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Investigation on chronic supportive otitis media with comparative treatment between myringoplasty and cortical mastoidectomy: A study in Mymensingh medical college, Bangladesh

Farid-Al-Hasan[1*], Md. Zahidul Islam[2]
[1] Resident Surgeon, Department of ENT, Mymensingh Medical College, Bangladesh
[2] Medical Officer, Medical Department, Power Development Board, Bangladesh

Abstract
Introduction: Chronic otitis media is an inflammatory process of the mucoperiosteal lining of the middle ear space and mastoid. Infection of the middle ear has been a problem encountered in the human race, and is as old as humanity itself. Chronic suppurative otitis media (CSOM) is one of the most common causes of ear infection in developing countries particularly in South-east Asian countries. Chronic middle ear disease is a major problem in India especially in the rural areas. It is estimated that 6% of Indian population suffers from chronic ear disease.
Objectives: To Find out Investigation on Chronic Supportive Otitis Media with Comparative Treatment between Myringoplasty and Cortical Mastoidectomy.
Materials and Methods: The Prospective study Department of ENT, Mymensingh Medical College Hospital during October 2014 to July 2019 and 50 patients Sample size. For all patients Diagnostic nasal endoscopy was done and CT scan paranasal sinuses were taken for patients with sinusitis. If septic foci found patients were taken up for endoscopic sinus surgery and disease cleared. Allergic symptoms were treated with steroid nasal spray and antihistamines.Culture and sensitivity of ear discharge was done and treated with appropriate antibiotics. Patients were given medical treatment for 3-4 weeks, and once the evidence of response obtained patients were randomly selected by an unrelated personnel and put into either group I i.e. cortical mastoidectomy with myringoplasty or group II i.e. Myringoplasty alone.The selected cases were made to undergo appropriate investigations. Routine blood investigations like Hemoglobin, total and differential count, bleeding and clotting time, chest x-ray, ECG and urine investigations were done for all patients.
Observations: In our study total number of patients was fifty. Out of which 25 patients were in cortical mastoidectomy with tympanoplasty group (Group I), of which 13 were males and 12 were females. The other 25 patients belonged to myringoplasty only (Group II) 14 males and 11 females in that group. Maximum number of patients belonged to 18 to 30 years range. Youngest patient was 18 years and oldest patient was 56 years. The population we cater mostly belongs to low socio economic strata, where in chronic otitis media is more common. The middle and high class population together constituted only 8% and 16% in group 1 and group 2 respectively where as low socioeconomic population was 92% in group 1 and 84% in group2 in our study. In both the groups maximum patients had normal mucosa. 20% of patients in either group had polypoidal middle ear mucosa. 28% in group I and 32% in group II had congested mucosa. In our study under group II, graft take-up in bilateral disease had a success rate of 85% and in unilateral disease it was 96%. In cortical Mastoidectomy with Myringoplasty group the success rate was 100% for both set of patients.
Conclusion: Cortical Mastoidectomy combined with Myringoplasty enhances the efficacy of graft uptake and the surgical success rate by complete clearance of the disease from Mastoid antrum and restoration of the pressure buffering capacity of Middle ear.

Keywords: cortical mastoidectomy, chronic otitis media, tubotympanic type, myringoplasty

1. Introduction

WHO (World Health Organization) defines chronic supportive otitis media as a stage in ear disease in which there is a chronic infection of the middle ear cleft in the presence of persistent tympanic membrane. Perforation Chronic supportive otitis media is typically a persistent disease, insidious in onset, often capable of causing severe destruction and irreversible sequelae and clinically manifests with deafness and discharge. According to Mawson's textbook of Ear disease, it is persistent otorrhea through a non-intact tympanic membrane. The global burden of chronic supportive otitis media is estimated around 65-330 million of which 60% suffer from significant hearing impairment. It accounts for 28,000 deaths and a disease burden of more than 2 million DALYs. Incidence of CSOM is higher in developing countries because of poor socio-economic standards, poor nutrition and lack of health education. It affects both sexes and all age groups. In India, the overall prevalence rate is 46 and 16 persons per thousand in rural and urban population respectively. It is also the single most important cause of hearing impairment in rural population. A mastoid is considered to be inflammatory when purulent exudates, granulation tissue, polypoid mucosa, cholesterol granuloma or cholesteatoma are noted. It is mandatory that this diseased mastoid be cleared off the disease before undertaking any reconstruction. Otologists have long realized the importance of mastoid disease in determining the success of tympanic membrane reconstruction. It is beyond doubt that the extension of pathologic process into mastoid air cell system

requires exposure and removal. It is often possible to eliminate chronic progressive inflammation of the middle ear and mastoid, and at the same time have a reasonable chance to preserve residual hearing or preferably to improve hearing. Controversy has been centered on the best surgical technique to achieve this desirable result. It is well known that chronic suppurative otitis media is a poor man's disease. Poor living conditions, overcrowding, poor nutrition and hygiene have been suggested as a basis for widespread prevalence of this disease in third world countries. Surgery plays an important role in its management and the outcome measures are closure of tympanic membrane perforation in myringoplasty, eradication of disease and achievement of a dry and safe ear in mastoidectomy and in some cases, improvement of hearing where ossicular reconstruction or ossiculoplasty is also carried out. A mastoidectomy done along with tympanoplasty may ensure clearance of disease, saves time, money, unnecessary hospital stay, and repeated Hospital visits for the patient.

