

Factors that affect the outcome of open-technique procedures performed in the treatment of cholesteatoma

Kolesteatom nedeniyle açık tenik cerrahi uygulanan olgularda başarıyı etkileyen faktörler

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Objectives: We evaluated the factors that have considerable significance on the outcome of open cavity procedures in the treatment of cholesteatoma.

Patients and Methods: The study included 66 patients (43 males, 23 females; mean age 47 years; range 21 to 69 years) who underwent surgery for cholesteatoma. Of these, 56 patients completed at least a five-year follow-up.

Results: Mucosal infections and granulation tissue formation occurred in seven patients (10%) in the early postoperative period. Retraction pockets developed in three patients (4%); of these, only one patient required excision because of deep localization. Drum perforations that occurred in two patients (3%) were repaired by myringoplasty. Revision surgery was performed in four patients (7.1%) due to residual cholesteatoma within a five-year follow-up.

Conclusion: The height of the facial ridge was found as the most important factor related to a successful outcome of open-technique procedures. Other factors included the creation of a smooth mastoid cavity with round edges, removal of all diseased mastoid cells, and an extensive conchameatoplasty.

Key Words: Cholesteatoma, middle ear/surgery/complications; otitis media with effusion/surgery; mastoid/surgery; mastoiditis/surgery; postoperative complications; recurrence; tympanic membrane.

Amaç: Çalışmamızda, kolesteatom tedavisinde uygulanan açık teknik ameliyatlarında başarıyı etkileyen faktörler araştırıldı.

Hastalar ve Yöntemler: Kolesteatom nedeniyle açık teknik uygulanan 66 hastaya (43 erkek, 23 kadın; ort. yaş. 47; dağılım 21-69) ait uzun dönemli sonuçlar değerlendirildi. Bunların 56'sı beş yıllık düzenli takibi tamamlamış hastalardı.

Bulgular: Ameliyat sonrası erken dönemde yedi hastada (%10) granülasyon dokusu ve mukozal enfeksiyon görüldü. Üç hastada (%4) retraksiyon cebi oluştu; ancak bunların sadece birinde eksizyon gerekti. İki hastada (%3) ameliyat sonrası dönemde zarda oluşan perforasyon miringoplasti yapılarak kapatıldı. Beş yıllık takip süresince dört hastada (%7.1) rezidü kolesteatom nedeniyle revizyon cerrahisi yapıldı.

Sonuç: Açık teknikte ameliyat başarısını etkileyen en önemli faktörün fasyal tümsek yüksekliği olduğu sonucuna varıldı. Kenarları keskin olmayan düzgün yüzeyli mastoid kavite oluşturma, tüm hastalıklı hücrelerin temizlenmesi, geniş konkameatoplasti oluşturma başarıyı etkileyen diğer faktörler olarak belirlendi.

Anahtar Sözcükler: Kolesteatom, orta kulak/cerrahi/komplikasyon; efüzyonlu otitis media/cerrahi; mastoid/cerrahi; mastoidit/cerrahi; ameliyat sonrası komplikasyon; nüks; timpanik membran.

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The optimum management of cholesteatoma in patients with chronic otitis media is still a matter of debate. In general, open-technique procedures are preferred in cases with facial recess or tympanic sinus involvement, and/or stapedial supra-structure erosion.

Open-technique tympanoplasties are single-stage procedures and have been shown to significantly reduce recurrence rates in the treatment of cholesteatoma. However, because it implies an abnormally shallow framework of the tympanomastoid cleft, which is a disadvantageous condition for the reconstruction of a functioning sound conducting system, this technique is less effective with regard to the surgical restoration of the auditory function.^[1] Moreover, even when open-technique procedures are used, it is still difficult to ensure a dry cholesteatoma-free ear in every case. Special attention to certain technical details during surgery may reduce the likelihood of recurrence.^[2]

The aim of this study was to evaluate the long-term results of open-technique procedures for cholesteatoma, to determine the factors that have influence on the outcome, and to identify the ways to improve the results of surgery in order to reduce the incidence of residual or recurrent disease.

MATERIALS AND METHODS

The study group included 66 patients (43 males, 23 females; mean age 47 years; range 21 to 69 years) who underwent open-technique surgery for cholesteatoma at Başkent University Hospital and Bayındır Hospital, both in Ankara, between 1992 and 1997. Of these, 56 patients completed a follow-up period of five years. Fifteen patients had undergone a previous surgery for cholesteatoma.

The indications for open-technique procedures in cholesteatoma cases were as follows: extension to the antrum and/or the Eustachian tube; involvement of the facial recess and tympanic sinus to the degree that it cannot be controlled by endoscopic methods; erosion in the stapedial crura; osteitis or erosion in the posterior meatal wall; the presence of residual or recurrent disease that may require an unplanned second-stage operation; uncontrolled labyrinthine fistula; and involvement of the only hearing ear. Indications for surgery are summarized in Table I.

Three different open surgeries were employed, namely, radical mastoidectomy, Bondy operation, and open-technique tympanoplasty. In each operation, the following measures were taken to improve the

outcome: the sharp edges of the mastoid cavity were rounded; the cavity was smoothed; the height of the facial ridge was reduced; an extensive conchameatoplasty was performed; and all diseased mastoid air cells were removed.

RESULTS

All the patients were adults. None of the patients had any systemic disease, e.g. allergy, that might interfere with the clinical presentation of cholesteatoma in the temporal bone.

Radical surgery was performed in 29 patients (44%), Bondy operation in two patients (3%), and open-technique tympanoplasty in 35 patients (53%). Cholesteatoma was located in the tympanic sinus and facial recess in 49 patients (74%); involvement of the antrum was found in 57 patients (86%), and Korner's septum was present in 13 patients (19%).

