

ANATOMICAL AND FUNCTIONAL OUTCOME FOLLOWING TYPE-1 TYMPANOPLASTY IN CHRONIC TUBOTYMPANIC SUPPURATIVE OTITIS MEDIA

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ABSTRACT

Objectives: To assess the improvement in hearing and rate of graft uptake after type-1 tympanoplasty in chronic tubotympanic suppurative otitis media and to identify the complications of surgery.

Study Design: Interventional study (quasi experimental).

Place and Duration: Department of Ear Nose Throat (ENT) and department of Head & Neck surgery at Combined Military Hospital (CMH) Rawalpindi from July 2002 to Feb 2004.

Materials and Methods: A total of 107 cases of chronic suppurative otitis media tubotympanic type with dry central tympanic membrane (TM) perforations were selected. Out of these, 85 cases were available for follow-up. The patients were evaluated by history, clinical examination and by examination under otomicroscope. All other cases with ear discharge and cholesteatomas were excluded. Preoperative and postoperative audiograms were done, laboratory investigations and X-ray of mastoids were also carried out. All the patient underwent type-I tympanoplasty, using temporalis fascia with underlay technique. The postoperative results were evaluated with respect to anatomical and functional out come.

Results: Our study showed an overall success rate of 92.95% as far as the graft uptake was concerned. Out of 85 cases, on examination at the interval of three months the perforations was closed in 79 (92.94%) cases. Improvement in hearing was seen in 73 (85.88%) cases, with notable reduction in air-bone gap at the end of three months. The complications at the interval of three months were dislodgement of graft 1 (1.17%) case, residual perforation 5 (5.88%) cases, deterioration of hearing 1 (1.17%) case, small retraction pockets 3 (3.52%) cases and metallic taste in mouth 2 (2.35%) cases.

Conclusion: From this study we concluded that in dry ears with central perforations, type-I tympanoplasty using temporalis fascia with underlay technique is a very satisfactory and reliable procedure for closing the tympanic membrane perforations and to restore hearing, provided attention is paid to aseptic technique, anatomical landmarks and by exercising good clinical judgment.

Keywords: Type-I tympanoplasty, temporalis fascia, underlay technique, hearing assessment.

INTRODUCTION

Chronic suppurative otitis media is a long standing infection of the middle ear cleft characterized by persistent or

recurrent aural discharge, deafness and perforation of tympanic membrane(TM). Chronic tubotympanic suppurative otitis media can be managed in two ways, conservative and surgical management. The aim is to restore the anatomy and function of

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the middle ear [1]. Small perforations usually heal spontaneously but when the edges of the perforation are covered by stratified squamous epithelium, a perforation becomes permanent and does not heal spontaneously [2]. Procedures such as grafting the tympanic membrane, alone, or in combination with ossiculoplasty (tympanoplasty with ossicular chain reconstruction), comprise the varying subtypes of tympanoplasty [3,4]. Type-1 tympanoplasty is performed when there is TM perforation without any ossicular damage [5]. The incidence of chronic tubotympanic suppurative otitis media is high in developing countries because of poor socioeconomic standards, poor nutrition and lack of health education. It is an important cause of hearing impairment 6. This study deals with anatomical and functional outcome in a series of patients who underwent type-1 tympanoplasty with underlay technique using temporalis fascia graft.

PATIENTS AND METHODS

The study was carried out from July 2002 to Feb 2004 at the department of ENT and Head & Neck surgery CMH Rawalpindi. A total of 107 patients of chronic suppurative otitis media tubotympanic type with dry central perforations were selected. Out of these, 85 cases were available for follow-up.

All patients were assessed pre-operatively by detailed history and clinical examination. All the patients with tubotympanic disease and dry central perforations were selected, the ears were dry for a period ranging from 3 – 6 months, patients with history of nasal allergy, other nasal diseases, throat problems or any systemic disease were either appropriately treated or excluded from the study. Similarly, those with abnormal Eustachian tube function or discharge from the ear, age less than 20 and more than 46 were also