2. Review of Literature

Hippocrates, "Father of Medicine" had noticed the development of intracranial complications following ear discharge, the treatment for such a disease was not well established due to lack of better understanding of the disease and the non-availability of better technology. Although, the introduction of sulpha drugs by Doeskin 1953 and penicillin by Sir Alexander Fleming in 1942 reduced the mortality in case of safe type of CSOM, they could not cure cholesteatoma. Shambaugh in his textbook 'Surgery of the Ear' states that the first contemplation of surgery for mastoid infection occurred four centuries ago. According to him the first recorded successful mastoid operation was done by Jean Petit of Paris and shortly thereafter in 1776, a Prussian surgeon, who operated on a soldier with a draining ear. The above procedures were developed mostly to eliminate the disease from tympano mastoid area, to prevent the development of life threatening complications and to exteriorize the cavities for the purpose of inspection and cleaning of recurrent process for the rest of the patient's life and if possible to achieve a dry ear, but functional hearing was not at all a major criterion.

Grafts used in Tympanoplasty & Mastoidectomy

There are four different types of grafts now available like the auto graft, isograph, homograft or allograft and heterograft (Frodo 1987). In 1640 a segment of bladder was used in an attempt to close tympanic membrane perforation by Marcus Banzer (Thawley 1982). In Ringenberg's article (1978), he has mentioned that artificial drum was proposed by Leschevian in 1973 and, by Authenrinth and Bohneberger in 1815. In 1878 Berthold successfully closed a perforation with a full thickness skin graft (Gibb *et al* 1982) [25]. But in an article by Wullstein (1971) it is said that it is Heerman in 1960 who first used auto graft temporalis fascia successfully and Wullstein first used absorbable gelatin sponge known as gel foam to promote growth of new health middle ear mucosa, to maintain a middle ear free of adhesions and to support the neotympanic membrane (Wullstein 1960). As an auto graft, in the repair of tympanic membrane perforation, the temporalis fascia is now preferred because it has a low metabolic rate, easy availability and good survival prospects. According to Ballenger (1977) the connective tissue graft used to replace the missing fibrous element of drum is rapidly covered by proliferating squalors layer which quickly carries blood to the graft during which time it is able to survive by tissue perfusion. Calcattera (1972) stated that, transplanted tissue with lower metabolic requirements such as connective tissue has been found to be much more resistant to necrosis in the early postoperative period. Jackler noticed a trend of increasingly successful results of graft take-up with larger mastoid sizes. According to him substantial hearing improvement was achieved with mastoids of all sizes. The degree of closure of air-bone gap was, however, dependent upon mastoid size. In all three frequencies (500, 1000, 2000 Hz) mastoid of 5 cm^2 fared better than those less than 5 cm^2. Similar studies had also been conducted by Holmquist (1972) [11] and he also compared his results with material published by Diamont (1940) [10], healing after myringoplasty is better when mastoid is pneumatised. Outcome of tympanoplasty with and without cortical mastoidectomy for tub tympanic chronic otitis media authored by Habib MA, Huq MZ, Aktaruzzaman M, Alam MS etal did their study on sixty patients out of which half underwent type I tympanoplasty and group II underwent cortical mastoidectomy with type I tympanoplasty. They compared postoperative hearing outcome between the 2 groups. After tympanoplasty the mean air bone gap (ABG) closure was 9.33dB in group I and in group II it was 20.61dB. Also it was observed that closure of ABG was greater in small to medium sized perforations in group I i.e. 10dB whereas it more in medium and large perforations in group II ie around 22dB.They concluded on the basis of their study that tympanoplasty when done with cortical mastoidectomy is the best treatment method for chronic otitis media. They stated that when tympanoplasty alone is done there is a chance of leaving behind granulation tissue in the middle ear cleft, hence compromising with the long-term results.

3. Materials and Methods

Study design: Prospective study
Study place: Department of ENT, Mymensingh Medical College Hospital
Study period: October 2014 to July 2019
Sample size: 50 patients

Inclusion criteria

1. Patients with chronic ear discharge (Chronic Supportive Otitis Media, safe type) attending Out Patient Department, ENT at Mymensingh Medical College Hospital.
2. Age group 18 to 60 yrs of age.
3. Both genders.
4. Unilateral or bilate Sral disease.

Exclusion criteria

1. Patients above the age of 60 yrs or below 18 yrs.
2. Chronic Suppurative Otitis media- unsafe type.
3. Deblitated and Immunocompromised patients.
4. Pregnant and lactating women
5. Patients with external or middle ear abnormalities (congenital or acquired)

Materials

In this study the procedure adopted is cortical mastoidectomy with myringoplasty for one set of patients (Group 1) and myringoplasty alone (Group 2) for another set.

The equipments used are

1. Binocular Microscope
2. Karl Storz zero degree Endoscope with camera and monitor.
3. Middle ear Microsurgical instruments like Rosens, Plester,curette, picketc.

Methodology

Among patients attending the ENT OPD in Mymensingh Medical College Hospital, 50 patients of age between 18 to 60 yrs who are clinically assessed for CSOM were chosen for study.

Assessment is based on the following criteria: History of persistent otorrhea and hard of hearing. Post-Operative Tympanic Membrane

1. Otoscopic evidence of chronic suppurative otitis media with central perforation.
2. Examination on table with Microscope.
3. Audio logical evidence of conductive hearing loss.

