Original Article

REVISION MASTOIDECTOMY AND OTO-ENDOSCOPY

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ABSTRACT:

OBJECTIVE:

To evaluate the reasons for persistent discharging mastoid cavities, the operative findings during revision surgery and medium term outcome.

MATERIALS AND METHODS:

Thirty four patients who had persistently discharging mastoid cavities underwent revision mastoidectomies between Jan 2008 to July 2013 were analyzed retrospectively.

RESULTS:

Recurrent or residual cholesteatoma was found in 86.6% of our cases. Poorly shaped cavities, high facial ridge, meatal stenosis/ inadequate concho-meatoplasty were the main reasons of failure of primary surgery. Peri-sinus and mastoid tip cells were the most frequent sites of residual air cells. A residual air bone gap ABG of < = 30dB was achieved in 60% of our cases.

CONCLUSION:

The characteristics and surgical outcome of persistently discharging mastoid cavities must be fully understood for complete control of disease and use of otoendoscope could decrease the recurrence rate.

Key words: Revision Mastoidectomy and Oto-Endoscopy

INTRODUCTION:

CSOM is still quite common in otolaryngology clinics in developing countries [1 - 3]. The complications associated with CSOM despite its reduced incidence still pose a great challenge[4 - 6] .The therapy of such ailment usually involves surgical intervention. The aim of such surgery is to achieve a dry self cleaning ear with complete removal of disease and preserve or restore the hearing whenever possible. The two most common surgical approaches in managing chronic active otitis media with or without cholesteatoma and chronic mastoiditis are canal wall up (CWUM) or canal wall down mastoidectomy (CWDM). The result of such surgery varies in literature[7 - 10].The common causes of surgical failure are recurrent or residual disease and poorly designed architecture of surgical cavities [11 - 22]. The present article reviews the causes of failure of primary surgical procedures in patients who presented at our centre with recurrent or persistent disease in ear.

MATERIAL AND METHODS:

Between the period of January 2008 to July 2013 105 cases of CSOM were operated at Madina Teaching Hospital Faisalabad. Out of these 34 cases on which revision mastoid surgery (CWDM) was performed during this

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period were reviewed. All of these patients had undergone primary surgery (CWDM) elsewhere. The patients record were reviewed and information gathered were age, sex, social status, clinical features, radiological status, audiological status, operative findings and post operative follow up. Patients having minimum follow up of 6 months were included with a range between 6 months to 2 years (mean follow up 1 year).

(CWD) mastoidectomy was performed in all cases by post aural route. At the end of procedure otoendoscopy using 30° 2.7mm telesope was done to look for any residual cholesteatoma. The decision regarding radical mastoidectomy was based on previously operated radical mastoidectomy, disease extension, unserviceable hearing and oto-endoscopic findings at the end of procedure if the disease was seen deep into sinus tympani which cannot be cleared by preserving stapes suprastructure. The hearing preservation was attempted in all cases by doing classical type III or type IV tympanoplasty using temporalis fascia graft depending upon presence or absence of stapes supra structure.

The functional hearing result is defined as mean of residual air bone gap i.e. difference between pre op bone conduction and post op air conduction. The functional hearing results in our study were based on 4 frequencies i.e. 250 Hz, 500 Hz, 1000 Hz and 2000 Hz. All the patients were evaluated for their functional hearing. Patients excluded from study were patients having graft failure or patients lost in follow up, thus 4 patients were excluded from the study. The mean pre op air bone gap was 31.8 dB and mean hearing threshold level was 52 dB.

RESULTS:

Majority of our patients were male (18 patients) with mean age 32.2 years (range 22 years to 48 years).

All were from rural areas of Punjab belonging to poor socio-economic status. Persistent discharging ear and hearing loss were the main symptoms present in all the cases followed by earache and headache **(See table I).**

Table:I

Presenting symptoms	No (n=30)No. of cases	Percentage
Otorrhoea	30	100%
Reduced hearing	30	100%
Earache	6	20%
Headache	6	20%
Tinnitus	4	13.3%
Vertigo/giddiness	3	10%
Facial paralysis	2	6.6%
Ear bleeding	1	3.3%

One third of our patients had some extra or intra cranial complications of CSOM(See fig I). In our study pre op mean hearing threshold level was 52dB range (range 45dB to 65 dB) and mean air bone gap was 31.8dB. Residual / recurrent cholesteatoma was the most common finding seen in 86.6% of our cases and in more than half of these cases it was associated with granulation tissue while in 13.3% patients had chronic granulomatous type of disease without cholesteatoma. CSOM with cholesteatoma was more commonly associated with extra / intra cranial complications **(See table II).**

(Fig: I)

