

# AN ANALYSIS OF INSIDE OUT MASTOIDECTOMY WITH TYMPANOPLASTY WITH OR WITHOUT OSSICULOPLASTY FOR MANAGEMENT OF MIDDLE EAR CLEFT CHOLESTEATOMA

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## ABSTRACT:

**AIMS:** To evaluate the advantages and shortcomings of inside out mastoidectomy with tympanoplasty with or without ossiculoplasty for management of middle ear cleft cholesteatoma.

**Material and Methods:** It is a Prospective Observational study. 40 patients of chronic otitis media with cholesteatoma in the age group of 10 years to 50 years who underwent inside out mastoidectomy were included in the study. Reconstruction was done with autologous ossicle, PORP or TORP as required. Temporalis fascia graft was placed over the assembly.

**Results:** 21(52.5%) patients had attic cholesteatoma, 17(42.5%) had postero-superior retraction pocket and 2 (5%) patients had both attic cholesteatoma and postero-superior retraction pocket on otoscopic examination. During follow up 2 patients (5%) had persistent ear discharge within 6 months of surgery and 2 patients (5%) developed ear discharge after 7 months and 1 year after surgery. Recurrence rate was 10%. The mean gain in air conduction was 16.2dB.

**Conclusion:** By this study it can be concluded that inside out mastoidectomy provides advantages over both outside in canal wall down mastoidectomy and intact canal wall mastoidectomy.

**Keywords:** Cholesteatoma, Canal wall down mastoidectomy, canal wall up mastoidectomy, inside out technique.

## INTRODUCTION:

Surgical management of cholesteatoma has undergone numerous changes since the 1<sup>st</sup> published report of mastoidectomy 350 yrs ago by Schwartz and Eysell who popularized Cortical mastoidectomy in year 1873. Radical mastoidectomy was described by Zaufal in 1890<sup>1</sup>. Bondy revised this Technique<sup>2</sup>. With the advent of operating microscope, mastoidectomy underwent further refinement. At present debate between canal wall up and canal wall down mastoidectomy is ongoing<sup>3</sup>. Canal wall up mastoidectomy provides good hearing outcome and is not associated with mastoid cavity problem but it is

associated with higher recidivism rate than canal wall down mastoidectomy due to poor visualization and

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increased chances of postoperative retraction pocket formation<sup>4</sup>. Canal wall up mastoidectomy is not a suitable option in situations like extensive disease, low lying dura, disease in a well pneumatized mastoid, anterior placed sigmoid or a cleft palate. In these situations canal wall down procedure is the surgery of choice<sup>5</sup>. Recurrence of cholesteatoma and occurrence of postoperative retraction pocket is low in canal wall down mastoidectomy due to good intraoperative exposure.

Canal wall down mastoidectomy allows better visualization, greater confirmation of cholesteatoma eradication and lower rate of recurrence than canal wall up mastoidectomy but at the cost of need for a lifelong cavity care<sup>6,7,8</sup>. Canal wall down mastoidectomy can be approached either through outside in or inside out technique.

Inside out mastoidectomy is performed through trans-meatal route via retro auricular or endaural approach. There has been very few published studies on the technique and surgical outcomes after inside out mastoidectomies. Our study gains importance as we have analyzed 40 cases of inside out mastoidectomy with a minimum follow up period of 1.5 yrs in homogenous study condition.

#### **MATERIAL AND METHODS:**

This is a prospective observational study carried out at Era's Lucknow Medical College, Lucknow between May 12 to May 15. 40 patients of chronic otitis media with cholesteatoma in the age group of 10 years to 50 years who underwent inside out mastoidectomy during this period were included in study.

Otomicroscopic findings, preoperative pure tone audiometry were noted, HR C.T. temporal bone and middle ear cleft was done in all the patients. All the patients were operated by single surgeon. All the patients were operated under general anesthesia. All the patients were admitted and 1 dose of injection ceftriaxone was given prior to surgery, postoperatively injection ceftriaxone was continued for 3 days and then patients were kept on oral medications. Sutures were removed on 7<sup>th</sup> post operative day.

Patients were followed up for minimum period of 1.5 years. Follow up were done at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> week

after discharge from hospital, then after 3, 6, 12, 18 months, and in between if required.

