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Original Article

Myringoplasty and Myringoplasty with Cortical Mastoidectomy in Dry Ear: Comparison of Surgical Outcome

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Abstract:

Background: *Chronic suppurative otitis media (CSOM) is one of the most common diseases of younger age in middle class population of the developing countries which causes significant impact in speech, cognitive, educational and psychological development in children and hearing impairment and recurrent ear discharge in adult.*

Aim: *To identify the difference of graft take rate and hearing gain in the treatment of CSOM by myringoplasty and myringoplasty with cortical mastoidectomy in dry ear.*

Methods: *Randomized controlled trial was conducted in the Department of Otolaryngology – Head & Neck Surgery, Dhaka Medical College Hospital, Dhaka from July 2018 to December 2019 with 54 patients having inactive mucosal COM. Total 54 patients age ranging from 15 to 55 years were taken. Group A: 27 of the patient were done myringoplasty and Group-B: 27 patient were done myringoplasty with cortical mastoidectomy. Postoperative follow up was given on 7th day, 2 weeks, 6 weeks and 3 months postoperatively. PTA was done to every patient 3 months postoperatively and hearing gain was compared between two groups.*

Results: *Graft take rate was 22(81.48%) and hearing gain was 8.48(±6.83) dB in 27 patients of group-A and 24(88.89%) and 10.61 (±12.25) dB respectively in 27 patients of group-B. No statistically significant difference was found between two groups.*

Conclusion: *Cortical mastoidectomy performed in inactive mucosal COM in this study gives no statistically significant benefit over myringoplasty alone as regards graft take rate and hearing improvement.*

Key words*: CSOM, Myringoplasty, cortical mastoidectomy, dry ear.*

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Introduction:

Otitis media is an inflammation of a part or whole of the mucoperiosteal lining of the middle ear cleft which is composed of eustachain tube, hypotympanum, mesotympanum, epitympanum, aditus and mastoid air cells[1].

It is one of the commonest ear disease of all age groups and it is caused by multiple interrelated factors including infections, Eustachian tube dysfunction, nasal allergy and trauma. The disease has been classified on the basis of its underlying pathology as active or inactive mucosal, active or inactive squamosal and healed chronic otitis media[2]. Various studies indicate that the incidence peaks in the paediatric population and declines with age[3]. The characteristic features of CSOM are thickening of the mucosal membrane of middle ear cleft owing to infiltration with chronic inflammatory cells, oedema and submucosal fibrosis[4]. It is estimated that almost 6.2% of Bangladeshi population suffers from chronic ear disease[5]. The aim of treatment in mucosal chronic otitis media is to improve the symptoms of otorrhoea, close the perforations, improve hearing, and reduce complications with minimum adverse effects of treatment[6]. Myringoplasty is a surgery designed to close tympanic membrane perforation. In tympanic membrane perforation two aims should be fulfilled, first one is closure of perforation and second aim is to obtain a new tympanic membrane with acoustic qualities similar to those of a normal tympanic membrane[7]. Many factors contribute to success or failure of surgery which are divided into mastoid and non mastoid factors. Non mastoid factors are age, general debility, eustachian tube dysfunction, septic focus in non mastoid areas, cochlear reserve and ossicular chain status. Mastoid factors are extent of pneumatization and presence of inflammatory disease in mastoid[8]. Well aerated mastoid is a prerequisite for well ventilated middle ear and long lasting success[9]. Traditionally myringoplasty with mastoidectomy has been identified as an effective method of treatment of chronic ear infection resistant to antibiotic therapy[10]. But the effect of mastoidectomy on patients without evidence of active infectious disease remains highly debated and unproven[11]. The aim of the present study is to evaluate the role of cortical mastoidectomy when associated with myringoplasty in relation to graft uptake rate, closour of air bone gap and postoperative complications in inactive mucosal type of chronic otitis media.

