

Efficacy of Canal Wall down Mastoidectomy In Surgical Treatment Of Cholesteatoma And Its Outcome

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Abstract: Chronic Suppurative Otitis Media (CSOM), the infection of the middle ear, has been recognized since prehistoric times. It is characterized by intermittent or persistent purulent discharge through a perforated tympanic membrane for more than 2 weeks and the unsafe variety may be associated with cholesteatoma, canal wall down mastoidectomy is significantly superior to the intact canal wall technique in visualizing and clearance of middle ear pathology.our study is prospective study carried out over a period of 3 years from July 2014 to July 2017 in Department of ENT, Gandhi Medical college, Secunderabad. All patients included under this study are selected from patients attending the ENT OPD at Gandhi Medical college, Secunderabad. Sixty seven cases (67) of chronic suppurative otitis media with cholesteatoma irrespective of the presence or absence of complications were selected for the study. Most of the patients had a dry, self-cleaning cavity at the end of the study. From this study it appears that the incidence of various postoperative complications mentioned are few within 6 months follow up Most of them can be managed either by medical or surgical intervention .

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I. Background

Chronic Suppurative Otitis Media (CSOM), the infection of the middle ear, has been recognized since prehistoric times. It is characterized by intermittent or persistent purulent discharge through a perforated tympanic membrane for more than 2 weeks and the unsafe variety may be associated with cholesteatoma. Cholesteatoma often runs a malignant course destroying the surrounding structures and hearing thereby increasing the morbidity and mortality of those affected. Abramson et al accurately defined cholesteatoma as "A three dimensional epidermal and connective tissue structure, usually in the form of a sac, and frequently conforming to the architecture of various spaces of the middle ear, attic and mastoid. This structure has the capacity for progressive and independent growth at the expense of underlying bone and has the tendency to recur after removal. Hulka and McElveen in a randomized, blinded, temporal bone study, suggested that canal wall down mastoidectomy was significantly superior to the intact canal wall technique in visualizing middle ear pathology.¹

II. Aims And Objectives

1. To know the Incidence of recurrent cholesteatoma,
2. To Evaluate the Hearing status both at preoperative and postoperative stage.
3. To know the Status of mastoid cavity in postoperative stage

III. Materials and methods :

This is a prospective study carried out over a period of 3 years from July 2014 to July 2017 in Department of ENT, Gandhi Medical college, Secunderabad. All patients included under this study are selected from patients attending the ENT OPD at Gandhi Medical college, Secunderabad. Sixty seven cases (67) of chronic suppurative otitis media with cholesteatoma irrespective of the presence or absence of complications were selected for the study. The selected cases had limited cholesteatoma (attic perforation, postero-superior marginal perforation) to extensive cholesteatoma and aural polyp, post aural fistula. Cases of congenital cholesteatoma and residual cholesteatomas and those with intracranial complications were excluded from this study. Informed consent was obtained from each patient after counseling them and their relatives regarding the nature of the disease and surgery. Outcome of the surgery and the possible complications were explained to them. All cases underwent canal wall down mastoidectomy for clearance of the disease.

IV. Results and observations :

Age Distribution

In this study the age group ranged from 10 to 65 years. Our observation is as follows (Fig.1, Table.1).

AGE IN YEARS	NO OF PATIENTS	Percentage
0 to 10	2	3%
11 to 20	24	36%
21 to 30	21	31%
31 to 40	12	18%
41 and above	8	12%

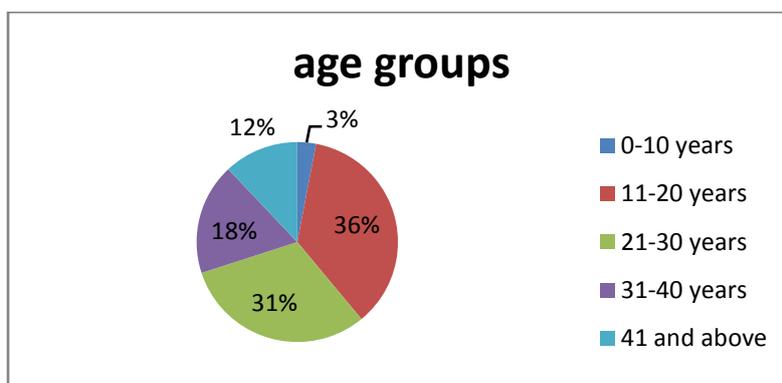


Figure 5.1 Age Distribution

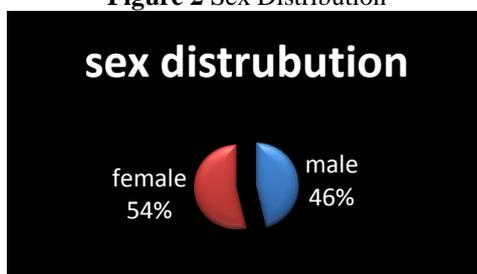
The mean age in this study was 27.33 years.

