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Main Articles

Revision myringoplasty

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Abstract

This retrospective study was undertaken to review the short- and long-term results of 70 revision and 16 re-revision myringoplasty operations. Of the former, 43 cases (61.4 per cent) had initial success, six weeks following surgery. The leading causes of immediate failure (27 cases) were associated with a complete no-take of the graft, infection with graft necrosis and poor anterior adaptation of the graft in decreasing order. Six out of the 43 patients developed late re-perforations during the follow-up period, thus reducing the success rate of revision myringoplasty to 52.8 per cent. Late re-perforations were attributed to insidious atrophy of the tympanic membrane or episodes of acute otitis media. Sixteen patients underwent re-revision myringoplasty and their success rate was 62.5 per cent. The overall success rate of revision and re-revision myringoplasty was 54.7 per cent. It has been concluded that results of revision myringoplasty were independent of patients' age, location and size of perforation and the seniority of the surgeon.

Key words: Otitis media, suppurative; Revision, surgical; Prognosis

Introduction

A previous report from our department (Sadé *et al.*, 1981), showed an initial successful closure of ear-drum perforation, in more than 80 per cent of patients with chronic otitis media who underwent myringoplasty. These results were comparable to those reported by other surgeons (Sheehy and Anderson, 1980; Glasscock *et al.*, 1982; Vartiainen *et al.*, 1985). Another study from our department (Jurovitzki and Sadé, 1988), demonstrated that 14 per cent of the patients with initial successful myringoplasty, developed late re-perforations during follow-up. Consequently, otologists are confronted with a considerable number of patients who failed surgery and are suitable candidates for revision myringoplasty. Vartiainen (1993), Packer *et al.* (1982) and Gibb and Chang (1982), reported that the success rate of revision myringoplasty had not differed from that of primary operations. By contrast, Halik and Smyth (1988), achieved only 60 per cent of perforation closure at revision surgery.

Unfortunately, the current data are very few and contradictory, thus making it difficult to provide patients with accurate information concerning the prospects of such a procedure. Therefore, the present study was undertaken to elaborate comprehensively on the short- and long-term results of revision myringoplasty operations, and to assess the impact of several factors such as: cause of failure in primary operation, location and size of perforation, patient's age and seniority of the surgeon on the final outcome of revision surgery.

Materials and methods

The retrieved charts of 78 patients who underwent 86 revision and re-revision myringoplasty operations between 1980–1995, form the material of the study. There were 70 revision myringoplasty operations following failure of a first surgical attempt, of which 63 (90 per cent) had initially simple chronic otitis media and seven (10 per cent) had a traumatic perforation. Sixteen patients underwent re-revision myringoplasty following two successive failures of perforation closure. There were 29 males and 49 females. The patients' age ranged between five and 66 years, their mean age was 29. The right ear was operated in 44 patients and the left ear in 34. Prior to surgery, all ears were dry with no sign of active inflammation. The surgical procedure involved either a postauricular or endaural incision, and preparation of a graft material, which consisted of temporalis fascia in 76 cases, tragal perichondrium in seven and mastoid periosteum in three. Following freshening of the perforation edges, a posterior-inferior tympano-meatal flap was elevated. Using the

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TABLE I
CAUSES OF FAILURE IN PRIMARY OPERATIONS

	No.	Per cent
Immediate failures		
Infection	21	35.0
Poor anterior adaptation	17	28.4
Complete no-take of the graft	8	13.3
Unknown	2	3.3
Subtotal	48	80.0
Late re-perforations		
Atrophy of the graft without infection	7	11.7
Infection	4	6.7
Trauma	1	1.6
Subtotal	12	20.0
Total	60	

underlay technique exclusively, the graft was placed medial to the remnant of the eardrum. Cases which required ossicular chain reconstruction were excluded from the study. The duration of the post-operative follow-up period varied between six weeks and eight years, the mean period was 22 months.

Audiological examination was carried out using a clinical audiometer calibrated according to ISO standards. The measurements of the pre-operative and post-operative air and bone conduction thresholds over the speech frequencies (500 Hz, 1000 Hz and 2000 Hz), served to calculate the post-operative air-bone gap closure.

Results were compared by the Chi-square test.

Results

Of the 70 patients who underwent revision myringoplasty, 60 had their first operation in our department, while 10 were operated elsewhere. Of the 60 patients who had their primary myringoplasty in our department by staff members, or senior residents, 48 failed immediately and 12 had late failures. Of the immediate failures: 21 patients developed a post-operative infection with purulent aural discharge and necrosis of the graft, 17 had a poor anterior adaptation of the graft manifested by a partial closure of the perforation posteriorly, and eight at the first post-operative follow-up visit had a complete no-take of the graft, characterized by a perforation identical to the original one. The most common cause of delayed failure was a graft atrophy without infection, developing insidiously months/or years after surgery (Table I).