Methods:

Randomized controlled trial was conducted in the Department of Otolaryngology – Head & Neck Surgery, Dhaka Medical College Hospital, Dhaka from July 2018 to December 2019 with 54 patients having inactive mucosal COM, selected by inclusion and exclusion criteria. After selection of the subjects, the nature, purpose and benefit of the study were explained to each patient in details. They were encouraged for voluntary participation. They were allowed to withdraw their name from the study whenever they feel like. Informed written consent was taken from the participants. Ethical clearance was obtained from the Institutional Review Board (IRB) of DMC. A predesigned proforma was used to record the relevant information from the individual patients. A detailed history, clinical examination and otoscopic examination of all the patients of chronic suppurative otitis media was done.

All cases were subjected to routine investigations (e.g. TC,DC, ESR, Hb%, RBS, S.Creatinine, ECG, X-ray chest, HBsAg) and specific investigations (Pure Tone Audiometry, Eustachian tube function by impedence audiometry, Examination under microscope

and X-ray mastoid - Towne's view). The patients included in the study was only 'dry' ear at the time of surgery. The patients were randomly allocated into two groups : Group A (17 patients who were subjected myringoplasty alone) and Group B (17 patients who were subjected to myringoplasty with cortical Mastoidectomy). The patients admitted in DMCH for inactive mucosal chronic otitis media in either ear were enrolled in the study and randomly allocated to one of the two groups. Patients having active or squamous COM, extreme age, history of surgery in either ear or with any systemic diseases were not included in the study.

All patients undergone surgery under local anaesthesia by post aural approach. Temporalis fascia graft was used for the repair of tympanic membrane perforation. Postoperative follow-up was performed at the end of 1st week, 2nd week, one and half months and three months. Hearing result was assessed by comparing pre-operative and post-operative pure tone averages, over the 0.5/1/2/4 KHZ frequencies as well as closure of the air bone gap. At follow up, the study parameters were: 1. The intactness and mobility of the graft. 2. The dryness of the ear. 3. Post-operative pure tone audiometric average and air bone gap. The postoperative audiograms were obtained from each of the patient three months after the surgery

Result:

A total 54 patients was taken as study subject with all having chronic otitis media. 27 of the subject ware undergone myringoplasty (Group A) and 27 subject were undergone myringoplasty with cortical mastoidectomy (group B).

Table I

Graft take up in relation to size of perforation

Size	Myringoplasty		Myringoplasty with corticalMastoidectomy	
	Taken	Not Taken	Taken	Not Taken
Small	5	0	4	0
Medium	11	2	9	1
Large	1	1	6	1
Subtotal	5	2	5	1
Total	22	5	24	3

But 2 cases in group-A and 1 case in group-B was failed among medium sized perforation. 1 in both group was failed among large perforation. Most of the cases failed among subtotal perforation, 2 out of 5 in group-A and 1 out of 5 in group-B.

Table II

Hearing Gain in relation to size of perforation.

Size	Number	Mean	SD(±)
Small	9	6.56	3.94
Medium	21	9.15	6.62
Large	9	9.38	14.97
Subtotal	15	11.98	12.55
Total	54	9.54	9.88

Mean hearing gain in small size perforation was 6.56 ± 3.94 dB. Mean hearing gain in medium size perforation in both group was 9.15 ± 6.62 dB. In case of large perforation mean hearing gain was 9.38 ±14.97 dB. Mean hearing gain in subtotal perforation was 11.98 ±12.55 dB. In both the group it signifies that more the size of perforation more the hearing gain.

Complication in group-A was found 4(14.8%) and complication of group-B was found 12 cases (44.4%). Complication of surgery was more in group-B(44.4%) compared to group-A(14.4%).Tinnitus was complained by majority of patient. Graft medialization found in 1 patient in each group. Retraction of tympanic membrane found in 1 patient of group-B. Postoperative otorrhoea found in 1 patient of each group. Facial paralysis persist less than 14 days found in 1 patient in group-A and 3 patient in group-B. No case of permanent facial paralysis was found. Postauricular wound infection foundin1 patient in group-A and 4 in group-B. Vertigo found in 2 patient lasting more than 2 days ingroup-B.