Sex Distribution

In the present study the sex distribution observed as follows:

SEX	NO OF PATIENTS	% OF PATIENTS
MALE	31	46.27
FEMALE	36	53.73

Figure 2 Sex Distribution



SIDE OF DISCHARGE

The side of the discharge whether right, left or bilateral was also noted in this Study.

SIDE	NO OF PATIENTS	% OF PATIENTS
RIGHT	24	36
LEFT	20	30
BILATERAL	23	34

Of the 67 cases studied, 23 (34%) of them had bilateral disease while the remaining 44 (66%) had unilateral disease. Among these patients who had unilateral disease, 24 (36%) of them had it on the right side while 20 (30%) of them had it on the left side (Table:3). Of the 44 cases which had unilateral ear disease, 4 of them had coexistent tubotympanic disease on other side.

SYMPTOMS

The presenting symptoms of all the patients were analyzed and the observations are shown in the table and chart below.

TABLE NO: 4 SYMPTOM DISTRIBUTION		
SYMPTOM	NO OF PATIENT	% OF PATIENT
OTORRHOEA	67	100%
HEARING LOSS	62	93%
OTALGIA	20	30%
FEVER	7	10%
GIDDINESS	7	10%
TINNITUS	5	7%
VOMITING	4	7%
HEADACHE	3	4%

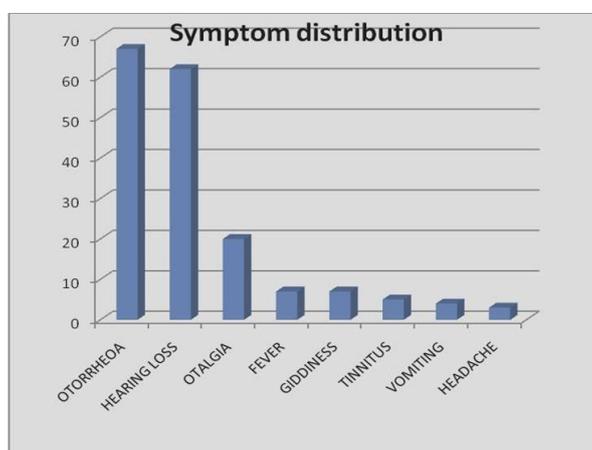


Figure 3 Symptom Distribution

CLINICAL SIGNS

The clinical signs regarding the site of cholesteatoma as follows:

TABLE NO: 5 CLINICAL SIGNS DISTRIBUTION			
SIGN		NO OF PATIENTS	% OF PATIENTS
CHOLESTEATOMA	POSTERO SUPERIOR	36	54
	ATTIC	31	46

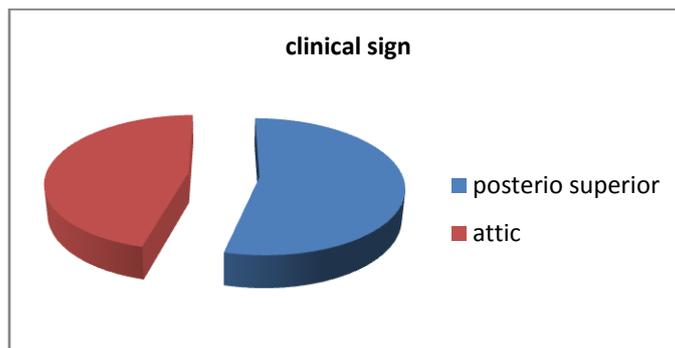


fig no :4 shows clinical signs

On examination, cholesteatoma was seen in the posterosuperior quadrant of the tympanic membrane in 36(54%) cases, while attic cholesteatoma was seen in 31(46%) of cases.

Type of Cholesteatoma

Cholesteatoma type in the present study is as follows:

Type	No. of patients	% of patients
Primary Acquired	64	96
Secondary Acquired	3	4

X- Ray Mastoids

In all the cases X-ray of the mastoids, Schuller’s view was taken and was analyzed. They were classified as whether they are pneumatized or sclerosed. Some cases showed a well defined cavity within which the cholesteatoma sac was present.

