

Vein Graft Myringoplasty in small and medium sized Perforations

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ABSTRACT

Aim: To establish vein graft as an alternative to the commonly used temporalis fascia with respect to the graft uptake and hearing improvement.

Methodology: Twenty patients with a small and medium sized central perforation, not involving more than 2 quadrants of the TM in the pars tensa underwent myringoplasty with vein graft harvested from the dorsum of the hand. The evaluation of hearing was done preoperatively and the amount of air-bone (AB) gap at 0.5, 1, 2 kHz was the parameter for evaluating hearing status. The outcome was evaluated after 1 month, and 3 months and 6 months.

Results: The patients were divided into three age groups (A: 15-30, B: 31-40 and C: >40 years). The mean age of patients observed in the study was 24.7 ± 7.62 years (range: 17-45 years). Overall successful graft uptake rate was found to be 85% at the end of 6th month. On statistical analysis there was no significant difference found in different age groups regarding the graft uptake and hearing improvement.

Conclusion: The graft uptake of 85% and a considerable improvement in hearing makes vein grafts an alternate and equally effective to the commonly used temporalis fascia as graft material for myringoplasty.

Key words : myringoplasty, temporalis fascia, vein graft

INTRODUCTION

Perforation of the tympanic membrane primarily results from middle ear infections, trauma or iatrogenic causes. Up to 80% of these perforations heal spontaneously.[1] Myringoplasty is a reconstructive operation of the tympanic membrane performed to prevent recurrent ear discharge and to improve hearing loss caused by tympanic membrane perforation.[2] The first surgical closure of tympanic membrane perforation, including removal of epithelium and grafting by skin was performed by Berthold in 1878, and he used the term Myringoplastic for this operation.[3]

In 1950s, Zollner [4] and Wullstein [5] reintroduced Myringoplasty. This period witnessed an improvement in surgical techniques with improved optics and emergence of microsurgery, thus making the Myringoplasty safer and lowered the rate of graft rejection.

A variety of autografts, allografts, xenografts, and alloplasts (temporalis fascia, tragal perichondrium, bovine pericardium, etc.) have been used for that purpose.[6,7]At present, the most frequently used graft is autologous temporalis fascia, which has been used in myringoplasty since the 1960s. [8]

The use of vein grafts for myringoplasty was first described by Shea.[9] Vein graft is readily available from any site of the body, commonly used is the dorsum of the left hand. Though, there are many different kinds of techniques and graft materials used, a survey of literature does not establish indisputably that a particular method is superior to the other. In the literature success rate of myringoplasties with temporalis fascia, vein graft, cartilage and perichondrium ranges 80–90 %. There are conflicting reports, which claim superiority of one procedure over the other.[10]

This is a prospective study and Purpose of this study is to determine the efficacy of vein graft in TM perforations, also to establish vein graft as an alternative and equally effective to the commonly used TM fascia graft.

MATERIALS AND METHODS

Study population and preoperative evaluation

The present study was conducted in the Department of Otorhinolaryngology, Silchar Medical College, Silchar, on 20 patients of either sex, Between April 2014 to march 2015, in the age group of 15-50 years with a small and medium sized central perforation, not involving more than 2 quadrants of the TM, Having dry ear over a period of at least 6 weeks without use of topical or systemic antibiotics. Any focus of infection in the nose and PNS were ruled out. Anesthesia was given according to the choice of the patients, 5 patients were done under general anesthesia and 15 under local anesthesia. All the patients were done through transcanal approach.

All patients were informed about the place from where the Vein will be harvested (dorsum of left hand). Informed consent was obtained after discussion of the alternatives. The approval of the institutional review board was obtained. Twenty patients were included in this study (10 males and 10 females). Fifteen patients had unilateral, and five patients had bilateral perforations. All patients underwent ENT history taking, a thorough clinical examination, audiometric and Eustachian tube function testing and laboratory preoperative testing and X-ray mastoid. The evaluation of hearing was done preoperatively and the amount of air-bone (AB) gap at 0.5, 1, 2, 4 kHz was the parameter for evaluating hearing status.