#### **Surgical Tehnique:**

A Post auricular approach was used in all the patients. Meatotomy was performed and microscopic findings were noted. Tympanomeatal flap was elevated and ossicular status was checked. Inside out mastoidectomy was started with the widening of EAC followed by drilling of outer attic wall. Drilling was continued posteriorly depending on the extent of cholesteatoma sac. Cholesteatoma sac was removed along with granulations. Drilling was stopped once the healthy mucosa was seen (Fig 1). When cholesteatoma extended beyond the aditus canal wall down mastoidectomy was performed. Sinus tympani region was inspected by drilling the posterior canal wall upto the level of base of pyramid, to look for hidden cholesteatoma, which was subsequently removed. Incus along with head of malleus and occasionally whole malleus was removed to facilitate eradication of disease from anterior attic.

#### **Reconstruction:**

Reconstruction was done with autologous ossicle, PORP or TORP as required. Reconstruction was done in same sitting. Incus long process was drilled and a groove was created with a diamond burr on the body to accommodate the capitulum of stapes. The short process was placed under the malleus long process to complete the ossicular continuity. When the stapes suprastructures were absent incus was refashioned and placed over the stapes footplate. Conchal cartilage was used to construct the attic and posterior canal wall. Temporalis fascia graft was placed over the assembly. Meatoplasty when required was done.

#### **Analyzed Parameters:**

We analyzed the intraoperative advantages and disadvantages, postoperative hearing status, recidivism of cholesteatoma, complications and postoperative healing of cavity.

#### **RESULTS:**

Of 40 patients included in study 24(60%) were male and 16(40%) were female (Table-1) with mean age 24.8 years (range 10-50 years) (Table-2). 21 patients had attic cholesteatoma, 17 had posterosuperior retraction pocket and 2 patients had both attic cholesteatoma and

posterosuperior retraction pocket on otoscopic examination (Table-3). Otorrhoea was present in 39 (97.5%) cases. Hearing loss was present in all cases. 1 (2.5%) case presented with only hearing loss. Extent of disease as revealed during surgery was as follows. Cholesteatoma was limited to tympanum in 14 patients while in 26 patients it extended to mastoid. Ossicles were eroded in 30 patients. Long process of incus was eroded in 20 patients, body of incus in 6 patients, stapes suprastructure was eroded in 12 patients and malleus was eroded in 4 patients. Tympanic sinus was involved in 14 patients and disease extended anteriorly to Eustachian tube in 4 patients.

Ossicular reconstruction was performed in 30 cases using remodeled incus (n=17), malleus head (n=4), partial ossicular reconstruction prosthesis (n=6) (PORP) or total ossicular replacement prosthesis (n=3) (TORP).

**Post operative complications:-** Postoperative transient vertigo in 4 patients and postoperative transient facial palsy observed in 3 patients. All cases were followed up for a minimum period of 1.5 years. A dry and trouble-free ear was found in 36 (90%) patients in follow-up.

**Complications during follow-up period (Table-4)** were as follows-

- (a) 2 patient had persistent ear discharge. (5%)
- (b) 2 patient developed ear discharge after follow up period of 7 months and 1 year respectively. (5%)
- (c) 1 patient developed perichondritis postoperatively. (2.5%)
- (d) 2 patient had temporalis fascia graft infection. (5%)

Maximum patients achieved a dry cavity in 3 months time duration (Table-5). The postoperative hearing assessment was done 6 months after surgery (Table-6). In 4 Patients (10%) postoperative air conduction gain was between 21-30 dB, in 11 patients (27.5%) it was between 10-20 dB, in 19 (47.5%) it was less than 10 dB. In 6 patients (15%) there was no gain in air conduction. The mean hearing gain was 16.2 dB. In none of the patient deterioration in hearing status was noted. The mean preoperative bone conduction was 13.16 dB and remained unchanged postoperatively at six months after surgery.



**Fig-1:** Mastoid cavity after completion of inside out mastoidectomy.

**Table-1:** Distribution of patients according to sex

Sex	No of patients	Percentage
Male	24	60
Female	16	40

**Table-2:** Distribution of according to age group:

Age group	No of patients	Percentage
10-20	16	40
21-30	18	45
31-40	04	10
41-50	02	5

**Table-3:** Distribution of patients according to otoscopic findings:

Otoscopic findings	No of patients	Percentage
Attic cholesteatoma	21	52.5
Posterosuperior retraction	17	42.5
Attic cholesteatoma and posterosuperior retraction pocket both	2	5.0

Table-4: Post operative Complications.

Complications	No of patients	Percentage
Postoperative transient vertigo	4	10.0
Postoperative transient facial palsy	3	7.5
Perichondritis	1	2.5
Temporalis fascia graft infection	2	5.0
Recidivism	4	5.0

Table-5- Time of drying of cavity.

Time period (Months)	Cases	Percentage
1.0	3	7.5
1.5	5	12.5
2.0	12	30.0
2.5	9	22.5
3.0	7	17.5

Note: 4 patients had persistent discharge postoperatively.