Graft take rate in both group fond after 3 month postoperatively by otoscopy and otoendoscopy. Graft take rate was 22(81.48%) case out of 27 ingroup-A and 24(88.89%) out of 27 in group-B. 5(18.52%) case in group-A and 3(11.11%) case in group-B found failed. But it is not statistically significant as p-value was0.704.

Table III

Complication of Surgery Comparison

Complications	Myringoplasty	Myringoplasty with Cortical Mastoidectomy	P-value
Graft Medialization	1	1	
Retraction of TM	0	1	
Postoperative Otorrhoea	1	1	
Facial paresis Immediate<14 days	1	3	0.035
Post-auricular wound infection	1	4	
Vertigo>2 days	0	2	
Total	4	12	

Table IV

Hearing Gain Comparison

Group	Pre-op PTA		Post-op PTA		Hearing gain		P-value
	Mean(dB)	SD(dB)	Mean(dB)	SD(dB)	Mean(dB)	SD(dB)	0.434
Myringoplasty	26.58	6.49	18.10	8.21	8.48	6.83	
Myringoplasty with cortical Mastoidectomy	28.53	9.99	17.91	8.74	10.61	12.25	

Table- V

Graft take up rates for the two groups in different series.

Author	Myringoplasty		Myringoplasty with Cortical mastoidectomy		p- value
	N	%	n	%	
Balyan et al	242	89.2	28	85.7	>.05
Mcgrew et al	320	90.6	144	91.6	>.05
Toros et al	46	76.1	46	78.3	.804
Nayak et al	20	60	20	100	
Ashok et al	20	75	20	100	
Present study	27	81.48	27	88.89	.704

Mean preoperative AB gap was 26.58 (±6.49) dB in group-A and 28.53 (±9.99) dB in group-B. Mean postoperative AB gap was 18.10 (±8.21) dB in group-A and 17.91 (±8.74)dB in group-B.Mean AB gap improvement in two groups was8.48(±6.83)dB and 10.61 (±12.25) dB for myringoplasty alone and myringoplasty with cortical mastoidectomy groups.

Postoperatively improvement in hearing was found in the range of </=5dB gain in 6(22.2%) cases, 6-10 dB gain in 12(44.4%) cases, 11-15 dB gain in 6(22.2%) cases, 16-20 dB gain in 2(7.4%)cases and 21-25 dB gain in 1(3.7%) cases with the mean hearing gain was 8.48 ± 6.83 dB by doing myringoplasty alone.

Postoperatively improvement in hearing was found in the range of >/=5dB gain in 4(14.8%) cases,6-10 dB gain in 13(48.2%) cases,11-15dB gain in 3(11.1%) cases, 16- 20d Bgainin 2(7.4%) cases, 21-25dB gainin 2(7.4%) cases and >30 dB gainin 1(3.7%) cases with the mean hearing gain was 10.61dB± SD=12.25by doing myringoplasty and cortical mastoidectomy.

Most of the hearing gain was in the range of 6-10 dB in both groups. Though it is apparently obvious that hearing gain was higher in group-B but was not significant statistically as p-value was 0.434

Table-VI

Hearing gain in different series

Author	Myringoplasty		Myringoplasty with cortical mastoidectomy		P-value
	Pre-op A-Bgap	Post-op A-BGap	Pre-op A-B gap	Post-op A-Bgap	
Balyan et al	29.2	19.4	27.8	20.1	>.05
Mcgrew et al	34.1±19.5	16.4±12.4	25.8±13.6	14.4±11.1	>.05
Toros et al	21.04±8.43	10.52±10.03	26.44±10.03	16.77±11.1	>.763
Kaur et al	35.44±6.86	27.72±7.2	36.96±7.35	27.88±5.79	.932
Tawab et al	22.3±8.2	18.3±10.0	22.5±8.5	20.0±8.3	>.05
PresentStudy	26.58±6.49	18.1±8.21	28.53±9.99	17.91±8.74	.434

Discussion:

