Original Article

Comparative study of use of dry and wet temporalis fascia Graft in type-1 Tympanoplasty

Naveen K[1], Jyothi Swarup R[2], Mohan M[3], Mereen Susan Roy[4], Sanjana P[1]

[1]Post graduate, [2]Professor, [3]Professor & HOD, [4]Assistant Professor
Department of ENT
Sri Siddhartha Medical College & Research Centre, SSAHE, Agalakote, Tumakuru

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Abstract

Background: Tympanoplasty is a procedure to eradicate disease in the middle ear and to reconstruct the hearing mechanism. **Objectives:** To assess the graft placement time, surgical and audiological improvement and to estimate the fibroblast count in dry and wet temporalis fascia. **Materials & Methods:** Out of 50 patients, two groups comprising of 25 patients each underwent type 1 tympanoplasty using dry and wet graft respectively. A comparative analysis was done on the graft placement time, fibroblast count and hearing improvement postoperatively between the two groups. **Results:** Complete graft uptake was seen in 96% patients in Wet graft group and 100% patients in Dry graft group. Majority of wet grafting was done within 10-12 minutes compared to dry grafting which was done within 3-6 minutes. Even though Fibroblast count was increased in wet graft tissue (88%) when compared with dry graft tissue (52%), surgical outcomes were similar for dry and wet grafting. We observed that there was statistically insignificant difference between the success rates of graft up take and hearing improvement on both groups. **Conclusion:** There is equal success rates, in terms of graft up take and hearing improvement, whether it is dry or wet temporalis fascia grafting, but Graft placement time will be less in dry grafting as compared to wet grafting.

Keywords: Tympanoplasty, chronic otitis media, temporalis fascia graft.

Introduction

Hearing impairment is a considerable burden in society and affects the patient in terms of reduced emotional, social and physical wellbeing. The assessment of hearing is primarily focused on detection of very quiet pure tones of varying frequencies. Decreased hearing may be congenital or acquired.[1]

The major etiology of hearing impairment among acquired disorders is chronic otitis media (COM) which is preventable and correctable. Chronic otitis media is a chronic infection and inflammation of mucoperiosteal lining of the middle ear cleft. Patients with COM suffer from chronic ear discharge and decreased hearing. The aim of the treatment is to make the ear dry and to improve the hearing by surgical procedure i.e., Myringoplasty, ossiculoplasty with or without mastoidectomy.[2]

Repair of tympanic membrane perforation was attempted since as early as in the seventeenth Century. Different graft materials like, temporalis fascia, tragal perichondrium, fasialata, split thickness skin graft and vein graft were used with varying success rates.[3] Temporalis fascia as a graft material is the main stay in reconstruction of perforated tympanic membrane in all cases which was first used by Heermann in 1958. Regardless of the technique employed, graft uptake with temporalis fascia range between 93-97%. The advantages of the temporalis fascia include that it can be harvested from the same surgical field, availability of a

Address for Correspondence:
Dr. Naveen K, Post graduate student,
Department of ENT , Sri Siddhartha Medical College, Tumkur.
Email id: naveen22krishna@gmail.com

large amount of graft and high take rates and low basal metabolic rate. [1,3]

Some surgeons harvest temporalis fascia at the beginning of surgical procedure and use it when it becomes dry (rigid), whereas others harvest it at the end of the procedure and use when it is still wet (soft). Using a wet or dry graft is usually the surgeon's choice.

Materials and methods

Patients aged between 18 years to 60 years of both gender attending outpatient department of ENT, Sri Siddhartha Medical College hospital, presenting with chronic inactive otitis media (mucosal) and taken up for type 1 tympanoplasty were studied for a period of 18 months (October 2017 to April 2019) after obtaining written informed consent. Ethical committee clearance was obtained. Patients were selected by random sampling from the A Total of 50 patients were grouped into two (25 in each group) following computer generated random number table. Patients with chronic otitis media (squamosal type), sensorineural hearing loss and revision tympanoplasty were excluded. The selected patients were subjected to detailed clinical examination, audiological evaluation (pure tone audiometry) and laboratory Investigations. All patients underwent type 1 tympanoplasty with tympanic membrane grafting using temporalis fascia graft placed underlay technique under local anesthesia. For a dry graft (Figure-1), the temporalis fascia was removed immediately after the post-auricular incision and then placed on and teased over the steel plate and air-dried until it became rigid at room temperature. For a wet graft (Figure-2), the fascia was harvested immediately before placing the fascial graft or just before placement in the middle ear. A small piece of temporalis fascia was cut at the time of surgery both during dry (Figure-3) and wet graft (Figure-4) preserved in formalin and sent to the pathology department for a fibroblast count.[4] During surgery time taken for the graft placement was noted. Patients were followed up postoperatively on third month to determine the graft uptake by otomicroscopy and hearing improvement by pure tone audiometry. The collected data was entered into an excel sheet and analyzed using Statistical Package for the Social Sciences (SPSS) software version–20. Descriptive statistics, chi-square test and paired t test was used. P-value < 0.05 was regarded as statistically significant.