Surgical technique

The osteocartilaginous junction of the external ear canal was infiltrated with 2 ml of 2% lidocaine with 1:100,000 epinephrine divided at 4 different sites 3, 6, 9 and 12 O'clock positions. The VG was harvested from the dorsum of the left hand as described by H. Tabb[11] shown in figure 1 & 2.

The VG was placed in such a way that the endothelial surface faced medially. The edges of the perforation were excised with a sickle knife or with a Rosen needle and were removed with microforceps. All the cases were performed through post auricular route by underlay technique.

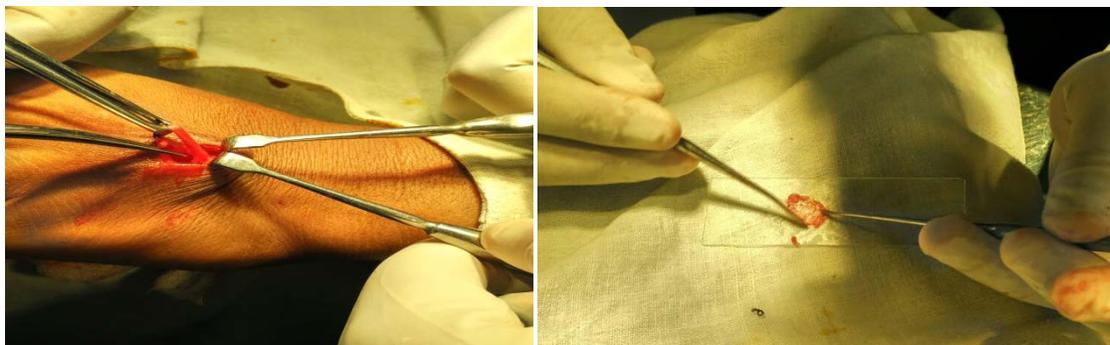


Figure 1 : harvesting vein graft.

Figure 2: preparation of the graft.

A large typanomeatal flap based on superior vascular pedicle was elevated along with the annulus. The graft was placed over the handle of the malleus medial to the annulus. Small pieces of absorbable gelatin sponge were inserted under the typanomeatal flap into the middle ear. Ear was packed with gel foam and antibiotic soaked aural pack. Aural pack removed after 7 days. Sutures were removed after 1 week. Postoperatively, hearing status was evaluated at 0.5, 1, 2 and 4 kHz and any change in the AB gap was noted.

Statistical analysis

The obtained data were compiled. Results were statistically analyzed by using the Chi-square test to assess the surgical outcome and the paired *t*-test to assess the audiological outcome.

Results

The patients were divided into three age groups (A: 15-30, B: 31-40 and C: >40 years). The mean age of patients observed in the study was 24.7 ± 7.62 years (range: 17-45 years). Of 20, 12 (60%) were in the age group of 15-30 years, 5 (25%) were in the age group of 31-40 years and 3 (15%) were in the age group of 35 years and above. [Dig-1] The gender ratio male versus female was 1:1 (10 of each sex). Five patients (25%) had bilateral TM perforations. Among the 20 patients 12 (60%) were presented with ear discharge, 5 (25%) with ear ache and 8 (40%) with hearing loss. 15 patients presented with unilateral TM perforations and 5 with bilateral TM perforations. Overall successful graft uptake rate was found to be 85% at the end of 3rd month. Among 10 males it was 90% and in 10 females it was 80%. Out of 5 patients who had bilateral disease, all 5 (100%) showed graft uptake, whereas in unilateral disease 12 out of 15 patients (80%) showed graft uptake. No difference was observed in the healing of bilateral and unilateral chronic suppurative otitis media cases and in both sexes.

Graph 1: showing various age distributions in patients.

