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A Comparison of Cartilage andTemporal Fascia in Type 1 Tympanoplasty for Tympanic Membrane Perforations in Children

Dr.Dharmendra kumar[1], Dr.VarunKumarThakur[2], Dr. S.P Singh[3]
[1]*Senior Resident Dept Of Otorhinolaryngology J..L.N.M.C.H Bhagalpur,Bihar*
[2]*Associate Professordept Of Otorhinolaryngology J..L.N.M.C.H Bhagalpur,Bihar*
[3]*AssistantProfessordept Of Otorhinolaryngology J..L.N.M.C.H Bhagalpur,Bihar*

Abstract
Objective: *To compare the graft success rates and audiological outcomes of performed type 1 tympanoplasty using cartilage or temporal fascia in childrenandtragal cartilage were used.*
Method: *In Total 60 childrenwhounderwent Type 1 Tympanoplasty, in Our Dept of ENT J.L.N.M.C.Hwere included. Temporalfasciaand tragal cartilage were used as graft material.Demographic ,anatomical and functional outcome were collected. Anatomical and functional outcome of cartilageand fascia were conducted at 6 month and we continued to follow the patient to 1year after surgery.*
Results*:The graft success rate for the fascia group was83.3%, and that for the cartilage group was 96.6%. The difference was statistically significant .Audiological improvements were seen in both groups, and the difference was statistically insignificant*
Conclusion: *Our data suggest that anatomical success rate for cartilage tympanoplasty was higher than for fascia tympanoplasty .Functional result with cartilage were not different than with fascia, even though we did not thin the tragal cartilage.*

I. Introduction

Tympanoplasty is surgical procedure used to eradicated the disease of midlle ear and reconstruction the ear drum. The principal aims of a tympanoplasty operation are to create an intact tympanic membrane and to restore functional hearing.Pediatrictympanoplasty is one of the most commonly performed procedures by surgeons; different success rates have been re-ported, ranging between 35% and 94% . Eustachian tube dysfunction can worsen the condition of the operated ear during the postoperative period.. However, retraction or perforation after reconstruction of the eardrum is a well-known problem in middle ear surgery as the temporalis fascia can change its shape because of uneven shrinking and thickening, even on the fifth day following grafting. The instability of the temporalis fascia is critical in cases where perforations of the TM are large.

The use of cartilage in the middle ear has been suggested for use on a limited basis to manage retraction pockets for many years. The array of different techniques developed, such as the perichondrial cartilage island technique, the palisade cartilage technique, the shield technique, the butterfly technique, and the crown cork technique, indicate the variety of methods used to surgically prepare the cartilage. It has been shown that large pieces of cartilage may twist after some years, so small palisades of cartilage are used. Cartilage Tympanoplastywas proposed as the method of choice for recurrent defects of the TM. Cartilage is very useful for managing eustachian tube dysfunction that may cause graft failures and retractions. Autologous cartilage obtained from the ear (tragus or cymba) may resist the negative pressure because of its rigidity and convexity. So this method, because of the rigidity and stability of the cartilage, may be a better choice than using temporalis fascia in resisting the anatomic deformations caused by infection and middle ear effusion. It has been shown that cartilage is well tolerated by the middle ear, and long-term survival is the norm. Fascia and perichondrium need a new vascular supply but cartilage is supplied by diffusion. Cartilage also seems to offer high resistance both to lack of vascularization and to infections.

The aim of this article was to compare the graft acceptance rates and auditory outcomes of cartilage tympanoplasty operations with those of primary tympanoplasties using temporalis fascia in two groups of patients.

II. Material & Method

Inclusion criteria
1 Patients in the age group of 07 -15 were included in the study .
2. All these patients had dry central perforation of ear drum .

3. Patients with demonstrable degree of conductive deafness was chosen (at least 30 dB pure tone average) .
4. Results of this procedure was compared to that of published results of microscopic myringoplasty .

Exclusion Criteria
1 .Csom With Cholestatoma
2Snhl Type Hearing Loss

60patients were enrolled in the study: 30 ears in the cartilage group and 30 ears in the fascia group. We collected the data of graft success rates, preoperative and postoperative air bone gaps (ABG), and air conduction thresholds (ACT) of the patients from the Medin integrated medical software system.

