

COMBINED METHOD OF FIXING THE NEOTYMPANIC FLAP IN MYRINGOPLASTY

PKHRIKYAN T.M.^{1*}, MIRAKYAN G.A.^{1,2}

¹Department of ENT diseases, Yerevan State Medical University after M. Heratsi, Yerevan, Armenia

²ENT clinic, "Armenia" Medical Center, Yerevan, Armenia

Received 27/01/2017; accepted for printing 08/07/2017

ABSTRACT

The essence of the fixing method lies in the combined stacking and fixation of the temporal fascia or perichondrium through a window made on the handle of the malleus, which makes it possible to hold the neotympanic membrane just in a well-tensioned and fixed position.

Thus, we operated on 26 patients with chronic purulent otitis media in remission, when the perforation was located in the posterior parts of the tympanic membrane. Considering the fact that within our method the neotympanic membrane is already stretched, well fixed and provided with a full vascularization, we removed the hemostatic sponges from the ear canal on day 7.

The results of the study showed that on the 7th day the vascularization of the neotympanic membrane of 23 patients out of 26 operated, the fascia was light pink throughout the entire surface, in a stretched state, and a good capillary network was observed from the periphery of the fascia to the center. In the anterior parts of the tympanic membrane, the capillary network was mainly marked by the injection of vessels, as a reaction to surgical intervention. Regarding the other 3 patients, the capillary network did not reach the center, and the neotympanic membrane was not completely pale pink.

On day 14, the neotympanic membrane was pinkish in color in all 26 operated patients; apparent capillary network was observed throughout the surface, especially at the periphery. On the 21th day after surgery, the neotympanic membrane was pink, well stretched and sufficiently mobile in all operated patients, and the capillary network was visible only on the periphery. On the second month after surgery, all patients reported significant improvement in hearing, which was confirmed by audiometric studies.

KEYWORDS: chronic mesotympanitis, myringoplasty, fixation of neotympanic flap.

INTRODUCTION

At present, considerable experience has been accumulated on the issues of myringoplasty as a separated surgery and as the final stage of reconstructive and functional ear surgery. However, the successful morphological result of the surgeries (i.e., complete engraftment of the transplant and the stable closure of the defect) is not always observed [Lee P et al., 2002; Jung T, Park S, 2005; Diskalenko V, Kurmashova L, 2006].

The reasons for unsatisfactory results of surgery include atrophy, necrosis, marginal abrupt

tion of the transplant, occurrence of reperforation, lateralization or flapping of the transplant, dullness of the anterior angle of the external auditory meatus [Grechko A et al., 2001; Lapchenko A et al., 2001; Anikin I, Anikin M, 2002]. The unstable position of the transplant in the early post-operative period, which is equally facilitated by the lack of reliable support elements, is the determining factor in the development of these complications. Deficiencies in the fixation of plastic material on the edges of the deepithelialized tympanic membrane (a loose fit of the transplant due to blood clots, air layers, flap dislocation during coughing, sneezing) lead to retraction of flap, lateralization and rejection of the transplant [Tsybusov S et al., 2001; Krotov Y, 2002].

Currently, surgeons use a number of methods to

ADDRESS FOR CORRESPONDENCE:

Tatev M. Pkhrikyan
2 Koryun Street, Yerevan 0025, Armenia
Tel.: (+374 91) 49-73-52
E-mail: pkhrikyanent@gmail.com

fix the transplant, which can be conditionally divided into several groups, namely: a temporary change of the physical properties of the transplant in order to increase its rigidity [England R *et al.*, 1997; Saraç S, Gürsel B, 2002], filling of the tympanic cavity with various absorbable and non-absorbable materials [Davydov A *et al.*, 2006], the use of synthetic pads and supporting frames [Patyakina O, Lyalin V, 1980; Ashmarin M, 2005], fixation of the transplant at the location of its contact with the fibrous ring and bone walls [Pluzhnikov M *et al.*, 2004], the use of more rigid transplants [Al-Shaikh A, Reddy V, 2000; Ferekidis E *et al.*, 2003; Fernandes S, 2003; Puls T, 2003].

The search for ways to improve the efficiency of the surgery was carried out in the direction of using various methods of fixing the neotympanic membrane.

Several solutions of this problem are reflected in the works of many authors. Methods with the use of means that additionally fix the transplant from the side of the tympanic cavity are widely used, and a number of authors use external means from the side of the ear canal for more reliable fixation.

Gelatine sponge (gelfoam) has a number of desirable qualities. The absence of antigenic and toxic properties, simplicity of handling, good tolerance with minor changes in the structures of the middle ear and intact mucosa, as well as hemostatic qualities provide significant advantages to this material. Studies have revealed that sponge resorption and evacuation occur not only through the auditory tube, but also through phagocytosis [Hashemi S *et al.*, 2009; Klacansky J, 2009], however, despite such desirable qualities, the accumulated experience has revealed a number of negative consequences, such as the development of connective tissue hyperplasia and deformation of the auditory ossicles, leading to retraction of the neotympanic membrane, especially in cases of injured (inflamed) mucosa. In addition, the porous structure of the gelfoam (Gelita Medical GmbH, Germany) enhances the migration of fibroblasts, which can lead to the formation of fibrosis. To minimize these undesirable affects, the gelfoam was used in combination with corticosteroids, antibiotics, hyaluronidase [Bahadir O *et al.*, 2003].