For all patients Diagnostic nasal endoscopy was done and CT scan paranasal sinuses were taken for patients with sinusitis. If septic foci found patients were taken up for endoscopic sinus surgery and disease cleared. Allergic symptoms were treated with steroid nasal spray and antihistamines. Culture and sensitivity of ear discharge was done and treated with appropriate antibiotics. Patients were given medical treatment for 3-4 weeks, and once the evidence of response obtained patients were randomly selected by an unrelated personnel and put into either group I i.e. cortical mastoidectomy with myringoplasty or group II i.e. Myringoplasty alone. The selected cases were made to undergo appropriate investigations. Routine blood investigations like Hemoglobin, total and differential count, bleeding and clotting time, chest x-ray, ECG and urine investigations were done for all patients. X-ray both mastoids lateral oblique view was taken for all cases to assess the pneumatisation pattern of mastoid and to know the status of legmen and sinus plate. Pure tone audiogram was done in sound proof room using Maico ma 52 clinical diagnostic two channel audiometer. Informed consent was obtained from each patient after counseling them and their relatives regarding the nature of disease and surgery. Outcome and all possible complications were also explained. All patients were admitted one day prior to the surgery.18 cases in group I and 20 cases in group II cases were operated were done under general anesthesia. And 7 cases from group I and 5 cases from group II were taken up under local anesthesia. Temporalis fascia graft was harvested in all cases. All cases were approached through the postaural route because of its definite advantage over endural route. Less skills necessary, more exposure is attained and complications such as perichondritis never occur. An area comprising 5 cm. above the upper border of pinna and 5 cm. behind pinna was shaved off hair. In this study they have concluded that, it is advisable to do cortical mastoidectomy with type I tympanoplasty especially in chronic persistent discharging years, to remove antral pathology if any. Jackler (1984) [28] assessed the mastoid cavity from x-ray mastoids by noting the cross sectional area of mastoid pneumatisation, usingplanimetric method of Diamont (1940) [10]. He divided mastoids into 3 groups according to mastoid size.

1. Small 0 – 5 cm^2
2. Medium 5 – 10 cm^2
3. Large 7 – 10 cm^2

4. Observations

In our study total number of patients was fifty. Out of which 25 patients were in cortical mastoidectomy with tympanoplasty group (Group I), of which 13 were males and 12 were females. The other 25 patients belonged to myringoplasty only (Group II) 14 males and 11 females in that group. Maximum number of patients belonged to 18 to 30 years range. Youngest patient was 18 years and oldest patient was 56 years.

Table 1: Age and gender distribution (n=50)

Sl No	Age	Group I (n=25)		Group II(n=25)	
		Male	Female	Male	Female
1	18-30	6 (24%)	7(28%)	7(28%)	7(28%)
2	31-40	4(16%)	4(16%)	5(20%)	4(16%)
3	41-60	3(12%)	1(4%)	2(8%)	0(0%)
		13(52%)	12(48%)	14(56%)	11(44%)

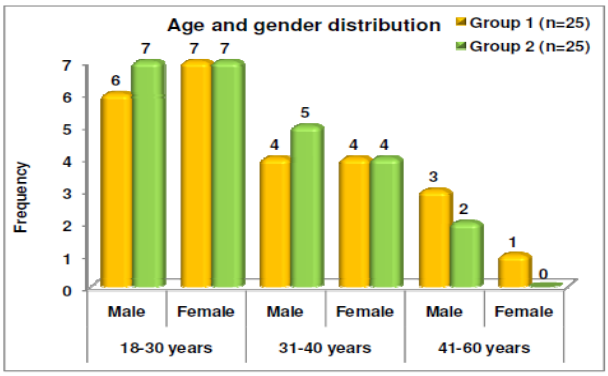

Fig 1: Age and Gender distribution.

Table 2: Socioeconomic status (n=50)

S. No	Status	Group I(n=25)		Group II(n=25)	
		Male	Female	Male	Female
1	Low	12(48%)	11(44%)	11(44%)	10(40%)
2	Mid	1(4%)	1(4%)	3(12%)	1(4%)
3	High	0(0%)	0(0%)	0(0%)	0(0%)

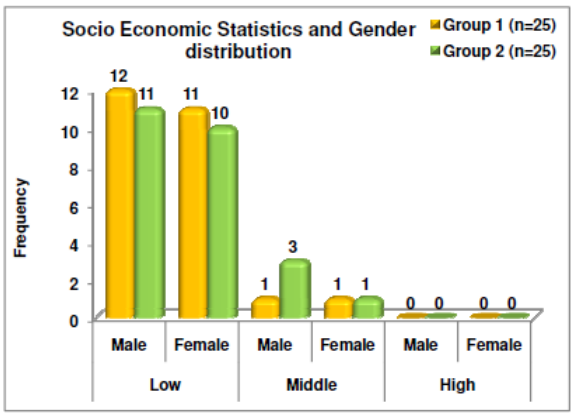

Fig 2: socio economic strata and gender distribution.

The population we cater mostly belongs to low socio economic strata, where in chronic otitis media is more

common. The middle- and high-class population together constituted only 8% and 16% in group 1 and group 2 respectively where as low socioeconomic population was 92% in group 1 and 84% in group2 in our study.