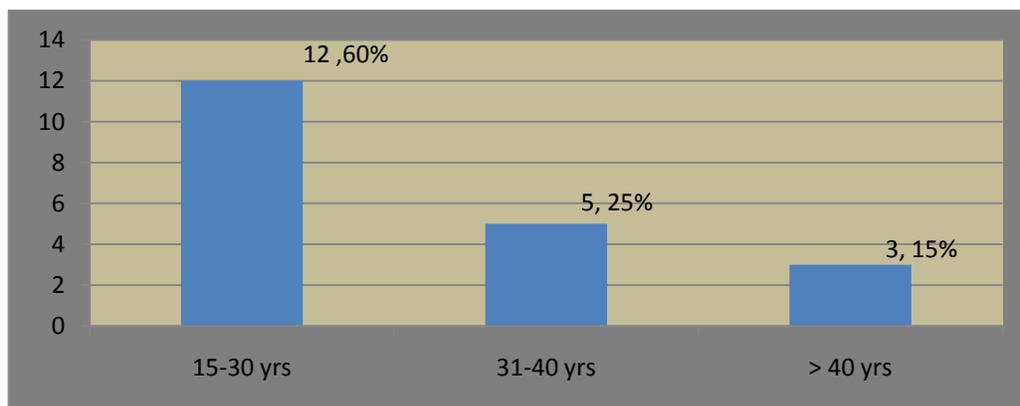
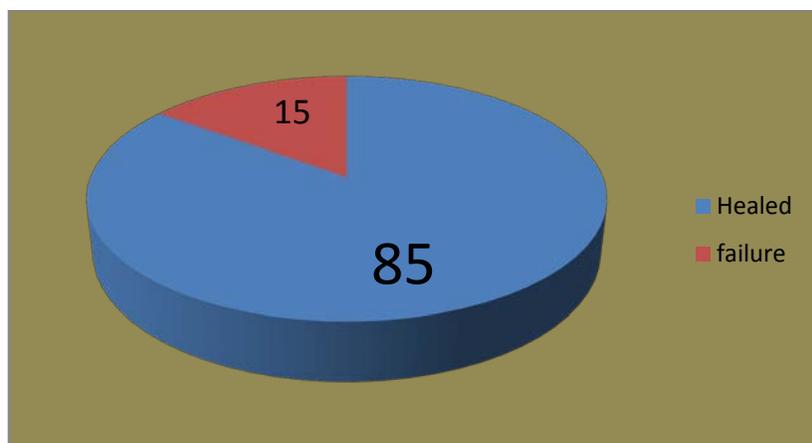


Table 1: showing various presenting symptoms

Presenting symptoms	Vein graft n=20	Percentage %
Ear discharge	12	60
Ear ache	5	25
Hearing loss	8	40

Table 2: showing tympanic membrane perforation in affected ear

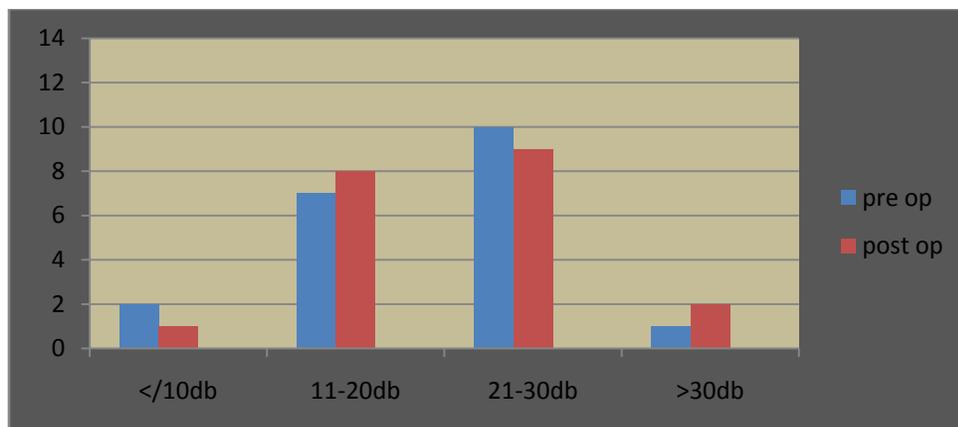
Ear affected (tympanic membrane perforation)	n = 20	Percentage %
Right	6	30
Left	9	45
Bilateral	5	25



Graph 2: the number of graft take up as compared to graft failure.