excluded from the study. Tympanosclerosis and condition of the middle ear mucosa was noted; cholesteotoma was carefully ruled out in all the cases. The type, size and location of the perforations were recorded. The patency of Eustachian tube was assessed by first instilling the sterile normal saline drops in the middle ear and then asking the patient to perform Valsalva maneuver. Hearing assessment was initially performed clinically by doing the voice tests, tuning fork tests and then by Pure tone Audiometry. Ossicular chain integrity was speculated by pre operative A-B gap on audiometry and then it was checked per operatively when the tympanum was opened. X-ray of the Mastoids was performed in all patients. The cases were operated under GA through post-aural approach using temporalis fascia by underlay technique, post aural approach was used to standardize the results, it is a reliable method for the repair of all perforations and it is the usual procedure done in our center. External auditory meatus was packed with gelfoam and Bismuth iodoform paraffin paste (BIPP) dressing. Post operative antibiotics were given for 7 days. Stitches and BIPP dressing were removed on 7th post operative day. Patients were followed at regular intervals post-operatively; however final post operative evaluation was made after an interval of 3 months. The findings were recorded in a pre-designed performa. Status of the graft, along with any evidence of complications was noted. Hearing assessment was made with the same protocol as used pre-operatively. Results were analysed using statistical software package SPSS 10.0.

RESULTS

A total of 107 cases underwent type-1 tympanoplasty. Out of these cases 22 cases were lost in the follow-up and only 85 cases were available for the analysis after an interval of three months. Among these 85 cases, 62 were males and 23 were females. The age range was from 21-46 years and mean age was 33.5 years. The distribution of side of

operation, size and location of perforation (table-1).

Our study showed an overall success rate of 92.95% as far as the graft uptake was concerned, i.e out of 85 cases, in 79 (92.95%) cases the perforation was closed on examination at the interval of three months. Overall improvement in hearing was seen in 73 (85.88%) cases, with notable reduction in air-bone gap at the end of three months. Hearing deterioration was seen in 1 (1.16%) case. Overall, the procedure failed in 6 (7.05%) cases; there was residual perforation of tympanic membrane in 5 (5.88%) cases whereas dislodgement of graft was seen in 1 (1.16%) case. Air bone gap was closed completely in 3 (3.52%) cases; 36 (42.35%) cases showed a reduction in air-bone gap upto 10 db or less whereas 24 (28.23%) cases had the residual air-bone gap upto 15 db. In the remaining 10 (11.76%) cases, there was a residual air-bone gap in excess of 20 db; however it was better than the preoperated levels.

The complications at the interval of three months were complete dislodgement of graft in 1 (1.16%) case and residual perforation of the tympanic membrane in 5 (5.88%) cases. Deterioration of hearing was seen in 1 (1.16%) case. Small retraction pockets were observed in 3 (3.52%) cases. Two (2.35%) cases complained of metallic taste in their mouth, which improved with the passage of time. Other complications like sensorineural hearing loss (SNHL), vertigo, damage to facial nerve and meatal stenosis were not observed.

Table-1: Patient demographics.

Characteristics	No of Patients	%age
No. of procedures	85	
Right ear	47	55.29%
Left ear	38	44.71%
Size of perforation		
Small	24	28.23%
Medium	51	60%
Large	10	11.76%
Location of perforation		
Anterior	57	67.05%
Posterior	18	21.17%
Subtotal	10	11.76%
Sex		
Male	62	72.94%
Female	23	27.05%

DISCUSSION

Tympanoplasty is considered to be a simple, easy-to-complete otologic surgery, with good success rate both anatomically and functionally. However, failures do occur. The main aim of this procedure is to prevent recurrent infection of the middle ear, to improve hearing, and minimize after care [7].

Many studies have been carried out in the past regarding structural and functional outcome following type-I tympanoplasty utilizing temporalis fascia with underlay technique. The quoted success rate in various studies ranges from 80% to 95% [8-11]. Pelva [12] reported 97% success of tympanic membrane repair and air-bone gap of less than 20 dB in 69% of the cases undergoing type-1 tympanoplasty. Regarding anatomical outcome our graft uptake rate, with complete closure and healing of the TM was 92.94%. These results are comparable to the results of other published studies. Our results for the graft uptake are slightly better because strict criteria was applied for the selection of cases and we selected only those cases which were dry for the period of at least 3-6 months. Secondly, our results are based on 3-month follow-up, with longer follow up different results may be obtained.

TM perforations < 50% of the drum surface perform significantly better than larger ones [13,14], we also observed that small sized perforations that were making 28.23% of all the cases healed better and the graft uptake rate was better as compared to the larger perforations.

