

A STUDY OF THE ROLE OF TISSUE ADHESIVES IN MYRINGOPLASTYSandeep Kaushik¹, Rajat Jain²¹Professor, Department of Otorhinolaryngology, Government Medical College, Kannauj, Uttar Pradesh.²Senior Resident, Department of Otorhinolaryngology, Government Medical College, Kannauj, Uttar Pradesh.**ABSTRACT****BACKGROUND**

The objective is to study the role of tissue adhesives in myringoplasty.

MATERIALS AND METHODS

Sixty cases with a dry central tympanic membrane perforation were operated upon with conventional underlay type I tympanoplasty using autogenous temporalis fascia graft and the glue to spot weld the graft to flaps and surroundings. Results of surgery were assessed after six months postoperatively.

RESULTS

At six months postoperatively, 54 grafts were intact (90%) and all patients had significant audiometric improvement also. These results were better than those from statistics obtained from medical records (82%) using conventional methods for Myringoplasty suggesting this technique to be very promising.

CONCLUSION

Use of cyanoacrylate glue, in specific, in the underlay tympanoplasty technique using the temporalis fascia graft has many advantages. The main advantage of glue is ensuring the graft stability, due to spot welding of graft with the adhesive.

KEYWORDS

Myringoplasty, Cyanoacrylate, Glue.

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BACKGROUND

Repair of tympanic membrane perforations with most accepted techniques reaches a success rate of 65 to 85.5% as cited in different literatures.^[1-2] Autogenous temporalis fascia, which was introduced by Storrs in 1961,^[3] has been the most commonly used and most satisfactory graft material as it is conveniently located and is resistant to infection. Regardless the pros and cons of lateral surface (onlay or overlay) versus medial surface (underlay), the most frequently used technique globally for type I tympanoplasty is the underlay of the temporalis fascia graft.^[4] The postoperative complications of tympanoplasty type I procedure regardless its type are failure of healing or residual perforation, re-perforation, excessive membrane thickness, canal stenosis, blunting of the anterior tympanomeatal angle, high frequency sensorineural hearing loss or conductive hearing loss, cholesteatoma and epithelial pearl formation and lateralisation of the graft.^[5-6] The underlay technique minimises, but not eliminates, the possibility of blunting or lateralisation because the skin of the anterior ear canal and annulus is left in place. However, placement of the graft medial to the tympanic membrane can be more technically challenging.^[5]

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In addition, the technique necessarily invokes lifting of a tympanomeatal flap for fixation of the graft, with its inherent tendency to provoke bleeding that sometimes impairs visualisation and causes flap tears, particularly with neophyte surgeons.^[4] Sometimes, post-operative ear packing may cause displacement of the graft, which may contribute to the failure rate.^[7] Temporalis muscle fascia shows disorderly arrangement of elastic fibres (loose, crisscross, and interrupted). The irregular and unpredictable gaps between the elastic fibres are filled by the fibrous connective tissue, which shrinks and thickens more than elastic fibres do. Thus, shrinkage of the temporalis muscle fascia is unpredictable and may lead to graft displacement or residual perforation with lower success rates especially for larger perforations.^[8,9] Many techniques like use of cartilage as grafting material and modification of the surgical techniques and packing methods^[6,8] were used to overcome the graft displacement problem (either to outside or inside). Using surgical glue to fix the graft to the surrounding more stable structures to prevent graft displacement, was one of these techniques. ^[10-16] The aim of our study is to present cases which use the tissue glue composed of N-butyl-2-cyanoacrylate during type I tympanoplasty and its impact on the surgical and functional results of the procedure, in addition to see any local or systematic side effects from the use of this material locally in the ear during the surgery.

MATERIALS AND METHODS

After taking approval from the departmental ethics committee, sixty cases with a dry central tympanic membrane perforation were operated upon with type I tympanoplasty using autogenous temporalis fascia graft and the glue to spot weld and fix the graft to flaps and

