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Original Research Article

Influence of Mastoidectomy Middle Ear Cleft Flora and Mucosal Status on Tympanic Membrane Perforation Repair

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Abstract:

Background and Objectives: Chronic otitis media is an inflammatory process of the mucoperiosteal lining of the middle ear space and mastoid. The mucus membrane may be thickened by edema, submucosal fibrosis and infiltration with inflammatory cells. Clinical, demographic, pathological & bacteriological assessment of patients subjected to tympanic membrane perforation repair. To follow up the patient and asses the outcome of graft acceptance aftertympanic membrane perforation repair.

Materials and Methods: This study was conducted in the Department of ENT, Dept. of Microbiology and Pathology, Darbhanga Medical College & Hospital,Laheriasarai, Darbhanga from April 2018 to December 2019. For thispurpose 145 patients who had chronic otitis media with or without ossicular chain discontinuity were studied.

Conclusion: The patients were subjected to Mastoidectomy on a random basis. Mastoidectomy was done from anterior to posterior direction Attic, aditus and antrum were planned to be opened in sequential manner only up to the extent to which there was suspicion or evidence of disease. 70 patients underwent only tympanoplasty, 60 patients hadtympanoplasty with mastoidectomy and l5 were revision tympanoplasty with mastoidectomy.

Keywords: Mastoidectomy, Tympanoplasty, Tympanic Membrane.

Introduction

Chronic otitis media is an inflammatory process of the mucoperiosteal lining of the middle ear space and mastoid. The mucus membrane may be thickened by edema, submucosal fibrosis and infiltration with inflammatory cells [1]. It is divided into cholesteatomus or non-cholesteatomatous type, non-cholesteamatous chronic otitis media is further divided into chronic suppurative otitis media, indicating an active condition with discharging ear and sequela of chronic otitis media indicating non-active condition and a dry ear.

The incidence of chronic suppurative otitis media depends on race, socio-economic factors, poor living conditions overcrowding, poor hygiene and poor nutritional status [2]. The Management of otitis media has witnessed a profound a change duringthe past century, from the early attempts at surgical exposure of middle earin 1889 to the present day technique tympanoplasty with canal wall up or down mastoid surgeries. Earlier methods of surgery were to control the disease even at the expense of hearing, however, now in the modern era control of the disease with preservation and reconstruction of hearing is possible. The introduction of antimicrobials and developments in microbiology together with emphasis in preservation of hearing has modified the approach of management of otitis media. Discovery of operating microscope was great achievement in the management of otitis media [3]. No assessment of the ear is complete without search for bothpossible complication and the presence of distant focus of infection in the upper respiratory tract infection. A longitudinal follow up with respect to "graft uptake" rate and benefits of hearing were always overlooked inmany of the studies. It was always a matter of debate to define a successfulor failed tympanoplasty.

The extent of surgical intervention required in 1st surgery has also been a highly debatable issue. While some authors have held the insufficient aeration of mastoid cavity in the first surgery responsible for subsequent failure and recurrence of diseases; others have reported development of cholesteatoma in a non-cholesteatoma ear following mastoidectomy (with complete removal of mucosa) in the first go. In this study, we have attempted to analyze the patient subjected to tympanoplasty and tympanomastoidectomy procedure with reference

to „graft take rate", hearing improvement and the status of attic mucous [4]

Objectives

Clinical, demographic, pathological & bacteriological assessment of patients subjected to tympanic membrane perforation repair.

To follow up the patient and asses the outcome of graft acceptance after tympanic membrane perforation repair.

Materials and Methods

This study was conducted in the Department of ENT, Dept. of Microbiology and Pathology, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga from April 2018 to December 2019. For this purpose 145 patients who had chronic otitis media with or without ossicular chain discontinuity were studied. A detailed history otoscopic examination, otomicroscopic finding, tuning fork test and audiometric evaluation was done pre-operatively. Only those cases were selected for the study who had intermittent aural discharge with tympanic membrane perforation. No case of Attico- antral disease was selected. Each patient was subjected to a detailed examination of nose and paranasal sinuses and throat to rule out of foci of infection which would contribute to the Middle ear disease and was attended to conservatively and surgically dependency on the severity.

