Abstract

Hypothesis: Split thickness cartilage combines the stiffness of cartilage to allow reduced retraction and recurrence while also providing the elasticity to allow equivalent sound conduction and hearing preservation as fascia grafts.

Methods: Retrospective chart review.

Results: 259 complete charts were reviewed for preoperative, intraoperative and postoperative data. We found statistically significant differences in several areas when comparing fascia, split thickness, and full thickness cartilage grafts in tympanoplasties. We found a trend towards decreased retraction rate in type III tympanoplasties with cartilage grafts and audiometrically superior outcomes with fascia as compared to full thickness cartilage.

Conclusions: Cartilage are useful for cases with poor middle ear status or more extensive disease. Split thickness cartilage is easier to manipulate than full thickness cartilage and performs equally well audiometrically.

Introduction

Tympanoplasty is a surgical procedure intended to provide patients with tympanic membrane and middle ear disease with a better or normal hearing and ideally with improved hearing, if it has been compromised by the disease. Several strategies have been used autogenous local temporalis fascia grafts, cartilage grafts, vein grafts, fat grafts and allogenic products including allograft. The tympanoplasty technique at our institution by our neurotology has evolved to be a case specific reconstruction as dictated by the anatomy and pathology. As a result, we have subclassified the cartilage grafts into thickness and used an intra-operative technique of cartilage remnant tympanoplasty (Figure 1) and we have used to reduce retraction and recurrence rates as well as improve hearing outcomes. We sought to determine how this technique compared to fascia and full thickness cartilage grafts in our hands.

Results

A retrospective chart review of all cases done from 2004 to 2012 under the procedure “Tympanoplasty” were queried. A total of 754 cases were queried. Cases excluded were if they were myringoplasties or cantholysis, autogenous or intra-operative data was not available, or the patient was less than 18 years of age. In total 259 charts with complete data sets were then analyzed. The age range at the time of surgery was 18-81 years of age, with a mean age of 36.4 years. Mean post op follow up time was 404 days. 118 cases were male and 141 female. We divided those into groups based on the graft material used: fascia, split thickness cartilage or full thickness cartilage. Within these groups there was a predominance of fascia tympanoplasties, 129, followed by full thickness cartilage tympanoplasties, 85, and 65 split thickness cartilage tympanoplasties. Statistical significance was calculated for the mean ANOVA with Bonferroni correction for the frequencies with X2 between the independent groups and t test between the combinations of two groups.

Analyzing our operative trends we found several statistically significant differences. We found that statistically a higher percentage of cartilage grafts over fascia grafts were used in cases of cholesteatomas, type III tympanoplasties, and canal wall up mastoidectomies. Alternatively, we found that a statistically higher percentage of fascia grafts over cartilage grafts were used in cases of tympanic membrane perforations only, type I tympanoplasties and middle ears that were either clear or had granulation tissue. Interestingly, there were no significant differences in recurrence or retraction rates between the three groups (Table 1).

When further subclassifying the groups and controlling for different conditions including tympanoma status, type of tympanoplasty, history of prior tympanectomy, and intraoperative tympanostomy tube placement we found a few areas of statistically significant difference, but generally these results were somewhat limited by the power of our groups. We found that audiometrically the improvement in air bone gap (ABG) and speech reception threshold (SRT) was greater for fascia compared to full thickness cartilage in the group overall. In those patients who had no prior surgery this was also true. For those who had a type II or III tympanoplasty the improvement in SRT was greater in the full thickness fascia group, those who had a tympanoma but type I tympanoplasty the improvement in SRT was greater in the fascia group. For those who had a history of tympanoplasty the improvement in SRT was greater in the fascia group and those who had a history of tympanectomy with a full thickness cartilage graft. Of note is that SRT was greater in the thicker fascia group, those who had a history of tympanectomy and a full thickness cartilage graft. We used a type III tympanoplasty, clear middle ear and no T-tube showed a greater improvement in ABG for the fascia graft group compared to the full thickness cartilage group. Interestingly morphologically our results showed an overall decreased retraction rate in full as compared to split thickness cartilage grafts and a decreased retraction rate in split thickness cartilage grafts compared to fascia grafts overall and specifically in type III tympanoplasties.

Discussion

There have been multiple variations of cartilage tympanoplasty described extensively in literature.2 Our approach to reconstruction of the tympanic membrane defect with a split thickness cartilage graft aligned in a petal technique attempts to resolve two commonly encountered dilemmas. First by using cartilage, the rigidity of the material better resists retraction, thereby reducing the risk of recurrence. Second, splitting the cartilage provides a thinner graft, which gives it more elasticity and allows for improved sound transmission. A prior study had shown that cartilage of 0.5mm thickness had the optimal audiologic results as sound transmission2. Our experience showed no statistically significant difference in hearing outcomes between fascia and split thickness cartilage grafts, though outcomes were better with fascia than full thickness cartilage. In addition, we found lower retraction rates with split thickness cartilage than with fascia. However, we did not see lower recurrence rates with split over full thickness cartilage grafts. The audiometric outcomes may also be related to poor hearing and greater severity of the disease process in the cases that tended to have cartilage graft repair.

Conclusions

When applied appropriately, any of those graft materials perform well. In our series, fascia was utilized more often in less severe cases with better middle ear status contributing to improved audiological outcomes for this group. For certain types of tympanoplasty, cartilage dramatically reduced the retraction rate, but not necessarily recurrence rate. We believe the split thickness cartilage technique provides several advantages to fascia and full thickness cartilage and should, especially, be considered in cases of type III tympanoplasty and more advanced ear disease.

Table 1. Overall peroperative case data.

Table 2. Postoperative results after controlling for tympanoplasty type and intraoperative findings.

Note: Highlighted items show statistically significant difference. The number in red shows the lower number and the number in green is the higher number. Yellow indicates the difference in among all those was significant and that number was greater than the red but less than the green number.

References

6. Senja Tomovic, MD

Department of Otolaryngology – Head & Neck Surgery
University of Medicine and Dentistry of New Jersey – New Jersey Medical School, Newark, NJ

Contact Information: Senja Tomovic, MD
senja@gmail.com