All of the procedures were performed under general anesthesia. The postauricular approach was favoured in all patients. The procedures were performed by the same surgeon . The procedure was randomly selected by the surgeon. Contralateral ears were operated upon using the same technique one month after the first operation. The cartilage graft was harvested from the tragus. Cartilage grafts were prepared to protect the perichondrium on two sides of the cartilage.. The temporalis muscle fascia was placed in an underlay fashion in all of the fascia patients. If the perforation persisted, secondary surgeries were performed with the same technique at least three months after the first operation.

Postoperatively, the patients were evaluated in a regular clinical manner and audiometrically at a six-month follow-up appointment. A successful tympanoplasty was defined as full acceptance of the graft, and intact healing of the TM without perforation, retraction, or lateralization within a follow-up period of six months from the operation. Auditory outcomes were evaluated using an audiogram. Audiological data were gathered from the preoperative and postoperative audiograms of the patients. The patients' data were reviewed for changes in the pre- and postoperative air–bone gaps (ABG), which was defined as the difference between the preoperative and postoperative air–bone gap; pure-tone averages (PTA) at 500, 1000, 2000, 4000, and 8000 Hz; speech reception thresholds (SRT); and speech discrimination scores (SDS). Data analysis was performed using SPSS for Windows version 16 and the chi-squared test, Fisher's exact test, and Student's t-test for independent samples and paired samples were used for statistical comparisons. A *P* value of less than 0.05 was considered statistically significant.

III. Result

The patients' ages ranged from 7 to 15 years with mean ± SD age was 10.17 ± 1.97 years in fascia group & cartilage group was 10.95 ± 1.88 year; 32 patients (53.3%) were female and 28 (46.6%) were male . In the patients who underwent Cartilagetympanoplasty 18 were female and 12 were male, and in the group who underwent fascia tympanoplasty 14 were female and 16 were male.Themean ± SD follow up period was 16.2 ± 9.9 month in the all group.Postoperative ABG values decreased for the fascia group, and this decrease was statistical-ly significant ($p<0.001$). Postoperative ABG values decreased for the cartilage group, and this decrease was statistically significant ($p<0.001$) (Table 2). Postoperative ACT values decreased for the fascia group, and this decrease was statistically significant ($p<0.001$) (Table 2). Postoperative ACT levels decreased for the cartilage group, and this decrease was statistically significant ($p<0.001$) (Table 3). The graft success rate for the fascia group was 83.3%, and that for the cartilage group was 96.6%. The difference was statistically insignificant ($p=0.078$) . One failure was observed in the cartilage group, and five failures were observed fascia tympanoplasty ear surgery.

Tabel -1

VARIABLE	FASCIA	CARTILAGE	P VALUE
AGE	10.17 ± 1.97	10.95 ± 1.88	0.64
GENDER 0.96			
MALE	16	12	
FEMALE	14	18	
SIDE OPERATED			
RIGHT	18	13	0.262
LEFT	12	17	0.267
GRAFT INTACT			
PRFORATION	5	1	
INTACT	25	29	0.009

Tabel-2 Preoperative and postoperative ABG and ACT in the fascia group

Fascia group n=30	ACT (dB) Mean ± SD	ABG (dB) Mean ± SD	p*
Preoperative	24.63 (3.93)	22.26 (2.86)	<0.001*
Postoperative	15.37 (6.28)	12.68 (4.81)	

Tabel 3. Preoperative and postoperative ABG and ACT in the cartilage group

Cartilage group n=29	ABG (dB) Mean ± SD	ACT (dB) Mean ± SD	p <0.001*
Preoperative	25.48 (3.69)	24.48 (2.81)	
Postoperative	16 (10–22)	17.55 (3.74)	