The detailed history about the disease was taken to settle a clinical diagnosis and to take decision. The following points were noted carefully by questioning the patient and their attendants. Chief complaints i.e. presenting symptoms, and their duration and other associated symptoms were noted. Character of aural discharge were asked to see whether it is mucoid, mucopurulent, blood mixed, foul smelling, scanty or profuse. Any positive history of vertigo, tinnitus and headache were noted.

S. No.	Projection	Primary structures for assessment
1.	Schuller"s	Mastoid air cells, sigmoid sinus, plate
2.	Mayer"s	Mastoid, antrum, additus, attic ossicles
3.	Stenver"s	Petrosa continuity (ridge and apex) labyrinth and mastoid tip

145 patients were taken for microbiological study. Ear swab was taken from middle ear additus/antrum for culture and sensitivity intra operatively. 60 patients were taken for histopathological study. Oedematousmucosa/granulation tissue was taken for histopathological examination.

Thereafter, all or part of the outer attic wall (scutum) and adjacent deep posterior meatal wall was removed to expose the Attic (epitympanum) and when necessary, the aditus and antrum in order to gain access to these sites and their contents. Granulation or thickened mucosa was removed from the attic. If required ossicular chain reconstruction was performed. Gelfoam was placed on the anterior part of middle ear to block the Eustachian tube opening. The temporalis fascia graft was placed lateral to (over) the long process of malleus and medial to (under) the drum remnant and annulus. Gelfoam soaked in antibiotic was the placed lateral to the tympanic membrane and wound closed in 2 layers. This technique was followed in all the cases and Attic aditus and antrum were opened as and when required finally leading to a total of 70 Tympanoplasties and 60 Tympanoplasty with Mastoidectomy. The biopsy specimen was fixed in 10% formalin for 24 hrs. The tissue was then dehydrated in graded alcohol, cleaned in xylol and paraffinembedding was done.

Results

The highest number of patients were seen among 21-30 yrs. (3l.03%) of age group and lowest (15%) seen among 51-60 yrs. of age.

The youngest patient in this series was 12 years old male and oldest was58 years old male.

Table 1:

Age group	No. of patients	Percentage
10-20	25	17.24
21-30	45	31.03
31-40	36	24.83
41-50	24	16.55
51-60	15	10.34
	145	

Table 2:

Sex	No. of patients	Percentage
Male	80	55.17
Female	65	44.83
	145	

Most of the patients were male and few of them female. This is an apparent figures and not real, owing to the general pattern of outpatient attendance in our country.

Table 3:

Dysfunction	No. of patients	Percentage
Patent	110	75.86
Not patent	35	24.14
	145	

Out of the total number of patients evaluated 110 had normalEustachian tube function and rest had defective tube Patency. All the cases selected for the study were of safe tubotympanic type. Of these 145 patients, 50 patients (34.48%) had perforation in antero- inferior quadrant, 35 cases (24.14%) had antero-superior quadrantperforation, 23 cases (15.86%) had perforation in Postero-inferior central perforation and 12 cases (8.25%) had postero-superior quadrant perforation but without cholesteatoma.

Table 4:

Site	No. of patients	Percentage
AIQ	50	34.48
ASQ	35	24.14
PIQ	23	15.86
PSQ	12	8.28
Subtotal Perforation	25	17.24
	145	

Table 5:

Organism	No. of patients	Percentage
Pseudomonas aeruginosa	60	41.38
Staphylococcus aureus	40	27.59
Proteus species	10	6.90
Sterile	35	24.14
	145	

The most common organisms encountered was pseudomonas species(4l.38%) followed by staphylococcus aureus (27.59%), 6.90% patients shared thwe presence of Proteous Species.

Table 6:

Type of Surgery	Graft accepted		Graft rejected	
	No. of patients	Percentage	No. of patients	Percentage
Tympanoplasty withmastoidectomy (n=60)	56	93.33	4	6.67
Tympanoplasty(n=70)	62	88.57	8	11.43
Revision Tympanoplasty withmastoidectomy (n=15)	15	100	-	-

The follow up at 2 month showed the acceptance of 99.33% graft in cases undergoing tympanoplasty with mastoidectomy graft acceptance ratewas 88.57% in cases undergoing tympanoplasty revision cases had a 100% graft acceptance.

Table 7:

Finding	No. of patients	Percentage
Normal	72	49.66
Dull	42	28.97
Retraction	16	11.03
Reperforation	8	5.52
Lateralization	4	2.76
Blunting	3	2.07

Otoscopy showed normal tympanic membrane in 49.66% of cases. 28.97% had dull tympanic membrane. 11.03% cases had the incidence of retraction whereas reperforation was undertaken on 5.52% cases. 2.76% had lateralization and 2.07% had blunting, respectively.

