INTRAOPERATIVE FINDINGS IN REVISION MASTOID SURGERY

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Abstract- While the main goals of surgery for chronic otitis media are elimination of disease and improving hearing, sometimes persistent drainage continues and mandates revision surgery. The aim of this study is to assess the intraoperative findings during revision mastoid surgery and to ascertain the preventable factors. A total of 88 revision mastoidectomies performed from 1996 to 2000 at Amiralam university hospital in Tehran were reviewed. The most frequent findings during surgery were retained infected air cells, cholesteatoma and mucosal inflammation/granulation tissue. The overall success of revision surgery was 97.5%. (Providing a dry and safe ear) While hearing preservation is possible in most cases, improvement of hearing is a difficult goal in these patients. With careful preoperative assessment and performing a complete surgical approach, the primary goal of revision mastoid surgery is obtainable in most patients.

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INTRODUCTION

The main goals of surgery for chronic otitis media are elimination of disease and improving hearing. When persistent drainage continues after surgery and conservative managements (medications and aural toilet) are unsuccessful, revision surgery will be mandatory (1). The cause of failure may be attributed to improper case selection and/or technical errors (2). The results of revision surgery are not as good as primary surgery and in addition will cause considerable morbidity for patients so reducing the failure rate after primary mastoid surgery is important for every otologic surgeon. The aim of this study was to assess the intraoperative findings during revision mastoid surgery and to ascertain the preventable factors.

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MATERIALS AND METHODS

From 1996 to 2000, at Amiralam Hospital in Tehran, the medical records of patients that had undergone revision mastoid surgery were reviewed and the results were documented. The patients were a heterogeneous group that had been operated by different surgeons in our center and many other centers but revision surgeries were performed by senior author (MS).

The following general data were recorded: gender, age and side of involved ear. The preoperative data were number of earlier operations, the period between earlier ear operation and the revision surgery and the patients' symptomatology. During the operation the main pathology (cholesteatoma, granulation tissue, etc), the state of ossicles, site of infection, location of residual cell tracts and complications were recorded. The pre- and post-operative hearing levels were compared. The final outcome of patients after follow-up period was documented. Residual or recurrent cholesteatoma, persistent or recurrent otorrhea, and reperforation of

the tympanic membrane are delineated for all surgical cases subdivided into intact canal wall (ICW) and canal wall down (CWD) procedures.

Minor operations such as myringoplasty and planned second stage procedures for ossicular reconstruction were excluded. Because of incomplete data, 23 patients were excluded and finally 88 patients entered the study.

RESULTS

Based on earlier operation, the patients were divided into 3 groups (Table 1). The frequencies and values for gender, age, the period between earlier ear operation and the studied operation and the patients' symptomatology are given in Table 2. In table 3 the intraoperative findings are presented based on the earlier operation.

The patients were analyzed as to the specific location of retained infected cells and granulation tissues or residual/recurred cholesteatoma in the mastoid region. Disease was found in hypotympanic/ retrofacial region in 52%, perilabyranthine in 35%, sinodural angle in 45%, sigmoid sinus in 10%, and mastoid tip in 78%.

The post-operative findings are provided in Table 4. The overall success of revision surgery was 97.5% (providing a dry and safe ear). The only recurred cholesteatoma was a patient with postoperative retraction pocket. The disease was removed and cartilage tympanoplasty performed. Otorrhea continued after operation and was non responsive to medical management. After 21 months and in second revision operation residual cholesteatoma was found in the middle ear and attic after and a CWD tympanomastoidectomy was performed.

Table 1. Classification of patients based on previous surgery

Group	Primary Operation	N (%)
A	ICW mastoidectomy	60/68
B	CWD mastoidectomy	20/24
C	Tympanoplasty (various types) ± atticotomy	10/11

Abbreviations: ICW, intact canal wall; CWD, canal wall down.

Table 2. Preoperative findings

Characteristic	Percent
Age (years)	30.1 (6-58) *
Male/Female ratio	53/47†
Period between 1st and studied operation (years)	8.6 (1- 35)*
Otorrhea	91%
Otalgia	48%
Poor hearing	94%
True vertigo	2%
Facial nerve paralysis	1%

* Mean (range).
† Ratio.

Table 3. Intraoperative findings*

Finding	Group 1	Group 2	Group 3
Cholesteatoma	18 (26)	7 (39)	2 (20)
Retained infected air cells	32 (47)	15 (83)	3 (30)
Cholesterol granuloma	8 (12)	2 (10)	-
Mucosal inflammation/ Granulation tissue	19 (27)	12 (67)	4 (40)
Eustachian tube obstruction	35 (51)	3 (10)	1 (10)
Labyrinthine fistulae	1 (2)	1 (6)	-
Facial nerve involvement	1 (2)	-	-
High facial ridge	-	8 (44)	-
Retained mastoid tip	-	4 (22)	-
Inadequate meatoplasty	-	4 (22)	-

*Data are given as number (percent).

