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SUCCESS OF CARTILAGE GRAFTING WITH MASTOIDECTOMY IN REVISION TYMPANOPLASTY

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ABSTRACT

INTRODUCTION

Patients for revision tympanoplasty have experienced at least one failed attempt at repair of the tympanic membrane and are, therefore, at higher risk for subsequent repair failure. The adjunctive use of mastoidectomy with tympanoplasty in those patients with noncholesteatomatous chronic otitis media is often used to decrease the risk for subsequent failure. Recently, cartilage has replaced fascia for these surgeries due to its stiffness and rigidity. Cartilage has been used in revision tympanoplasties, anterior TM perforations, and Atelectatic ears, as well as for perforations exceeding 50% of TM area

AIMS AND OBJECTIVES

Aim of our study is to compare effect of mastoidectomy in revision cartilage tympanoplasty in terms of successful graft uptake, hearing improvement, and prevalence of other complications.

The arguments in favour of mastoidectomy include the facts that the open mastoid cavity provides an improved volume and pressure buffer, rids the mastoid of diseased mucosa, and ensures adequate patency of the aditus.

Results:

Successful closure without reperforation was obtained in 90 out of 95 patients (94.7%). Average postoperative pure-tone average air–bone gap was 12.2 ± 7.3 dB compared with 24.6 ± 13.8 dB preoperatively ($p < 0.001$).

CONCLUSION

In conclusion, we states that in revision cases of safe CSOM, mastoidectomy with cartilage grafting provide greater structural stability and strength than traditional graft materials.

Key Words: Cartilage graft, Mastoidectomy, Perforation, Revision tympanoplasty

INTRODUCTION

Tympanic membrane grafting has gained a significant amount of attention in the literature since its original description in 1952 by Zollner (1) and Wullstein (2). Dozens of approaches, techniques, and grafting materials have been popularized and supported by various authors.

Recently, the use of cartilage in reconstruction of part or all of the tympanic membrane has been described as an effective method for achieving a dry hearing ear with no perforation in certain challenging circumstances (3–10). Multiple publications describe success rates with cartilage tympanoplasty in terms of achieving a dry ear, which are equivalent to those of more traditional

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graft materials, with equivalent hearing results (3,5,11). Multiple authors currently recommend cartilage tympanoplasty in patients with high-risk perforations (i.e., subtotal, bilateral, craniofacial abnormalities) (3,11–13).

Revision tympanoplasty surgery represents another high-risk situation that may benefit from the use of mastoidectomy with cartilage grafting. Many authors support the adjunctive use of mastoidectomy in these revision cases in an effort to improve the success rate, regardless of graft material (14,15). The arguments in favor of mastoidectomy include the facts that the open mastoid cavity provides an improved volume and pressure buffer, rids the mastoid of diseased mucosa, and ensures adequate patency of the aditus (14– 16). Although this logic is sound and is supported in the literature, we believe that in many revision cases, reconstruction with a robust material such as cartilage provides the additional stability necessary to allow the middle ear and mastoid to revert naturally to a normalized environment.

Often used in atelectatic ears and cholesteatoma surgery, cartilage grafting provides a tympanic membrane with greater structural stability during times of negative middle ear pressure (13,17). To examine the success rates with revision tympanoplasty using cartilage grafting with mastoidectomy, we carried out a retrospective study of the results of revision case with mastoidectomy and cartilage tympanoplasty .Primary study parameters included incidence of reperforation of the grafted tympanic membrane, hearing result, and prevalence of other complications.

AIMS AND OBJECTIVES

Candidates having non-cholesteatomatous chronic otitis media who have failed tympanoplasty in first attempt (graft used conchal or tragal cartilage) is at higher risk of failure in subsequent repair.

The adjunctive use of mastoidectomy with cartilage tympanoplasty (tragal or conchal) in these patients has decreased the risk for subsequent failure.

Aim of our study is to compare effect of mastoidectomy in revision cartilage tympanoplasty in terms of successful graft uptake, hearing improvement, and prevalence of other complications.

The arguments in favor of mastoidectomy include the facts that the open mastoid cavity provides an improved volume and pressure buffer, rids the mastoid of diseased mucosa, and ensures adequate patency of the aditus (14– 16). Although this logic is sound and is supported in the literature, we believe that in many revision cases, reconstruction with a robust material such as cartilage provides the additional stability necessary to allow the middle ear and mastoid to revert naturally to a normalized environment.

STUDY DESIGN:

We conducted a retrospective case study in Tertiary referral centre (LLRM Medical College, Meerut, Uttar Pradesh)

A total of 95 patients (42 female, 53 male; 20–50yr of age) with past history of tympanoplasty having recurrent perforation who were treated surgically with cartilage tympanoplasty without mastoidectomy were included in the study.

Inclusion criteria- Patients must have undergone at least one previous tympanoplasty without mastoidectomy and had to have complete audiologic and atleast 3month follow up.

Interventions: An underlay tympanoplasty technique using either a tragal or chonchal cartilage. Ossiculoplasty was performed as needed.

Main outcome measures were incidence of reperforation, hearing result, and prevalence of other complications.

MATERIALS AND METHODS

Study has been conducted between dec 2021 and feb2023 , over 300 cartilage tympanoplasties were performed by the consultants and senior residents under direct supervision in the Department Of Otorhinolarygology (ENT), Lala Lajpat Rai Medical College And Sardar Vallabh Bhai Patel Hospital,Meerut, Uttar Pradesh.