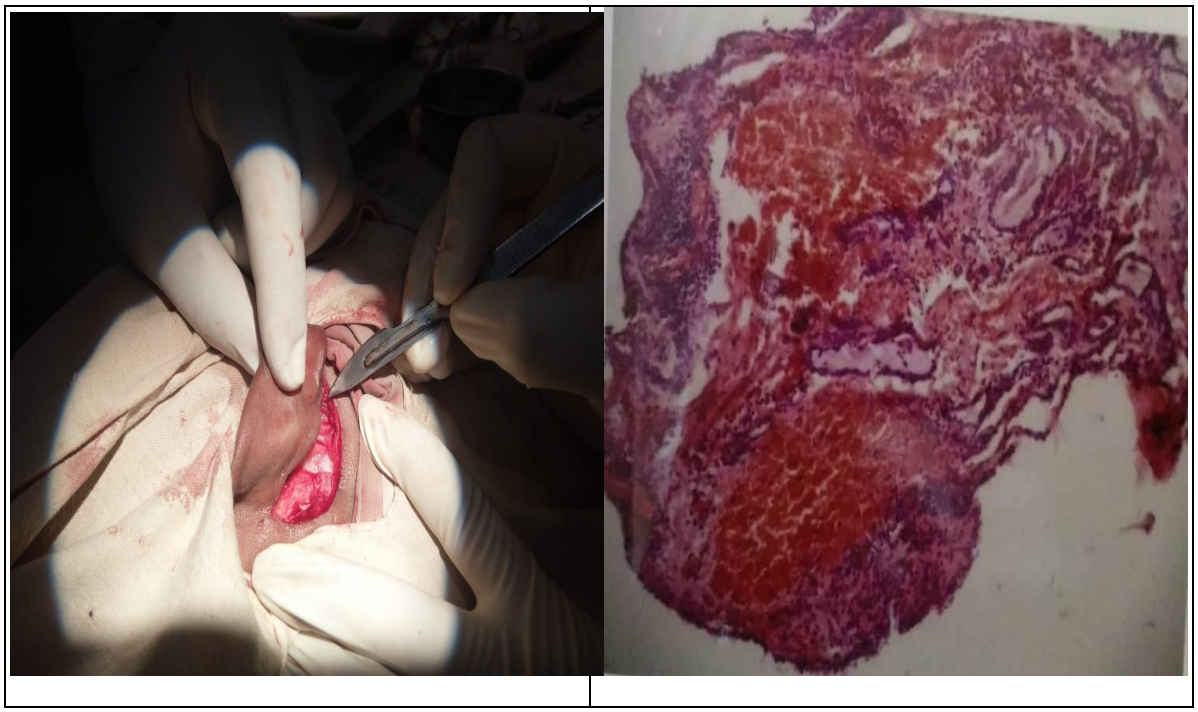

Figure 1: Photograph showing the post aural incision

Photograph showing flattened to denuded attic mucosal lining note the haemorrhage and the inflammatory infiltrate in lamina notice multiple sub epithelial (mucous cell metaplasia) cysts on right of the picture

Discussion

For this purpose 145 patients were studied, mucosal and swab samples obtained from their middle ear and subjected to microbiological and histo-pathological examination [5]. The perforated tympanic membranes were repaired by either tympanoplasty or Tympanoplasty with mastoidectomy. The case selection for this purpose was done randomly. Out of the total 145 patients evaluated, maximum no. of patients were in the age group 21-30 years (31 .03%) followed by 24.83% patients in age group 31-40 yrs. 17.24% patients were in the 10-20 yrs. group followed closely by 16.55% in the age group 41-50 years [6]. The least number of patients were in the 51-60 yrs. group. Sheehy (1977) and Sade et al. (1980) also showed a similar age distribution but this distribution must not be taken to be representative of the age distribution in the general public because of the variable pattern of OPD attendance and wide variation in the socio-economic status in the Indian Society [7]. The perforation size was small (< 4 mm) in 80 cases 55.17%, medium (4-6 mm) in 27.59% cases and large (> 6 mm) in the rest 17.24%.

Marginal perforation was excluded from this study. Pure Tone Audiometry of all the 145 cases was done to find the type and severity of deafness. This revealed a pure conductive loss in 110 patients (75.86%) and a mixed type in 35 cases (24.14%).

