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Factors that may affect graft success in tympanoplasty with mastoidectomy

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Abstract

Objective: The aim of this study was to evaluate the different factors that may affect graft success in tympanoplasty with mastoidectomy.

Methods: Patients who underwent tympanoplasty with mastoidectomy between September 2004 and July 2010 were included in this study. Patient data were collected retrospectively. The effects of the epitympanic patency, duration of the dry period of the ear, presence of preoperative otorrhea, location of the perforation, status of the middle ear mucosa, and status of the tympanic membrane on the rate of postoperative graft success in patients who underwent tympanoplasty with mastoidectomy were investigated. The chi-square test and Fisher's exact test were used for statistical analysis.

Results: A total of 130 patients, 74 male and 56 female, with an average age of 35.7 (range: 11 to 56) years were included. The overall success rate for full postoperative graft success was 75%. A >3-month dry period of the ear, absence of preoperative otorrhea, preoperative normal middle ear mucosa, and presence of epitympanic patency significantly increased the postoperative success rate of graft ($p<0.001$). The presence of preoperative otorrhea and granulation tissue in the middle ear mucosa, presence of preoperative myringosclerosis, and lack of epitympanic patency were significantly associated with graft failure after tympanoplasty with mastoidectomy ($p<0.001$).

Conclusion: Epitympanic patency, middle ear infection, morphologic features of the tympanic membrane and middle ear mucosa are likely to affect graft success in tympanoplasty with mastoidectomy.

Keywords: Tympanoplasty, mastoidectomy, prognostic factors, epitympanic patency.

Özet: Mastoidektomili timpanoplastide greft başarısını etkileyen faktörler

Amaç: Çalışmanın amacı mastoidektomili timpanoplastide greft başarısı üzerinde etkisi olabilecek faktörleri araştırmaktır.

Yöntem: Bu retrospektif çalışmada Eylül 2004 ile Temmuz 2014 arasında mastoidektomili timpanoplasti ameliyatı geçiren olguların verileri değerlendirildi. Epitimpanik açıklık, kulağın kuru kalış süresi, preoperatif otore olup olmaması, perforasyonun yeri, orta kulak mukozasının ile timpanik membranın durumunun postoperatif greft başarısı üzerindeki etkisi araştırıldı. İstatistiksel analiz için ki-kare ve Fisher exact testleri kullanıldı.

Bulgular: Çalışmada toplam 130 hasta (56 kadın, 74 erkek; yaş ortalaması: 35.7, yaş aralığı: 11–56) dahil edildi. Greft başarı oranı %75 olarak belirlendi. Kulağın 3 aydan daha uzun süre kuru kalması, preoperatif olarak kulak akıntısı olmaması, preoperatif normal orta kulak mukozası ve epitimpanik açıklık oluşu postoperatif greft başarısını anlamlı şekilde artırmıştır ($p<0.001$). Preoperatif otore ve orta kulakta granülasyon dokusu varlığı, preoperatif miringoskleroz varlığı ile epitimpanik açıklığın olmaması mastoidektomili timpanoplasti sonrası greft başarısını anlamlı olarak olumsuz yönde etkileyen faktörler olarak izlendi ($p<0.001$).

Sonuç: Çalışmamızın sonuçlarına göre epitimpanik açıklık, orta kulak enfeksiyonu ve timpanik membran ve orta kulak mukozasının yapısal özellikleri mastoidektomili timpanoplasti yapılacak hastalarda prognostik açıdan önem taşımaktadır.

Anahtar sözcükler: Timpanoplasti, mastoidektomi, prognostik faktörler, epitimpanik açıklık.