surroundings within a period of one and half years. The patients had dry central tympanic membrane perforation and conductive hearing loss without any cholesteatoma or other otologic symptoms or signs. The ear was dry without any active infection for more than six weeks. The conductive hearing loss was of no greater than 35 dB in any frequency. There was no preoperative sensorineural hearing loss or history of prolonged noise exposure, tinnitus, vertigo or any otologic complications to avoid misinterpretation of the preoperative condition as a side effect for the technique or the glue material used. There was no known allergy or sensitivity to any drug, chemicals or biological and synthetic material. The cases were operated upon by the underlay technique using autogenous temporalis fascia graft under local anaesthesia & intravenous sedation/general anaesthesia without usage of nitrous oxide. Xylocaine 2% with 1: 100, 000 epinephrine was infiltrated locally in the external auditory canal, postauricular region and in the temporalis fascia graft area. The patients were positioned, prepped, and draped as usual. The postauricular approach was used. Postauricular incision made and the temporalis fascia graft was harvested and dried. Next, the periosteum flaps elevated, after meatotomy, pinna retracted anteriorly. Tympanic membrane was examined and the margin of the perforation was freshened all around. A laterally based flap of the posterior canal skin was elevated, this was after the canal skin incisions had been done. First of these incisions was done transversally immediately lateral to the tympanic annulus, from six o'clock to twelve o'clock position along the posterior bony canal wall. The two longitudinal incisions were then made from the upper and lower ends of the transverse one laterally to stop few millimetres from the meatus. Anteriorly based skin flaps were next developed along the superior and inferior borders of the rest of the skin canal. Now the tympanic membrane became better exposed and the posterior tympanic annulus could be elevated. Chorda tympani nerve and ossicles were identified and evaluated to be normal and mobile with the rest of the middle ear cavity and its contents also were evaluated. The middle ear and eustachian tube orifice then were packed with Gelfoam soaked with non-ototoxic antibiotic eardrops. Once the graft is trimmed, it was used to graft the perforation and carefully inserted medial to the bony annulus. Skin flaps were rotated back into its normal position to overlay the fascia graft. At this step, a layer of the glue was used to fix the flap's edges and tympanic membrane remnants to the graft underneath them using insulin syringe. The cyanoacrylate glue was retrieved from storage at 4°C, and kept at room temperature for two hours. The pack was opened and the transparency and fluidity of the glue was checked, then the sterile single-dose vial containing 1 mL was poured directly on the surgical table in a sterile field. The glue then was drawn out of the single-dose vial with a sterile 4-5 cm needle and insulin syringe. The glue was directly applied a drop at a time slowly using the same syringe with a 16-G IV. Glue does not polymerise in the needle or cannula, it should come in contact with tissue or blood to polymerise. The glue applied at minimum amount formed, with polymerisation, a thin adhesive film. For this purpose, it was essential not to apply more than one drop in the same spot.

The excess glue was removed with a dry Gelfoam swab within the first 5-6 seconds after its application. Most polymerisations of the glue occurred within approximately sixteen second, but the canal was packed after three to five minutes and no Silastic was used according to the manufacture instructions. The canal was packed with Gelfoam soaked with non-ototoxic antibiotic eardrops. Wound closure was performed in two layers. Packing of the canal with mastoid dressing was done as usual. Similar surgical technique without adhesive has been used routinely in our institution in the past.

Postoperative Care

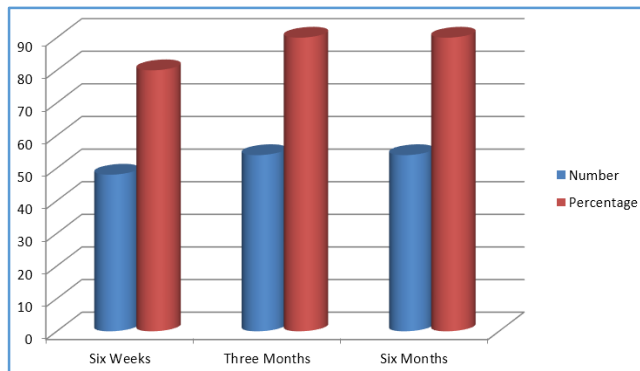
Postoperatively, mastoid dressing was left for one week. Patients were instructed as usual for bath care, avoiding middle ear pressure elevation and warning signs as usual and for allergy and toxic effects. Patients were first seen one week postoperatively and packing was removed. This was done under otomicroscopy with suction and forceps. Patients were followed up at six weeks, three months and six months and assessed for healing, any residual perforation or granulations were recorded. Patient had pure tone audiometry done after three months and six months postoperatively. The main outcome measures were the anatomical (morphological) and functional results of the technique. Therefore, the study adopted the same principle to demonstrate the anatomical results, a healed and intact tympanic membrane but also without lateralisation or anterior blunting and with near normal membrane translucency. Audiometric data included preoperative and postoperative air-bone gap (ABG) at three tested frequencies (500, 1000 and 2000 Hz), average ABG at three-tone pure-tone has been taken into account. Bone audiograms were obtained with masking.

RESULTS

In our study of 60 cases of central tympanic membrane perforation, 35 were female and 25 were male with age ranging from 16-55 years. The average preoperative hearing loss (air bone gap) was 34.4 dB. After six months followup, 54 out of 60 patients had successful graft uptake and only six patients had failure, out of which one case with small residual perforation healed after two sittings of chemical cauterisation and patching. Postoperatively, average hearing loss was 13.66 dB with average hearing gain of 20.74 dB. None of the patients had postoperative sensorineural hearing loss.