Type	No. of cases	Percentage of cases
Bilateral Sclerosed	42	62
Sclerosed on affected side and pneumatized on opposite side	20	30
Cavity	5	8

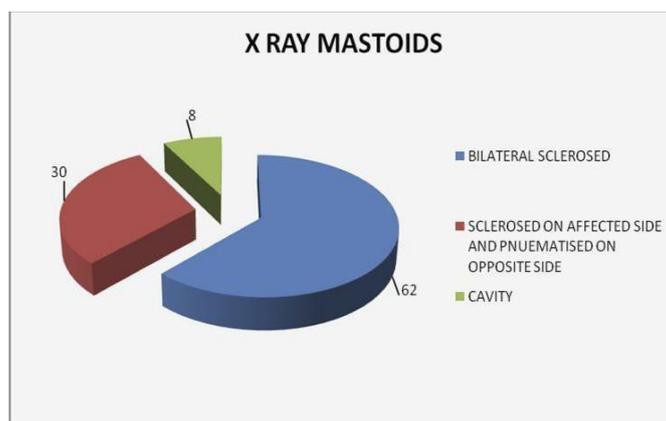


Fig no :5 shows results of x-ray mastoids

AUDIOLOGICAL PROFILE

All the cases were subjected for pure tone audiometry and the hearing threshold for air conduction and bone conduction were noted.

Type	No. of cases	%age of cases
Conductive	37	55.22
Mixed	24	35.82
Sensorineural	5	7.46
Dead Ear	1	1.5

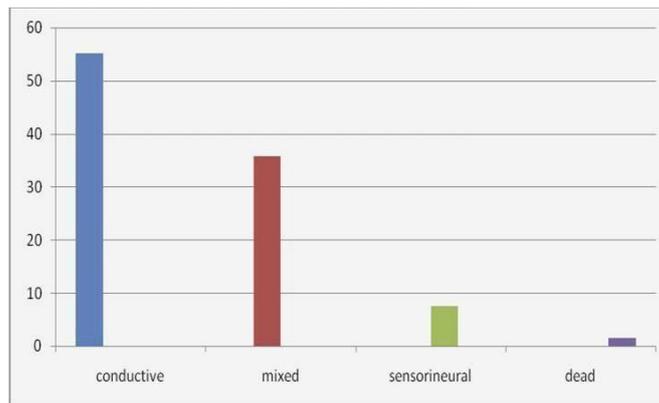


Figure 6 Hearing loss

The air-bone gap was also found out and the observations were as follows:

Air- Bone gap	No. of cases (n=49)	Percentage of cases
<20dB	18	27.27%
21 to 30dB	27	40.91%
>31dB	21	31.82%

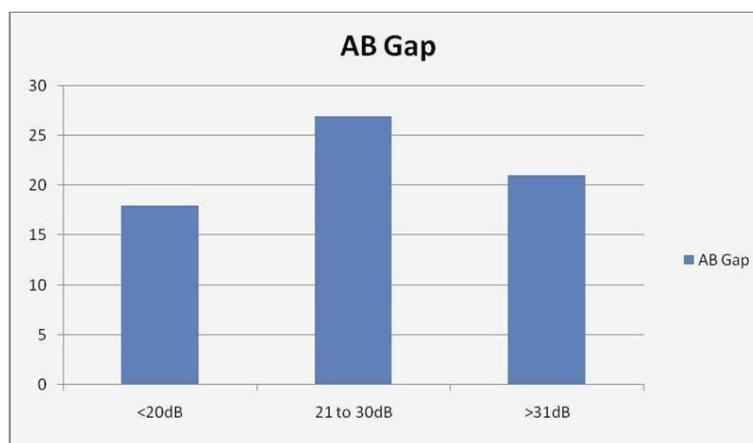


Figure 7- Bone gap

The median air conduction threshold was 42.5 dB while the median air bone gap was 28.03 dB in the present series.

HEALING TIME DURATION

The patients were followed up after surgery and the duration of healing of the postoperative cavities in all cases were noted. The observations made are as follows:

Table: 10 Healing Time

Nature of mastoidectomy	At 3 months		At 6 months	
	No. of cavities healed	% of cavities healed	No. of cavities healed	% of cavities healed
Canal wall down	55	82	62	92.5

POSTOPERATIVE COMPLICATIONS

During follow up, observations were also made regarding development of any complications.