Chronic suppurative otitis media (COM) is the chronic infection of middle ear cleft which consists of the Eustachian tube, tympanic cavity, and mastoid cells.[1] The management of COM is mostly surgical and the surgical procedure is selected with respect to the pathology of COM. The mail goals of tympanoplasty are removal of the

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active disease and restoration of damage due to sequelae.[2] Various factors such as smoking, pathology in the contralateral ear, size of the tympanic membrane perforation, experience of the surgeon, and duration of the dry period have been reported to have an effect on the rates of success after tympanoplasty.[3] Other factors supposed to be associated with the surgical outcome of tympanoplasty are age, gender, site of the perforation size, drainage status of the ear at the time of surgery and surgeon experience.[4,5] However, the actual roles and effects of these factors remain controversial.[4,5] Graft success is an important indicator after tympanoplasty and if the tympanic membrane heals during the postoperative period, improvement in hearing loss and prevention of recurrent middle ear infection may be expected.

In the present study, we evaluated the influence of different factors on graft success after tympanoplasty with mastoidectomy.

Patients and Methods

Data derived from COM patients who underwent tympanoplasty with mastoidectomy in the otorhinolaryngology department of our tertiary care center between September 2004 and July 2010 were analyzed retrospectively. Approval of Institutional Review Board and written informed consents were obtained. All patients were subjected to ear, nose, and throat examination. Evaluation of the tympanic membrane was performed with an otomicroscope. If there was no active infection in the middle ear, the duration of the dry period of the ear was obtained from the patient's medical history. The location of the tympanic membrane perforation, morphology of the tympanic membrane, morphology of the middle ear mucosa, and presence of otorrhea were recorded during the otologic examination. Hearing measurements were performed at 500, 1000, 2000 and 3000 Hz both preoperatively and pure-tone averages were obtained at postoperative 6th month *(Interacoustics AD629, Interacoustics A/S, Assens, Denmark)*.

All patients were operated under general anesthesia via a retroauricular approach. The temporalis muscle fascia was used for reconstruction of the eardrum. An antrostomy was performed in all patients to evaluate the opening between the antrum and the epitympanum by pouring water into the antrum. If the water could pass through the aditus and this passage was observed in the tympanic cavity, then epitympanic patency was confirmed. If the water did not pass through the aditus and was not seen in the tympanic cavity, a simple mastoidectomy was performed for eradication of the pathology (such as hypertrophic mucosa, granulation, or sclerosis) and opening of the epitympanic region. The patients were examined at postoperative 6th months for graft success. The mean follow-up period was 19.4 months.

Data was analyzed by Statistical Package for Social Sciences Program version 11.0 (SPSS Inc., Chicago, IL, USA). The chi-square test and Fisher's exact test were used for statistical analysis.

Results

This study included data derived form 130 COM patients, 74 male and 56 female, with an average age of 35.7 (range: 11 to 56) years. The follow-up period ranged from 6 to 30 months (mean: 19.4 months). The influences of the prognostic factors on graft success during the postoperative period among 130 patients who underwent tympanoplasty with mastoidectomy are shown in Table 1.

The success rate of graft success was 85.7% for patients with a >3-month dry period of the ear, whereas it was 56.5% in the group whose dry period was <3 months. The difference between the two groups was statistically significant ($p<0.001$).

The status of the middle ear mucosa also significantly affected the rate of postoperative graft success. The rate of graft success was 93.5% in patients with normal middle ear mucosa, whereas it was 75% in tympanosclerotic ears and 44.4% in patients with granulation tissue in the middle ear ($p<0.001$).

The rate of graft success was 88% in tympanic membranes without myringosclerosis, but it decreased to 52% in tympanic membranes with myringosclerosis ($p<0.001$). The location of the tympanic membrane perforation did not significantly affect the postoperative rate of graft success ($p=0.648$).

The rate of graft success was 89.4% in patients with epitympanic patency, whereas it was 55.5% in patients without epitympanic patency ($p<0.001$) (Table 1).

The mean level of hearing improved after tympanoplasty. The mean air bone gap was 32.54±3.75 dB preoperatively and 18.23±2.33 dB postoperatively.

Discussion

The aims of tympanoplasty are restoration of the eardrum, eradication of middle ear infection, and improvement in the hearing level. A healthy mucosa lining the middle ear cleft can be achieved after a successful tympanoplasty.[3]

Table 1. Prognostic factors and rate of graft success after tympanoplasty.