Sixteen of the re-perforations were large and occupied half or more of the eardrum surface, while 54 were smaller. It was observed that the size of the immediate re-perforations varied considerably, while late re-perforations were exclusively small. There were 41 anterior re-perforations, 26 central and three posterior ones. Three patients had two re-perforations in the same eardrum.

TABLE II
RESULTS OF REVISION MYRINGOPLASTY (70 PATIENTS)

	No.	Per cent
Initial success	43	61.4
Immediate failure	27	38.6
Late failure	6	8.6
Overall success	37	52.8

TABLE III
CAUSES OF FAILURE IN REVISION MYRINGOPLASTY

	No.	Per cent
Immediate failures		
Complete no-take of the graft	13	39.4
Graft necrosis associated with infection	9	27.3
Poor anterior adaptation of the graft	5	15.1
Subtotal	27	81.8
Late re-perforations		
Atrophy of the graft without infection	3	9.1
Acute otitis media	3	9.1
Subtotal	6	18.2
Total	33	

Revision surgery was performed by a staff surgeon in 60 cases and by a senior resident in 10. The time lapse from primary operation to revision, ranged from four months to 12 years, with a mean of three years.

Table II shows the short- and long-term results of revision myringoplasty operations. The overall success rate was 52.8 per cent. Forty-three (61.4 per cent) had intact tympanic membranes, while 27 (38.6 per cent) disclosed an immediate perforation at the first post-operative visit, six weeks after surgery. During the follow-up period, six patients with an initial success developed late re-perforations. The time interval from revision surgery to the appearance of late re-perforation, ranged from five months to seven years.

Table III shows the causes of failure in revision surgery. Thirteen patients of the immediate failure group had a complete no-take characterized by disappearance of the graft, and presence of a perforation similar to the original one. Nine had infection with purulent discharge and necrosis of the graft. In another five patients there was a partial take of the graft at the posterior portion, leaving a smaller perforation anteriorly. Of the six late revision failures, three patients developed a gradual thinning-out of their eardrum, causing a small perforation that occurred with no history of trauma or evidence of infection. The other three developed re-perforation following an episode of acute otitis media. According to our data, the cause of perforation following primary and revision surgery was similar only in one third of the cases, others had a different cause of failure in each procedure.

Table IV demonstrates that the success rate of revision myringoplasty was similar in all age groups. Likewise, Table V shows close results for anterior perforations, and those located in other regions of

TABLE IV
SUCCESS OF REVISION MYRINGOPLASTY VERSUS AGE

Age	No. of ears	Per cent of success
<12	16	62.5
12–49	42	59.5
>50	12	66.6

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TABLE V
SUCCESS OF REVISION MYRINGOPLASTY VERSUS THE LOCATION OF PERFORATION

	Success	Failure	Per cent of success
Anterior perforation	26	15	63.4
Perforation at other locations	17	12	58.6

$p = 0.68$

TABLE VII
SUCCESS OF REVISION MYRINGOPLASTY VERSUS THE SENIORITY OF THE SURGEON

	Success	Failure	Per cent of success
Staff member	38	22	63.3
Senior resident	5	5	50

$p = 0.42$

the eardrum. Furthermore, no significant difference was found between small and large perforations, or between the results of operations performed by staff members versus senior residents (Table VI, VII).

Sixteen patients underwent re-revision myringoplasty, of whom eight were referred to us by other hospitals, following failure of two successive attempts, the other eight had their previous surgery in our department. Table VIII shows a 62.5 per cent success rate of re-revision myringoplasty.

Hearing results after revision myringoplasty operation are shown in Table IX. The mean post-operative hearing gain was 5.8 dB. Only one case of significant sensorineural hearing loss (loss of bone conduction thresholds by 10 dB or more) occurred, with a 15 dB deterioration in the post-operative bone conduction thresholds.

Discussion

The results of the present study demonstrate a lower success rate of revision myringoplasty operations, compared with those of primary myringoplasty, presented in an earlier publication from our department (Sadé *et al.*, 1981). The difference in the success rate between the two studies is further emphasized because the results of primary myringoplasty were obtained from a training programme, where a considerable number of operations were performed by residents; while the great majority of revisions were operated by experienced staff members.

Packer *et al.* (1982) and Gibb and Chang (1982), reported that the success rate of revision myringoplasty was high and similar to primary operations. Likewise, Vartiainen (1993) also found a high success rate of revision surgery (87 per cent). By contrast, our results reveal a smaller chance of success in revisions compared to primary operations, and closely resemble those of Halik and Smyth (1988), who showed a 59 per cent perforation closure in revision as well as in re-revision myringoplasty.

An assessment of the possible factors associated with the results of revision myringoplasty, reveals that the condition of the middle ear mucosa, as well as the graft material and the operative technique had no significant effect on the results. All ears were found dry at the time of surgery, temporalis muscle fascia was the graft material in most cases, and the underlay technique was employed exclusively. Furthermore, a similar success rate of perforation closure was achieved, whether the perforation was located anteriorly or elsewhere. This is in contrast with Halik and Smyth (1988) and Sadé *et al.* (1981), who reported that perforation of the anterior half of the tympanic membrane had a higher failure rate than all other sites. The increased failure rate was attributed, according to Halik and Smyth (1988), to visualization difficulties that caused limited exposure of the operative field. Our results indicate that anterior perforations do not have a higher failure rate, and a score of approximately 60 per cent was found in perforations involving all areas of the tympanic membrane.