In connection with this the search for new methods of laying and fixing the neotympanic mem-

brane remains topical and of great scientific and practical importance.

MATERIAL AND METHODS

The study was carried out on the basis of "Armenia" RMC in the Ear Microsurgery and Hearing Restoration Department. We operated on 26 patients with chronic purulent otitis media in remission, whose perforation was located in the posterior parts of the tympanic membrane. The age of patients varied from 15 to 57 years.

All patients underwent a general otorhinolaryngological examination. The diagnosis of the disease was made on the basis of patients' complaints, history, otoscopy, otomicroscopy (with 8-fold increase), fork-tonal samples and tonal threshold tympanometry. The radiography of the mastoid processes according to Schuller and Mayer was determined, and CT scan was done as needed.

The method proposed by us is recommended for perforations in the posterior quadrants of the tympanic membrane and for chronic secretory otitis media of retraction pockets at III-IV [Tos M, Poulsen G, 1980].

The essence of the method lies in the combined stacking and fixing of the temporal fascia or perichondrium through a window made on the handle of the malleus (Fig. 1), which allows to keep the neotympanic membrane immediately in a well-tensioned and fixed position and to use a smaller amount of hemostatic sponges.

Endaural incision of Heermann is performed by excision of the tympanomeatal flap with a fibrous ring, and the tympanic cavity is opened, after which the sickle knife performs the removal of the tympanic membrane from the hammer handle in the middle third, resulting in a window up to 3 mm in length between the upper bone surface of the hammer handle and the drum membrane. At the upper part of the prepared and dried temporal fascia, two longitudinal incisions are made at a distance of 2-2.5 mm from each other and a depth of up to 5 mm, resulting in the formation of three separate flaps – the upper, middle and lower (Fig. 2).

The fascia is connected to the handle of the malleus, and the middle flap (2mm × 5mm) is drawn by microsurgical needle through the already formed window above the handle of the malleus and immerses under the tympanic membrane into

the anterior parts of the tympanum, and the upper and lower flaps fit into the anterior parts of the tympanum under the tympanic membrane. All three flaps from the inside are fixed with a minimum amount of hemostatic sponges (gelfoam) impregnated with corticosteroid preparations. The lower part of the fascia is tightly attached to the sulcus tympanicus and to the adjacent sections of the osseous part of the external hearing canal. After that, the tympanomeatal flap with the fibrous ring fits into its original spot, thereby covering and fixing the lower fascia and at the same time ensures its good vascularization. The external auditory meatus, as usual, is loosely filled with hemostatic sponges under the protection of the silastic.

RESULTS AND DISCUSSION

Postoperative period with all patients proceeded uneventful, without complications. All patients received antibiotic therapy for 5-7 days.

Usually hemostatic sponges are removed on day 14 or 21, but some authors even prefer their removal on the 30th day. Considering the fact that with our technique the neotympanic membrane is already stretched, well fixed and fully vascularized, we removed the haemostatic sponges in the ear canal on the 7th day and made a comparative assessment of the degree of vascularization on days 7, 14 and 21, as well as during follow-up periods.

The analysis of the degree of vascularization of the neotympanic membrane showed that in 23 patients out of 26 operated on the 7th day, the fascia was light pink throughout the entire surface, well-stretched, and a good capillary network was observed from the periphery of the fascia to the center.

In the anterior parts of the tympanic membrane, the capillary network was mainly marked by the

injection of vessels as a reaction to surgical intervention. With the remaining 3 patients, the capillary network did not reach the center, and the neotympanic membrane was not completely pale pink.

On day 14, all 26 operated patients had a neotympanic membrane with a pinkish color, a pronounced capillary network was observed throughout the surface, especially at the periphery.

On postoperative day 21, the neotympanic membrane of all operated patients was pink, well stretched and sufficiently mobile; the capillary network was visible only on the periphery. It should also be noted that in 16 patients the boundary between the neotympanic membrane and the normal tympanic membrane of the anterior section was practically smoothed out.

On the second month after surgery, almost all patients reported significant improvement in hearing, which was confirmed by audiometric studies.

On a year later follow-up in all patients otomicroscopy revealed that the tympanic membrane was grayish in color, well stretched, the identification contours were well defined, and the hearing was within the age norm.

CONCLUSION

On the basis of the obtained data, we concluded that the application of this technique provides:

Reliable, good fixation of the neotympanic membrane.

Early vascularization of the neotympanic membrane.

Absence of a retraction or rejection.

Early recovery of auditory function.

Thus, the method proposed by us fully justifies both from the clinical and practical perspectives and is recommended for the wide introduction in the practice of otosurgery.

