Pediatric Myringoplasty: Does Perforation Size Matter?
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Introduction and Objectives
Gelfoam myringoplasty involves plugging a tympanic membrane (TM) perforation using a water-insoluble, porous, hemostatic sponge. Hekkenberg and Smitheringale first described this technique in 1995 [1], and subsequent series have supported its efficacy [1-5]. While prior meta-analyses have analyzed the effect of perforation size on the success of type I tympanoplasty, these studies have limited their analysis to compare perforations smaller than 50% to those larger than 50% of TM surface area [6-8]. Similarly, these studies and those looking more precisely at perforation size have included varying surgical techniques (i.e. underlay, onlay, inlay) and graft materials [6-9]. The objective of this study is to evaluate the effect of perforation size on tympanic membrane closure rates using a single myringoplasty technique.

Methods
Institutional review board approval was obtained prior to onset of review. All patients (<18 years old) undergoing gel foam myringoplasty by a single pediatric otolaryngologist at the Cleveland Clinic from August 2008 through January 2015 were identified. All charts were reviewed and 22 patients were excluded due to lack of follow up. 159 patient met criteria for inclusion; 60 underwent bilateral myringoplasty. Successful myringoplasty was defined as an intact tympanic membrane post-operatively. Categorical variables were analyzed using the chi-square test. Quantitative and ordinal variables were analyzed by Wilcoxon rank sum test for group comparisons and by logistic regression for outcomes. Odds ratios of closure is reported for quantitative variables.

Results
A total of 219 procedures were included in the final data set. Overall, gelfoam myringoplasty had an 83.1% rate of successful closure. The average perforation size overall was 15.31%. Patients with successful closure had statistically smaller perforations than those with persistent perforations (p= < 0.001). Classification tree analysis further separated our cohort into three groups based on perforation size with group 1 (< 16.25% perforation) having a 91% closure rate, group 2 (16.25 to < 31.25% perforation) having 66.0% closure rate, and group 3 (≥ 31.25% perforation) having a 30.0% closure rate. Five patients had a documented 40% perforation of which three (60%) had successful closure following a single attempt at gelfoam myringoplasty.

Discussion
Previous meta-analyses have suggested that larger perforations (those greater than 50%) result in higher rates of failure when undergoing type I tympanoplasty [6-9]. However, there is a paucity of studies analyzing more precisely the size of perforation amenable to surgical repair. Those that have often include multiple surgical techniques [10] or use alternate or varying graft materials. In comparison, our study controlled for technique and graft material so as to focus on determining the effect of perforation size. Our study confirms that patients with smaller perforations are significantly more likely to have a successful myringoplasty. However, even in patients with perforations involving more than 30% of the tympanic membrane, nearly one third had successful closure. Similarly, 60% of our patients with 40% perforations also had successful closure. This data suggests that even larger perforations are amenable to repair with myringoplasty, potentially sparing patients the need for a more invasive underlay tympanoplasty.

Conclusion
This data suggests gelfoam myringoplasty may be considered as a potential first-line option for repair in perforations up to 40% before committing to a formal tympanoplasty.

References

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