Table: 11 Post-operative Complications

Postoperative complications	Immediate	At 1 Month	At 3 Months	At 6 Months
Facial paralysis	3	1	1	1
Meatal stenosis	0	0	1	2
Perichondritis	1	0	0	0
Postaural fistula	0	1	1	0
Recurrent cholesteatoma	0	0	0	0

POSTOPERATIVE

Audiometry

Postoperative Pure tone audiometry was taken in all cases after 6 months. The average airbone gap was measured at 500, 1000 and 2000 Hz for all patients.

Table: 12 Postoperative Audiometry

Air Bone Gap	No. of cases (n=66)	%age of cases
< 20 dB	37	56.06
21 to 30 dB	21	31.82
>31 dB	8	12.12

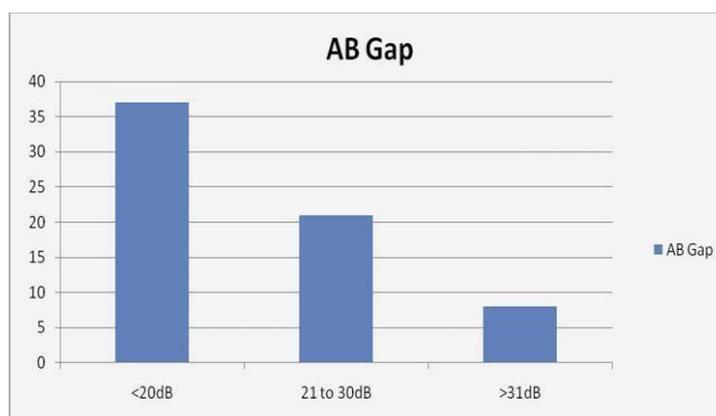


Fig no :8 shows AB gap

Cavity Condition on Follow - Up

The follow up period in this series was 6 months. During this period cavities were inspected for any accumulation of wax, debris, persistent discharge or if they were stable and completely dry and self-cleansing.

Table:14 Cavity condition on Follow-up

Nature of mastoidectomy	Condition of operated ear								
	1 Month			3 Months			6 Months		
	Dry	Wet	Debri	Dry	Wet	Debri	Dry	Wet	Debri
1. Modified radical mastoidectomy+ Tympanoplasty	9	38	0	34	9	4	38	4	5
2. Atticotomy and attic reconstruction+ tympanoplasty	1	5	0	6	0	0	5	0	1
3. Atticoantrostomy and posterior canal wall reconstruction+ tympanoplasty	3	11	0	13	1	0	12	1	1

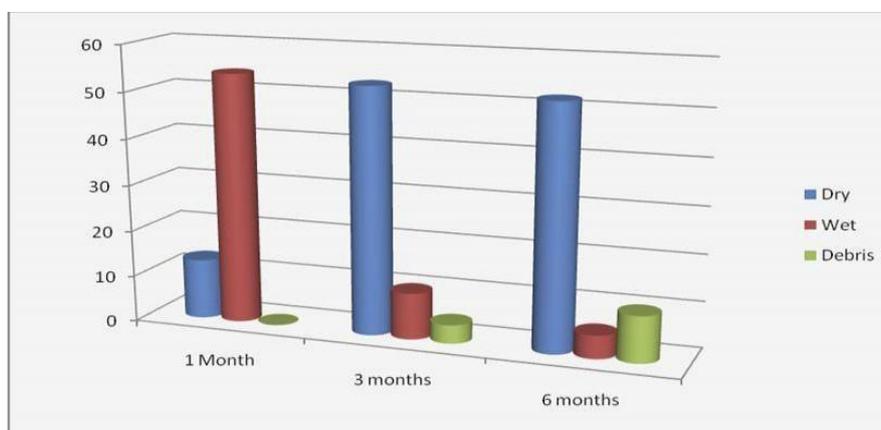


Fig no:9 – shows cavity condition on follow up

V. Discussion :

This study was conducted at Gandhi Medical college, Secunderabad from July 2014 to July 2017. 67 patients with cholesteatoma were selected and all of them were subjected to canal wall down mastoidectomy. The youngest patient in the present study was 10 years old and the eldest was 65 years old. The maximum number of patients was in the age group 11 to 20 years which is in accordance with the study conducted by Gupta et al ². The mean age in our series was 27.33 years. In a study conducted by Eero Vartiainen³, the mean age was found to be 38 years while Paparella and Kim⁴ noted a mean age of 35.1 years. Males to female ratio being 0.86:1 in the present study.