These findings of the pattern of hearing loss are supported by the studies conducted by Paparella, Brady and Hoel (1970) they reported that in addition to conductive hearing loss, many patients have sensorineural hearing loss [8]. This may be due to cochlear damage due to diffusion of toxicproducts of inflammation through scala tympani. This phenomenon was observed by Goycooles et. al. (1980) in experimentally induced otitismedia in cats. Degree of hearing loss was found to be at 20 - 40 dB in 90 cases (62.07%) and at 40 - 60 as in 55 cases (37.93%). Impedance audiometry of the 145 patients revealed a Patent Eustachian tube in 110 cases (75.86%) and variable degree of Eustachian tube function defects in the rest of 35 cases (24.14%). Microbiological evaluation demonstrated a dominance of Pseudomonas aeruginosa (41.38%) followed by Staphylococcus aureus in 40 cases (27.59%). The third dominant species was that of Proteus (6.40%).35 cases (24.14%) tumed up sterile. Sivaranjan K. Mallya and Nandy (1991) also had pinned Pseudomonas as the most dominant bacteria (43.8%) followed by Staphylacoccus aureus (18.2%) and proteus (12.0%). Similar results were also obtained by Rajamma Rama and coworkers (1992) [9]. In their study also Pseudomonas was the commonest bacteria isolated (31.9%) followed by Staphylococcus in 30.6%. But the third commonest species in their study was Klebsiella spp. (13.4%) followed by Proteus as the 4th (11.5%). Histopathological examination of 60 mucosal samples obtained from the cases undergoing mastoidectomy with Tympanoplasty also revealed some interesting facts. Of the 60 samples 10 were reported backas „No tissue present". Of the rest 50 cases inflammatory changes in lamina propria was

reported in a large number of cases (88%). In addition to this 64% cases showed the presence of squamous epithelium with keratinization in 56% cases [10]. This finding was important in view of the fact that all the cases we carefully selected were of safe tubotympanic type. But many studies also have refuted this concept. Baylon et al. in their retrospective study have maintained that mastoidectomy is not at all necessary for successful treatment of non-cholesteatomatous chronic suppurative otitis media [11]. Further studies by Lau and Tos also don‟t supportthis theory. Long term follow up in their study also did not show any significant difference in the groups undergoing Tympanoplasty with mastoidectomy or Tympanoplasty only. Studies by Halik and Smyth 1988 also showed no effect of the type of surgery performed on the graft acceptance rate. Balyan et al [12]. (1997) studied 323 ears from a total sample of 308 patients with a follow up between 12 to 97 months. But they also did not find any statistically significant difference between the group undergoing Tympanoplasty with mastoidectomy and the group undergoing Tympanoplasly alone either in terms of graft acceptance rate or in terms of hearing improvement. A very recent study by McGrew, Jackson and Glassock (2004) [13] has stated that though the mastoidectomy may not have much impact on the Tympanoplasty but it may have long term benefit in terms of reduced number of patients requiring future procedure. Our study shows that there is no statistically significant difference between the graft acceptance rate in the two groups [14]. Histopathological examination showed the presence of squamous epithelium in the middle ear in large number of cases. Considering our own results and the results of some other authors described above we would say that atticotomy is necessary for the repair of safe type perforation in terms of graft acceptance, but not in terms of hearing improvement. Opening the mastoid antrum in this patient was not necessary. Rather it only adds to the cost and risk factor [15]. It unnecessarily increases the operating time and exposes the patient to some unwanted complication associated with the process of mastoidectomy.

Conclusion

The improvement in hearing and graft acceptance rate between thetwo groups was not affected by the atticotomy. Microbiological evaluation pointed Pseudomonas aeruginosa as the most common bacterial pathogen followed by Staphylococcus. The antibiotics to eradicate Pseudomonas should be given to these patients pre and post-operatively. Histopathological study showed the presence of squamous epithelium in the middle ear mucosa in 64% cases which might be the causes of future complication and recurrence of disease. So doing atticotomy along with tympanoplasty may decrease the chances of recurrence of disease in operated ear. Considering the results of this study we would like to conclude that opening the mastoid antrum in patient of safe type perforation is of no use as it only increase the time required for surgery and exposes the patient to risks of mastoidectomy especially in the hands of a less experienced surgeon.

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