Considering the functional outcome, one author reported approximately an 80% success rate at five years to within 10 dB. He recommended aiming for a final air-conduction threshold less than 30 dB or within 15 dB of the other ear for the patient to benefit from binaural hearing and sound localization [9]. The largest study to date on overlay and underlay grafting was performed by Rizer, improvement in hearing (closure of

air-bone gap to within 10 dB) was seen in 84.9% cases of the underlay group [6]. Our

Table-2: Post op air bone gap results (n=85).

Perforation	Total	A-Bgap closure	10db or less	15 db	20 db or more	No imp	Deterioration
Small	24	2	15	3	2	2	
	28.23%	8.33%	62.55%	12.50%	23.52%	8.33%	
Medium	51	1	20	18	6	6	
	60.00%	1.96%	39.21%	35.25%	11.76%	11.76%	
Large	10		1	3	2	3	1
	11.76%		10%	30%	20%	30%	1.11%
Total	85	3	36	24	10	11	1
	100%	3.52%	42.35%	28.23%	11.76%	12.94%	1.17%

study was based on the experience with underlay technique only and overall improvement in hearing was seen in 73 (85.88%) cases with notable reduction in air-bone gap and out of these cases 63 (74%) cases had air-bone gap to within 15 dB, at the end of three months. Hearing deterioration was seen in 1 case only (1.16%).

Recently various new other tissues have proved to be good grafting materials. Many studies have been conducted to compare the hearing results of patients with cartilage tympanoplasty, using perichondrium and it was concluded that hearing results after cartilage tympanoplasty are comparable to temporalis fascia and perichondrium [15-17], but results of cartilage tympanoplasty were not good by some authors [18]. Recently in many studies alloderm and human amniotic membrane have also proved to be an effective TM graft when used in type I tympanoplasty [19-21].

Various complications regarding type-I tympanoplasty have been mentioned in the literature, among these infection, residual perforation, dislodgement of graft, retraction pockets and damage to chorda tympani are the common ones [22]. Postoperative infections can lead to graft failure. In our study the graft failed in 6 ears (7.05%). Graft failure can also occur because of inadequate packing of the anterior mesotympanum with gel foam. In this study dislodgement of graft was seen in 1 case only. In some cases conductive hearing loss may increase, despite

successful repair of a TM perforation. In our series, out of 85 cases hearing worsened in 1

case (1.17%) postoperatively in spite of satisfactory graft uptake, this was of conductive type and possibly because of post-operative fibrosis following infection. Injury to the chorda tympani nerve results in disturbances of sensation of the tongue [23]. We found 2 patients with the complaints of slight metallic taste in their mouths which improved by the end of three months. Other complications like SNHL, vertigo, damage to facial nerve, chondritis and meatal stenosis were not seen. In this study we observed that type-1 tympanoplasty using temporalis fascia with underlay technique is a reliable and preferred procedure because of less complications and better anatomical and functional results. In an other study by Singh M underlay technique was judged to be better because of its technical ease, better assessment of ossicular chain integrity and mobility, less time consumption, earlier healing of graft, hearing gain in more patients and fewer minor complications [24]. To say that a tympanoplasty failed or succeeded in a given case is meaningless if our criteria are different. Specifically we need to standardize the outcome measures.

CONCLUSION

From this study we concluded that in type-1 tympanoplasty (underlay technique) with reasonable skill and experience, good anatomical and functional results can be obtained. Complications do occur but most complications can be prevented by paying

careful attention to the aseptic operating technique, anatomical landmarks and by exercising good clinical judgment during the operative procedure. Case selection (middle ear status, age, infection) is a very important factor and can have significant bearing on the post-operative results. Longer the duration of disease there are chances of poor functional results. Moreover there is need for uniform methods of reporting the results and future studies with longer follow-up of the cases is recommended.

