

Per-meatal myringoplasty; determinants of outcome of tympanic membrane reconstruction

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Objectives: To evaluate the outcome and pit falls of per-meatal myringoplasty.

Methodology: This randomized control trial was conducted from August 2010 to August 2012 at the Department of ENT, Combined Military Hospital, Gujranwala Cantonment. It included 97 ears from 97 patients of chronic inactive mucosal otitis media, irrespective of size and location of pars-tensa perforation. They underwent myringoplasty under general anesthesia through three different approaches, i.e. per-meatal, post-aural and end-aural.

Results: Out of 97 myringoplasties, a successful graft take up was noticed in 74(76.3%) and 24(24.7%) procedures were carried out through a post-aural approach. Twelve (12.4%) operations were performed through end-aural and 61(62.9%) through per-meatal approach. Out of 61 per-

meatal myringoplasties, a successful graft take up was found in 51(83.6%) patients. Successful graft take up was observed in 15(62.5%) post-aural and eight (66.7%) end-aural myringoplasties. Take up of graft was influenced by pre-operative patient selection and the size and location of perforation, surgical technique and presence or absence of post-operative infection.

Conclusion: Per-meatal myringoplasty, if skillfully performed, is a more favored approach of tympanic membrane repair having favorable outcome. It is less time consuming, involves little blood loss, is cosmetically appealing and has relatively better outcome. Careful patient selection and pre-operative preparation influence the results. (Rawal Med J 202;45:414-418).

Keywords: Myringoplasty, otitis media, suppurative, tympanoplasty, fascia.

INTRODUCTION

Chronic otitis media often occurs in underprivileged population dwelling in remote and overcrowded parts. It can result in hearing handicap and social annoyance, and constitutes major operative burden of an ENT department. British population has a prevalence of chronic otitis media of 4.1%.¹ It has an annual incidence of 39 cases per 100,000 individuals under the age of 15 without any gender bias.² Regions with highest prevalence (>4%) include Tanzania, India, Solomon Islands, Guam, Aboriginal Australia and Greenland and on an average 5.2% of population of south-east Asia suffers from chronic otitis media.³

Myringoplasty (sometimes referred to as the *Type-I tympanoplasty*, or a *tympanoplasty without ossicular reconstruction*) is the surgical closure of a tympanic membrane perforation. Benefits of myringoplasty are fewer ear infections, freedom to get the ear wet and improved hearing. Toynbee performed first tympanoplasty in 1853; Wullstein,

Zollner, Shea and Glasscock refined the techniques in mid 20th century.^{4,5}

With autogenous temporalis fascia as the commonest graft material, the surgical access is achieved through either a post-aural, end-aural or a per-meatal approach. Graft can be placed under the freshened edges of tympanic membrane perforation using the *underlay*, or the *overlay* technique. For various advantages, the former technique of placement of the fascial graft is more favored. Many authors advocate inlay placement of the graft to be more promising.⁶ Whichever approach is selected, it may not have any bearing on the take up of graft, however, per-meatal myringoplasty needs less surgical exposure, consumes less operating time, promotes faster healing and is cosmetically favored technique of drumhead repair.⁷ Conversely, the limited exposure of operative field may pose an impediment where a perforation is more anterior or the external auditory canal is narrow.⁸ Much work has been done on

comparing various approaches of myringoplasty in the region.^{9,10} However, our study aims at evaluating the three approaches in the perspective of very sparse nationwide data.

METHODOLOGY

A total of 97 patients of chronic inactive mucosal otitis media were operated upon after obtaining a written informed consent, at the Combined Military Hospital, Gujranwala from August 2010 till August 2012. There was no age or gender restriction. All were followed weekly for a post-operative period of one month. The study was approved by the hospital research ethics committee.

We sought detailed history, with emphasis on the otologic symptoms, allergies and co morbidities like diabetes mellitus and examined all the ears under microscope pre-operatively to assess the state of middle ear mucosa. A pre-operative audiogram was also conducted in each patient to evaluate the hearing thresholds as well as a co-existing sensorineural hearing loss. Following otomicroscopy, all patients were prescribed oral ciprofloxacin 500mg and topical polymyxin twice daily for one week, and the ears were kept dry for at least three weeks.

The patients with documented inactive central perforation were randomized into three groups based on the surgical approach. Group A had post-aural access, Group B had End-aural approach and Group C had Per-meatal myringoplasty. Individuals having a concurrent mastoid ear disease (posterior marginal perforation), those requiring ossiculoplasty, and those with polypoidal granulation in the middle ear following one week of oral quinolone treatment, were excluded.

Surgeries were performed independently under general anesthesia by two different surgeons having difference of experience. Autogenous temporalis fascia graft was harvested and edges of perforation freshened. Myringoplasty was performed through a per-meatal approach exploiting the Rosen's incision in the region just lateral to the hair bearing area of the osseo-cartilaginous junction of external auditory meatus. Inlay technique was used invariably. The graft was supported on each side with small chips of

gel-foam soaked in Polymyxin topical ear drops. External ear canal was splinted with gel-foam and Bismuth Iodoform Paraffin Paste (BIPP) ribbon. Patients were put on oral ciprofloxacin 500mg twice daily for 7 days after surgery. Scalp sutures were removed in patients falling in groups A and B. BIPP ribbon gauze packing was removed on 7th post op days.