Table-6: Post op hearing status at 6 months.

Gain in air conduction	No of patients	Percentage
No Gain	6	15.0
<10db	19	47.5
10-20db	11	27.5
21-30db	4	10.0

## DISCUSSION:

The 1<sup>st</sup> published description of cholesteatoma dates back to 16<sup>th</sup> century when Duverney described it to be abscess of bone originating from auditory canal<sup>9</sup>. Cholesteatoma can be defined as cystic lesion formed from keratinizing stratified squamous epithelium, the matrix of which is composed of epithelium that rests on stroma of varying thickness, the primatrix<sup>9</sup>. Its incidence can be upto 10% in people of chronic suppurative otitis media. There has been statistically significant decline in the incidence of cholesteatoma<sup>10</sup>.

Cholesteatoma itself is a morbid condition. The surgical management of cholesteatoma also results in deterioration of quality of life because of mastoidectomy cavities which require lifelong care from moisture and cleaning by trained personal.

Closed technique for management of cholesteatoma entails preservation of posterior wall of EAC but at cost of risk for recurrence of cholesteatoma due to limited intraoperative exposure and occurrence of post operative retraction pocket. Second stage surgery is frequently recommended 9-12 months after the initial surgery<sup>4,11</sup>. Canal wall down mastoidectomy provides good exposure and lower recidivism rate but at the cost of lifelong mastoid care. Inside out mastoidectomy provides the advantages of both canal wall down and canal wall up technique<sup>12,13</sup>. In our study 40 patients of chronic otitis media with cholesteatoma were managed with inside out mastoidectomy. All the patients were followed for a minimum period of 1.5 years. A dry and trouble free ear was found in 36 patients (90%) which is similar to previous studies<sup>13,14,15</sup>. 2 patient developed persistent ear discharge within 6 months of surgery and 2 patient developed ear discharge after 7 months and 1 year after surgery. We defined residual disease as persistent ear discharge starting within 6 months of surgery and recurrent disease as persistent ear discharge after 6 months of surgery. HRCT was done at end of 6 months to look for cholesteatoma and differentiate between residual and recurrent disease. Residual disease was due to incomplete removal of cholesteatoma during surgery and recurrent disease was due to new cholesteatoma formation because of persistence of predisposing factors. Both residual and recurrent diseases were designated as recidivism. A total of 4 patients developed persistent ear discharge after surgery making recidivism rate 10% which is in accordance with previous literature<sup>16,17,18,19,20</sup>.

This study elucidates the advantages of inside out mastoidectomy. Intraoperative advantages included early identification of ossicles, facial nerve, lateral semicircular canal and dural plate. Surgery could be stopped once the healthy bone is encountered thus reducing the size of the cavity as compared to outside in canal wall down mastoidectomy, where cavity size is usually large. Facial recess could be explored more easily and early in the procedure. Limited size of cavity

avored easy reconstruction. A chance of injury to lateral semicircular canal, dural plate and sigmoid sinus plate is minimal because of early identification of important landmarks. Ability to deal with Korner's septum is better as the aditus and lateral semicircular canal comes into the operating view early in the surgery. Reduced cavity size favors small meatoplasty which looks cosmetically better. Maximum patients had a dry cavity within 3 months time duration which is better than those stated in literature<sup>21</sup>. Postoperative air conduction gain 6 months after surgery was between 10-30 dB in 15 patients and in 19 patients it was less than 10 dB. In 6 patients preoperative and 6 months postoperative air conduction was same. Postoperative hearing gain in this study was better than that stated in studies of conventional mastoidectomy, this can be due to small cavity size and ease of reconstruction<sup>22,23,24</sup>. It is a technically demanding surgery and should be practiced after doing good number of temporal bone dissection. The results of inside out mastoidectomy are similar to outside in mastoidectomy but intraoperative and postoperative advantage gives this technique an edge over the outside in technique.

#### CONCLUSION:

It can be concluded that inside out mastoidectomy provides advantages of both outside in canal wall down mastoidectomy and canal wall up mastoidectomy. By this approach both eradication of disease and minimal disturbance to functional status of ear can be achieved. Because of early identification of landmarks chances of injury to vital structures are less. For limited cholesteatoma this approach provides the clear advantage of being minimally invasive. Postoperative cavity related problems are less, hearing status is better compared to outside in mastoidectomy.

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#### DISCLOSURES:

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2. Conflict of interest: The authors declare that they have no conflict of interest.
3. Informed consent: Informed consent was taken from every patient.

4. Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standard of institution.

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