Figure 1: Harvested dry temporalis fascia graft

Figure 2: Harvested wet temporalis Fascia graft

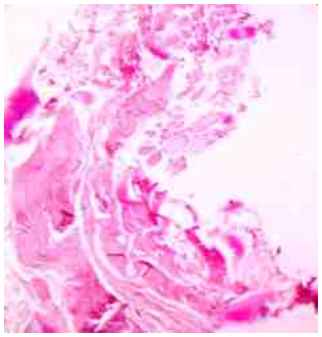

Figure 3: Dry temporalis fascia graft histology

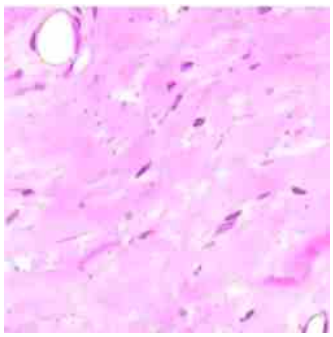

Figure 4: Wet temporalis fascia graft histology

Results

We have included a total number of 50 cases of mucosal type of COM. These cases were divided into two groups of 25 each dry and wet graft groups. Mean age in wet graft group was 37.96± 8.27years, where as in dry graft group it was 36.8±7.09years. Out of 50 patients, 24 were male and 26 were females slightly female preponderance. Slight predominance for the Right sided disease is noted in 29 patients in comparison with 21 cases of left sided disease. The mean graft placement time of dry graft is 5.64 ± 1.52 minutes and graft placement time for wet graft is 9.76 ± 1.58 minutes and this difference was statistically significant (Figure-5). In dry graft group has 13 (52%) fibroblast count ≥10 in one high power field microscopy and 12 (48%) has fibroblast count <10 in one high power field microscopy and in wet graft group, 22 (88%) has fibroblast count ≥ 10 in one high power field microscopy and 3 (12%) has fibroblast count <10 in one high power field microscopy. (Table-1) The number of fibroblasts in wet graft was significantly higher than dry graft (p = 0.005479). With only one residual perforation case in wet graft group and no residual perforation post

operatively in all dry graft group, graft uptake rate was slightly better in dry graft group compared to wet, but not statistically significant (P =0.640429). (Table-2)

Figure-5: Graft placement time in dry and wet graft

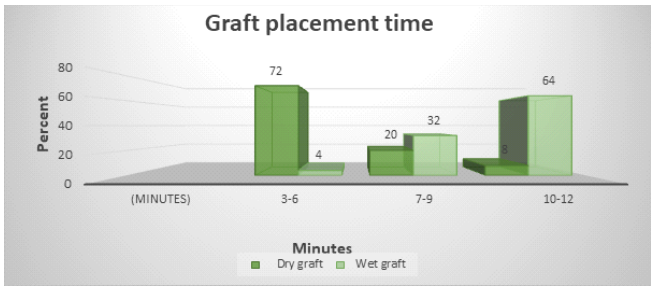

Table-1: Fibroblast count and surgical outcome in wet and dry graft

Variables		**Dry graft number (%)** No of patients	**Wet graft number (%)** No of patients	
Fibroblast count	>=10	13(52)	22(88)	P value: 0.005479 (χ^2 test)
	<10	12(48)	3(12)	
Comparison of graft uptake	Graft failure	0(0.0)	1(4.0)	P value: 0.640429 (χ^2 test)
	Graft intact	**25(100)**	**24(96)**	
	Total	**25(100)**	**25(100)**	

Pure tone audiometric evaluation done pre and post operatively 3 months after surgery to assess hearing improvement. There was an improvement of 22(88%) patients with mild hearing loss to normal hearing range i.e., < 25 db, and 3(20%) patients with moderate hearing loss to mild hearing loss in dry graft group. There was an improvement of 20 (80%) patients with mild hearing loss and 2 (8%) moderate hearing loss to normal hearing range, 3 (12%) patients with moderate hearing loss to mild hearing loss in wet graft group. Mean gain after 3 months was 12.92 ± 3.04 db in dry graft group and 12.72 ± 3.64 db in wet graft group. There was no significant difference between the wet and dry graft in PTA. There was audiological success in both wet and dry graft group but was not statistically significant .Comparing mean difference of hearing gain from pre operative with post operative PTA after 3 month in dry and wet grafting showed statistically significance (P <0.001).