95 patients (42 female, 53 male; 15–50 yr of age) presented failure of cartilage tympanoplasty were considered under study with fully informed consent.All the patients are fully assessed about date of surgery; type of tympanoplasty; audiologic result(both pre and post op); and development of recurrent perforation, try to indentify cause of failure in primary surgery. The middle ear environment at the time of surgery was also noted, including the presence or absence of drainage and the status of the middle ear mucosa. Computed tomography scanning of the temporal bones was performed in select cases that demonstrated marked drainage, granulation tissue, or had an examination otherwise in concern of the presence of cholesteatoma. Only those patients without evidence of cholesteatoma by computed tomography scan were included in this study group

SURGICAL TECHNIQUE

An underlay tympanoplasty using either a tragal cartilage (3,4) or conchal cartilage with the palisade technique (8,11,18) was used in all cases. Ossiculoplasty, when necessary, was performed with the Dornhoffer HAPEX Total or Partial Ossicular Replacement Prosthesis (TORP or PORP).

RESULTS

Patient population Of the 95 patients included in this study, 42 were female and 53 were male. The average age was 32.5 years. A tympanoplasty alone was performed in 66 of the 95 patients. 21 patients required ossicular reconstruction with a PORP, and 08 required more extensive ossiculoplasty with a TORP. All surgeries were performed under general anaesthesia, and no immediate complications were apparent in any case.

At the time of surgical repair, the ear was actively draining in 20 of 95 patients (21.1%). The remaining patients exhibited dry ears at the time of surgery. In revision case successful closure of the ear without reperforation was obtained in 90 patients (94.7%).

Audiologic data was analyzed for the 95 ears using preoperative and postoperative pure-tone average air– bone gaps (PTA-ABG) obtained on four frequencies (500, 1000, 2000, and 4000 Hz). The average preoperative PTA-ABG was 24.6 ± 13.8 dB, The average

postoperative PTA–ABG was 12.2 ± 7.3 dB. This difference was statistically significant using the Student t test ($p < 0.001$).

DISCUSSION

Repair of the recurrent tympanic membrane perforation is a common task facing the otologic surgeon. Although primary tympanoplasty enjoys success rates of 90% or greater, successful outcome in revision cases can be more difficult. The prevailing consensus has been that those patients who experience a poor outcome typically have environmental factors, nasal allergy, eustachian tube dysfunction, infection with resistant organism, smoking predisposing them to failure.

Many authors have recommended mastoidectomy in conjunction with tympanic membrane grafting to increase graft success in revision, and even primary, tympanoplasty. The primary argument in favor of mastoidectomy has been an improvement in the middle ear and mastoid environment through clearance of diseased, secretory mucosa and the ventilatory mechanisms of an open mastoid system (14–16). The mastoid air cell system is thought to function, at least in part, as a buffer to changes in pressure within the middle ear (23). According to Boyle's Law, an increase in the volume available to the middle ear space through a surgically opened mastoid would be protective for the tympanic membrane in response to middle ear pressure changes. Although this physiological concept is certainly well supported in the literature, very few papers actually compare the success of tympanoplasty with and without the addition of mastoidectomy. Ruhl and Pensak (14) presented their results with 135 revision tympanoplasty surgeries performed in conjunction with mastoidectomy as evidence supporting this concept. Although they obtained grafting success in over 90% of patients, even in those with a history of intermittent or active drainage, they acknowledge the lack of a control arm without mastoidectomy. Balyan et al. (24) have reported equivalent results of graft take and hearing result with or without mastoidectomy in their series of 323 tympanoplasties. Eighty-one of these patients were described as discharging severely at the time of surgery. The authors did not, however, limit their population to revision surgeries. Mishiro et al. (25) also supported the use of tympanoplasty without mastoidectomy in chronic noncholesteatomatous otitis media with an equivalent rate of grafting success and hearing results regardless of the addition of a mastoidectomy. However, in each of these studies, the choice of grafting material is largely ignored as a factor in success. Since its introduction approximately 50 years ago, cartilage tympanoplasty has been used in many challenging circumstances. The use of cartilage in cases of cholesteatoma and retraction is commonplace (4,10,18,26,27). Others have advocated its use in cases of recurrent perforation, bilateral perforations, and craniofacial abnormalities predisposing to eustachian tube dysfunction. The intrinsic characteristics of cartilage provide a stiffer, harder alternative to traditional graft materials. At our institution, we advocate mastoidectomy with use cartilage grafts in tympanoplasty in failure/revision/recurrent cases.

Mastoidectomy with cartilage tympanoplasty improves abnormal environment of middle ear ,function of the middle ear , provides a buffer system for air exchange prevent development

of negative pressure in middle ear hence effusion and failure. mastoid cavity also provides a resonant effect that will also improve hearing of patients.

Patients in whom cartilage tympanoplasty without mastoidectomy fails in first seating become candidates for mastoidectomy at our institution. Additionally, we find it important that any patient with active drainage be treated preoperatively with oral and topical antibiotic, often containing steroids, in an attempt to optimize the surgical milieu.

A greater cohort of patients with regard to these subsets would strengthen our conclusions. However, in comparison with traditionally reported success rates for primary and revision tympanoplasty, as well as the results reported in those papers supporting the adjunctive use of mastoidectomy (14,15), our success rates compare favourable. In conclusion, we states that for revision cases of safe CSOM, mastoidectomy with cartilage grafting provide greater structural stability and strength than traditional graft materials

CONCLUSION

In conclusion, we states that in revision cases of safe CSOM, mastoidectomy with cartilage grafting provide greater structural stability and strength than traditional graft materials.

DECLARATION

Ethics approval and consent to participate: The study was approved by Organisational Ethics committee.

Conflict of Interests- The authors declares that there are no conflicts of interest.

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