Table 3: Duration of discharge (n=50)

S. No	Duration (years)	Group I(n=25)	Group II(n=25)
1	<5 years	4(16%)	5(20%)
2	5-10years	10(40%)	9(36%)
3	Since childhood	11(44%)	11(44%)

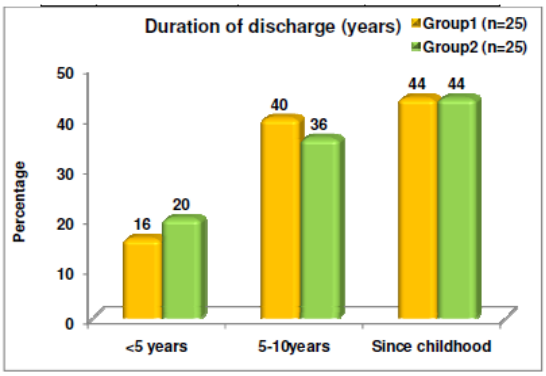

Fig 3: Duration of discharge with groups.

In both groups maximum number of patients had history of otorrhea from Childhood (44% each). The number of patients in 5 to 10 years range were 10 in group I and 9 in group II.

Table 4: Duration of Hard of Hearing (n=50)

S. No	Duration (years)	Group I(n=22)	Group II(n=21)
1	<1 year	6(27.3%)	5(23.8%)
2	1-5years	10(45.5%)	7(33.3%)
3	5-10yrs	6(27.3%)	9(42.9%)

Though maximum number of patients with ear discharge belonged to since childhood period, hard of hearing was maximum in the 1 to 5 years range.

Table 5: Laterality of the disease (n=50)

S. No	Laterality	Group I (n=25)	Group II (n=25)
1	Bilateral	11(44%)	9(36%)
2	Right ear alone	9(36%)	8(32%)
3	Left ear alone	5(20%)	8(32%)

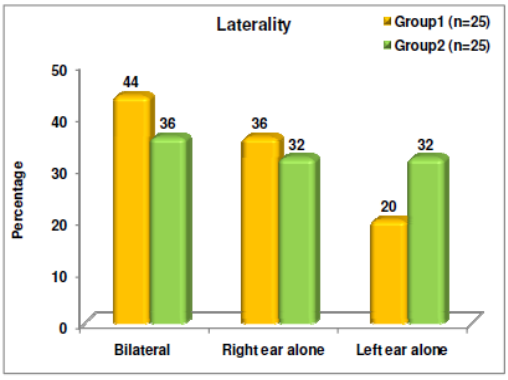

Fig 4: patients had bilateral disease with groups.

In group I 11 patients had bilateral disease and 14 patients had unilateral disease of which 9 patients had right ear disease and 5 patients had left ear disease. In Group II 9 patients had bilateral disease and 16 patients had unilateral disease.

Table 6: Size of perforation (n=50)

S. No	Size of perforation	Group I (n=25)	Group II (n=25)
1	Small	7(28%)	8(32%)
2	Medium	9(36%)	10(40%)
3	Large	9(36%)	7(28%)

In group I 36% each had medium to large perforation. Only 28% had small size perforation. In group II 40% had medium sized and 32% had small size perforation. Only 28% had large perforation. Among the cases that failed in group II 2 cases had large perforation.

Table 7: Status of Middle Ear (ME) Mucosa (n=50)

S. No	Status of ME mucosa	Group I(n=25)	Group II(n=25)
1	Normal	13(52%)	12(48%)
2	Congested	7(28%)	8(32%)
3	Polypoidal	5(20%)	5(20%)

In both the groups maximum patients had normal mucosa. 20% of patients in either group had polypoidal middle ear mucosa. 28% in group I and 32% in group II had congested mucosa. This is the recorded finding of the patient at their first visit. All patients with abnormal mucosa was treated with culture sensitive local antibiotics. A few who were refractory to outpatient treatment was admitted and given intravenous antibiotics. Treatment was given for a period of 3-4 weeks and after obtaining evidence of response patients were taken up for surgery.

Table 8: X-Ray Both Mastoids (n=50)

Sclerosis in x ray mastoids	Group I	Group II
Bilateral	9/11	7/9
Right ear only	5/9	4/7
Left ear only	4/5	5/9

Among group I we had 11 patients of which nine patient's x-ray mastoids showed sclerosis. And in those patients with right ear affection five out nine patients in group I and four out of seven in groups II had evidence of sclerosis. Similarly four out of five in group I and five out of nine with left ear disease had radio logically sclerotic mastoid.

Table 9: Anesthesia (n=50)

S no	Anesthesia	GroupI(n=25)	GroupII(n=25)
1	General	18(72%)	20(80%)
2	Local	7(28%)	5(20%)

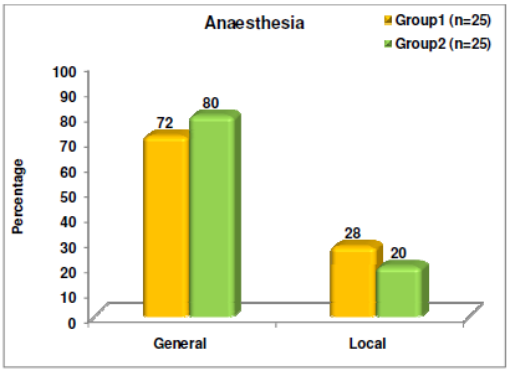

Fig 5: anesthesia patients groups.

72% in group I and 80% in group II were taken up for surgery under general anesthesia and 28% in group I and 20 % among group II were done under local anesthesia. Advantages of local anaesthesia are less bleeding and early recovery. Disadvantage is that apprehensive patients will not tolerate the procedure.