All were followed on 1st post-op day and 7th post-op day, and then weekly for four weeks. Microscopic ear examination was carried out whereby outcome in terms of infection, neo-vascularization and epithelialization were observed. Furthermore, take up of graft was documented meticulously at this stage. A post-operative audiogram was obtained in each case to see closure of air-bone gap.

Statistical Analysis: Descriptive statistics were used to cross tabulate the means and standard deviation of quantitative variables. Outcome of surgeries was evaluated by applying descriptive statistics and Kruskal-Wallis H and χ^2 analysis, using SPSS Version 25.

RESULTS

Out of 97 patients, 55(56.7%) were male and 42(43.3%) females. Mean age was 27.72 ± 9.957 . Our patients presented with a diverse size and site of pars tensa perforations, predominantly being large central variant 59%, followed by anteriorly located central perforation, small central perforation and subtotal perforation in 18, 17 and 6%, respectively. Twenty-four (24.7%) operations were conducted through a post-aural approach (group A), 12(12.4%) through an end-aural approach (group B), and 61(62.9%) per-meatal approach (group C).

Take up of graft was seen in 74(76.3%) patients. Graft uptake was observed in 15(62.5%) of group A patients, 8(66.66%) from group B and 51(83.66%) from group C. Graft failure (necrosis or retraction at the end of 4th week) was found in 23(23.7%) patients. There was a statistically significant difference in operative duration amongst the three surgical approach groups, (Kruskal-Wallis H 6.562, $p=0.038$); with a mean rank operative time of 60.77 minutes for group A, 51 minutes for group B

and 43.98 minutes for group C. However, the difference in final outcome after 4 weeks of surgery (in terms of graft uptake) remained insignificant (Fig. 1).

Post-operative infection appeared without any significant predilection to any of the surgical approach (Kruskal-Wallis H 1.449, $p=0.485$). Pearson's Chi Square test confirmed that the size of tympanic membrane perforation directly influenced graft uptake (Pearson's Chi Square $p=0.019$) (Fig. 2). Inadequate size of the external auditory canal also posed a significant impact on graft uptake (Pearson's Chi Square $p=0.000$) (Fig. 3).

Fig. 1. Outcome of the three surgical approaches (in terms of graft uptake).

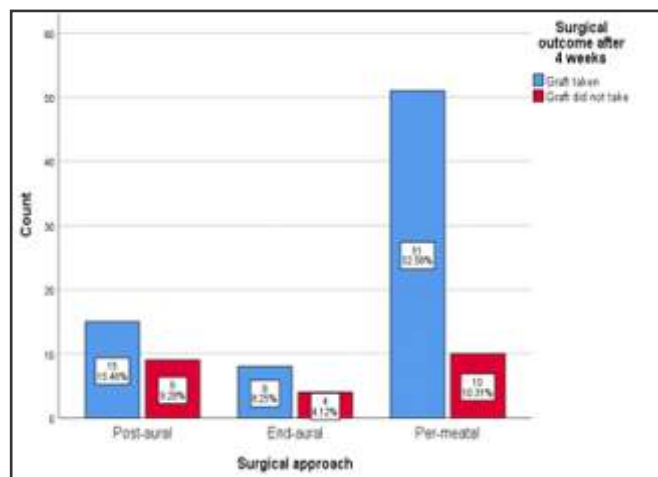


Fig. 2. Type of tympanic membrane perforation and graft uptake.

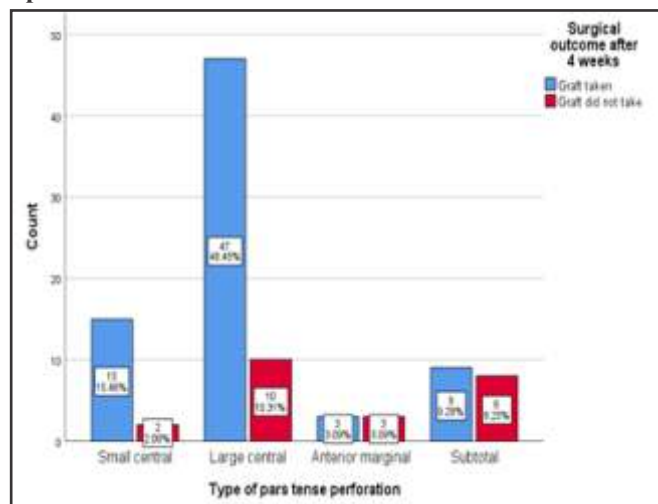


Fig. 3. Size of external auditory meatus vs. surgical outcome.

