A Comparative Study of Temporalis Fascia Graft and Cartilage - Perichondrium Graft in Tympanoplasty

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Abstract

Objective

The repair of the tympanic membrane has been attempted with large variety of synthetic, homologous and autologous tissue; however, temporalis fascia and cartilage-perichondrium are used most commonly today.

Study Design

This is a prospective study of patients confirmed to have CSOM and operated during the years of 2012-2013 at Al Nahdha Hospital, Muscat, Sultanate of Oman. The patients were followed up postoperatively at which we compared the graft success rate and level of hearing improvement.

Setting

ENT clinic at Al Nahda hospital

Subjects

Patients who presented to the ENT clinic at Al Nahda hospital, operated in the period between 2012 and 2013, diagnosed as CSOM and meeting our inclusion criteria.

Methods

We compared the outcome of the repair of the tympanic membrane perforation using temporalis fascia graft versus cartilage perichondrium grafts.

Results

100% of the cartilage-perichondrium group showed a successful graft uptake in comparison to 98.9% in the temporalis fascia. Our data did not show significant differences in the average air bone gap change in both groups.

Conclusion

Both cartilage-perichondrium and temporalis fascia provide viable autograft material. Both achieve comparable and excellent graft uptake. Completion of our study is needed to study the hearing restoration in both groups.

Introduction

The repair of the tympanic membrane has been attempted with large variety of synthetic, homologous and autologous tissue; however, temporalis fascia and perichondrium are used most commonly today. This study was taken to compare the easily available autologous graft materials, i.e. temporalis fascia and cartilage-perichondrium. The study also compares the result of these grafts in various aspects; the prime interest is the closure of tympanic membrane perforation and hearing restoration in successfully grafted ear.[2]

Objective

This study aimed to compare the results of autologous tissues as graft materials for the Repair of the tympanic membrane defect. (Temporalis fascia graft and cartilage / perichondrium graft) and to compare the result of these grafts in term of closure of the perforation and the hearing restoration.

Patients and methods

This is a prospective cohort study was performed to compare the outcome of temporalis fascia graft versus cartilage/ perichondrium graft in CSOM patients with perforations who presented to our clinic at Al Nahda hospital and operated by the same team between 2012 and 2013. The research protocol was approved by the ethic committee at Al Nahda Hospital, and written consent has been taken from the patients before data collection. Data was collected from the electronic medical records (Al-Shefa System) looking at the patients' clinic visits, admission notes and their surgical reports. We included all the patients of both sexes, who presented to the Otolaryngology clinic at Al Nahda hospital, Otology clinic, confirmed to have CSOM (chronic suppurative otitis media) –both tubotympanic & atticoantral disease type, with tympanic perforation and was operated during the period from 2012 and 2013. The follow up of these patients was 2 weeks, 3 months, 6 months and 1-year postoperatively at which we compared the outcome for those who underwent temporalis fascia graft and cartilage perichondrium graft. At 2 weeks postoperatively visits the packs were removed and Bismuth Formic Iodide powder was in sufflaed on the gelfoam and the graft. Later at one month postoperatively the external auditory canals were cleaned from debris and gelfoam and the grafts uptake were checked. After three months postoperatively the neo-tympanum. Were re-examined and audiometric evaluations (Pure Tone Audiometry) were performed for all the patients. Any complications or complains reported from the patients during that period were noted. Few patients missed their follow up appointments and that was also recorded. The main outcome measured was the graft success rate and the Level of hearing improvement. Successful graft take was defined as the presence of full, intact healing of the graft without perforation, retraction or lateralization throughout the follow up period.

Level of hearing improvement was measured as the following:

- Hearing results were based on the preoperative audiogram available.[1]
- Comparing both preoperative and postoperative air and bone pure-tone averages (PTAs) at the frequencies of 0.5, 1, 2, and 4 kHz. [1]
- Compare the average air conduction gap postoperatively of both groups of patients.
- Gap change was defined as the difference between the preoperative and postoperative air-bone gaps (ABGs). [4]
- ABG closure to within 20 dB or better was considered successful. [1]

Study Population

In this study we included those patients, who presented to the ENT clinic at Al Nahda hospital, Operated in the period between 2012 and 2013, diagnosed as CSOM and meeting the following inclusion and exclusion criteria:

Inclusion criteria

- Diagnosis of CSOM with central perforations with presence of margins.
- Age above 18 and below 50.
- Omani patients.
- Dry ear at time of surgery.

Revision tympanoplasty cases where also included in our study.

Exclusion criteria

- Obvious ossicular dysfunction.
- External ear pathology.
- Chronic otitis media (COM) with Retraction pockets and cholesteatoma

Preoperative assessment

All of the patients underwent thorough clinical examination of the ear; nose and throat .Examination of the ear was done by the microscope. Both tuning fork tests and pure tone audiometry were used to assess the hearing status.

Surgical Technique

All of our patients where operated under general anesthesia. Either postauricular approach or endaural approach were used .The grafts placement was done using an underlay technique. The patients were operated by the same team.

Postoperative assessment

Postoperatively, all the patients were admitted for 24 hours in the ward. If sutures were present, they were removed on day 7 postoperatively. The first follow up was on day 14 postoperatively at which the packs were removed.

Follow up

The patients' first postoperative follow up in the clinic were after 2 weeks at which the packs were removed and BIPP was insufflated. Three months postoperatively, the patients had their second clinic visit at which the external auditory canals were cleaned and the neo tympanums were checked to be in place. On the same visit the first audiometric evaluation (PTA) were performed and then repeated again at 6 months and one-year postoperatively. During these OPD visits we compared the outcome for those underwent temporalis fascia graft and cartilage perichondrium graft.

