 dB. Only 2 patients (3.33%) had hearing threshold down by 2 dB.

Postoperatively discharging ear was present in 4 (113%) out of 30 cases where mastoidectomy was not done. There was no ear discharge in cases with mastoidectomy. This was found to be statistically significant ($p < 0.05$) Residual perforation was found in 4 cases where mastoidectomy was not

done, whereas no case of residual perforation was seen when mastoidectomy was done. Thus when dry ear with no residual perforation and improved hearing was considered as success criteria, Tympanoplasty alone was found to have less success rate than those done with mastoidectomy. This is statistically significant with uncorrected 'p' value of 0.03. Cases of Tympanoplasty with cortical mastoidectomy had a significantly higher success rate as compared to those without mastoidectomy.

As far as hearing improvement is concerned, more functional success was observed in patients who had undergone Tympanoplasty with mastoidectomy with average gain of 16.9 dB as compared to 10.2 dB gain in cases with Tympanoplasty alone. Another study by Anita Krishnan et al concluded as no significant role of mastoidectomy in hearing gain. The study by Anita Krishnan et al concluded the need for opening the mastoid antrum and air cells if the middle ear mucosa is unhealthy^[7]. Z. Benjamin et al studied impact of mastoidectomy and simple tympanic membrane perforation repair^[8]. According to them mastoidectomy was not necessary for successful repair of simple tympanic membrane perforation. However mastoidectomy impacted the clinical course in patients by reducing the number of patients requiring future procedure and by decreasing disease progress. This suggests that even in the absence of active evidence of infection, mastoidectomy with Tympanoplasty improved the underlying disease process. Another retrospective study by Zensak et al concluded that for patients with non-cholesteatomatous chronic otitis media who had failed prior Tympanoplasty reconstruction, an aerating mastoidectomy may be indicated and may improve the success rate of the surgery^[9].

6. CONCLUSION:

Our observations are summarized as follows:

1. In CSOM, the ossicular destruction due to granulation was more with increased in duration of ear discharge.
2. Incus was the most common ossicle to be destroyed in cases with CSOM.
3. The ossicular status of M+ I- S+ was most common.
4. More success rate was observed in patients who had undergone Tympanoplasty with mastoidectomy with regards to graft uptake, achievement of dry ear and hearing improvement.

In conclusion, simple mastoidectomy is found to be an effective means of re-pneumatizing the sclerotic

mastoid and eradicating mastoid sources of infection. Simple mastoidectomy is considered to be a safe and useful adjunct to Tympanoplasty in cases of chronic otitis media with perforation.

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