Long-Term Outcomes of Cartilage-Buttressed T-Tube Tympanoplasty for Prolonged Middle Ear Ventilation

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Abstract

Objectives: To report on the safety and efficacy of cartilage-buttressed T-tube tympanoplasty for long-term middle ear ventilation, specifically by examining duration of tube survival, as well as adverse events associated with prolonged middle ear intubation, including persistent tympanic membrane perforation.
Study Design: Retrospective case series of patients undergoing cartilage-buttressed T-tube tympanoplasty between January 2005 and December 2016 in a tertiary-care neurotology private practice.
Methods: Patients who underwent cartilage T-tube tympanoplasty with complete pre- and postoperative audiometric data and a minimum follow up duration of 12 months were analyzed. T-tube survival and adverse events including persistent tympanic membrane perforation were recorded and compared to published data for other long-term middle ear ventilation techniques.
Results: The study cohort included 72 cartilage-buttressed T-tube tympanoplasties in 68 patients. Median tube survival was 34 months (2-131 months). Incidence of persistent tympanic membrane perforation (n=1) was 1.4%.
Conclusions: Cartilage-buttressed T-tube tympanoplasty is a safe and effective means of accomplishing long-term middle ear ventilation with a considerably lower rate of persistent tympanic membrane perforation as compared to alternative methods of prolonged middle ear ventilation.

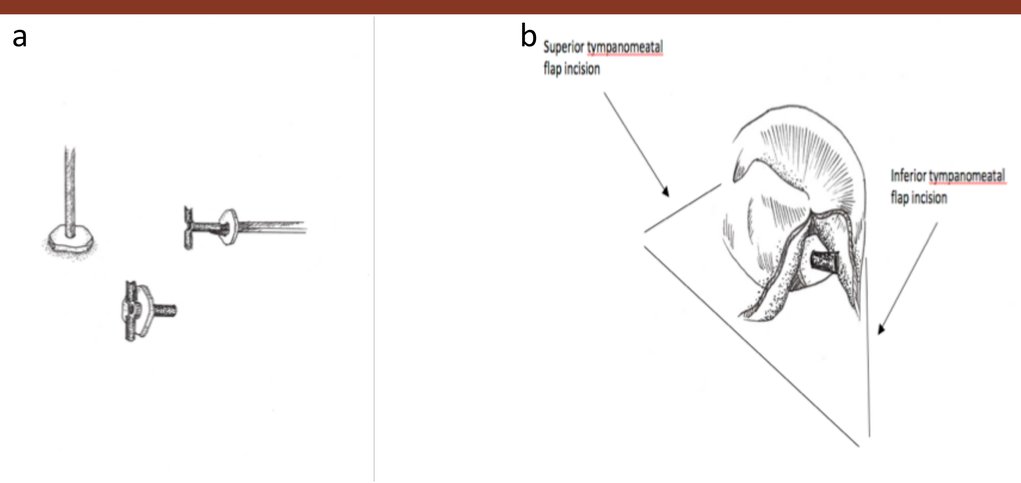
Introduction

- Management of chronic otitis media remains a significant challenge for clinicians and patients, alike
- Currently ventilation tube insertion is the most common treatment for chronic otitis media with effusion
- Early tube extrusion and persistent tympanic membrane perforation following tube removal plagues several commonly utilized techniques for long-term middle ear ventilation
- Creation of a cartilage T-tube complex may afford long-term tube retention with minimal risk for persistent tympanic membrane perforation
- Outcomes of this technique, including tube survival and rate of persistent tympanic membrane perforation were reviewed at a single institution over a 12-year period

Methods and Materials

- Case series with chart review of 72 cartilage-buttressed T-tube tympanoplasties performed between 2005 and 2016
- Rate of persistent tympanic membrane perforation following tube removal or extrusion was reviewed
- Duration of middle ear intubation, recorded as tube survival, analyzed using Kaplan-Meier method
- Surgical technique:
  - Creation of a tympanomeatal flap followed by harvest of a 7mmx7mm tragal cartilage graft
  - T-tube then drawn through central hole in cartilage made by 1.5mm punch biopsy, creating T-tube cartilage complex (Figure 1, a)
  - Anterior and posterior tympanomeatal flaps created and the tube complex is introduced into the middle ear (Figure 1, b)