Table 10: Subsequent ear procedures (n=50)

	Group I (n=25)	Group II (n=25)
Subsequent procedure	0 cases (0%)	4 cases (16%)

4 cases that failed among tympanoplasty group, underwent revision mastoidectomy and postoperatively graft take-up was good in all cases

Table 11: Post-operative dry ear status (n=50)

Dry ear status	Group I		Group II	
	No.	Percent	No.	Percent
Discharge+	-	0	3	12
Discharge-	25	100	22	88
Total	25	100	25	100

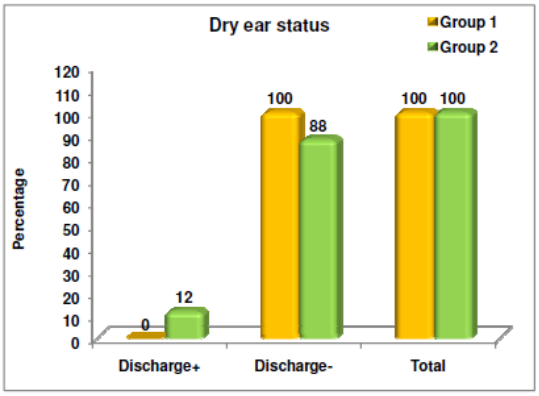

Fig 6: Dry ear status of two groups.

In our study 100% of patients in group I had post-operative dry ear. In group II there were 4 failures of which 3 patients had discharging ears post operatively and one remained dry.

Table 12: Pre-operative hearing assessment (n=50)

Hearing threshold	Pre op PTA (dB)	
	Group I	Group II
Mean BCT	9.4	10.8
Mean ACT	37.8	36.4
Mean ABG	32.4	30.6

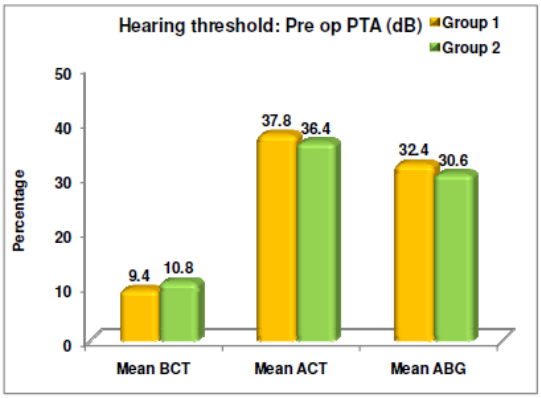

Fig 7: Hearing threshold (BCT)

Pre-operative audiogram was done for all patients. Bone conduction threshold (BCT) remained within normal range. Mean air conduction threshold (ACT) in group I was 37.8dB (obtained by taking average of all 25 patients air conduction), and the same in group II was 36.4dB.

Table 13: Post-operative hearing assessment (n=50)

Hearing threshold	Post op PTA (dB)	
	Group I	Group II
Mean BCT	9.4	10.8
Mean ACT	23.4	22.6
Mean ABG	18.4	17.8

Table 14: Hearing improvement (n=50)

Post op hearing	Group I	Group II
Improved	21(84%)	21(84%)
Remained same	4(16%)	4(16%)
Decreased	0(0%)	0(0%)

In both groups hearing improvement was comparable.

Table 15: Level of improvement of hearing threshold and graft Relation to ear involved (n=50)

Laterality	Group I (Mean AB closure)	Group II (Mean AB closure)
B/L	13.1Db	12.6dB(3 cases failed)
U/L	13.2dB	13.0dB(1 case failed)

Table 16: Post-operative Graft Take Up (6 months) (n=50)

	GroupI(n=25)	GroupII(n=25)
Graft taken up	25(100%)	21(84%)
Graft failure	0(0%)	4(16%)

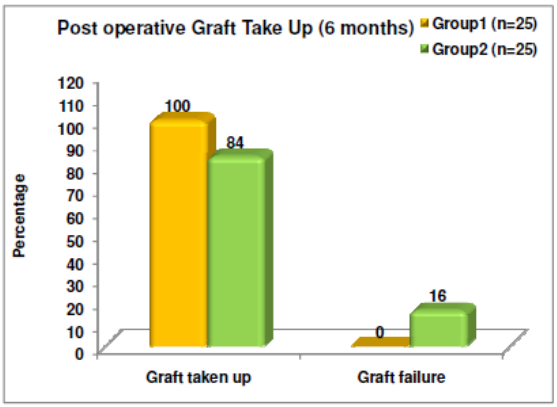

Fig 8: Post-operative graft take up.

Table 17: Post-operative complications (n=50)

S. No	Post-operative complications	Group1(n=25)	Group2(n=25)
1	Post op otorrhea	0(0%)	4(16%)
2	Wound infection	1(4%)	0(0%)
3	Perichondritis	1(4%)	0(0%)
4	Immediate VII N palsy	0(0%)	0(0%)
5	Delayed VII N palsy	0(0%)	0(0%)
6	Profound SNHL	0(0%)	0(0%)
7	Meningitis	0(0%)	0(0%)
8	CSF leak	0(0%)	0(0%)
9	Death	0(0%)	0(0%)

Table 18: Size of perforation and Graft take up (n=50)

Size	Total	Group-I	Group-II
Small	15	7/7	8/8
Medium	19	9/9	8/10
Large	16	9/9	5/7
Total	50	25/25	21/25

In group II out of 4 failures, 2 occurred in large perforations and one each in small and medium sized perforations.

