

Original Research Article

Comparative study of quality of life and surgical outcome in open mastoid cavity and mastoid cavity obliteration in canal wall down mastoidectomy

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ABSTRACT

Background: Canal wall down mastoidectomy is a surgical technique used for the eradication of middle ear disease. The remaining large mastoid bowl is associated with a number of issues; one of the techniques that have been developed in order to avoid such problems is the obliteration of the mastoid cavity. Mastoid obliteration resulted in a decrease in the complications associated with the open mastoid cavity. The materials used for this reason are either biological or synthetic. Mastoid obliteration with synthetic materials is a valuable and safe surgical technique for patients who undergo canal wall down mastoidectomy.

Methods: This is a prospective study carried out in the department of otorhinolaryngology. Sample size: 30 patients out of which 15 were operated by Modified Radical Mastoidectomy with obliteration (Group A) and 15 were operated by Modified Radical Mastoidectomy without obliteration (Group B). Study design: single centre, longitudinal, prospective, two group, parallel, follow-up, randomly allocated statistical method and tools: Fischer's Exact Test. Study period: August 2017 to August 2020.

Results: Study was divided in two groups, group A (modified radical mastoidectomy with obliteration) & group B (modified radical mastoidectomy without obliteration).

Conclusions: The incidence of pain, discharge, giddiness and wax formation was markedly reduced in obliterated cavities as compared to open cavities. Healing of the cavity as evidenced by epithelialization, at the end of 3 months, was better in obliterated ears. Patients with obliterated mastoid cavity required less cavity care, doctor dependence, frequent OPD visits.

Keywords: Mastoid obliteration, Cholesteatoma, Canal wall down mastoidectomy, Bone dust, Bone pate

INTRODUCTION

The chronic discharging ear is still one of the most common problems that the Otorhinolaryngologist in India and other developing countries are encountering. It is estimated that 6 % of Indian population suffers from chronic ear disease.¹ The continuation of the infection and the bone eroding properties of granulation tissue and cholesteatoma seen in CSOM are known to be the major

pathological process causing these complications. As there is no simple means to eradicate this chronic pathology, appropriate and timely intervention by an otologist goes a long way in the prevention of these human maladies.² The popularity of intact canal wall mastoidectomy stems from the benefits of maintaining a canal wall, which includes freedom from the need for frequent mastoid bowl cleanings, freedom from water intolerance and calorically induced vertigo, and less

difficulty in fitting and use of hearing aids.² Some problems faced by patients with open mastoid cavity post operatively can be fairly summarized as recurrent drainage and infection, water intolerance leading to infection, the need for frequent oto-microscopic cleaning, calorically induced vertigo from either water or air exposure, barometrically induced vertigo, and, in those with compromising hearing loss, being unable to wear traditional hearing aids.²

In cases of chronic suppurative otitis media with atticointral/posterosuperior marginal pathology, treatment modality is only surgery. Surgical options available are the canal wall down mastoidectomy and intact canal wall mastoidectomy.³ Though these complications are not present in intact canal wall mastoidectomy, disease clearance could not be achieved completely in intact canal wall technique.³ Goals of surgical management of chronic otitis media include the eradication of disease, restoration of hearing, and to the extent possible, maintenance or restoration of a normal anatomic configuration. Prior to the mid-1950s, the first 2 of these goals were usually accomplished by removal of the posterior external auditory canal wall, resulting in a radical or modified radical mastoidectomy cavity.⁴ Many otologic surgeons now prefer intact canal wall mastoidectomy with tympanoplasty except when canal wall removal is required because of extensive disease. In canal wall down mastoidectomy, complete disease clearance can be given. But this could be achieved only at the cost of post operative cavity problem and considerable hearing loss. Mastoid obliteration has been used in Canal Wall down mastoidectomy for cholesteatoma to facilitate tympanic aeration and ultimately to prevent future recurrence of cholesteatoma. The principal advantages of mastoid cavity obliteration are: Reduced nitrogen-absorbing mucosa in the mastoid cavity preventing recurrence of retraction in patients with Eustachian tube dysfunction, elimination of mastoid cavity dead space preventing accumulation of squamous epithelium and bowl infection.⁴ To make small cavity that is self-cleaning and easily maintainable.

Both autologous and synthetic materials have been used for obliteration. Materials such as free graft, fat, cartilage, bone chips, bone pâté, hydroxyapatite, and periostio-muscular flaps are used. In this study we obliterated the mastoid cavity with bone pate and cartilage.⁵ Thus, the present study has been carried out to compare the post operative results of canal wall down mastoidectomy with and without obliteration in patients with atticointral or postero superior marginal pathology of chronic suppurative otitis media.