Sadé *et al.* (1981) showed a significant relationship between size of perforation and success of operation. By contrast, our findings are in concert with Packer *et al.* (1982) and Gibb and Chang (1982), who did not find a significant difference between perforations that occupied more than half of the tympanic membrane, and those covering a smaller area. The latter comment also applies to the success rate of revision myringoplasty performed by staff members. In our department a considerable number of myringoplasties are performed by residents, except for revisions that are reserved mostly for staff members, in order to provide these patients with the best chance of success. Our analysis shows no significant difference, in the performance of staff members and senior residents, yet both fared relatively poorly when compared with the score of primary myringoplasty operations.

The data show that approximately 14 per cent of the patients with an initial success (six out of 43), developed late re-perforations in revision, as well as in primary myringoplasty operations (Jurovitzki and Sadé, 1988). In light of the equal ratio of late failures, it is concluded that immediate failures are responsible for the increased failure rate in revision myringoplasty. Complete no-take of the graft, constituted the leading cause of immediate failure

TABLE VI
SUCCESS OF REVISION MYRINGOPLASTY VERSUS THE SIZE OF PERFORATION

	Success	Failure	Per cent of success
Large perforation	8	8	50
Small perforation	35	19	64.8

$p = 0.28$

TABLE VIII
SUCCESS OF RE-REVISION MYRINGOPLASTY

	No. of patients	Per cent
Success	10	62.5
Failure	6	37.5
Total	16	

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TABLE IX
HEARING RESULTS OF REVISION OPERATIONS (in dB)

	Mean
Air conduction threshold	
Pre-operative	36.3
Post-operative	28.9
Bone conduction threshold	
Pre-operative	15.1
Post-operative	13.5
Air-bone gap	
Pre-operative	21.2
Post-operative	15.4

in revision myringoplasty (48 per cent). Other causes were infection with graft necrosis and poor anterior adaptation of the graft. Complete no-take could be related to a technical fault of the surgeon. However this is not in keeping with the fact that in primary myringoplasty operations it was responsible for a relatively small proportion of immediate failures. It is also worthy of note that revision surgery was regularly performed by experienced surgeons, who scored considerably higher in primary operations. Thus, it may be suggested that no-take of the graft is not necessarily linked to a technical fault, but rather associated with the operated ear, and may reflect the consequences of a reduced blood supply to those ears that already had chronic infection and a previous unsuccessful intervention. Poor anterior adaptation of the graft, which resulted in a smaller perforation at the anterior portion is considered a technical fault, and was responsible for 19 per cent of the immediate failures.

It has been reported that 0– three per cent of the patients who underwent myringoplasty operations, developed a post-operative sensorineural hearing loss (Gibb and Chang, 1982; Halik and Smyth, 1988). In our series, one out of 78 patients had a 15 dB deterioration of bone conduction thresholds in the operated ear. Moreover, Vartiainen (1993) in 38 cases, as well as Gibb and Chang (1982) in 55 cases, observed no sensorineural hearing loss among their patients who underwent revision myringoplasty. These data suggest that revision myringoplasty operations do not increase the likelihood of developing significant cochlear damage.

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References

Gibb, A. G., Chang, S.-K. (1982) Myringoplasty (a review of 365 operations). *Journal of Laryngology and Otology* **96:** 915–930.

Glasscock, M. E. III, Jackson, C. G., Nissen, A. J., Schwaber, M. K. (1982) Postauricular undersurface tympanic membrane grafting. *Laryngoscope* **92:** 718–723.

Halik, J. J., Smyth, G. D. L. (1988) Long-term results of tympanic membrane repair. *Otolaryngology – Head and Neck Surgery* **98:** 162–169.

Jurovitzki, I., Sadé, J. (1988) Myringoplasty: long-term follow-up. *American Journal of Otology* **9:** 52–55.

Packer, P., Mackendrick, A., Solar, M. (1982) What's best in myringoplasty: underlay or overlay, dura or fascia? *Journal of Laryngology and Otology* **96:** 24–41.

Sadé, J., Berco, E., Brown, M., Weinberg, J., Avraham, S. (1981) Myringoplasty short and long-term results in training program. *Journal of Laryngology and Otology* **95:** 653–665.

Sheehy, J. L., Anderson, R. G. (1980) Myringoplasty: a review of 472 cases. *Annals of Otology, Rhinology and Laryngology* **88:** 331–334.

Vartiainen, E., Karja, J., Karjalainen, S., Harma, R. (1985) Failures in myringoplasty. *Archives of Otorhinolaryngology* **242:** 27–33.

Vartiainen, E. (1993) Findings in revision myringoplasty. *Ear, Nose and Throat Journal* **72:** 201–204.

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