Table 19: Status of middle ear mucosa and graft take up (n=50)

Middle Ear Mucosa	Total	Group I	GROUP II
Normal	25	13/13(100%)	11/12(91.6%)
Edematous	16	7/7(100%)	6/8(75%)
Polypoidal	9	5/5(100%)	4/5(80%)
Total	50	25/25(100%)	21/25(84%)

In Group II inspire of the ear being inactive at the time of surgery one case failed, and among the diseased mucosa cases, three of them failed. Whereas in Group I, since a mastoid disease clearance was done, all cases including the ones with diseased mucosa were taken up.

Table 20: Total patients studied (n=50)

Study	Year of study	Total patients in study	
		Myringoplasty.	Cortical with myringoplasty
Mc Grew etal	2004	297	131
Sahaetal	2006	30	10
Habit Metal	2011	30	30
Our study	2012	25	25

McGrew *et al* had studied the biggest series consisting of 428 patients. Our sample size was comparable to Saha and Habit *et al*.

Table 21: Gender distribution in various studies (n=50)

Study	Year	Total patients	Male	Female
Ruhl *et al*	1999	135	53	82
Mcgrew *et al*	2004	464	212	216
Albert *et al*	2005	40	27	13
Saha *et al*	2006	40	24	16
Our study	2012	50	27	23

The sample in our study almost approximates with that of Saha and Albert *et al* study with small sample size for which statistical significance can be given only by approximate values. Our distribution of sample size matches with that of Habib and Saha *et al* with equal number of patients in each group.

Table 22: Comparison of post-operative Air Bone closure (n=50)

Study	Year of study	Post op AB closure	
		Myringo	Mast+myringo
Mc Grew etal	2004	17.7dB	11.4dB
Sahaetal	2006	6.5dB	3.2dB
Habibetal	2011	9.4dB	20.6dB
Our study	2012	13dB	12.8dB

The post op Air Bone closure in Myringoplasty group is around 13db and that of Mastoidectomy is around 12.8 db in comparison with that of Habib *et al* which showed 9.4 and 20.6 respectively favoring group I.

Table 23: Overall Graft takes up (n=50)

Study	Year of study	Graft take up	
		Tymp	Mast+tymp
Palva etal	1969	97%	97%
Mc Grew	2004	90.6%	91.6%
Saha etal	2006	85%	100%
Athira etal	2010	93.5%	96.7%
Our study	2012	84%	100%

The overall graft uptake in our study was in coherence with study by Saha *et al* and Athira *et al*, which also showed more than 95% success in group I.

Table 24: Subsequent Procedures (n=50)

Study	Mastoidectomy+Myringo plasty	Myringoplasty
Mc Grew etal	8/131(6%)	42/297(14%)
Our study	0/25(0%)	4/25(16%)

In our study bilateral diseases were taken up as important criteria that influence the surgical outcome as for other two studies, the influence was on the Myringoplasty only group with three failures and it did not influence Mastoidectomy group. In our study under group II, graft take-up in bilateral disease had a success rate of 85% and in unilateral disease it was 96%. In cortical Mastoidectomy with Myringoplasty group the success rate was 100% for both set of patients. Hence it could be deduced that bilateralism plays a role in surgical success of Myringoplasty alone patients because of lack of complete clearance of disease from Mastoid. This finding is comparable to similar findings from a study by Saha etal. Their result was 92.85% for unilateral disease and 66.6% for bilateral group.

5. Discussion

Chronic Supportive Otitis media is a disease of developing countries like India, Bangladesh, Nepal, Pakisthan etc. Various factors such as poor living conditions, illiteracy, low socioeconomic status and pollution play a major role in the prevalence of the disease, and hence improvement in these basic parameters of life will help the society to lower the prevalence of this chronic ear disease. In our study the population we cater mostly belong to the low socioeconomic status who hardly turn up for routine follow-up so in these patients mere reconstruction of the tympanic membrane without complete removal of the disease from the mastoid antrum will not be sufficient to attain surgical success in terms of graft uptake and attainment of dry ear. Mastoid air cells acts as a continuous source of ventilation to the middle ear, whereas the Eustachian tube supply is intermittent, this important fact is stressed upon by many of the studies that favor Mastoidectomy with Tympanoplasty. Various Studies found that the disease lurking behind, in the mastoid air cells may have granulations harboring Infective agents that act a constant source of infection. According to literatures chance occurrence of cholesteatoma is 2% in the antrum of safe type of disease. According to Mc Grew *et al* an aerated mastoid act as a buffering system to bring down the effects of aerodynamic changes in middle ear. While the 'Mastoid reservoir of infection theory' holds good for actively discharging ear the same may not be true in the quiescent or dry ear. When active discharge is absent the question thus arises whether to routinely address mastoid surgically or not. Even though it is desirable to explore Mastoid Antrum in order to confirm the absence of the