METHODS

This is a prospective study carried out in the department of otorhinolaryngology data for the study was collected from the patients attending ENT OPD and undergoing surgery (modified radical mastoidectomy with

obliteration and modified radical mastoidectomy without obliteration) in our institute.

Sample size

Total 30 patients undergoing surgery out of which 15 were operated by Modified Radical Mastoidectomy with obliteration (Group A) and 15 were operated by modified radical mastoidectomy without obliteration (Group B).

Sampling procedure

A pre-designed proforma was used to record the relevant information from the individual patient selected as per inclusion and exclusion criteria. 30 patients were divided into two groups, A & B, which included patients operated by modified radical mastoidectomy with obliteration and modified radical mastoidectomy without obliteration respectively. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Study design, duration and statistical analysis

Single centre, Longitudinal, Prospective, Two group, Parallel, Follow-up, Randomly allocated used were Statistical method and tools: Fischer's Exact Test. Study period was from August 2017 to August 2020.

Inclusion criteria

Inclusion criteria for current study were; patients with unsafe CSOM, patients going for canal wall down mastoidectomy and patients of all age groups and sex were included in this study.

Exclusion criteria

Exclusion criteria for current study were; Patients with safe CSOM, Patients with malignancy and Patients not consenting for study.

RESULTS

In present study, we included a total number of 30 cases of atticointral type of CSOM. These cases were divided into two groups: Group A was operated by canal wall down mastoidectomy with obliteration of mastoid cavity and, Group B was operated by canal wall down mastoidectomy alone. These two groups were analysed for similarities to be comparable. The post operative mastoid cavities were objectively assessed for epithelization of cavity and waxy debris accumulation. Patients were asked about complaints of pain, giddiness and discharge.

Age distribution

Patients of all age groups were included in this study, with the age group (20-30 years.) making a majority 9 (30%) patients followed by 8 (26.7%) patients in the age group (0-20 years.). The third most common group was in the (31-40 yrs.) having 6 (20%) patients. Statistically p value (0.797871) is insignificant.

Table 1: Preoperative hearing loss.

Pre-operative hearing loss	Group A		Group B		Total	
	N	%	N	%	N	%
Mild (26-40 dB)	3	20	3	20	6	20
Moderate (41-60 dB)	6	40	8	53.33	14	46.67
Severe (61-80 dB)	4	26.67	4	26.67	8	26.67
Profound (>81 dB)	2	13.33	0	0	2	6.67
Total	15	50	15	50	30	100

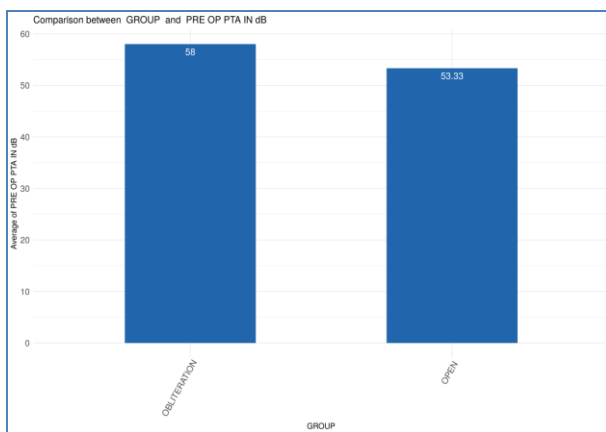


Figure 1: Pre operative hearing loss, p value=0.442725.

Laterality

In our study 15 patients were operated for right side and 15 patients were operated for the left side. In group A 7 patients had right side operated and 8 patients had their left side operated similarly in group B 8 patient had right side operated and 7 left side operated. Statistically p value (1) is insignificant

Gender distribution

Our study consisted of 22 males and 8 females (2.75:1) with Group A having 11 males and 4 females and Group B consisted of 11 males and 4 females. Statistically difference in two groups is insignificant, p value was 1.

Fisher's exact test

On audiological examination 6 (20 %) cases had a mild (26-40 dB) hearing loss, 14(46.67%) patients had moderate (41-60dB) hearing loss, 8 (26.67%) had severe hearing loss and 2 (6.67%) had profound (>81dB) hearing loss. Statistically difference in two groups is insignificant (p value was 0.442725).

Pain

In our study on Follow up day 15, 8 (53.33 %) patients complained of pain in group B, whereas in group A 11 (73.33 %) patients complained of pain. On Follow up day 21 4 (26.67 %) patients in Group B and 4(26.67 %) in Group A complained of pain. On Follow up day 45 1 (6.66 %) in Group B and 1 (6.66 %) in Group A complained of pain. No patient complained of pain at Follow up day 90 in Group A while 1(6.66 %) in Group B complained of pain and at the end of study period. Statistically p value is 1 which is insignificant. Though statistically insignificant for 1st 30 days in both groups more patients had to bear the pain.