Table – 2: Pre and post operative PTA evaluation between wet And dry graft

Variable	**Hearing Loss**	**Dry graft number (%)** No of patients	**Wet graft number (%)** No of patients	
Pre-operative pure tone audiometry	Mild (26-40dB)	22(88)	20(80)	p >0.05
	Moderate (41-55dB)	3(12)	5(20)	
Post-operative pure tone audiometry	Normal (0-25dB)	22(88)	22(88)	p >0.05
	Mild (26-40dB)	3(12)	3(12)	
Hearing gain after 3 months	> 10db gain	24(96)	23(92)	p>0.05
	< 10db gain	1(4)	2(8)	
	Total	**25(100)**	**25(100)**	

Discussion

In this study, we have compared two groups of patients with dry and wet temporalis fascia graft 25 cases in each group. The graft placement time in wet grafting with mean time of 5.64 ± 1.524 minutes was more compared with dry grafting with mean time of 9.76 ± 1.588 and the mean difference was of 4.12 minutes, which is statistically significant, p value 0.0429. In a study by Seyhan Alkan et al, graft placement time for dry grafting group was longer than for wet grafting, and this difference of mean time 6.78 minutes was found to be statistically significant 0.014 (p <.05) which is in contrast with our study which shows wet grafting takes longer time compared with dry grafting with a difference of mean time 4.12 minutes.[7] The graft placement time was found to be longer in wet grafting as compared to dry grafting (the placement time being measured after the graft is harvested and dried). In our study, owing to the rigidity of dry graft, the placement time was found to be lesser as compared to wet graft, especially during anterior tucking procedures.

In the present study the percentage of fibroblast count showing more than 10 per high power field microscopy in dry graft was 52% ,in contrast to study by GB Singh and Seyhan Alkan et al which showed 78% and 0% respectively. In the present study the percentage of fibroblast count showing more than 10 per high power field microscopy in wet graft was 88%, in contrast to study by GB Singh and Seyhan Alkan et al which showed 96% and 7% respectively.[6, 7] In the present study, fibroblast count was increased in wet graft tissue, but surgical outcomes were similar for both dry and wet grafts. When a dry graft is placed in the wet physiological environment of the middle ear, it will shrink and lose contact with the remnant margins of the tympanic membrane which may lead to graft failure. In contrast, in wet grafts fibroblasts lay down collagen for a reparative process in the wound, with formation of a granulation tissue matrix to allow the spread of epithelialisation, which thereby promotes successful graft uptake.[8] However, in this study, the success rates of dry and wet grafts were not significantly different with respect to their relative fibroblast count. Temporalis fascia graft merely serves as a framework for migration of epithelium over the perforation. These grafts serve as a form of tissue matrix scaffold that is then revascularised in readiness for epithelium migration.[5]

In this study, postoperative follow up by otomicroscopic examination after 1 month showed intact graft in 25 patients in Dry graft group (100%) and 24 patients in wet graft group (96%). 1 patient Wet graft group showed residual perforation. Graft uptake rate was almost successful in both the groups with a statistically insignificant (p value=0.064). In GB Singh et al in their study on type 1 tympanoplasty, showed graft uptake in wet grafting was 45 (90%) out of 50 cases and 41 (82%) out of 50 in dry grafting which shows no significant difference.[6] They Concluded that type 1 tympanoplasty in wet grafting was as successful as in dry grafting and had no increased incidence of complications. In another study done Seyhan Alkan et al in 495 patients they found graft uptake in wet grafting was 90.3% and 94.2% in dry grafting group.[7]

Pure tone audiometric evaluation was done and hearing loss was assessed. 20 (80%) patients had mild hearing loss, 5 (20%) patients had moderate hearing loss and no patient with severe hearing loss in dry graft group. 22 (88%) patients had mild hearing loss, 3 (12%) patients had moderate hearing loss and no patients with severe hearing loss in wet graft group. This shows that majority of patients will have mild to moderate hearing loss. In a similar study by Maharjan M et al done on 2009 in which majority had mild hearing loss (34.37%), moderate hearing loss (52.94%) and severe hearing loss (12.6%) which is comparable to our study that the majority of patients were having mild to moderate hearing loss.[5]

Hearing improvement was assessed by pure tone audiometry at third month. Preoperatively, mean pure tone threshold in wet graft group was 36.84 dB and 37 dB in dry graft group. At third month, mean PTA was 23.92 dB in wet graft group and 23.48 dB in dry graft group.

Mean gain after 3 months was 12.92 ± 3.04 db in dry and 12.72 ± 3.64 db in wet grafting. The p value between the wet and dry grafting is 0.8340 which is statistically insignificant.

In this study there was an average hearing improvement of 12.82dB. Hearing improvement was seen in 96% cases in dry ear and 92% in wet ear. The p value between the more or less than 10 db gain post operatively between wet and dry graft is 0.551515 which is

insignificant.

GB Singh et al studied on influencing factors in type 1 tympanoplasty. Out of 41 cases of surgical success in the dry graft group, only 25 showed audiological improvement. In the wet graft group, out of 45 cases of surgical success, 29 showed audiological improvement. This finding was not statistically significant (p= 0.369).[6] Hence, both the groups had comparable audiological results.

Conclusion

Considering the observations of our study and comparing with similar studies we conclude that there will be equal success rates, in terms of graft up take and hearing improvement, whether it is dry or wet temporalis fascia grafting, but Graft placement time will be less in dry grafting as compared to wet grafting.

The results of this study helps the surgeon to make a decision to operate with dry temporalis fascia graft and to get an equally good result as comparable to fresh wet temporalis fascia graft.

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Conflicts of interest: Nil

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