Parameters		n	Success rate	p value
Duration of dry period	Less than 3 months	46	26 (56.5%)	<0.001*
	More than 3 months	84	72 (85.7%)	
Peroperative otorrhoea	Dry	116	94 (81%)	<0.001*
	Wet	14	4 (28.5%)	
Location of perforation	Anterior	18	12 (66.6%)	0.648
	Posterior	42	32 (76.2%)	
	Central	70	54 (77.1%)	
Status of the middle ear mucosa	Normal	62	58 (93.5%)	<0.001*
	Tympanosclerosis	32	24 (75%)	
	Granulation tissue	36	16 (44.4%)	
Status of the tympanic membrane	Without myringosclerosis	84	74 (88%)	<0.001*
	Myringosclerosis	46	24 (52%)	
Epitympanic patency	Open	76	68 (89.4%)	<0.001*
	Close	54	30 (55.5%)	

*: Statistically significant.

Graft success is an important component after tympanoplasty because it prevents recurrent middle ear infections and may result in improvement of hearing. Various demographic and clinical factors may be associated with the success rate of tympanoplasty.[5–10]

Mastoidectomy is preferred for eradication of middle ear infection. However, its effect on the success of tympanoplasty remains controversial.[11–16] There are three potential reasons for this. Many authors accept that mastoidectomy is useful for both infected and dry ears, while others recommend it only for infected ears.[5–7,11,12] On the other hand, some others suggest that mastoidectomy is not useful for either infected or dry ears.[16,17] Onal et al. reported that dryness of the ear is important in the timing of tympanoplasty.[3] In our study, we found that the rate of graft success was significantly higher after tympanoplasty in patients with a >3-month dry period of the ear ($p<0.001$).

The influence of the location of the perforation on surgical outcome after tympanoplasty has frequently been an issue of interest. The location of the perforation reportedly had no effect on the surgical results in some studies.[18,19] However, Pinar et al. found that the rate of graft success was higher for central perforations than for posterior and anterior perforations.[20] Onal et al. reported significant differences in the success rates between smaller and larger perforations.[3] Controversy remains regarding the influence of the location of the perforation on postoperative success.[10,21] The location of the tympanic perforation did not significantly affect the success rate of graft after tympanoplasty in our study.

Myringosclerosis of the tympanic membrane may cause poor feeding of graft material. In addition, removal of sclerotic plaques during surgery results in a larger perforation. Onal et al. found no correlation between myringosclerosis and the surgical outcome of tympanoplasty.[3] Pinar et al. reported that the absence of myringosclerosis increased the success rate of tympanoplasty.[20] In the present study, we found that the rate of graft success was significantly higher in tympanic membranes without myringosclerosis ($p<0.001$).

There is inadequate data indicating that tympanoplasty combined with mastoidectomy has better results than tympanoplasty without mastoidectomy. In a previous publication, tympanoplasty combined with intact canal wall mastoidectomy provided no significant improvement in the rate of closure of simple tympanic membrane perforations.[4] In these patients, it is suggested that mastoidectomy is not necessary for successful closure of simple postinfectious tympanic membrane perforations. In a temporal bone study, a significant difference was noted in the ability to observe middle ear pathology between the intact canal wall and canal wall-down tympanomastoidectomy, with the latter showing superiority.[22] Tos recommended mastoidectomy for discharging ears, and Mishiro et al. reported that they do not routinely perform mastoidectomy for simple tympanic membrane perforations accompanied by chronic otitis media.[2,23]

In the present study, the rate of graft success after tympanoplasty was significantly higher in patients with epitympanic patency ($p<0.001$). In addition, the presence of granulation tissue in the middle ear had a negative effect on the success rate of graft success after tympanoplasty ($p<0.001$). As a result, we advocate mastoidectomy with tympanoplasty in patients with active middle ear infection to achieve epitympanic patency and remove the granulation tissue from the middle ear.

In conclusion, middle ear infection and the morphology of the tympanic membrane and middle ear mucosa must be taken into consideration as preoperative predictive factors for full closure of the tympanic membrane after tympanoplasty.

Conflict of Interest: No conflicts declared.

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