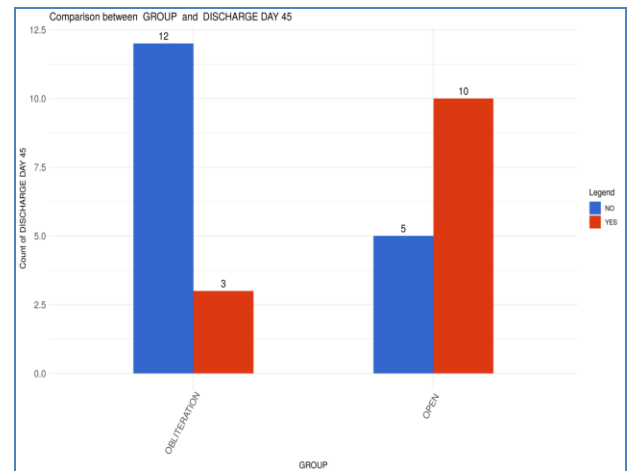


Figure 2: Comparison between group and discharge.

Discharge

In our study on Follow up day 15, 15 (100%) patients complained of discharge in group B, whereas in group A 13 (86.67%) patients complained of discharge. On Follow up day 21 15 (100%) patients in Group B and 13 (86.67%) in Group A complained of discharge. On Follow up day 45 10 (66.67%) in Group B and 3 (20%) in Group A complained of discharge and here p value is 0.025328 and it is significant. At the end of the study, On Follow up day 90 5 (33.33%) in Group B and 2 (13.33%) in Group A complained of discharge. Statistically p value is 0.025 which is significant.

Giddiness

In our study on Follow up day 15, 5 (33.33%) patients complained of giddiness in group B, whereas in group A 2 (13.33%) patients complained of giddiness. On Follow up day 21 2 (13.33%) patients in Group B and 2

(13.33%) in Group A complained of giddiness. On Follow up day 45 1 (6.66%) in Group B and 1 (6.66%) in

Group A complained of giddiness.

Table 2: Mastoid cavity examination follow up.

Follow up days	Cases/Control Groups (N=15)	Pain	Discharge	Giddiness	Wax	Epithelialisation
Post-Op. Day 15	Group A	11	13	2	0	0
	Group B	8	15	5	0	0
Post-Op. Day 21	Group A	4	13	2	0	0
	Group B	4	15	2	0	0
Post-Op Day 45	Group A	1	3	1	1	4
	Group B	1	10	1	3	1
Post-Op Day 90	Group A	0	2	0	1	10
	Group B	1	5	0	3	4
P value <0.05	P value	1	0.02538	1	0.0597	0.065595
	Significance	No	Yes	No	No	No

At the end of the study, On Follow up day 90 no patient complained of giddiness. Statistically p value is 1 which is insignificant.

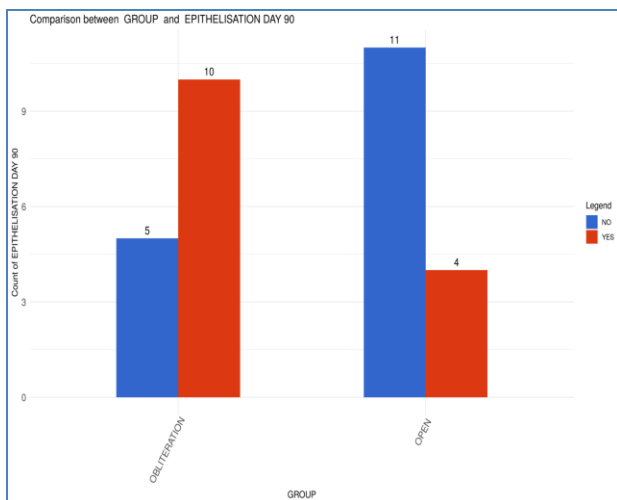


Figure 3: Comparison between group and epithelisation.