Cases selected were between 15-55 years as per inclusion criteria. Patient aged between 15-24 years were more in the study group i.e., 12 patients (44.44%) in both groups. This correlates with the studies conducted by Varshney et al[11]. The early presentation may be due to increased awareness, difficulty in hearing affecting working ability and efficiency and learning patient and the parents to seek medical intervention. In another study conducted by Lasisi A.O. et al.[12] majority of the patient were 21-34 aged group. In another study by Biswas S.S.(2010)[13] found better success with advancing age and they concluded that low incidence of upper airway infections and better Eustachian tube function may be the cause. Younger the age, the incidence of the cold and upper respiratory tract infection is high probably which might be the reason for higher incidence of CSOM in this age group Male were more in group-A i.e. 16(59%) and female were more in group-B i.e. 15(56%). Overall in both group male female ratio were 1:1.07. This correlates with the study of Abdel Tawab et al[14] of whose male female ratio was 1:1.5. In an study conducted by Haque M.R. et al[15] male female ratio was 1:1.5. There is no definitive evidence for the higher incidence in the female patient in literature. probably poor socio-economic status, overcrowding in the residing place and close contact with children having upper respiratory tract infection may increase the incidence of CSOM in female.

Most of the patient in this study was from urban area. 14 out of 27 in group-A and 11 0ut of 27 in group-B was from urban area signifies no association statistically In our study maximum number of patients, 25 patients belonged to lower socioeconomic status, 20 patients belonged to middle class group and 9 patients belongs to poor socioeconomic status. It has been proven that socioeconomic factors such as poor living conditions, overcrowding, poor hygiene and poor nutrition are predisposing factors for COM. The influence of socioeconomic factors in graft up take has not been studied indetail.

Small perforation was seen in 9 patients (16.67%), medium size perforation seen in 21 patients (38.89%), large perforation seen in 9 patients (16.67%) and subtotal perforation seenin15patients (27.78%). Most of the cases were medium sized perforation correlates with the study of Islah SAM et al[16] and Manpreet Kaur et al[17]. In another study conducted by Akriti Sharma et al[1] found to be large perforation in more incidence 48%.Graft uptake was influenced in this study showing 0 out of 9 cases (0%) failed in small perforation, 3 out of 20 cases(15%) failed in medium sized perforation, 2 out of 7 cases (28%) failed in large perforation and 3 out of 15 cases (20%) failed in subtotal perforation. Smyth G.D.et al (1976)[4] showed that more the size of perforation more the chance of failure. In a study conducted by Islah SAM et al[16] Concluded by same result “as the size of perforation increases chance of graft take up decreases”. On the other hand Robert K Jacklar[18] concluded that larger perforation do not adversely affect the success rate.

Mean hearing gainin small size perforation was6.56 ± 3.94 dB. Mean hearing gain in medium size perforation in both groups was 9.15± 6.62 dB. In case of large perforation mean hearing gain was 9.38 ±14.97 dB. Mean hearing gain in subtotal perforation was 11.98 ±12.55 dB. In both the group it signifies that more the size of perforation more the hearing gain. Same types of result of hearing gain in relation to size of perforation also found by Yogita Dixi[19] i.e. 6.8 dB in medium size,12.6 dB in large size and 13.4 dB in subtotal type of perforation. A recent study conducted by Manpreet Kaur et al[17] found more improvement in hearing as small=5.24, medium=13.13, and

large=21.88. But a study conducted by Pei-Wen wu et al[20] smaller size perforation air-bone gap closure was1.08±7.53 dB and larger size air-bone gap closure was 9.77±9.40 dB. But it is proven by all study that more the size of perforation more hearing gain in successful myringoplasty.

Complication of surgery was more in group-B (44.4%) compared to group-A(14.4%).Tinnitus was complained by majority of patient and not measured as a complication as intratympanic gelfoam may be acause of tinnitus. Graft medialization found in 1 patient in each group. Retraction of tympanic membrane found in 1 patient of group-B. Postoperative otorrhoea found in 1 patient of each group. Facial paralysis persist less than 14 days found in 1 patient in group-A and 3 patient in group-B. Postauricular wound infection found in 1 patient in group-A and 4 in group-B. Vertigo found in 2 patients lasting more than 2 days in group-B.A study conducted by McGrew BM[21] concluded that no difference of complication between the two group and traditionally feared complications associated with mastoidectomy, including facial paresis, cerebrospinal fluid leak, and meningitis, did not occur in the tympanoplasty with mastoidectomy group. Another study conducted by Balyan FR et al[22] reported that extra effort and risk in addition to mastoidectomy with myringoplasty in dry ear support present study.