The incidence of discharge in the left ear was 36% and that in the right ear was 34%. 30% of our cases had bilateral ear discharge. The commonest presenting symptom in our study was otorrhoea which was found in all our cases. This was followed by hearing loss which was found in 92% of the cases in this study. Edelstein et al ⁵ noted hearing loss in 85% and otorrhoea in 73% of cases. Other symptoms like otalgia, tinnitus and vertigo in our study were 30%, 7% and 10% respectively. This is similar to that noted by Edelstein et al⁵ in which otalgia; tinnitus and vertigo were found in 32%, 8% and 8% respectively. Apart from these symptoms related directly to ear disease, few patients had some systemic symptoms as well. Fever was noted in 7 patients, headache in 3 patients, vomiting in 4 patients. These systemic symptoms herald the development of complications which are mostly intracranial. Also sudden increase in the discharge and development of pain is often seen in cases going for complications. Cholesteatoma was found in the posterosuperior quadrant in 54% of cases while it was found in attic in 42%. Edelstein et al⁵ noted 32% in posterosuperior quadrant and 20% in

attic. Central perforation either subtotal or total was found in only 4% in this series while it was present in 9% in the study conducted by Edelstein et al.⁵ In this study, primary acquired cholesteatoma was the commonest type seen in 96% of the cases. The remaining 4% were secondary acquired. Congenital cholesteatoma and residual cholesteatoma were excluded from this study. Edelstein et al.⁵ noted 48% primary acquired cholesteatoma, 10% of secondary acquired cholesteatoma, 18% recurrent cholesteatoma and 24% of congenital cholesteatoma. Sade and Skatz⁶ noted 57.8% primary acquired and 7.3% secondary acquired cholesteatoma.

In our study all the cases with cholesteatoma were found to have a sclerosed mastoid. Bilateral sclerosis was found in 42 cases (62%). Of the 42 cases that showed bilateral sclerosis, 22 of them had bilateral disease and the rest 20 had bilateral sclerosis but unilateral disease. So it is difficult to infer whether sclerosis predisposes the mastoids to cholesteatoma formation or if sclerosis is the result of cholesteatoma.

Sclerosis on the affected side and pneumatized on the opposite side was noted in 20 of our cases (30%). The remaining 5 cases i.e. 8% of the patients showed a cavity on their X Rays. This is because of the bone eroding property of the cholesteatoma. However such cases should be differentiated from postoperative cavities. C.T scanning was done in all cases to rule out any possible intracranial spread. Sinus plate was found to be eroded in one case and erosion of tegmen was found in 3 cases but there was no evidence of spread of infection intracranially. Other cases did not show any significant features.

All the patients selected for the study were taken up for pure tone audiometry. 10.5% of them had a hearing threshold less than 30dB while a majority of them i.e. 62.7% had a hearing threshold between 31 to 59dB. 25.3% had a severe hearing loss and presented with a threshold of more than 60dB. 35.82% of the patients in this study showed mixed loss while 7.46% patients had a sensorineural hearing loss. One case was a dead ear. 18 patients had an air bone gap of less than 20dB, while another 27 and 21 cases had an air bone gap of 21 to 30dB and more than 31dB respectively. The present series as compared to Eero Vartiainen³ is shown in the tables below. The air conduction threshold is more or less similar to that found by Vartiainen³ in his 1976 to 1985 subgroup. In the present series, we see that 27.27% (18 cases) had an air bone gap of less than 20dB. This is because in this category, there are 5 sensorineural loss, 10 mixed loss. Only 3 cases had a mild conductive loss and this was because of a limited disease in the attic with no significant destruction of the ossicular chain. One case had a dead ear and is excluded in this analysis. The median air conduction threshold was 42.5dB in the present series. This is comparable to 47.0dB found by Vartiainen³ in his first subgroup and high as compared to 39.0dB found by him in his second subgroup. The median air bone gap in this series was 28.03dB which is equal to top subgroup of Vartiainen. The second subgroup of Vartiainen³ i.e. had a median air bone gap of 25dB. The greater amount of hearing loss noted in our study may be due to the increased incidence of ossicular chain necrosis.

