ABSTRACT: Graft failure continues to be a problem for surgery of the perforated eardrum. We present our experience of six cases managed using commercially available superglue (cyanoacrylate) for myringoplasty. This method is simple, office based, less time consuming and cost effective. An insulin syringe was used to deliver the glue after a temporalis fascia graft was tucked under the edges of the perforation.

Key Words: Myringoplasty, Cyanoacrylate, CSOM

INTRODUCTION
Complex techniques have evolved for tympanoplasty to prevent graft failure and to improve hearing. The aim of using tissue adhesives is to simplify the procedure and achieve similar or better results.

As early as 1965 McKelvie used cyanoacrylate for myringoplasty by dipping the periphery of the graft in the glue and presumably by overlay method, placed it on the drum remnant. Caution was exercised in its initial usage as animal studies showed inflammatory reaction in the middle ear which was not observed in humans. In an evaluation of ethyl, isobutyl and fluoroalkyl cyanoacrylates in adult cats’ middle ears, chronic inflammatory responses are noted.

Later, in 1997 isobutyl cyanoacrylate was used for underlay myringoplasty as well as ossceuloplasty using the Indermil precision application system with hand piece and cannula to facilitate regulated delivery successfully.

In India we had no access to such a precision regulated delivery system. We present our experience with 6 cases of permanent perforation of the tympanic membrane repaired using cyanoacrylate adhesive as an office based procedure, the adhesive being delivered in an insulin syringe.

Technique
A sample of the superglue preparation was sent to the microbiology laboratory and tested for pathogens and found to be negative. All the myringoplasties were done as outpatient procedures. There was no preoperative preparation except that all were started on oral ciprofloxacin a day prior to the procedure.

The ears were cleaned with betadine and infiltrated with 1:2,00,000 adrenaline in 2% xylocaine. Temporalis fascia graft was harvested after local infiltration in the supra aural region. The edges of the perforations were freshened and the under surfaces curetted. The middle ear cavities were packed with gel foam and the graft placed by inlay, technique and carefully tucked under the drum remnants. A drop of cyanoacrylate was carefully dropped on the graft using insulin syringe, which spread evenly over the graft and drum remnant as a thin layer.

CASE REPORTS
Case I
A 21-year old lady presented to the outpatients for a persistent mild hearing loss with a past history of otorrhoea. She underwent underlay myringoplasty as described earlier. She was reviewed at one month, 3 months and at 4 months intervals. At one month a thin layer of dried cyanoacrylate could be peeled leaving behind an intact tympanic membrane. The audiogram done at the end of 4 months was normal.

Case II
A 36 year old male, who had undergone left myringoplasty for recurrent otorrhoea, had become discharge free but continued to have a hearing loss. He was found to have a residual dry central perforation. Audiometry revealed 40 dB hearing loss.

1Lecturer, 2Professor, Department of ENT-I, Christain Medical College, Vellore-632 004, Tamil Nadu, India.
dB low frequency hearing loss

He underwent underlay myringoplasty in a similar fashion and at 6 week review his drum had healed well and audiogram was normal

Case III
A 22 year old male who presented with recurrent left otorrhoea (following a bomb blast) and mild hearing impairment was found to have a moderate sized dry central perforation. On audiometry he had a conductive hearing loss with an air bone gap of 20 dB in the left ear with minimal bilateral sensorineural hearing loss.

He underwent our simple myringoplasty technique as an outpatient procedure and returned for a review 8 months later. His tympanic membrane had healed well and there was good closure of air bone gap except for the sensorineural component.

Case IV
A 35 year old lady with a past history of recurrent left otorrhoea, presently discharge free for 5 years had persistent hearing loss. She was found to have a dry moderate sized posterior central perforation exposing the incudostapedial joint. Audiogram showed a 40 dB conductive hearing loss.

She underwent myringoplasty as explained above and was reviewed after four months. The drum had healed well and her hearing restored to normal.

Case V
A 60 year old lady with a past history of intermittent otorrhoea was found to have a dry subtotal perforation with a 60 dB air bone gap probably due to an ossicular pathology. She was unwilling for an ossiculoplasty but wanted a dry ear.

Hence a myringoplasty was done in the outpatients and she was reviewed after 3 months. The tympanic membrane had healed well and audiometry revealed no change in the hearing threshold as the loss was probably due to an ossicular pathology. She was happy with the result.

Case VI
A 40 year old lady who had undergone right cortical mastoidectomy with tympanoplasty for bilateral CSOM had a residual moderate central perforation. She was found to have bilateral 40 dB conductive hearing loss.

She underwent a myringoplasty but an excess of methyl cyanoacrylate was applied inadvertently on the graft and drum remnant. On review the drum had healed, but the residual glue when peeled away took the graft along with it. Also considerable difficulty was encountered to remove the graft and glue from the ear canal.

DISCUSSION
Cyanoacrylate adhesives have been used for about 40 years in surgery. The initial enthusiasm in middle ear surgery was dampened by inflammatory response and ototoxicity involved. However, more recent adhesives have been shown to be neither ototoxic nor have significant inflammatory response. The polymerization of this family of tissue is exothermic which when used in small amounts is not significant enough to cause any significant reaction. In all our patients there was only a mild discomfort and a feeling of warmth for a few minutes.

Also as it was used in overlay technique as a surface application no middle ear reaction was encountered.

Non availability of the Indermil precision delivery system was overcome using a sterile insulin syringe with a 28 gauge needle, which enabled access as well as precise delivery except in one patient. Inaccurate and over zealous application of glue could lead to excess amount in the canal and tympanic membrane leading to a poor end result as in one of our cases. The middle ear when packed with a few layers of gel foam, supports the graft and prevents spillage into the cavity.

With minimal application the glue stabilizes the graft and prevents graft lateralisation/medialisation as seen in five of our patients. No ototoxicity detected.

CONCLUSION
This article hopes to renew interest in the use of cyanoacrylate for closure of dry central perforation in CSOM. The glue helps to stabilize the graft and acts as scaffolding while vascularization occurs and will probably help to improve graft take. Also, medialisation/lateralisation of the graft is prevented.

We also hope that this simple, low cost procedure with readily available material will become popular, especially in developing countries where CSOM still remains a