REFERENCES

1. *Al-Shaikh AH, Reddy V.* Tympanoplasty outcome: King Fahd Hospital Experience in Jeddah. 4th European Congress of Oto-Rhino-Laryngology Head and Neck Surgery. Berlin (Germany). 2000; 2: 915-921.
2. *Anikin IA, Anikin MI.* [Question on "lateralization" of the neotympanic membrane and "blunting" of the anterior lower corner of the external auditory meatus in tympanoplasty] [Published in Russian]. Problems and possibilities of ear microsurgery. Materials of the Russian scientific and practical conference of otorhinolaryngologists. Orenburg. 2002. 33-36.
3. *Ashmarin MP.* [Frame tympanoplasty in extensive defects of the tympanic membrane] [Published in Russian]. Vestn Otorinolaringol. 2005; 1: 30-31.

4. Bahadir O, Aydin S, Caylan R. The effect on the middle-ear cavity of an absorbable gelatine sponge alone and with corticosteroids. *Eur Arch Otorhinolaryngol.* 2003; 260(1): 19-23.
5. Davydov AV, Starokha AV, Solodilov VY. [Use of a self-absorbable sponge during the myringoplasty of dry perforations of the tympanic membrane] [Published in Russian]. XVII Congress otorhinolaryngologists of Russia. Nizhny Novgorod. 2006. 95-96.
6. Diskalenko VV, Kurmashova LM. [Comparative-characteristics of the outcomes of the plastic of sub- and total defects of the tympanic membrane using the biosynthetic wound covering "Biokol-1"] [Published in Russian]. Materials of the XVII Congress of otorhinolaryngologists of Russia. Saint Petersburg. 2006. 97-98.
7. England RJ, Strachan DR, Buckley JG. Temporalis fascia graft shrink. *J Laryngol Otol.* 1997; 111(8): 707-708.
8. Ferekidis EA, Nikolopoulos TP, Kandiloros DC, Ferekidou EE, Yiotakis JE., et al. Chondrotympanoplasty: a modified technique of cartilage graft tympanoplasty. *Med Sci Monit.* 2003; 9(2): CR73-78.
9. Fernandes SV. Composite chondroperichondrial clip tympanoplasty: the triple "C" technique. *Otolaryngol Head Neck Surg.* 2003; 128(2): 267-272.
10. Grechko AT, Glaznikov LA, Kochergin GA. [Pharmacological correction of high-speed adaptogens of surgical trauma in reconstructive operations in the middle ear] [Published in Russian]. Materials of the XVI Congress of otorhinolaryngologists of Russia "Otorhinolaryngology at the Turn of the Millennium". Sochi. 2001. 65-67.
11. Hashemi SB, Sohrabi H, Bohranifard H. Comparison of tympanoplasty results with use of perichondrium-cartilage and temporalis fascia. *Iranian Journal of Otorhinolaryngology.* 2009; 21(56): 63-66.
12. Jung TT, Park SK. Mediolateral graft tympanoplasty for anterior or subtotal tympanic membrane perforation. *Otolaryngol Head Neck Surg.* 2005; 132(4): 532-536.
13. Klacansky J. Cartilage myringoplasty. *Laryngoscope.* 2009; 119(11): 2175-2177.
14. Krotov YA. [Miringoplasty with the use of the fixator of the neotympanic transplant] [Published in Russian]. Problems and possibilities of ear microsurgery: Proceedings of the Russian scientific-practical conference of otorhinolaryngologists. Orenburg. 2002. 71-73.
15. Lapchenko AS, Mironov AA, Tour DR. [Rehabilitation surgical interventions in the treatment of patients with narrowing of the ear canal and perforations of the tympanic membrane using polyphosphazene prostheses] [Published in Russian]. XVII Congress of otorhinolaryngologists of Russia. Sochi. 2001. 89-91.
16. Lee P, Kelly G, Mills RP. Myringoplasty: does the size of the perforation matter? *Clin Otolaryngol Allied Sci.* 2002; 27(5): 331-334.
17. Patyakina OK, Lyalin VL. [Method of myringoplasty of dry perforation on tympanic membrane] [Published in Russian]. Moscow. 1980. 18p.
18. Pluzhnikov MS, Filimonov SV, Yagmurov OD. [Long-term results of laser myringoplasty] [Published in Russian]. *Folia otorhinolaryngologica.* 2004; 10(3-4): 69-73.
19. Puls T. Tympanoplasty using conchal cartilage graft. *Acta Otorhinolaryngol Belg.* 2003; 57(3): 187-191.
20. Saraç S, Gürsel B. Use of homograft dehydrated temporal fascia in tympanoplasty. *Otol Neurotol.* 2002; 23(4): 416-421.
21. Tos M, Poulsen G. Attic retractions following secretory otitis. *Acta Otorhinolaryngol.* 1980; 89(5-6): 479-486.
22. Tsybusov SN, Kochenov VI, Cherkasova OG., et al. [Plastic surgery of the tympanic membrane using a magnetic seam] [Published in Russian]. Issues of reconstructive and plastic surgery. 2001; 1: 57-58.