The patients in our series were regularly followed to assess the healing time of the postoperative cavity. 13 (19.4%) cavities had healed by one month in our series while Paparella and Kim⁴ noted 30%. By the end of three months 55 (82%) cavities were healed which was lesser than that of Paparella and Kim (87%) was higher. By the end of six months almost all cases i.e. 62 (92.5%) of canal wall down cavities had shown complete epithelialization, which was almost similar to that of Paparella and Kim (1977) who noted 95% success. The longer duration of healing seen in our series may be attributed to higher rate of infection. Those patients with smaller cavities and no infection showed better healing and the cavity was completely epithelialized in 3 months in most of these cases. 2 of the cases took almost 5 months for complete epithelialization. Two of them had a meatal stenosis for which revision meatoplasty was done after 2 months. The other case had extensive granulations near the meatoplasty site topical antibiotic steroid ear drops were given and finally the cavity healed by 5 months without any further problems. Also, in this particular patient the postoperative cavity was relatively larger because of extensive disease and this may also contributed for delayed healing. Perichondritis was seen in 1 (1.49%) case in this series. Case was admitted and systemic antibiotics were given. Ceftriaxone with sulbactam 1.5gms was given intravenously twice daily for one week and later continued with oral cefixime 200mg twice daily for another 7 to 10 days, it responded well to conservative treatment. Meatal stenosis was noted in 2 patients i.e. 2.99% at the end of study. A new meatoplasty was done after 2 months and the patients did not have any further problems. Facial nerve palsy after surgery was seen in 3 cases. The nerve was exposed at the mastoid segment and the cholesteatoma sac was adherent to the nerve. Facial nerve palsy was noted immediately postoperatively and was treated with steroids (injection Dexamethasone 4mg i.v. thrice daily for 5 days and tapered). There was no recovery at the end of the medical treatment and the patient was advised facial nerve decompression and grafting, but she did not undergo. Another 2 cases Grade 2 facial nerve palsy recovered with medical treatment. Postaural fistula was noted in 2 cases, they were resutured and treated with systemic antibiotics.

In present series there was a failure rate of 7.46% (5 cases). This was comparatively better than that found by Sade et al.⁸ who had failure rate of 20% in 65 cases operated by him. Brown⁹ found a failure rate of 13%, which was higher to the present series. The results of the present series was also better than that of

Gristwood who had 17% failure in his series of 141 canal wall down mastoidectomies. The success rate in our study was better to that of Abramson et al ⁷ who had 9% failure rates in 155 cases. A postoperative PTA was obtained in all cases after 6 months. 37 of the cases i.e.56.06% of them had less than 20 dB air bone gap. Of these 37 cases,9patientshadamixedhearinglossandtheremaining23caseshad a pure conductive loss. 21 patients i.e. 31.82% had an air bonegap. between 21 to 30 dB of which 14 were having mixed loss. The remaining 8 patients i.e. 12.12% had an air bone gap of more than 31 dB after surgery.

Postoperatively, the average air bone gap was found to be 18.5 dB which was similar to that of MWYung¹⁰ who noted 19dB in his study. The average hearing gain was 9.76dB as compared to 11.8in MWYung series. Cavity Condition on Follow – Up All cases were followed up till the end of the study. During this period, we inspected the cavities for any excessive accumulation of wax, fungal debris, and persistence of discharge. 55 patients i.e. 82.09% had dry self cleansing cavities and rarely needed regular cleaning on their follow up visits. 7 cases had excessive accumulation of debris and wax. 4 of them had a very large cavity, which may be contributory to his problems. 2 patients had a high facial ridge leading to accumulation of wax in the cavity.5 cases had persistent ear discharge. Out of 17 inside out mastoidectomies done, 13(76.5%) cavities were dry. Shah N ¹¹ in his 75 inside out mastoidectomies found 89% of his cavities to be dry. In his series, 6% of the cavities were problem cavities and there was persistent discharge in 4% of the cases.

VI. Conclusion:

In this study we studied 67 cases of cholesteatoma and a canal wall down mastoidectomy was performed in all the cases. In this study the results regarding complete removal of the disease was comparable to any other series where canal wall down procedure was employed. There was improvement in postoperative hearing status and was also comparable to other series. The present series also analyzed the cavity problems which were comparable to other series of canal wall down mastoidectomies. The large postoperative cavity is usually associated with accumulation of wax, debris, discharge, etc. A smaller cavity is thought to decrease these problems. Most of the patients had a dry, self-cleaning cavity at the end of the study. From this study it appears that the incidence of various postoperative complications mentioned are few within 6 months followup. Most of them can be managed either by medical or surgical intervention.

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