Pediatric Endoscopic Ear Surgery: Lessons Learned and Surgical Outcomes

Lukas D. Landegger1,2, Parth V. Shah1,2, Elliott D. Kozin1,2, Daniel J. Lee1,2, Michael S. Cohen1,2

1 Department of Otolaryngology, Massachusetts Eye and Ear Infirmary, Boston, MA, USA
2 Department of Otolaryngology and Laryngology, Harvard Medical School, Boston, MA, USA

ABSTRACT

Introduction: Transcanal endoscopic ear surgery (TEES) offers distinct advantages to traditional visualization with the operating microscope, including improved depth of field, wider viewing angle, indirect exposure with angled endoscopes, and minimally invasive approach. Recent improvements in surgical equipment and techniques have made totally endoscopic approaches possible for many procedures previously requiring an open approach. Our study is a single-institution retrospective review of outcomes following TEES in children.

Methods: Charts were reviewed for all pediatric middle ear surgical cases over an 18-month period. Studied procedures included tympanoplasty, ossiculoplasty, and cholesteatoma resection. Primary outcome measures included intraoperative use of the endoscope, closure rate of tympanic membrane perforations, surgical times, and audiometric results.

Results: Ninety-four patients underwent 121 middle ear procedures. The endoscope was used in 114/121 cases (94%). Forty-five of these cases were performed using the endoscope for the entire case (TEES) (37%). TEES was incorporated into practice with a steady learning curve, with 75% of cases performed using TEES by the final third of the study period. Type-I tympanoplasty closure rates were similar for TEES vs. non-TEES cases (78.9% vs. 84.6%, p=0.99). Hearing outcomes were comparable for TEES vs. non-TEES approaches for both type-I tympanoplasty cases (-7.8 dB vs. -1.3 dB, p=0.03) and ossiculoplasty cases (-10.7 dB vs. -5.9 dB, p=0.38). Surgical times were similar among groups.

Conclusion: TEES can be performed in children with comparable and by some metrics superior outcomes to non-TEES surgery.

INTRODUCTION

Use of the rigid endoscope for visualization during middle ear surgery continues to gain in popularity. The endoscope offers distinct advantages to traditional operative microscopy for visualization of the middle ear: [1] There is no need for sterile airway visualization or repositioning of the microscope. [2] Improved surgical visualization and surgical instrumentation have made transcanal endoscope-only approaches feasible and may improve postoperative morbidity/recovery time, and potentially prevent long-term sequelae of the postauricular approach. [3] Barriers to entry of TEES include the technical difficulty of one-handed dissection, concerns relating to the safety, and long-term outcomes of this relatively new technique. We hypothesize that EES techniques are useful to address middle ear pathology and that TEES can be incorporated into a pediatric otology practice with a neutral or positive effect on outcomes.

METHODS

Electronic medical records were reviewed for all pediatric patients undergoing middle ear surgery from January 1, 2013 through July 1, 2014 at a tertiary care specialty hospital. Two attending surgeons performed or directly supervised all cases (M.S.C. and D.J.L.). Procedures were evaluated for intraoperative use of the endoscope using the classification scheme in Table 1. “EES”/“TEES techniques” are used as catch-all terms describing any use of the endoscope for visualization during ear surgery. This study was approved by the Massachusetts Eye and Ear Infirmary Institutional Review Board.

Endoscopic use by procedure & classification

Table 1. Massachusetts Eye and Ear Infirmary (MEEI) Endoscopic Ear Surgery Classification System

RESULTS

Tympanoplasty: We reviewed 32 type-I tympanoplasties, of which 19 (59.4%) were performed via TEES, using the endoscope entirely. On average, the non-TEES group was significantly older than the TEES group (11.5 years vs. 7.0 years, p=0.01). Of the 13 non-TEES cases, 11/13 (84.6%) demonstrated intact tympanic membranes at the most recent postoperative exam, compared to 15/19 (78.9%) of ears undergoing TEES. The difference in rate of closure was not statistically different between groups, p=0.99 (two-tailed Fisher’s exact test). Of the 26 cases where tympanic membrane closure was achieved, pre- and post-operative audiometry was available in 22 cases. The mean pure tone average change for TEES cases was -7.8 dB (n=13, SD=5.85) and the mean change for non-TEES cases was -1.33 dB (n=9, SD=6.98). The difference in means between the groups was statistically significant with more hearing improvement seen in the TEES group, p=0.03 (2-tailed Student’s t-test).

Ossiculoplasty: 30 patients underwent ossiculoplasty, of which were performed with TEES (43.3%). The two groups were similar in age (TEES = 9.3 years, non-TEES = 11.8 years, p = 0.11). Pre- and post-operative audiograms were available for 25 cases total. The pre-operative PTA was similar for both groups (TEES = 39.8 dB, non-TEES = 34.9 dB, p = 0.40). The mean change for TEES cases was -10.73 dB (n=11, SD=16.58) and for non-TEES cases -5.85 dB (n=14, SD=10.72), but statistical significance was not achieved (Student’s t-test, p=0.38).

Cholesteatoma: Use of EES was subjectively found to be very helpful for complete cholesteatoma removal, especially in difficult to visualize areas such as the sinus tympani and epitympanum. Comparison of TEES vs. non-TEES outcomes was not possible as only one initial resection was performed with TEES.

CONCLUSION

• TEES can be incorporated into a pediatric middle ear surgery practice
• EES techniques should be gradually added over time
• Classification of degree of endoscope use is helpful for description and comparison
• Outcomes were similar between TEES and non-TEES cases

REFERENCES