disease the procedure itself is not without disadvantages. Addition of Mastoidectomy with Myringoplasty carries several disadvantages such as increased risk of damage to the Incas, Dura, Sigmoid Sinus and Facial nerve, prolongation of surgery and higher morbidity due to bone drilling in inexperienced surgeon's hands. Thus the advantage and disadvantage of adding Mastoidectomy to Myringoplasty in non cholesteatomatous Mastoiditis have been the focus of much controversy and debate. Previous research findings provided evidences both for and against the use of Mastoidectomy in non Cholesteatomous otitis media. Most of these studies used retrospective case series, whereas ours is Prospective case study. In our study two groups of patients were studied group I underwent Mastoidectomy with Myringoplasty whereas group II underwent Myringoplasty alone and two parameters were analyzed in the postoperative follow-up viz. the graft uptake rate and the hearing improvement. The sample in this group was 50 that was divided between the two groups were equally, so only approximate statistical disparity could be obtained. Analysis of the observations shows that chance of graft giving away was more with Myringoplasty alone group though the percentage is not statistically very significant because of small number analyzed. However there is no gross difference in the hearing improvement between the two groups. This points to the fact that success of the surgical closure depends on multiple factors and the status of the mastoid such as antral mucosal hypertrophy, aditus block, sclerotic changes in mastoid, altered pressure buffering capacity of the mastoid air cell system etc. has got significant influence over the successful closure of the perforations. In our study the follow up period was up to 6 months, and majority of our patients belonged to low socioeconomic status. In our study the duration didn't influence the graft take-up. Albert *et al* conducted study on 40 patients out of which there were 27 males and 13 females. Out of all cases 33 patients had aditusblock, inspire of the fact that 8 cases were inactive during the study. They found aerobic and anaerobic cultures from mastoid antral granulation tissue. Out of 40 cases 23 turned out positive for aerobic culture and 1 turned positive for anaerobic. Culture reports surprisingly showed that 6 out of 8 inactive ears were culture positive, and out of the 8 inactive groups, 5 ears were dry for more than one and half years, yet three of these grew aerobes of which two had two organisms each. The conclusion was –inspection of mastoid antrum, in all cases of CSOM, irrespective of duration of disease should form an integral part of the surgery because of the mastoid granulations blocking aditus is not always sterile. In study conducted by Ashok k saha type I Tympanoplasty was done in 30 patients and cortical mastoidectomy with tympanoplasty was done in 10 patients(male -24 and female -16).Bilateral disease was seen in 30%.right ear disease was seen in 8 cases(20%) and left ear disease in 20 cases(50%).bilateral disease in 12 cases(30%). Right ear operated in 12 cases and left ear in 28cases.Youngest patient was 14 years and oldest was 56 years. Out of total 40 patients,30 patients underwent type I tympanoplasty alone whereas 10 patients with discharging year were taken up for cortical mastoidectomy with type I tympanoplasty. Overall graft take-up was found to be 85%, in males it was 83.3% and females it was 87.55%.In this study they have concluded that, it is advisable to do cortical mastoidectomy with type I tympanoplasty especially in chronic persistent discharging years, to remove antral pathology if any. Jackler (1984) [28] assessed the mastoid cavity from x-ray mastoids by noting the cross-sectional area of mastoid pneumatisation, usingplanimetric method of Diamont (1940) [10]. He divided mastoids into 3 groups according to mastoid size :(Small 0 – 5 cm^2, Medium 5 – 10 cm^2, large 7 – 10 cm^2). Thus in our study the failure of the Myringoplasty alone group in graft uptake is attributed to non-clearance of the disease process in the mastoid antrum and lack of restoration of adequate ventilation and the pressure buffering system by avoiding Mastoidectomy. Holmquist and Bergstrom and Ingelstedt *et al* suggested functional advantage of aerated mastoid for the first time, and Richards *et al* and Sade *et al* later on substantiated it. According to them when an aerated mastoid cavity communicates with middle ear, it helps to reduce the aerodynamic changes occurring in the middle ear, by way of acting as a buffering system. This helps those patients with intermittent Eustachian tube dysfunction to better tolerate the negative pressure. They also concluded that lack of aeration and disease progression and need for subsequent procedures in myringoplasty group shows the functional impact of aeration by doing a mastoidectomy on the repair of perforation.In our study we achieved the result that, doing a cortical mastoidectomy improves graft success rate, especially in cases of persistent mucosal Disease, which was the case for us. As supported by a retrospective study by Ruhl *et al*, who gave similar results, we assume by opening up the mastoid, thereby creating a connection between the mastoid and middle ear, we are able to re-create a physiological pressure buffer. A poorly pneumatised mastoid air cell system has defective pressure buffering capacity and is therefore prone to develop chronic inflammatory conditions and tympanic membrane retractions. According to Boyle's law the pressure buffering system of mastoid is recreated by the additional volume obtained by doing a Mastoidectomy. In their study radiological studies showed 73% scleroses mastoid air cells, which would have contributed to development of chronic otitis media. Thus Cortical Mastoidectomy should be routinely performed in all cases of Chronic Supportive Otitis media safe type irrespective of the duration of discharge. In our series, Myringoplasty combined with Mastoidectomy offered significant improvement in the rate of closure of simple tympanic membrane perforations and reduction in the number of patients requiring subsequent procedures, but no significant improvement in hearing result.

6. Conclusion

Cortical Mastoidectomy combined with Myringoplasty enhances the efficacy of graft uptake and the surgical success rate by complete clearance of the disease from Mastoid antrum and restoration of the pressure buffering capacity of Middle ear. Patients from low socioeconomic strata who are hesitant for frequent follow up should be given complete disease clearance by doing Mastoidectomy with Myringoplasty as a single procedure. Combining Mastoidectomy with Myringoplasty does not produce any statistical significance in the postoperative hearing results. Mastoidectomy should be favored along with Myringoplasty when there is coexistence of confounding factors such as mucosal changes, bilateralism, scleroses and contracted mastoid.