Figure 1. Illustration demonstrating (a) creation of T-tube complex, and (b) inset of cartilage T-tube complex into middle ear



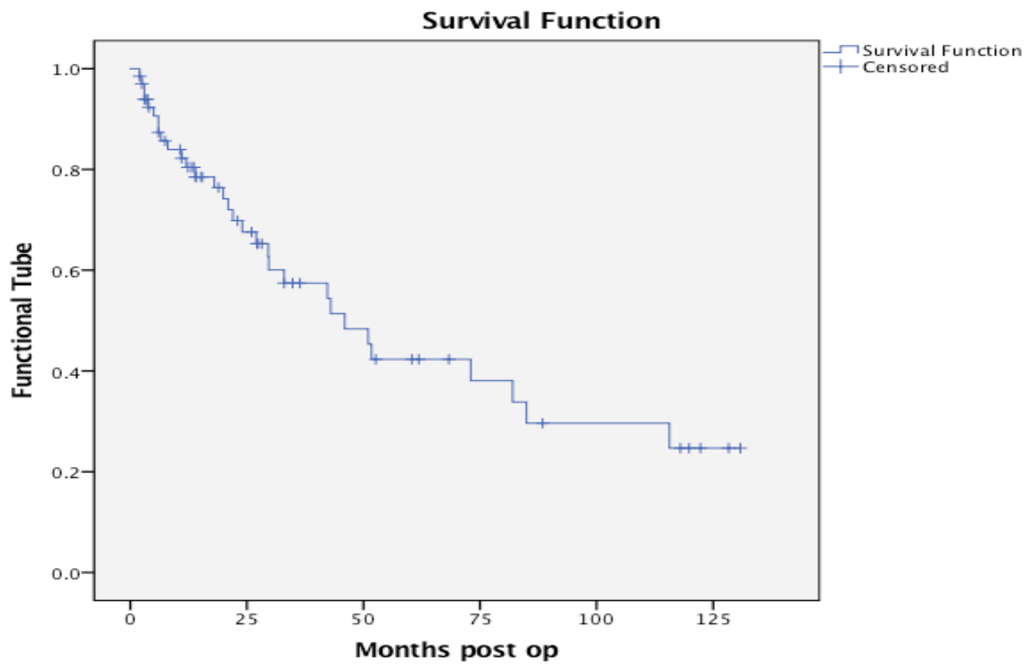
Results

Table 1. Distribution of Tube Survival and Perforation Rate

	Duration of Tube in situ (months) Mean (range)	Length of Follow Up (months) Mean (range)	Rate of Persistent Perforation
Overall[†]	34 (2-131)	46 (2-131)	1.4% (1/72)
Extrusion	31 (2-116)	61 (3-127)	0 (0/23)
Removal	25 (6-46)	45 (18-86)	0 (0/5)
Intact and Patent	43 (2-131)	43 (2-131)	2.3% (1/44)

[†]Overall includes all patients in the study; subgroups are detailed and broken down into patients for whom the tube extruded spontaneously, was removed in the office, or was intact and patent at the time of last documented physical exam.

Figure 2. Kaplan-Meier plot depicting the probability of tube survival as a function of time.



Discussion

- The dichotomous goals of achieving durable, long-term middle ear ventilation while preventing concomitant persistent tympanic membrane perforation, represents a considerable challenge
- Several prior studies have investigated the utility of various surgical techniques in achieving these goals with varying results
- Our experience with 72 cases of cartilage-buttressed T-tube tympanoplasty represents the largest series to date
- We achieved a mean tube survival of 34 months; this is comparable to studies describing a similar technique, most notably Duckert et al. who described mean tube survival of 38 months
- Overall persistent tympanic membrane perforation rate of 1.4% represents a considerable improvement when compared to other described techniques for long-term middle ear ventilation

Conclusions

- Cartilage-buttressed T-tube tympanoplasty is an effective means of long-term middle ear ventilation with minimal risk of persistent tympanic membrane perforation
- Marriage of a long-term tympanostomy tube with a cartilage graft provides durable and safe reestablishment of middle ear ventilation
- Proven benefits provide a viable alternative to long-term middle ear ventilation when compared to historic data

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