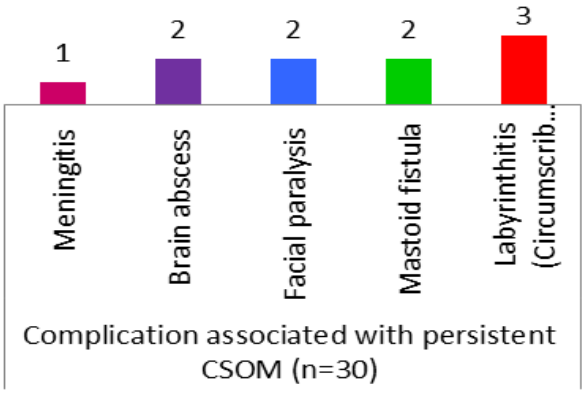


Table: II

Type of disease	**Complications**		**Total**
	Absent	Present	(n=30)
Chronic active media with cholesteatoma and mastoiditis	17 (65.3%)	9 (34.6%)	26 (86.6%)
Chronic active OM with mastoiditis without cholesteatoma	3 (75%)	1 (25%)	4 (13.3%)
Total	20 (66.6%)	10 (33.33%)	30 (100%)

The most frequent site of cholesteatoma was mastoid antrum / mastoid cavity 73% followed by attic 42.3%, and meso-tympanum 38.46% (Sinus-tympani and stapes) **(See table III)**.

Table: III

Site of disease	Without Cholesteatoma (n=4)		With Cholesteatoma (n=26)	Percentage	Total (n=30)
	No. of Cases	Percentage	No. of Cases	Percentage	Total percentage
Mastoid antrum/Mastoid cavity	3	75%	19	73 %	73.3%
Attic	1	25%	11	42.3 %	40%
Meso-tympanum	2	50%	10	38.46%	40%

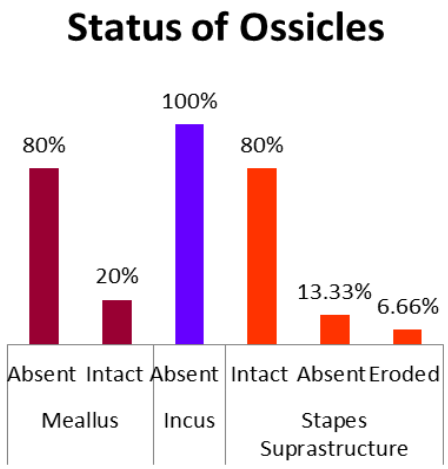
In 13.3% of our cases without cholesteatoma the disease was mainly seen in mastoid antrum and mastoid cavity (perisinus, perifacial, sinu-dural angle, perilabyrinthine and tip cells). Poor architecture of mastoidectomy was seen as the most common cause of failure in primary surgery. Facial ridge was inadequately lowered in 70% of cases. EAC/meatus was stenotic in 60% cases and bony over hang was seen in 20% of our patients **(See table IV)**.

Disease associated with faulty anatomic cavity

Table: IV

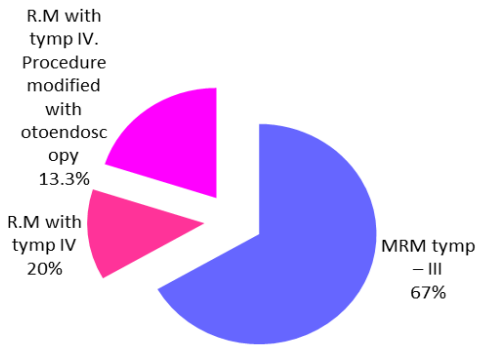
Anatomic Irregularity	With Cholesteatoma (n=26)		Without Cholesteatoma (n=4)		Total Cases (n=30)	
	No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage
High facial ridge	18	69.23%	3	75%	21	70%
Stenotic meatus	15	57.69%	3	75%	18	60%
Bony over hang	5	19.23%	1	25%	6	20%

(Fig: II)



During revision surgery the status of ossicles was also seen and it was observed that meallus was missing in 80% of cases while it was intact in remaining 20% of cases, incus was missing in all cases, stapes suprastructure was absent in 13.3% and eroded 6.6% of cases **(See Fig II)**.