Table 4. Postoperative findings*

Characteristic	Mean (range)
Follow-up duration (years)	2.4 (0.8-3.9)
Dry at the end of follow-up	97.5 (86) †
Recurred cholesteatoma	1‡
Dry perforation	1‡
Preoperative mean hearing level (dB)	57 (35-95)
Postoperative mean hearing level	32 (20-90)

*Data are given as mean (range) unless specified otherwise.
† Percent (number).
‡ Number.

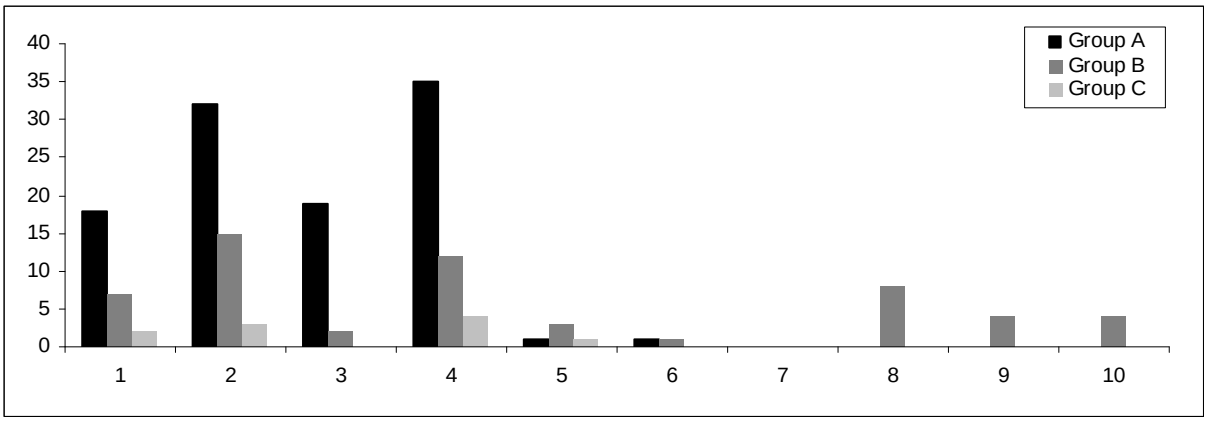

Fig. 1. Intraoperative findings. 1, cholesteatoma; 2, infected air cells; 3, cholesterol granuloma; 4, granulation tissue; 5, Eustachian tube obstruction; 6, labyrinthine fistulae; 7, facial nerve involvement; 8, high facial ridge; 9, retained mastoid tip; 10, inadequate meatoplasty.

DISCUSSION

The most common cause of failure in mastoid surgery performed in order to achieve a dry and disease free ear include persistent suppurative process in middle ear /mastoid and recurrent and/ or residual cholesteatoma.

As stated by Veldman *et al*, (2) the recurrent or persistent disease in both ICW and CWD procedures is often due to heavily diseased mucosa within the mastoid or middle ear cavity and eradication of it will solve the problem in the majority of patients.

The long term outcome of revision mastoid surgery (providing a dry and noninfected ear) generally is good. Nadol (3) in a review of 66 patients reported a success rate of 85% in creating a dry ear. In his study recurrent cholesteatoma was found in 41% of the CWD and 70% of ICW procedures requiring revision. Unexenterated cells were found most commonly in tegmental cells and sinodural angle. In the Veldman study (2) 90% of revision cases finally had a dry and safe ear. In this study the most common location for persistent disease was around the facial nerve, sigmoid sinus and mastoid tip and nearly 30% of patients had recurrent or residual cholesteatoma. The success rate of revision mastoidectomy in our series of patients compares favorably well with results of other revision series and those of primary surgery (4, 5).

Exenteration of all disease in every individual case is the aim of revision surgery but this is not always successful. The recurrent cholesteatoma or reperforation after revision surgery shows that factors other than mucosal disease or retained cell tracts may be responsible for failure in mastoid surgery. For example 58% of our patients had Eustachian tube obstruction by granulation and/ or scar tissue that may lead to tube dysfunction.

Reperforation of TM (2.5%) occurred with near the same frequency of other series for primary (5) or revision surgeries (2, 4). In despite of other reports we had no case of persistent otorrhea after revision surgery (2, 6).

Hearing rehabilitation must be kept in proper perspective and is a secondary goal in this group of patients. Jackson et al (7) in patients with difficult ear disease concluded that hearing rehabilitation is not a reasonable expectation in these complicated cases but hearing is rarely worsened after infection control. Our data support this statement and the results of other series (8). In conclusion, with careful assessment of disease process and performing a complete surgical approach, the primary goal of revision mastoid surgery (dry and well healed ear) is obtainable in most patients. Although hearing improvements is a secondary goal, it is possible to preserve or improve the hearing in this patient population.

Conflict of interests

The authors declare that they have no competing interests.

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