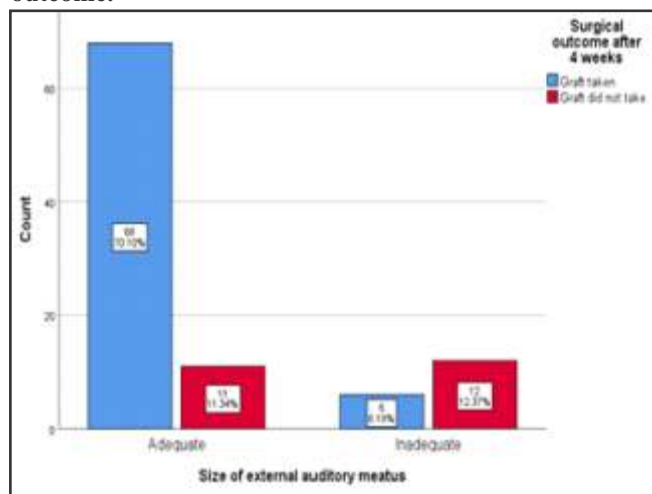
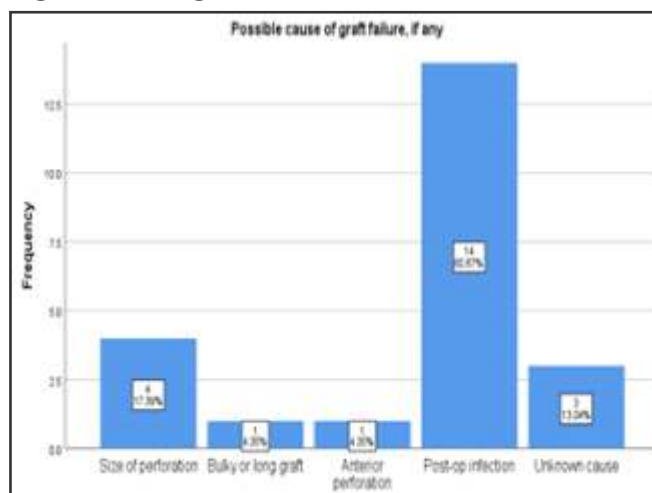


Fig. 4. Causes of graft failure.



Early post-operative infection was observed in 16(16.5%) ears. Graft necrosis occurred in 15(93.75%) of these operated ears ($p=0.000$). Significant neo-vascularization was apparent in 11(11.3%) patients on microscopic examination 3 weeks following operation. All of these patients were younger than 23 years of age and demonstrated a 100% uptake of graft. We noticed epithelialization at the end of two weeks in 76.3% ($n=74$) patients. Graft uptake was 63.5% ($n=47$) ears in the hands of senior surgeon. Whereas 36.5% ($n=27$) successful uptake was seen with the surgeon having relatively less experience ($p=0.088$).

Mean frequency of closure of air-bone gap in speech frequency was 3.61dB (SD \pm 4.31) at the end of four

weeks of surgery. Analysis attributed 52.5% failures to a large sized central perforation; 30.43% due to a sub-total perforation, 69.5% due to post-op infection, 17.3% due to complications related with inadequate external auditory meatus and 4.3% owing to very anterior perforation (Fig. 4).

DISCUSSION

Multiplicity is highlighted in literature regarding outcome of myringoplasty utilizing various surgical approaches. Tan et al reported an average success rate of Type-I tympanoplasty in a meta-analysis to be 86%, which is comparable to our results.⁸ Israr ud Din et al reported an anatomical success of 88.6%.¹¹ In our study, we had an average closure of 3.61 dB of air-bone gap, with no worsening of hearing or sensorineural hearing loss regardless of surgical approach. Sangavi accounted air-bone gap closure of 23dB.¹² He attributed the pre-operative increase in air-bone gap to the size of perforation. Mean improvement in closure of air-bone gap of 14.73dB was observed by Bhatia.¹³ Dawood ascribed size and location of perforation to impact post-operative hearing outcome.¹⁴ Carr et al demonstrated a reduced closure rate attributed to more anterior and subtotal perforations, which conforms to our outcome.¹⁵

Das et al also regarded large sized perforations to end up in a more frequent graft failure, with graft uptake rate as low as 42.9% in subtotal perforations.¹⁶ No significant impact of surgical approach on graft uptake has been stated by Sharma et al.⁸ Niazi et al compared temporalis fascia placement through a per-meatal approach without elevating tympano-meatal flap, with conventional end-aural and post-aural approaches, and demonstrated a similar outcome in all three.¹⁷ Noteworthy is to mention that various authors consider the presence of mucoid otorrhea at the time of surgery to have no significant impact on outcome of myringoplasty.^{18,19} More promising results are under way considering application of autologous platelets-rich plasma to the fascial graft with an intent to promote neovascularization and minimizing infection.²⁰

Our results, as far as the take of graft is meant, are comparable to the literature. Gibb and Chang

experienced a take of graft in 91.4%; Palva achieved 97%, Vartiainen and Nuutinen had 88% success rate and Subramaniam and Abdul had closure of perforation in 55%.^{11,15,21} Exclusively day-care myringoplasties showed graft take of 91.5% and 83.3%, respectively.^{8,22}

CONCLUSION

Per-meatal myringoplasty is a better approach because it is minimally invasive, needs less surgical exposure, promotes faster healing and is cosmetically favored technique of drumhead repair provided the patient selection is appropriate.

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