(Fig: III)



Effect Of Otoendoscopy On Mastoidectomy

Facial nerve was exposed in 5 cases. The most common site was tympanic segment (3 cases) followed by second genu and vertical segment (1 case each). Two of our patients had presented with facial paralysis one 2 days and other 1 week after onset of paralysis. Both had exposed facial nerve due to cholesteatoma one at second genu and other in vertical segment, both had facial nerve recovered within 3 months of surgery. Labyrinthine fistula was seen in 3 cases all in

the region of lateral semi circular canal, which was covered by temporalis fascia graft after denuding the margins of fistula. The Middle fossa dura was exposed in 6 cases, herniation of dura was seen in 1 case, which was pushed back by manipulation, cortical bone piece along with salistic sheet placed and cavity was packed for 1 month. Oto-endoscopy at the end of procedure modified surgical procedure in 13.3% of our cases Concho-meatoplasty was required in all cases. **(See Fig III)**

RESULTS OF REVISION SURGERY:

In our study healing was defined on a doing well epithelized cavity. Complete healing was seen in 93.34% cases. There was no residual or recurrent cholesteatoma and no incidence of meatal stenosis. Intermittent otorrhea was seen in 6.66% which was controlled by regular suction clearance. The two patients with facial nerve paralysis had recovered within 3 months of surgery and had (Grade II recovery) at 1 year follow up and none of our patients had dizziness after surgery. Post op functional hearing results show that 80% of patients with MRM and type III tympanoplasty had ABG < =30dB while only 20% of our patients with RM and type IV tympanoplasty could have their ABG < =30dB although 60% of our patients with RM and type IV tympanoplasty had ABG < =35dB . Over all 60% of our patients had ABG < =30dB, all the patients had ABG < =40dB and mean ABG post op was 32dB **(See table V)**

Table: V

	MRM with tymp – III (n=20)		R.M with tymp – IV (n=10)		Total (n=30)	
Air – bone gap	**Pre op**	**Post op (mean Residual gap)**	**Pre op**	**Post op (mean Residual gap)**	**Total (n=30) Pre Op**	**Post Op**
10 – 20 dB	10%(n=2)	(n=Nil)	(n=nil)	(n=nil)	6.66%(n=2)	(n=nil)
20 – 30 dB	50%(n=10)	80%(n=16)	40%(n=4)	20%(n=2)	46.66%(n=14)	60%(n=18)
30 – 40 dB	40%(n=8)	20%(n=4)	40%(n=4)	80%(n=8)	40%(n=12)	40%(n=12)
> 40 dB	(n=nil)	(n=nil)	20%(n=2)	(n=nil)	6.66%(n=2)	(n=nil)

DISCUSSION:

The aim of modern otologic surgery for chronic otitis media is to make the ear safe and to preserve or restore the hearing although the former takes the priority over the later. Both (CWUP) and (CWDP) are done depending upon extent of disease, priority of the patient and surgical expertise available[7-10]. Persistent drainage and recurrent infection after mastoid surgery hallmarks failure at achieving these results. While intact canal wall procedures have reduced the difficulties associated with open cavities they are more prone to failure. Disease persistence after surgery should be carefully considered in the spectrum of complications and development of surgical approach that is both flexible and complete will maximize success in revision surgery[11 - 22]. The main objective in revision surgery is eradication of disease which was achieved in our study as 93.3% of ear cavities were dry and healed well within 3 months period and these results are comparable to that in literature[9,13,16,17,23]. Thus proper removal of disease process both cholesteatoma and chronic granulomatus air cells should be done and use of modern techniques like microscope and endoscope is key to outcome[9,18]. The most important factor in failure of (CWD) procedure resulting in persistent drainage or recurrence of disease is poor execution of surgical technique. The important factors contributing to failure of primary surgery are high facial ridge, stenotic meatus, badly shaped cavity, bony over hang, large mastoid bowl and residual or recurrent cholesteatoma[12 - 22,] . In our series 70% of patients had high facial ridge, 60% had stenotic EAC and 20% had bony over hang (See Table: IV). These anatomical defects act as mechanical barrier preventing self cleaning of cavity and promotes disease process by accumulation of debris. The lowering of facial ridge is necessary to prevent this effect by transforming the classical "bean-shaped" cavity into "Round-shaped" cavity. Our results are similar to that

