

**Assessment of multiple factors is necessary when evaluating the success rate of myringoplasty**

Dear Editors,

We would like to address the manuscript by Carr *et al.* entitled ‘Factors affecting myringoplasty success’.<sup>1</sup> This is an interesting study and constitutes excellent work. The authors evaluated the success of myringoplasty from the following five perspectives: experience of the surgeon, dry ear or not, the condition of the contralateral middle ear, perforation size, and the simultaneous performance of cortical mastoidectomy. It was concluded that, in adults, a significant association was evident between the tympanic membrane perforation site and the closure rate. Anterior and subtotal perforations had significantly lower closure rates. None of the factors evaluated significantly influenced tympanic membrane closure in a paediatric group. However, we believe that the factors assessed were not comprehensive. Also, the use of different graft materials has confused the findings.

The authors write, in the Methods section:

‘Inclusion criteria comprised perforations of the pars tensa, all age groups, and cortical mastoidectomy and myringoplasty for non-cholesteatoma ears. Exclusion criteria comprised cholesteatoma surgery and concomitant ossiculoplasty. ... Potential influencing factors were surgeon grade (consultant, associate specialist or registrar); pre-operative condition of the ipsilateral middle ear (inactive or active chronic otitis media, with persistent or intermittent discharge); pre-operative condition of the contralateral middle ear (normal, otitis media with effusion, inactive chronic otitis media or active chronic otitis media); perforation site (anterior, posterior, inferior or subtotal); perforation size (0–20 per cent, 21–40 per cent, 41–60 per cent or subtotal); and simultaneous cortical mastoidectomy. The indication for a cortical mastoidectomy was myringoplasty in the presence of an actively discharging ear or a revision paediatric case’.

The authors did not assess the Eustachian tube or record concomitant myringosclerosis. Furukawa *et al.* suggested that removal of myringosclerosis at the edge of a perforation was beneficial when simple underlay myringoplasty was planned, improving the operative success rate and post-operative hearing threshold, especially when the myringosclerosis extended over the entire tympanic membrane.<sup>2</sup> Migirov and Volkov believed that appropriate freshening of the perforation edges, with removal of sclerotic plaques, improved the success rate when tympanoplasty was performed in patients with concomitant myringosclerosis.<sup>3</sup> Pinar *et al.* found that the absence of myringosclerosis and a low middle-ear risk index were significantly (and independently) prognostic of successful tympanoplasty.<sup>4</sup> The Eustachian tube plays a significant role in the success of myringoplasty. One effect of Eustachian tube dysfunction in paediatric populations is that the middle-ear cavity is under negative pressure, which can cause retraction of the tympanic membrane, triggering failure of myringoplasty.<sup>5</sup> Collins *et al.* reported that Eustachian tube dysfunction was associated with a poor success rate of tympanoplasty.<sup>6</sup> Onal

*et al.* performed a multivariate analysis of otological, surgical and patient-related factors, and concluded that smoking status increased the myringoplasty failure rate.<sup>7</sup> In addition, follow-up time may affect the success rates recorded in retrospective studies. Two studies reported re-perforation rates of 5–10 per cent in the first year after type I tympanoplasty, and rates of 10–15.5 per cent over the next 3–10 years.<sup>8,9</sup> Thus, factors affecting the success rate of myringoplasty should be analysed more thoroughly in future studies.