IV. Discussion

The use of cartilage is experiencing a renaissance in ear surgery because it appears to offer an extremely reliable method for reconstruction of the TM in cases of advanced middle ear pathology and eustachian tube dysfunction. Repeated upper respiratory tract infections, shorter and unpredictable function of the eustachian tube (ET), and difficulties in postoperative care in children affect the success rates of pediatrictympanoplasties. In the study of Dinc¸et al. it was shown that the more horizontal angle and shorter length of the ET influenced the develop-ment of chronic otitis media. In children, the ET is more horizontal and shorter than in adults. To our knowledge, there is no reported study that focused on the interaction between the angle and length of the ET and the success rate of pediatrictympanoplasties. The success rate of tympanoplasties without complete maturation of the ET seems to be lower. In the literature, the maturation of the ET is complete at approximately 6 years of age. However, some authors suggest performing a tympanoplasty at an earlier age, considering the complications and sequelae of chronic otitis media.In the retrospective study of Duval et al., it was shown that children younger than 4 years had the worst outcomes in pediatrictympanoplasties. Variable outcomes have been reported in studies investigating the effects of gender and success rates in tympanoplasties. In the study of Emir et al., a good correlation was shown between males and success rate, in contrast to the Vartiainenetal.study results. In the literature, there is no consensus on graft materi-als for pediatrictympanoplasties. Generally, some previous studies compared the anatomical and functional success rates of cartilage and fascia grafts. Demirci et al. reported the anatomical success rate was 92% in the cartilage group and 82.9% in the fascia group, with no significant difference in functional success between the groups. Likewise, Dornhoffer et al. reported no significant difference in func-tional success between the groups. Özbek et al. reported that the anatomical success rate was 100% in palisade car-tilagetympanoplastiesand in the fascia group and that the anatomical success was significantly statistically higher in the cartilage group than in the fascia group.

However, they reported no significant difference in functional success between the groups. Similarly, Albirmawy et al. found that anatomical success was significantly higher in the cartilage-perichondrium composite ring group than in the temporalis fascia muscle group in pediatrictympanoplasties. In another pediatric study, Couloigner et al. reported no significant difference in graft success or hearing gain between inlay butterfly cartilage and fascia tympanoplasties. Tragal car-tilage is a fibroelastic cartilage and being composed of collagen type II is similar nature of the tympanic membrane; temporalis muscle fascia consists primarily of collagen type I. Collagen type II has higher tensile strength than other types.20 The superiority of cartilage with regard to tympanic membrane closure is thought to be derived from its rigidity, a characteristic that seems especially important in ears with eustachian tube dysfunction. In the present study, the suc-cess rate of the temporalis fascia group was significantly lower than might be expected from a recently published meta-analysis. The results of the present study show no difference in terms of audiological outcomes between the two techniques, but higher rate of reperforation (35% vs. 8%) occurred in fascia groups. Confounding variables that were addressed include the surgical approach used, experience and skills of the surgeons, and the sizes of the tympanic membrane perforations. Regarding higher rate of reperforation in fascia group, it is notable that size and location of perforation differed between studies, and that some studies did not describe either of these perforation characteristics. Small perforations have a comparatively good preoperative hearing and are easier to close. In the present study, tympanic membrane perforation was mainly subtotal perforations; there might be heterogeneity between recently published meta-analysis. Secondly, there is heterogeneity between the present study and published studies with regard to length of follow-up. Thirdly, experience of surgeon can affect the success rate of tympanoplaties.The success rate of tympanoplasties decreases with time. The success rates of tympanoplasties with long-term follow-up were lower than with short-term follow-up.15,23 In the present study, all patients were followed for at least one year. Longer follow-up is essential after tympanoplastyoper-

ations, because repaired membranes often reperforate, especially when the initial perforation is subtotal or total. Our follow-up period was sufficiently long to see some reperforations.

Reconstruction of the TM using the palisade cartilage technique in tympanoplasties allowed us to achieve good anatomic and audiologic results that were at least similar, if not better than, traditional methods of reconstruction in high-risk cases

V. Conclusion

The results of this study are in favour of using the cartliage technique in difficult cases. The outcomes in our patient series indicate that cartilage tympanoplasty achieves good results. Cartilage a very effective material for the reconstruction of the TM and grafts can provide an excellent anatomical result, perfect stability, and good functional outcomes.

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