Pure tone audiometry was used to assess average AB gap pre- and post-operatively. Mean preoperative AB gap was 23.54 ± 5.65 dB (range: 10–35 dB). Mean postoperative AB gap was 21.40 ± 4.23 dB (range: 10-37 dB). Mean improvement in AB gap was 2.14 ± 1.42 dB. When the difference was analyzed statistically using paired *t*-test. There was no difference between the audiometric improvement in both sexes.

Age group wise postoperative improvement in AB gap in 15-30 years was 5/9 (55.5%), in 30-40 years was 2/4 (50%) and in >40 years group it was 1/3 (33.3%). There was no significant difference found between audiometric improvement in different age groups following vein graft myringoplasty in successful patients.



Graph 3: Comparison of pre and post operative air bone gap on pure tone audiometry

DISCUSSION

Myringoplasty is the surgical procedure to repair tympanic membrane perforations and thereby improving hearing, providing a dry ear and reducing susceptibility to infections[12]. Success in myringoplasty is usually assessed in terms of healing of the perforation as well as hearing gain [12,13]. Myringoplasty is successful when there is no infection in the middle ear, mastoid, nose, PNS and if present it should be treated prior to surgery. DNS, sinusitis, nasal polyp should be treated surgically to get good results in myringoplasty. A critical problem early in the development of myringoplasty was finding a suitable material for tympanic membrane grafting. This evolution of the tympanic membrane grafting has been based on biological tissues of mesodermal origin which contain collagen matrix.[14] The use of vein grafts for myringoplasty was first described by Shea [9]. Heerman was the first to use temporalis fascia for myringoplasty [12]. Since then myringoplasty surgery came a long way adopting various techniques and innumerable graft materials to close the tympanic membrane perforations.

Tragal perichondrium was introduced by Goodhill et al the results showed that tympanic membrane healing rates were 80% when temporalis fascial grafts were used and it was better when perichondrial graft (88%) were used and even better when composite grafts were used (92.3%).[13]

The cause for the failure is attributed to lack of elasticity and decreased resistance to pressure changes in middle ear and external ear in case of temporalis fascia.

Skin grafts were the first graft materials used in myringoplasty, by Horst Wullstein and Fritz Zollner (1952). However, they were discontinued from use because of high failure rates and formation of cholesteatoma. Fascia lata and temporalis fascia were established as the preferred materials for tympanic membrane reconstruction.[17]

Homografts have also been used extensively and include cadaveric tympanic membrane, pericardium, duramater, formaldehyde preserved temporalis fascia, and sclera.[17] Homografts are not preferred now because the risk of transmission of Creutzfeld-Jakob disease.[18]

Ringenberg used free autologous fat graft in the early 1960s.[19]

Austin DF (1963) in a series of 503 tympanoplasties performed 190 myringoplasties with vein graft. 117 were re-examined 12 month later. There were 14 failures and 89% of these the cases was air- bone gap of 0-20 db.[31]

With respect to limitations, homologous vein grafts do not appear to survive on raw soft tissue surface. The following table shows success rate achieved by different authors using vein graft material:

Author	Year	Success in %
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Livingstone ³²	1961	100%
Gulliford ³³	1962	95.7%
Austin ³¹	1963	82%
Wright ³⁴	1963	93.5%
Nickel ³⁵	1963	82%
Smyth ³⁶	1964	96%

Myringoplasty can be performed using either overlay technique or underlay technique [12,13]. The underlay method can be achieved by either trans-canal approach or post-aural approach.

Patients with small or moderate central perforations were included in the present study because of the fact that limited size of the autologous VG, which would be insufficient to close larger perforation [9, 21]. Shea who first used VG advised not to use VG if the defect in the tympanic membrane is occupying more than 40 % of the tympanic membrane area [9]. It is difficult or impossible to bridge a large perforation by VG [20,21]. The failure rate was high while repairing large tympanic membrane perforations, using VG [20,21]. It is obvious from the various studies that VG are suited for small or moderate size perforations [20,21]. High failure rate (6.5–20 %) has been reported with larger perforation irrespective of grafting material used [20, 22]. But according to study of Wasson et al. [23] neither perforation size nor any other assessed variable was a statistically significant determinant factor for successful myringoplasty. Inactive ears were preferred for the study to rule out the focus of infection and resultant graft failure. However, Adkins and white [22] found in his study that preoperative dry intervals do not influence the outcome of the surgery.