The authors write (in the Methods section): ‘Several different graft materials were used: temporalis fascia, perichondrium, perichondrium and cartilage, fat, and periosteum’. Five different graft materials were, in fact, used in the study. The indications for, and success rates associated with, different graft materials during myringoplasty differ. Fat grafts are used to repair small chronic tympanic membrane perforations. Konstantinidis *et al.* showed that fat graft myringoplasty was most successful when used to repair perforations smaller than 30 per cent of the pars tensa; the success rates decreased significantly when the perforations were larger.<sup>10</sup> Kim *et al.* also found that patients with perforations of more than 30 per cent had poor closure rates after fat graft myringoplasty.<sup>11</sup> In addition, several studies have shown that tympanoplasty using cartilage (with or without perichondrium) was associated with better anatomical success rates than tympanoplasty employing temporalis fascia.<sup>8,12–14</sup> Ozbek *et al.* found that tympanoplasty using palisade cartilage was associated with a significantly higher graft acceptance rate (100 per cent) than tympanoplasty using fascia (70.2 per cent;  $p = 0.008$ ).<sup>15</sup> Most scholars suggest that temporalis fascia will degenerate and shrink over time, triggering eardrum atrophy and re-perforation.<sup>12–14,16</sup> However, cartilage perichondrium can receive nutrients by diffusion, maintain bradytrophic metabolism and resist deformation by pressure variations.<sup>12–14,17</sup> Thus, factors affecting myringoplasty outcomes should be evaluated using the same graft material in future studies.

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#### Authors' reply

Dear Editors,

Thank you for your letter regarding this article and the opportunity to respond.

We performed a retrospective study assessing the factors which may affect the outcome of myringoplasty using logistic regression analysis of a large cohort of both adult and paediatric patients undergoing myringoplasty.

It is interesting you state that Eustachian tube function was not assessed. The measure of Eustachian tube function was determined by the state of both the ipsilateral middle ear (inactive or active chronic otitis media with persistent or intermittent discharge) and the pre-operative condition of the contralateral middle ear (normal, otitis media with effusion, inactive or active chronic otitis media). Although one could argue that the condition of the contralateral middle ear is a proxy for ipsilateral Eustachian tube function, it certainly provides a reasonable measurement, as Eustachian tube dysfunction, in the main, tends to occur bilaterally. It would be interesting for the authors to elaborate on how they would measure Eustachian tube function, but, unfortunately, they do not address this in their letter.

I agree that myringosclerosis was not assessed as part of the study. However, if you look at many other studies in the literature, myringosclerosis is not assessed as an independent factor.<sup>1–5</sup> Whilst the authors have drawn reference to three studies which have assessed myringosclerosis,<sup>6–8</sup> I do not feel that they can draw a unifying conclusion from them. Pinar *et al.*<sup>6</sup> stated that the presence of myringosclerosis was a poor prognostic factor for myringoplasty success,

whereas Migirov and Volkov<sup>7</sup> and Furukawa *et al.*<sup>8</sup> discussed operative technique. Migirov and Volkov, in a retrospective study of 40 children with myringosclerosis who underwent plaque excision during myringoplasty, concluded that plaque excision along with freshening of the perforation edges can result in a high rate of successful closure.<sup>7</sup> This is a cohort study with no control group and no statistical significance determined, so a robust conclusion cannot be drawn. Furukawa *et al.*, in a cohort study of 11 patients with myringosclerosis affecting the entire drum remnant, with no control group, concluded that removal of myringosclerosis at the edge of a perforation is a beneficial technique in improving graft take rate in these patients.<sup>8</sup> I would agree that grafting onto a plaque of myringosclerosis with no drum remnant is likely to result in a poor graft take rate. It should be noted that this group also used fibrin glue to secure the graft. As there is no control, we cannot be certain of the effect of the fibrin glue and cannot determine whether this was the sole reason why there was successful closure of the perforation. There is no mention either of perforation size or site, which may also have influenced their results. With respect to our study, there were no cases of such extensive myringosclerosis.

I think the authors may have missed the point regarding the assessment of different graft types. The purpose of the study was to assess whether different graft types influenced the outcome. I agree that different graft materials have different properties. However, had we just included patients that had received the same graft material, it would have been impossible to state whether graft material had an effect on the outcome. Previously published studies have performed similar analyses on different graft materials.<sup>4</sup>

Overall, whilst the authors may have raised an interesting point regarding myringosclerosis, I do not feel that it is relevant to this study, and I would question the validity of their arguments regarding Eustachian tube function and graft material.

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