REFERENCES

- Perez-Carro Rios A, Farina Conde JL, Ibarra Urbieto I, Gonzalez Guijarro I, Clemente Garcia A. [Myringoplasty: our results] [Article in Spanish]. *Acta Otorrinolaringol Esp* 2002; 53(7): 457-60.
- Khan NA. Repair of traumatic perforation of tympanic membranes by a new technique. *Pak J Otolaryngol* 1992; 8: 177- 9.
- Javed M, Khan S, Ullah H, Shah J. Onlay versus underlay myringoplasty, audiological results. *Pak J Otolaryngol* 2000; 16: 59-60.
- Vrabec JT, Deskin RW, Grady JJ. Meta-analysis of pediatric tympanoplasty. *Arch Otolaryngol* 1999; 125(5): 530-34.
- Ashfaq M, Aasim MU, Khan N. Myringoplasty: anatomical and functional results. *Pak Armed Forces Med J* 2004; 54(2): 155-8.
- Rizer FM. Overlay versus underlay tympanoplasty. Part I: Historical review of the literature. *Laryngoscope* 1997; 107(12) suppl 84, 1-25.
- Jalisi M, Khalid I, Khalid AA. The human amniotic membrane graft material in tympanoplasty. *Pak J Otolaryngol* 1997; 13: 11-12.
- Ogale SB, Bhaya MH, Verma S, Sheode JH. Inferior based flap in myringoplasty. *Pak J Otolaryngol* 1992; 8: 13-15.
- Smyth GDL. Toynbee Memorial Lecture 1992: facts and fantasies in modern otology: the ear doctor's dilemma. *J Laryngol Otol* 1992; 106: 591-6.
- Aslam N, Iqbal J, Mehmood K. TypeI Tympanoplasty underlay technique and results. *Proceeding Shaikh Zayed Postgrad Med Inst* 2001; 15(2): 77-80.
- Fadl FA. Outcome of type-1 tympanoplasty, *Saudi Med J* 2003; 24(1): 58-61.
- Palva T. Myringoplasty and tympanoplasty. *Acta Otolaryngol* 1987; 104: 279-84.
- Frade GC, Castro VC, Cabanas RE, Elhendi W, Vaamonde LP, Labella CT. Prognostic factors influencing anatomic and functional outcome in myringoplasty *Acta Otolaryngol Esp* 2002; 27(5): 331-4.
- Lee P, Kelly G, Mills RP. Myringoplasty: does the size of the perforation matter? *Clin Otolaryngol Allied Sci* 2002; 27(5): 331-4.
- Gerber at el, and Dornhoffer. Hearing results after primary cartilage tympanoplasty. *Laryngoscope* 2000; 111(12): 1994-9.
- Gierek T, Slaska-Kaspera A, Majzel K, Klimczak-Golab L Results of myringoplasty and type I tympanoplasty with the use of fascia, cartilage and perichondrium grafts. *Otolaryngol Pol.* 2004; 58: 529-33.
- Wielgosz R, Mroczkowski E. Assessment of the hearing results in tympanoplasties with the use of palisade-technique. *Otolaryngol Pol* 2006; 60: 901-5.
- Effat KG. Results of inlay cartilage myringoplasty in terms of closure of central tympanic membrane perforations. *J Laryngol Otol* 2005; 119(8): 611-3.

19. Vos JD, Latev MD, Labadie RF, Cohen SM, Werkhaven JA, Haynes DS. Use of Allo Derm in type I tympanoplasty: a comparison with native tissue grafts. *Laryngoscope* 2005; 115: 1599-602.
20. Fishman AJ, Huang TC, Kanowitz SJ. Total tympanic membrane reconstruction: Allo Derm versus temporalis fascia. *Otolaryngol Head Neck Surg* 2005; 132(6): 906-15.
21. Harvinder S, Hassan S, Sidek DS, Hamzah M, Samsudin AR, Philip R. Underlay myringoplasty: comparison of human amniotic membrane to temporalis fascia graft. *Med J Malaysia* 2005; 60(5): 585-9.
22. Emir H, Ceylan K, Kizilkaya Z, Gocmen H, Uzunkulaoglu H, Samim E. Success is a matter of experience: type 1 tympanoplasty: Influencing factors on type 1 tympanoplasty. *Eur Arch Otorhinolaryngol* 2007.
23. Green JD. Jr., Shelton C., Brackmann DE. Iatrogenic facial nerve injury during otologic surgery. *Laryngoscope* 1994; 104: 922-6.
24. Singh M, Rai A, Bandyopadhyay S, Gupta SC. Comparative study of the underlay and overlay techniques of myringoplasty in large and subtotal perforations of the tympanic membrane. *J Laryngol Otol.* 2003; 117(6): 444-8.