

Surgical Findings in Revision Radical Mastoidectomy

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Objective: To assess the intra-operative findings and the long-term results of 91 revision surgeries performed for failure after cholesteatoma surgery.

Design: Retrospective study.

Setting: King Abdul-Aziz University hospital, (KAUH).

Method: The medical records of ninety-one patients who had undergone mastoidectomy revision operations over 10 years period were reviewed, and the data were extracted and analyzed. The indications for revision were recurrent cholesteatoma and persistent otorrhea.

Result: Ninety-one patients were included in the study; twenty-nine were females and sixty-two were males, ages ranged from 6 to 63 years. Revision mastoidectomies were performed in canal wall down (CWD) mastoidectomies. Sixty-six (72.5%) had recurrent or residual cholesteatoma, 61 (67%) had narrow external canal and 44 (48.35%) had high facial ridge.

Infected not exenterated mastoid air cells were found in 49 patients (53.8%), involving closed supratubal recess in 26 (53%), persistent sinodural angle air cells and persistent mastoid apex air cells in 13 (26.5%) and persistent tegmental air cells in 10 (20.4%). After an average of 10 years follow up of revision mastoidectomy, 79 (87%) cases had dry and healed cavities.

Conclusion: Incomplete removal of infected mastoid air cells and incomplete aeration of the mastoid cavities are the most important factors in failure of the primary surgery. Successful CWD mastoidectomy requires removal of all diseased air cells.

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Although chronic otitis media with cholesteatoma is a disease that occurs globally, it is more common in developing countries. Cholesteatoma is a benign disease histologically; however, its behavior may be aggressive locally, and its invasive properties are associated with significant morbidity and on occasion mortality¹. Cholesteatoma may lead to bone destruction and other complications, for example meningitis, brain abscess, labyrinthitis, and facial nerve

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paralysis². The recurrence rates reported after surgery are reported to be between 7.6% and 57%³.

The only way to eradicate this disease is through surgery, aiming to achieve a dry self-cleansing ear and elimination of the disease. Literature reviews are replete with surgical treatment techniques, although much controversy exists concerning the optimal technique for managing cholesteatomas⁴.

The indications for revision mastoidectomy include recurrent cholesteatoma, recurrent suppuration, recurrent perforation, or recurrent or residual conductive hearing loss; the complications of revision surgeries are more hazardous and difficult than the primary surgeries.

The aim of this study is to assess the intra-operative findings and the long-term results of 91 revision operations performed for failures after cholesteatoma surgery.

METHOD

The medical records of patients who had revision canal down mastoidectomy from 1991 to 2000 were reviewed. The gender, age, patients' complaints, operated side; the number of earlier operations, the period between earlier ear operation and the revision surgery were documented.

During surgery cholesteatoma, granulation tissue, the state of ossicles, site of infection, location of residual cell tracts and complications were recorded. The pre and postoperative hearing levels were compared. The outcome of patients after 10-year follow up was documented. Residual or recurrent cholesteatoma, persistent or recurrent otorrhea, and re-perforation of the tympanic membrane are noted. All the surgeries were CWD procedures.

RESULT

Ninety-one patients had revision surgery, 29 females and 62 males. The age of the patients ranged from 6 to 63 years. The mean interval between the first and revision surgery was 18 months. Sixty-eight patients (74.7%) had their original surgery performed at our hospital, twenty-three (25.3%) were referred from other hospitals. Only consultants performed the revision mastoidectomies. Canal wall down revision procedure was performed in all the patients and radical mastoidectomy in seven ears.

Eighty-two cases (90.11%) presented with a wet, discharging mastoid cavity not responding to medical treatment, two (2.2%) had facial palsy, and one (1.1%) had discharging post-auricular fistula. At the time of revision mastoidectomy, cholesteatoma was found in sixty-six (72.5%), 61 (67%) had narrow external auditory canal and 49 (53.8%) had a high facial ridge. Infected not exenterated mastoid air cells were found in 49 patients (53.8%), involving closed supratubal recess in 26 (53%), persistent sinodural angle air cells and persistent mastoid apex air cells in 13 (26.5%) and persistent tegmental air cells in 10 (20.4%).