Average Conductive Hearing Loss (dB)	Pre-operative (No. of Patients)	Post-operative (No. of Patients)
0-10	0	24
11-20	8	32
21-30	12	4
31-40	28	0
41-50	12	0

Table 1. Comparison of Pre and Post-operative Air-Bone Gap



Average Conductive Hearing Loss (dB)

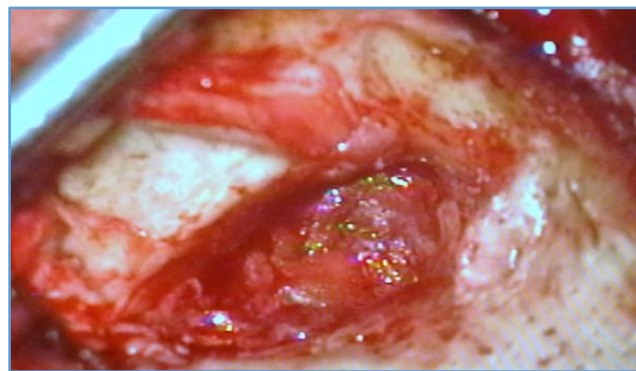
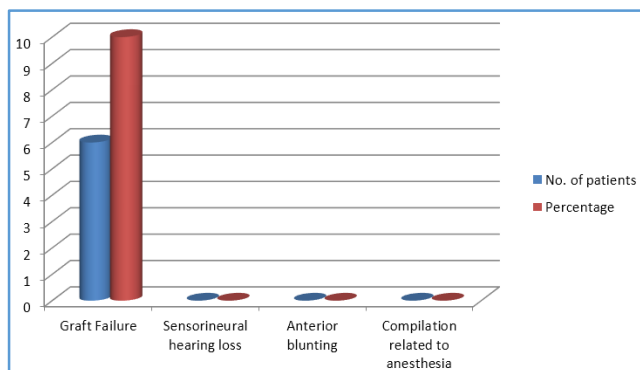


Figure 2. Intraoperative Photograph Showing Graft Spot welded and fixed with Adhesive.

Technique	Six Weeks		Three Weeks		Six Months	
	No. of Cases	%	No. of Cases	%	No. of Cases	%
Conventional myringoplasty with glue	48	80%	54	90%	54	90%

Table 2. Showing Graft Uptake in Cases under Study



Conventional Myringoplasty with Glue



Figure 3. Photograph of the Cyanoacrylate Glue used in the Study

Complications	Number of Patients	Percentage
Graft failure	6	10
Sensorineural hearing loss	0	0
Anterior blunting	0	0
Complications related to anaesthesia	0	0

Table 3. Complications

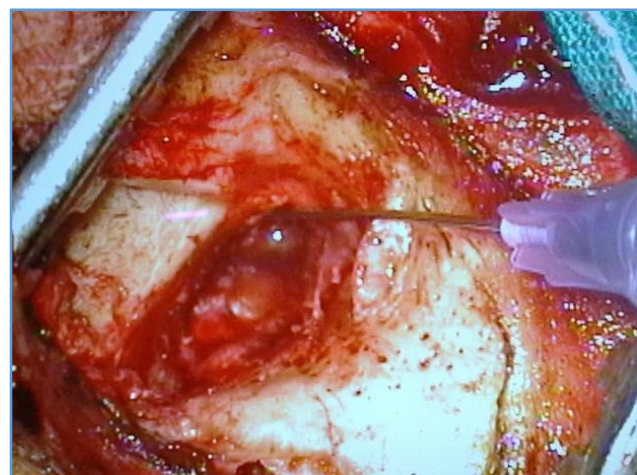


Figure 1. Intraoperative Photograph Showing Adhesive being Applied



Figure 4. Postoperative Photograph Showing healed Graft

DISCUSSION

In our study, successful graft uptake was 90 percent which was better than those from statistics obtained from medical records (82%). Incorporating the use of cyanoacrylate glue, in specific, in the underlay tympanoplasty technique using the temporalis fascia graft has many advantages. The main advantage is by ensuring the graft stability due to the adhesive character of the glue, in relation to the different skin flaps and the fixed bony structures. This would prevent the graft displacement and subsequent residual perforation.

Many techniques including the usage of cartilage as grafting material and modification of the surgical techniques and packing methods were used to overcome the graft displacement problem.^[6-8] Compared with our technique of using the glue, these techniques are more difficult and morbid and need special training and instruments. In addition, the usage of glue has some other benefits. The synthetic cyanoacrylate surgical glue has a haemostatic property, which reduces the bleeding in the space between the flap edges and the graft. Thus, prevents any haematoma formation, which may lead to graft displacement and subsequent residual perforation. During surgery, sometimes a considerable blood collection tends to occur with necessary suction. The repeated suction may be another factor in graft destabilisation. Infection with subsequent graft necrosis is another cause of immediate failures in myringoplasties.^[17] This explains another favourable role of the use of the glue during the surgery, as the cyanoacrylate glue once set (solidified) it produces an effective antiseptic barrier against infectious agents or pathogens commonly found in surgical settings, this is in addition to its direct antibacterial effect.

CONCLUSION

Use of cyanoacrylate glue, in specific, in the underlay tympanoplasty technique using the temporalis fascia graft has many advantages. The main advantage of glue is ensuring the graft stability, due to spot welding of graft with the adhesive.

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