In all our cases myringoplasty was done by underlay technique and a post aural approach. The vein graft was harvested from the dorsum of the hand and placed with the endothelium facing medially. We found that harvesting and preparing the graft was not a time taking cumbersome procedure. Shea [9] and Tabb [11] have reported the use of VG with endothelium inwards because endothelium facing inwards minimizes adhesions and the rough sticky adventitia adhering well to the prepared inner drum margin. Nickel [24] P.K.Parida et al compared vein graft and temporalis fascia graft and he found both VG and TFG have proved to be equally efficacious in terms of graft take up 83.3% and hearing improvement 70% when used in myringoplasty for small or moderate size tympanic membrane perforation.[25]

In our case the overall success rate for graft uptake at the end of 3rd month was 85 percent. It was 90 percent in male patients and 80 percent in female patients. In cases of bilateral perforation graft uptake was 100 percent and unilateral cases it was 73.33 percent. The success rate for vein grafting in our study is as good as temporalis fascia graft as mentioned in various other studies [26,27,28,29].

Improvement in hearing was assessed by doing a pre operative and post operative audiogram. The preop AB gap was 23.54 ± 5.65 dB (range: 10–35 dB) as compared to post op AB gap which was 21.40 dB ± 4.23 dB (range: 10-37 dB). It was observed that mean improvement in hearing was 2.14 dB ± 1.42 dB. Our findings support current literature that autologous vein graft can be successfully used in cases of CSOM with small to medium sized perforations. The results in our study with vein graft is comparable to temporalis fascia grafting as suggested in various other studies [30]

CONCLUSION:

The graft uptake of upto 85 percent and a significant improvement in hearing as assessed by pre and post op audiogram suggests that vein grafts can be safely used for myringoplasties of small to medium sized perforation. The results are as good as myringoplasties done with temporalis fascia and other available common graft materials.

In prospective of post operative scarring with a very minimal scar over the dorsum of hand makes it a cosmetically suitable and efficient grafting technique over other techniques.