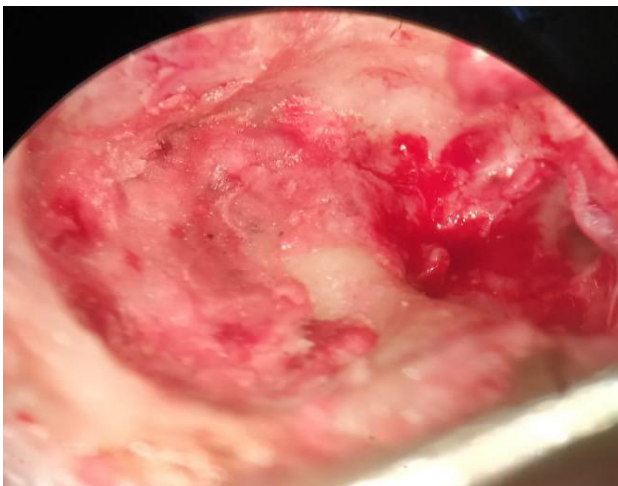


Figure 4: Bone pate and cartilage were used for obliteration.

Wax

In our study at 90 days follow up, 1 (6.66%) cases in Group A had waxy debris and 3 (20%) cases in Group B. Statistically p value is 0.5977 which is insignificant.

Epithelisation

In our study average time for epithelization in Group A was 5 weeks, whereas in Group B was 16 weeks, At the end of study period, on follow up day 90 10 (66.67 %) cavities had complete epithelization in Group A. Whereas 4 (26.67%) cavities in Group B had complete epithelization. Statistically p value is 0.06559 which is insignificant.

DISCUSSION

Patients of all age groups were included in this study, with the age group (20-30 yrs) making a majority 9 (30%) patients followed by 8 (26.7%) patients in the age group (0-20 yrs). The third most common group was in the (31-40 yrs) having 6 (20%) patients. In a study by Ramsey et al patients age group ranged from 4-84 yrs with mean age of 39 yrs.²¹

In a similar research by Singh et al consisting of 88 patients had majority of patients 59 % (n=52) in the age group of (12-20 yrs).²⁴

Chhapola et al in their study of 60 patients had majority of patients in the age group of (11-20 yrs) followed by 27.5 % in between (21-30 yrs), and 25 % were more than 30 yrs of age and 10 % were less than 10 yrs.²⁷

Shah et al in a similar study consisting of 100 patients having age groups ranging from (7-68 yrs.) with 60 (60%) cases in (11-30 yrs.) age group. Mean age of distribution was 28.34 yrs.³⁴

Gender distribution

Our study consisted of 22 males and 8 females (2.75:1) with Group A having 11 males and 4 females and Group B consisted of 11 males and 4 females. Ramsey et al in their study of 59 patients had 28 males and 31 females making a ratio of 1:0.90.21

Beutner et al in their study of 26 patients had a male:female ratio of 1.4:1.22

Singh et al in a comparable study had a ratio of 16:19 males:females cases having 1:0.625 ratio and control group having ratio of 1:0.550.²⁴

In a similar research by Mokbel et al consisting of 100 patients with male making 55 cases and females 45 having a M:F ratio of 1 : 0.81.²⁶

Shah et al in their study had 49 males and 51 females with the patient ratio of 0.9:1.³⁴

Researches by Shah et al, Singh et al and Ramsey et al have shown a predominantly female preponderance and Studies by Mokbel et al and Beutner et al having more male preponderance.^{22,26}

There is no emerging pattern which favours male or female affliction for the disease. Thus our study is comparable to other studies.

Laterality

In our study 15 patients were operated for right side and 15 patients were operated for the left side. In group A 7 patients had right side operated and 8 patients had their left side operated similarly in group B 8 patient had right side operated and 7 left side operated. However, 2 patients had a bilateral presentation, Ear with more extensive pathology on HRCT temporal bone was operated first in such a case followed by second ear. Ramsey et al study consisted of 26 left sided patients and 34 right sided. In a similar study by Beutner et al 7 patients were operated for left side and 11 patient were operated for right side. Sun et al had 23 left ears, 19 right ears and 3 with a bilateral presentation.²³ There was no significant right/left dominance seen in comparable studies.

Pain

In our study on follow up day 15, 8 (53.33%) patients complained of pain in group B, whereas in group A 11 (73.33%) patients complained of pain. On Follow up day 21 4 (26.67%) patients in Group B and 4 (26.67%) in Group A complained of pain. On Follow up day 45, 1 (6.66%) in Group B and 1 (6.66%) in Group A complained of pain. No patient complained of pain at Follow up day 90 in Group A while 1 (6.66%) in Group B complained of pain and at the end of study period. In a

study by Chhapola et al on post operative day 30, 12 (60%) patients of control group had pain, while only 8 (40%) patients of case group experienced pain.²⁷ On post operative day 45, only 1 (40%) patient of case group had pain, while 2 (10%) of control group experienced pain. Deshmukh et al found on postoperative day 30, 40% of control group had pain, while only 20% of cases group experienced pain.³⁸