seen in literature[17,19,20,21]. In our study cholesteatoma was found in 86.6% of our patients and was the most common reason of recurrence of disease and these findings were consistent with Bercin S et.al[21] and Tekin M et.al[23]. The most common site of cholesteatoma was mastoid 73% followed by attic and meso-tympanum and these findings are similar to Bhatia S et.al[17].The major sites of residual / recurrent disease contributing to discharging cavities at the time of revision mastoid surgery in our series were those in peri-sinus /sinu-dural angle and mastoid tip cells thus special attention should be given to adequately exteriorize the mastoid air cells especially those of the peri-sinus, perilabyrinthine and the mastoid tip areas[12,20,21,22]. The attic region which was second most common site of residual cholesteatoma in our series, disease was found in anterior epi-tympanum anterior to head of meallus in patients (n=6) having intact meallus and removal of meallus head was mandatory to remove the disease from this area. In others (n=5) the bony over hang was the main reason of persistence of disease in this area. In 40% of patients with residual cholesteatoma in meso-tympanum the sinus tympani and stapes were culprit areas. Otoendoscope was a great help to view this area as we had to convert 13.3% of our patient (n=4) into radical mastoidectomy after viewing with otoendoscope at the end of primary surgery under microscope. The cholesteatoma was lying deep in sinus tympani in these cases which could only be viewed by angled telescope and removal of stapes suprastructure was necessary to eradicate the disease from this area. Thus we agree with Ajalloueyan M et.al[9] and El-Meselaty k et.al[18] that usage of otoendoscope in cholesteatoma surgery is important as it will help to reduce the incidence of residual disease in mastoid surgery. The principle of creating a dry and self cleaning mastoid cavity involves extensive surgery. The size of a large cavity can be reduced by amputation of the mastoid tip and drilling it to level of EAC. Rounding of the cavity edges over the tegmen, sinodural angle and sigmoid sinus along with saucerization of the cavity helps in reducing the size of the cavity by prolapse of surrounding soft tissue within the cavity. New techniques of mastoid obliteration are also used with good results[24,25,26]. Decreasing the size of the cavity not only is important for healing but also decreases the need for post-operative cavity care as all of our patients had complete epithelization of cavity within 3 months. Narrow meatus is one of the common reasons of failure in CWD mastoidectomy[12,14,17,19,21] thus an enlarged meatus is an essential integral part of the CWD procedure and failure to perform an adequate meatoplasty may fail even the most perfectly performed CWD procedures. Adequate meatoplasty opening is necessary to provide adequate surface volume ratio for aeration, epithelial stability and good post operative visualization. The final appearance of the meatus should be cosmetically acceptable to the patients. Wide meatoplasty decreases the incidence of stenosis of canal after surgery as none of our patients had canal stenosis after 6 months to 2 years of follow up. Revision surgery of a chronic ear disease needs extra care because of the possibility of dehiscent or exposed facial nerve, fistula in labyrinth or dural exposure. This may be due to the disease process itself or result of the previous surgery. We had encountered exposed facial nerve in 16.6% (n = 5) of our cases as compared to 24% by Bhatia S et.al [17] and 29.7% by Wang HM et.al[27] . The most common site of facial nerve dehiscence was in the tympanic segment. Two of our patients had presented with facial paralysis, both had cholesteatoma covering the exposed facial nerve which was gently removed and patient had recovered the facial nerve paralysis within 3 months of surgery. The facial nerve should be identified from a distance and the disease should be removed with constant visualization of the facial nerve. Failure to adhere to this principle increases the risk of facial nerve injury. Familiarization with temporal bone anatomy is a key to the outcome and frequent temporal bone dissection plays an important role in such cases. Facial nerve monitoring is also an important tool to prevent such injury[28]. The occurrence of a labyrinthine fistula in a cholesteatomatous chronic ear is a frequent finding and these are usually located in the

lateral semicircular canal[17,27]. 10% of our patients (n=3) had labyrinthine fistula, all in the region of lateral semi circular canal which was managed by covering it with temporalis fascia graft after denuding the margins. The incidence of dural exposure in 20% (n=6) of our patients resembles Wang HM et.al[27]. These patients should be carefully managed as they may have brain herniation[17] as seen in one of our patients. We had pushed back the dura by manipulation, cortical bone piece was placed along with salistic sheet, cavity was packed and no recurrence was seen. The prerequisite for hearing improvement is a dry cavity with adequate air-containing middle ear space along with an intact tympanic membrane. In our study, we had done tympanoplasty at the same stage in all cases (n = 34). 4 of our patients who had graft failure and lost in follow up were excluded and only patients having successful graft intake up were included in the study. The hearing results were fairly acceptable, 80% of patients with type III tympanoplasty had ABG within 30dB and 60% of our patients with type IV tympanoplasty had ABG within 35dB. All of our patients had functional hearing < = 40dB which was fairly acceptable to our patients.Hearing rehabilitation in these open cavities is said to be effective from 25 to 40 dB Jackson et.al[29]. In this study the mean residual gap was 32 dB and the air-bone gap was closed to within 30 dB in 60% of patients as compared to only 46.6% pre-operatively and are results comparable to Veldman JE and Braunius WW[16] and Shrestha BL et.al[30].

CONCLUSION:

We conclude that revision mastoidectomy can be safely performed with good results. Thorough knowledge of temporal bone anatomy, disease behaviour and familiarity with reasons for failure in primary surgery are key to outcome. Otoendoscope can be a good tool to decrease the incidence of residual / recurrent disease in patients undergoing surgery for residual / recurrent disease. An attempt should be made to preserve or restore the hearing even in revision cases.

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