In this present study graft rejection rate was 5 cases(18.52%) in group-A and 3 cases(11.11%) in group-B. cortical mastoidectomy show better success rate (88.89%) than myrigoplasty alone (81.48%) but not significant as p value>005.The results of present study is consistent with the study of Chavan S et al[23]where success rate of myringoplasty without mastoidectomy was reported 93.33%, similarly the results of myringoplasty with mastoidectomy reported to be 97.5%. Kaur M et al[17]reported the success rate for myringoplasty with or without mastoidectomy respectively were 88% and 76%; they also concluded that combining cortical mastoidectomy with tympanoplasty would not give additional benefits in terms of hearing improvement, disease clearance and graft take up .

As far as graft take up rate is concerned, our results are comparable also to Bhat et al[24] and Albu et al[25] who observed success rate of 75% for myringoplasty alone group as compared to 82.85% for myringoplasty with cortical mastoidectomy group. Most of the studies above have reported between 70 to 80% for myringoplasty alone and between 80 to 90% for myringoplasty with cortical mastoidectomy. In study by Jackler and Schindler et al[8] it was found that cortical mastoidectomy was found to be an effective means of re-pneumatizing the sclerotic mastoid and restoring the hearing and eradicating mastoid sources of infection. Sheehy JL et al[26] recommended performing cortical mastoidectomy routinely of all myringoplasty, because it is “good practice and because it is better to be safe than sorry”. Similarly a study conducted by Holmquist and Bergstrom[9] suggested that mastoidectomy improves the chance of successful tympanoplasty for patients with non- cholesteatomatous chronic otitis media. Also a study conducted by of Chavan S et al[23] of a sample size of 40 patients which were followed up for a period of 4months had a success rate of 100% in association of mastoidectomy compared to 60% in myringoplasty alone revealing that mastoidectomy is required in all cases. However, no study was available to show a statistically significant difference. McGrew et al[21] conducted a retrospective study, where 464 patients who underwent surgical repair of simple tympanic membrane perforations

were identified and reviewed. Surgical outcome and clinical course were assessed to compare results of myringoplasty with and without canal wall up mastoidectomy. They found that graft take rate was equal in both groups. Same types of result was found by Balyan et al[22] and Toros et al[28]. They concluded that mastoidectomy was not necessary for successful repair of simple tympanic membrane perforations.

In our study, mean AB gap improvement in two groups was 8.48±6.83 dBand 10.61±12.25 dB for myringoplasty alone and myringoplasty with cortical mastoidectomy groups. A wide range reported from 3.3dB to 20.61dB respectivelyin different series of study. Similar to our results, Habibetal[29] and Kauretal[17] have also shown that gap closure was higher for myringoplasty with cortical mastoidectomy as compared to myringoplasty alone. However, investigators like Balyan et al[22], McGrew et al[21], Saha et al[30] and Toros et al[28] found that AB gap closure values were higher for myringoplasty alone as compared to myringoplasty with cortical mastoidectomy.

Variability in air-bone gap closure has been observed in different series with different values, however, it would be pertinent to mention here that except for the difference of 11.23 dB between two modalities as observed by Habib et al [29].All the other investigators got difference between two groups to be within 2 to 3 dB, a very nominal difference and has a limited clinical value as observed in present study.

Conclusion:

Many factors contribute to the failure of the myringoplasty and it still remains a point of controversy weather a perforation should be repaired by myringoplasty alone or in association with cortical mastoidectomy in dry ear. The factors influencing graft take up and hearing outcome are better Eustachian tube function, age of patient, duration of disease, discharge free period, size of the perforation, and status of middle ear mucosa. Incidence of upper respiratory tract infection has adverse effect on healing and hearing outcome.

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