REFERENCES

1. Galdstone HB, Jackler RK, Varav K. Tympanic Membrane Wound Healing. An Overview. *OtolaryngolClin North Am.*, 28, 1995, 913–932.
2. Frootko NJ. Applying the language of Tympanoplasty. *Acta otolaryngology*, 1985; (39): 377.
3. Berthold E, UeberMyringoplastik, *Wier Med Bull*, 1878, 1, 627–627, Cited By: Sismanis A. Tympanoplasty, In *Glasscock-Shambaugh Surgery Of The Ear*, Vol. 1, 5th Edn, Pp. 463-486, BC Decker Inc., 2003.
4. Zollner F, The Principles Of Plastic Surgery Of The Sound-Conducting Apparatus, *J LaryngolOtol*, 69,1955, 637–652.
5. Wullstein H, Theory And Practice Of Myringoplasty. *Laryngoscope*,66, 1956, 1076–93.
6. Gibb AG, Chang SK. Myringoplasty (A review of 365operations). *J LaryngolOtol* 1982;96:915-30.
7. Downey TJ, Champeaux AL, Silva AB. AllodermTympanoplasty of tympanic membrane perforations. *Am J Otolaryngol* 2003;24:6-13.
8. Sheehy JL, Crabtree JA, Tympanoplasty, Staging The Operation, *Laryngoscope*, 83, 1973, 1594-1621.
9. Shea JJ. Vein graft closure of eardrum perforations. *J Laryngol Otol*. 1960;74:358–362.
10. P.K. Parida et al, A Comparative Study of Temporalis Fascia Graft and Vein Graft in Myringoplasty, *Indian J Otolaryngol Head Neck Surg*, v.65(Suppl 3); 2013 Dec PMC3889340.
11. Tabb HW. Closure of perforations of the tympanic membrane by vein grafts. *Laryngoscope*. 1960;70:271–286.
12. Athanasiadis-Simanis A (2010) Tympanoplasty: tympanic membrane repair. In: Gulya AJ, Minor LB, Poe DS (eds) *Glasscock-shambaugh surgery of the ear*, 6th edn. Peoples Medical Publishing House, Shelton, pp 468–478.
13. Browning GG, Merchant SN, Kelly GK, Swan IRC, Canter R, Mckerrow WS (2008) Chronic otitis media. In: Gleeson M, Browning GG, Burton MJ, Clarke R, Hibbert J, Jones NS, Lund VJ, Luxon LM, Watkinson JC (eds) *Scott-Brown's otorhinolaryngology*, 7th edn. Hodder Arnold, London, pp 3421–3422
14. Booth JB. Myringoplasty - Factors affecting results. Final report. *J LaryngolOtol* 1973;87:1039-84
15. Goodhill, V et al: Tympanoplasty with perichondrial graft; *Archives of Otolaryngology*; 1964; 79; 131-137
16. Mohamed A1 lakhany, Nadia NassifSarkis, 2006 "Functional results after myringoplasty and type I tympanoplasty with the use of different graft materials": *Journal of Medical Research Institute*:26:369-374
17. Spiros Manolidis. Closure of tympanic membrane perforations in Glasscock – Shambaugh Surgery of the ear, Hamilton, Ontario, 2003, 400-418.
18. James Robinson. Reconstruction of the middle ear in Ludmann Wright's Diseases of the ear, New Delhi, 6th edition, p430.
19. HussamK.El-Kashian, Lee A. Harker. Tympanoplasty and ossiculoplasty in Cummings Otolaryngology Head and Neck Surgery, Philadelphia, Pennsylvania, 4th edition, 2005, p3059
20. Wright WK (1963) Tissues for tympanic grafting. *Arch Otolaryngol* 78:291–296
21. Mitchell JF (1967) Myringoplasty by homogenous vein graft. *JLaryngolOtol* 81:339–346
22. Adkins WY, White B (1984) Type I tympanoplasty: influencing factors. *Laryngoscope* 94:916–918.
23. Wasson JD, Papadimitriou LE, Pau H (2009) Myringoplasty: impact of perforation size on closure and audiological improvement. *J LaryngolOtol* 123:973–977
24. Nickel AL (1963) The use of homologous vein grafts in Otolaryngology. *Laryngoscope* 68:919–925.
25. Pradipta Kumar Parida et al, A Comparative Study of Temporalis Fascia Graft and Vein Graft in Myringoplasty *Indian J Otolaryngol Head Neck Surg*. 2013 Dec; 65(Suppl 3): 569–574.
26. Sheehy JL, Anderson RG (1980) Myringoplasty: a review of 472 cases. *Ann OtolRhinolLaryngol* 89:331–334.
27. Glasscock ME III, Jackson G, Nissen AJ, Schwaber MK (1982) Post auricular undersurface tympanic membrane grafting: a follow up report. *Laryngoscope* 92:718–727.
28. Strahan RW, Ward PH, Acquarelli M, Jafe KB (1971) Tympanic membrane grafting. Analysis of materials and techniques. *Ann OtolRhinolLaryngol* 80:854–860.
29. Glasscock ME (1973) Tympanic membrane grafting: overlay vs.undersurface technique. *Laryngoscope* 88:754–770
30. Hordijk GJ, Rietema SJ (1982) Tympanic membrane grafting with fascia, pericardium and vein. *J LaryngolOtol* 96:43–47.
31. Austin DF. Transcanal tympanoplasty. *OtolaryngolClin North Am*. 1972;5:12743.
32. Livinstone G and Miller H: Results of tympanoplasties. *J Laryng*. 1961; 75:668.
33. Guilford FR, Wright WK and Draper WL: Tympanic skin grafting and reconstruction of the middle ear sound conducting mechanism. *Arch. Otolaryng*. 1959; 69: 70.
34. Wright WK (1963) Tissues for tympanic grafting. *Arch Otolaryngol* 78:291–296.
35. Nickel AL (1963) The use of homologous vein grafts in Otolaryngology. *Laryngoscope* 68:919–925.

36. Smyth G.D.L, Kerr A.G : tympanic membrane homografts. J. Laryngol. Otol 1969; 83; 1061-1066.

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