Data analysis

Data were analyzed using the SPSS version 16.

Results

We had total of 64 patients, 31 (48.4%) were more than 30 years old and 33(51.6 %) were less than or equal to 30 years old. 35 (54.7%) patients were females and 29 (45.3%) were males. 58 of our patients were operated for the first time, while another 6 had a revision tympanoplasty. Moreover, 60 patients

were having conductive hearing loss, while 4 patients had a mixed hearing loss. Temporalis fascia was used as a graft material in 34 (53 %) patients and cartilage /perichondrium was used in 30 (46.9%) patients. (Table1)

In regards to postoperative complications, 50 patients (78%) developed no complications, 5 patients had postoperative infection, 2 had a residual perforation and one patient complained of a metallic taste secondary to chorda tympani injury. 3 patients of the cartilage / perichondrium group developed displacement of the cartilage graft .The surgical findings of our sample were noted and we found that 5 patients had sclerosis of the tympanic membrane, 2 had a superior posterior retraction pocket, similarly another two were found to have adhesions of the middle ear. Furthermore, one patient had atelectatic tympanic membrane, and another patient had eroded ossicles. In general, the difference in the air bone gap preoperatively and postoperatively in our sample is highly significant (p 0.000). The average preoperative gap was 31 dB, while the average postoperative gap was 25 dB.

In the temporalis fascia group, the average preoperative ABG was 30 dB, the average postoperative ABG was 23 dB and the average difference between them was 6.8 dB. Calculated p value is 0.003 significance. On the other hand, the cartilage /perichondrium group showed an average preoperative ABG of 32 dB and an average postoperative ABG of 28 dB. The average difference was 3.9 with a p value of 0.033.

Discussion

The best graft material for tympanoplasty has been the subject of many researches for many years. The goal of tympanoplasty is to reconstruct the tympanic membrane and the sound-conducting mechanism in a long-lasting way.[4] Temporalis muscle fascia and perichondrium remain the most frequently used materials, with a primary tympanoplasty closure rate of approximately 90 percent[4]. In this study we are looking at our experience in a tertiary hospital, Al Nahda Hospital, and we are comparing our results with the literature. We compared temporalis fascia versus cartilage/perichondrium as graft material and we primarily looked at the improvement in Air-Bone Gap (ABG). We had total of 64 patients and none of them missed their follow up appointments. The significant surgical findings were noted in our study in order to look at the other possible factors causing deterioration of hearing. 5 of our patients were found to have tympanosclerosis and one patient found to have a superior posterior retraction pocket. However, the correlation of these findings and the improvement in ABG was not studied.58 % of our sample were undergoing tympanoplasty for the first time, while the remaining 5 patients were operated previously and underwent a revision tympanoplasty when they were included in our study. Out of them, only one patient of the temporalis fascia group was operated earlier and the remaining 5 patients belongs to the cartilage/perichondrium group. It was our surgeons' preference to choose the cartilage /perichondrium as a graft material for most of the revision cases. (Table 1)

Most of our patients (60%) were having an isolated conductive hearing loss, in comparison to 4% who suffered from a mixed hearing loss. The latter group was included hence we were looking at the average improvement in the ABG and that will not be affected by the sensorineural component. Jyothi P. and his colleges achieved an uptake result of 84% and 80% with temporalis fascia and tragal perichondrium respectively.[2] In our study, the total success rate was 96.9 %, where only 3.1% of our patients had a residual perforation. However, the failure rate was equal; composing of one patient is each group.

76 % of the patients in each group achieved < 10 dB closure of ABG in the study conducted by Jyothi

Table 1. Number of patients underwent a revision tympanoplasty versus those operated for the first time in both groups

			No of surgeries		Total
			1st surgery	Revision	
Type of grafting	TF	Count	33	1	34
		% within Type of grafting	97.10%	2.90%	100.00%
	Cartilage	Count	25	5	30
		% within Type of grafting	83.30%	16.70%	100.00%
Total		Count	58	6	64
		% within Type of grafting	90.60%	9.40%	100.00%

Table 2. Number of cases underwent MRM previously in each group

			MRM		Total
			Post MRM	No MRM	
Type of grafting	TF	Count	0	34	34
		% within Type of grafting	0.00%	100.00%	100.00%
	Cartilage	Count	1	29	30
		% within Type of grafting	3.30%	96.70%	100.00%
Total		Count	1	63	64
		% within Type of grafting	1.60%	98.40%	100.00%

P.[2] On the contrary, we found that the overall average difference in ABG was 31 dB. In addition, the noted average difference in the temporalis fascia and cartilage/perichondrium group were 6.8 dB and 3.9 dB respectively. However, average difference was statistically significant in the temporalis fascia group (0.003) and insignificant in the cartilage/perichondrium group (0.033). Only one patient, which belongs to the cartilage/perichondrium group, underwent a modified radical mastoidectomy (Table 2). Therefore, this factor is unlikely to justify the insignificant average improvement in the ABG in the cartilage/perichondrium group.

Conclusion

Temporalis fascia and cartilage / perichondrium are equally good graft material for chronic suppurative otitis media – tub tympanic type –with tympanic membrane perforation. However, the hearing improvement is better with the use of the temporalis fascia.

Declaration of interest

There is no conflict of interest with any financial organization regarding the material presented.

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