Concerning open-technique tympanoplasty procedures, 20 patients (30%) underwent type III ossicular reconstruction, and 15 patients (22%) underwent stapediomyringopexy. In ten cases (15%), temporalis fascia was used to line the cavity after surgery.

In 17 patients (25%), dehiscence was observed on the bony covering of the horizontal and pyramidal segments of the facial nerve.

Table II presents the findings of 56 patients who completed a five-year follow-up period. Within the first postoperative year, seven patients showed granulation tissue formation, four of whom had an excessively high facial ridge. These four patients were successfully treated with debridement and topical ciprofloxacin.

TABLE I
INDICATIONS FOR OPEN-TECHNIQUE PROCEDURES

	No. of cases
Site of cholesteatoma	
Antrum	57
Eustachian tube	12
Tympanic sinus and facial recess	49
Stapedial crura erosion	21
Osteitis or erosion of the posterior canal wall	7
Recurrent or residual disease (unplanned second surgery)	10
Uncontrolled labyrinthine fistula	3
The only hearing ear was affected	1

TABLE II
FINDINGS AFTER FIVE-YEAR FOLLOW-UP
IN 56 PATIENTS

	No. of cases	%
Healthy radical cavity	20	35.7
Intact tympanic membrane with healthy cavity	27	48.3
Perforated tympanic membrane with healthy cavity	2	3.5
Retraction pocket formation	3	5.4
Residual cholesteatoma	4	7.1

Four other patients developed early-postoperative mucosal infections, all of which resolved with local antibiotic applications.

Three patients developed retraction pockets during the follow-up period, and pocket excision was required in only one patient. Two patients developed drum perforations, and myringoplasty was performed in both cases. Residual cholesteatoma was encountered in the tympanic sinus in four patients. These patients underwent revision surgery.

DISCUSSION

All mastoid air cells should be removed in patients with cholesteatoma because the remaining diseased cells in the mastoid bone may ultimately lead to recurrences. In particular, the coexistence of cholesteatoma and osteitis mandates the eradication of all diseased cells to obtain a healthy ear. Residual sharp edges or irregularities on the surface of the cavity may hamper re-epithelialization and facilitate granulation tissue formation. Thus, a smooth rounded cavity is a major key for success when open technique procedures are to be performed.^[3]

Patients with open mastoid cavities often complain about debris accumulation in the ear. Any residual dampness may give rise to secondary infections. Creating a smooth cavity and performing an extensive conchameatoplasty during the operation will promote self-cleansing of the cavity afterwards, and will thus allow the ear to remain dry and healthy, even after swimming.^[4,5]

Open-technique procedures for cholesteatoma provide excellent access to the mastoid and middle ear cavities postoperatively.^[6] The height of the facial ridge is very important with respect to viewing the

posterior part of the mastoid cavity. A low ridge enables the examiner to observe the entire cavity.^[7] In order to achieve a healthy ear, Wormald and Nilssen^[8] proposed 3 mm as the ideal height for the facial ridge. Reducing the ridge to a height lower than this may increase the risk for facial nerve damage.

It has been stated that a successful outcome is almost always achievable provided that the above-mentioned criteria are fully met.^[9-11] In addition, van Hasselt^[12] proposed that a vascularized pedicled temporalis fascia flap be placed in the cavity to keep the mastoid cavity dry and clean. This provides a vascularized tissue bed on which a more stable epithelium can grow.

Portmann^[13] defined the "V/S ratio," where V and S represent the volume of circulating air from outside and the surface area of the skin in the cavity, respectively. Since these values may differ individually, the aim during open-technique procedures is to increase V (meatoconchoplasty) and decrease S (reconstruction of the posterior auditory canal, obliteration of the cavity), or to obtain an appropriate combination of both.

Görür et al.^[14] observed in their revision surgeries that an insufficient meatoplasty, a high facial ridge and residual diseased cells were highly responsible for recurrences.

Recurrent cholesteatoma is always related to persistent Eustachian tube dysfunction. Nevertheless, certain measures can be taken to reduce the occurrence of postoperative retraction pockets. Removal of the anterior epitympanic recesses is very important in preventing the formation of these pockets.^[15] The type of the graft material used is also important in this regard. Composite cartilage and perichondrium grafts tend to resist negative pressures in the middle ear, which may be caused by Eustachian tube dysfunction; thereby strengthening the grafted tympanic membrane and preventing retraction pocket formation. Another factor associated with retraction pockets is the height of the facial ridge; a value above 3 mm may result in retraction pocket formation in the posterior epitympanum. Retraction pockets may even develop in cases in which the medial part of the mastoidectomy cavity is not properly obliterated. It should be known that complete obliteration of the cavity reduces the incidence of cholesteatoma recurrence to 5%.^[16] Alternatively, reconstruction of the cavity rather than obliteration has been proposed to overcome inherent problems of having open cavities.^[17]

In addition to retraction pockets, accumulation of epithelial debris is another problem that may occur following open procedures. This is especially common in cases with a narrow meatus, in which the transport mechanism of keratin is interrupted. An extensive conchameatoplasty facilitates the removal of such debris.

These five above-mentioned parameters for open-technique surgery all play a significant role in achieving a healthy ear, but the height of the facial ridge seems to be the most relevant factor to avoid recurrences. A lower ridge enables the surgeon to clearly visualize the facial recess and tympanic sinus during the procedure as well as reducing postoperative problems.

Our data from 56 patients with a long-term follow-up indicated a residual cholesteatoma rate of 7.1% within five years after surgery. Our results substantiate the contention, which was put forward by Palva,^[16] that if the cholesteatoma recurrence rate for any center or surgeon is above 10% at the end of five-year follow-up, then it would be advisable to revise the operative techniques used in the treatment of cholesteatoma.

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