The results of intra-operative findings are summarized in Table 1. At recent clinical follow up 79 (87%) revision cases had dry and healed cavities. The average follow up was 10 years, with a range of 8 months to 17 years.

Table 1: Intra-operative Finding in the Patients Included in the Study

Intra-operative Findings	No. of Patients	Percentage
Cholesteatoma (8 had extensive cholesteatoma)	66	72.5
Narrow external canal	61	67
Granulation tissue in mastoid	49	53.8
High facial ridge	44	48.35
Polyp or polypoidal tissue	9	9.9
Facial nerve dehiscence	6	6.6
Fistula in lateral semi-circular canal	3	3.3
Prominent sigmoid sinus	3	3.3
Facial nerve paralysis	2	2.2
Erosion of attic	2	2.2
Large defect in dura plate (dura exposed)	1	1.1
Extension of cholesteatoma to zygomatic arch	1	1.1
Discharging post auricular fistula	1	1.1

DISCUSSION

The first three priorities in surgery for chronic otitis media are:

- The elimination of progressive disease to produce a safe and dry ear,
- Modification of the anatomy of the tympanomastoid compartment to prevent recurrent disease and
- Reconstruction of the hearing mechanism.

The indication for revision mastoidectomy is failure to achieve any of the above goals, which includes recurrent cholesteatoma, recurrent suppuration, recurrent perforation or recurrent residual conductive hearing loss¹.

Harkness et al described four factors, if present, which could influence the resulting mastoid cavity to remain dry². These were the presence of an open middle ear large cavity, a high facial ridge, a small meatus and infected not exenterated mastoid air cells. If all four factors were present, then the cavity has 100% chance of discharging⁴.

Revision surgery for chronic otitis media is clearly a more complicated and potentially risky procedure than primary surgery. In this study, there were two cases of facial nerve paralysis, one case of discharging post auricular fistula, one case of loss dural integrity and five cases with profound sensorineural hearing loss in the operated ear. Cottrell and Pulec found similar complications in their patients who had radical or modified radical mastoidectomy at the Mayo Clinic⁵. Vartiainen and Nuutinen reviewed the surgical findings and long-term results of 112 revision operations performed for failures after cholesteatoma surgery and found 71% with residual cholesteatomas and infected unexenterated mastoid air cells in 63% of ears⁶.

In this study, 66 patients (72.5%) were found to have cholesteatoma. Sixty-one patients (67%) had an inadequate meatus and 44 patients (48.35%) had a high facial ridge.

Infected but not exenterated mastoid air cells were found in 49 patients (53.8%), involving closed supratubal recess in 26 (53%), persistent sinodural angle air cells and persistent mastoid apex air cells in 13 (26.5%) and persistent tegmental air cells in 10 (20.4%).

It is not clear whether these findings alone or in combination were the causes of failure and persistent discharge. The extent of surgical exenteration during primary or revision surgery

regarding the uninvolved or uninfected cell is controversial. Brandow advocated that infected or diseased bone should be removed⁷.

Meatoplasty is possibly the most neglected and often the worst performed part of mastoid surgery⁸. An inadequately performed meatoplasty or subsequent stenosis due to infection results in inadequate ventilation of the cavity or in a cavity that is not self-cleansing with accumulation of debris and secondary infection. Inadequate lowering of the facial ridge leads to accumulation of debris which results in infection and discharge⁸. Wormald et al found that the facial ridge height in dry cavities was on average 3 mm lower than in wet cavities⁹.

A large mastoid cavity prolongs proper healing; therefore, amputation of the mastoid tip helps in reducing the size of the mastoid cavity by 50% and is more likely to result in a dry cavity⁴.

Fisch reported that the most important factor for the failure of canal wall down surgery is related to poor surgical technique. Incomplete exenteration of the infected cells and incomplete removal of cholesteatoma could lead to a persistent discharging cavity. Assessment of disease process and performing a complete surgical exenteration is the primary goal of revision mastoid surgery, and a dry and well healed ear is obtainable in most patients¹⁰.

CONCLUSION

In revision chronic otitis media surgery, the judgment and technical ability of a well-trained experienced surgeon are the most important factors affecting the outcome of the surgery.

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