References

1. Cuneyt M, Alper Charles D. Bluestone page "Otitis media" chronic suppurative otitis media without cholesteatoma. No, 299.
2. Middle Ear, Mastoid Surgery chapter 3, Underlay Tympanoplasty pg 12- By Rex S. Haberman
3. Mawson S, Ludman H. Disease of the Ear. A Textbook of Otology. 4th ed. London, Edward Arnold Publication, 1979.
4. Rita ruby Anbuselvi Albert, Anandjob, Georgekuruvila, Richard KN. Brahmadathan and Alice John on "Myringoplasty-Are we justified in doing it".
5. "Evaluation of improvement of hearing in type I tympanoplasty and its influencing factors" authored by Ashok K Saha, D. M. Munshi, and S.N Ghosh. Indian journal of Otolaryngology and Head and Neck Surgery. 58(3):253-257
6. Wehrs RE, Tulsa OK aeration of middle ear and mastoid in tympanoplasty laryngoscope. 1981; 91:1463-7.
7. Hedge MC, Kamath MP, Kumar S, Kumar A, Chandra S.A study of mastoid cellularity and middle ear diseases. Indian journal of otolaryngology. 2004; 10:6-9.
8. Adkins WY, White B, Charleston SC Laryngoscope 1984; 94:916-8 8. Myringoplasty with simple mastoidectomy: results in eighty-two consecutive patients done by Jackler RK, Schindler RA published in otolaryngol head and neck surg. 1983; 91(1):14-7.
9. Role of the mastoid in tympanic membrane reconstruction Laryngoscope. 1984; 94(4):495-500. *Jackler RK, Schindler* RA.
10. Diamont M. Otitis and Pneumatisation of the Mastoid Bone. Acta Otolaryngologica supplement. 1940; 41;1-10.
11. Holmquist J. Size of Mastoid Air Cell System in Relation to healing after Myringoplasty and to Eustachian Tube function. Acta Otolaryngologica. 1972; 69:89-93
12. Habib M A, Huq MZ, Aktaruzzaman M, Alam MS-Outcome of tympanoplasty with and without cortical mastoidectomy for tubotympanic chronic otitis otitis media. Mymensingh journal of Otolaryngology
13. Vartiainen E, Kansanen M Tympanomatoidectomy for chronic otitis media without cholesteatoma journal of otolaryngol Head and Neck surgery in. 1992; 106:230-234.
14. Vartianen E. *et al*. Surgery of Chronic Otitis Media in Young patients. Journal of Otolaryngology. 1986; 100:515-519
15. Mc Graw. *Et al.* "Impact of mastoidectomy on simple tympanic membrane perforation repair" Laryngoscope in. 2004; 114:506-511.
16. Ruhl CM, Pensak ML. Role of aerating mastoidectomy in non cholesteatomatous chronic otitis media. Laryngoscope. 1999; 109(12):1924-1927.
17. Nayak DR, Balakrishnan R, Hazarika P, Mathew PT. Role of cortical mastoidectomy in the results of myringoplasty for dry tubotympanic disease. Indian journal of Otology. 2003; 9:11-5
18. Austin DF. A decade of Tympanoplasty-Progress or regress. The Laryngoscope. 1982; 92:527-530.
19. Ballenger JJ. Surgery in chronic ear disease. In Diseases of Nose, Ear, Throat, Head and Neck. 13th Edition. Edited by Ballenger; Lea and Febinger, Philadelphia, 1146-1169.
20. Beales HP. Management of Chronic Suppurative Otitis Media, In Scott brown's Diseases of Ear, Nose and Throat. FourthEd. Edited by John Ballantyne and John Groves, 1979, 259-304
21. Betow C. 20 years of Experience with Homografts in ear Surgery, Journal of Otolaryngology Supplement. 1982; 5:1-28.
22. Choisson E. The establishment of an ear bank in Homograft tympanoplasty; The Otolaryngologic Clinics of North America. 1977; 10:599-612. edited by S. George Lesinki.
23. Cole JM. Hagan PJ. Electronic processing Of OTolaryngologic Data, Archives of Otolaryngology, 79:380-388.
24. Frootko NJ. reconstruction of the Ear, In Scott brown's Diseases of Ear, Nose and Throat fifth. 1987; 3:238-263.
25. Gibb AG. *Et al.* Myringoplasty A review of 365 operations. Journal of Laryngology and Otology. 1982, 96:915-930.
26. Hawkins J. *E*Hearing: Biomechanics and Neurophysiology. The Physiological Basis of medical Practice. 1966; 8:395-408.
27. Glasscock. *Et al.* Homograft Transplants in Middle Ear-A Follow up report. The Laryngoscope. 1972; 82:868-881.
28. Jackler KR. Role of Mastoid in Tympanic Membrane Reconstruction; the Laryngoscope. 1984; 94:495-500.
29. George E. Shambaugh, Michael E Glascock. Tympanoplasty in Surgery of Ear, 3rd Ed:425-454
30. Tos M. *et al.* Tympanoplasty and age Archives of Otolaryngology. 1972; 96:493-498.
31. Tos M. Late results of Tympanoplasty. Archives of Otolaryngology. 1974; 100:302-305.
32. Wullstein H. Tympanoplasty. The problem of free graft and mucous membrane Graft. Archives of Otolaryngology. 71:363-368
33. Yammamoto, Iwanga Comparison of bacteria in tympanic cavity and mastoid antrum in chronic otitis media. American journal of Otolaryngol. 1986; 7:298-301.
34. Fadl FA etal Outcome of type I tympanoplasty Soudi Medical Journal I 24(I) 58-54,2003jan Tai CF, Ho KY, Juan KH Age and Prognosis of tympanoplasty-type I Kaohsiumg Journal of Medical science 14(9):543-7 1998 Sep.