Discharge

In our study on Follow up day 15, 15 (100%) patients complained of discharge in group B, whereas in group A 13 (86.67%) patients complained of discharge. On Follow up day 21 15 (100%) patients in Group B and 13 (86.67%) in Group A complained of discharge. On Follow up day 45 10 (66.67%) in Group B and 3 (20%) in Group A complained of discharge and here p value is 0.025328 and it is significant. At the end of the study, On Follow up day 90 5 (33.33%) in Group B and 2 (13.33%) in Group A complained of discharge. Chappola et al three months after surgery, of the 20 cases, 16 (80%) patients had a dry cavity whereas 4 (20%) patients still had ear discharge. Of the 20 control cases, 12 (60%) had a dry cavity and 6 (30%) still had ear discharge. Deshmukh et al three months after surgery, of the 20 cases, 16 (80%) patients had a dry cavity whereas 4 (20%) patients still had ear discharge.³⁸ Of the 20 control cases, 12 (60%) had a dry cavity and 6 (30%) still had ear discharge.

Giddiness

In our study on follow up day 15, 5 (33.33%) patients complained of giddiness in group B, whereas in group A 2 (13.33%) patients complained of giddiness. On Follow up day 21 2 (13.33%) patients in Group B and 2 (13.33%) in Group A complained of giddiness. On Follow up day 45 1 (6.66%) in Group B and 1 (6.66%) in Group A complained of giddiness. At the end of the study, On follow up day 90 no patient complained of giddiness. In study by Chhapola et al 1 (5%) patient of control group had giddiness, case group did not have patient complaining of giddiness.²⁷

Epithelization

In our study average time for epithelization in Group A was 5 weeks, whereas in Group B was 16 weeks, At the end of study period, On follow up day 90 10 (66.67 %) cavities had complete epithelization in Group A. Whereas 4 (26.67%) cavities in Group B had complete epithelization. Chhapola et al 18 (90%) cases with obliteration had complete epithelisation at the end of study period of 6 months, and 14 (70%) cases in open cavity.²⁷ Deshmukh et al found among the patients where cartilage and flap were used to obliterate mastoid cavity, epithelisation had occurred in 60% of cases whereas where bone dust was used epithelisation had occurred in 40% of cases. Epithelisation had occurred in 80% of patients where cartilage and flap was used whereas 100%

of patients showed epithelialisation with the use of bone dust for obliteration.

Wax

In our study at 90 days follow up, 1 (6.66 %) cases in Group A had waxy debris and 3 (20%) cases in Group B. Chhapola et al found at the end of study period 2 (10%) patients presented with wax in the control group.²⁷ Deshmukh et al at the end of the study period found only 2 patients in the control group presented with waxy debris.³⁸

Limitations

In our study patient with multiple surgeries were not taken; obliteration done with bone dust and cartilage only; patient with mucosal type CSOM were not taken; patient with malignancy were excluded; patient with age more than 40 years were not included in our study; follow up of operated patient were done for 3 months which limits our study.

CONCLUSION

Obliteration of the mastoid cavity leaves a smaller surface which epithelializes easily and rapidly, with a reduced likelihood of developing cavity granulations. The cavity, being smaller, is also more likely to retain its epithelial migratory potential and be self-cleaning. Exposed bone following mastoidectomy secretes tissue fluid, which is a rich medium for bacterial proliferation. When the bony walls are covered with obliteration material, this process of secretion is reduced, with a resultant reduction in the risk of infection. Patients with an open cavity and an exposed lateral semicircular canal describe vertiginous episodes while swimming and exposure to cold air. Hearing aids, if required, are better tolerated in an obliterated cavity than an open cavity. Advantages of cartilage with bone pate obliteration are as follows: It could be easily used to seal perforation of the tympanic membrane by its fascial component and obliteration of the cavity by the periosteum component. The pliability of the flap enables the flap to adjust in all corners of the mastoid cavity, good vascular supply leading to better healing of the cavity, Bone pate prevents the shrinkage of flap and maintains the volume of mastoid cavity. Thus it can be concluded that the incidence of pain, discharge, giddiness and wax formation was markedly reduced in obliterated cavities as compared to open cavities. Healing of the cavity as evidenced by epithelialization, at the end of 3 months, was better in those ears where cavity was obliterated as compared to those where cavity was kept open. Patients with obliterated mastoid cavity required less cavity care, thus decreasing doctor dependence, frequent OPD visits and fewer courses of medical treatment and fewer burdens on hospital resources. In Group A patients the cavity was obliterated with bone pate and cartilage.

Whereas in Group B patients cavity was packed with povidone iodine soaked gel foam.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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