

Otologic Complications of Cotton Swab Use: One Institution's Experience

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Objectives/Hypothesis: To evaluate the indications for observation versus surgery in the management of cotton swab-induced tympanic membrane perforations (TMP).

Study Design: Institutional review board-approved retrospective cohort study of 1,540 patients with a diagnosis of TMP from 2001 to 2010. Patients with a cotton swab injury were subdivided into two groups: observation and surgery.

Methods: Data collection included demographics, symptoms, surgery type, and pre- and postintervention audiometry. Successful outcomes were defined as healed TMP; resolution/improvement of vertigo, tinnitus, or facial nerve paralysis; and/or closure of the air-bone gap (ABG).

Results: Fifty-four of 1,540 patients presented with a cotton swab-induced TMP. Four of the 54 patients (7.4%) underwent delayed surgical repair with 100% success. Preoperatively, one patient had a facial nerve paralysis and two had vertigo with confirmed perilymphatic fistulae (PLF). Postoperatively, the facial nerve paralysis resolved, and one patient had mild vertigo. Fifty of 54 patients opted to forego surgery with 35 patients available for follow-up. Thirty-four (97%) of the 35 patients had spontaneous healing. The average time to perforation closure was 1.75 months. Twelve of 35 patients had no ABG after healing.

Conclusions: Observation is an appropriate consideration for patients who have a TMP due to a cotton swab injury. Surgical intervention should be offered early when a PLF is suspected, or if facial paralysis, severe vertigo, and/or profound sensorineural hearing loss are present. As otolaryngologists, we should be reluctant to offer surgical intervention of an acute injury without significant symptoms as most patients will heal spontaneously within 2 months.

Key Words: Cotton swab, tympanic membrane perforation, perilymphatic fistula.

Level of Evidence: 2b.

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INTRODUCTION

Tympanic membrane perforation (TMP) is a condition commonly encountered by otolaryngologists. Etiologies of TMP include infection, trauma, or iatrogenic causes. Traumatic TMPs are commonly caused by a slap injury to the ear, barotrauma, slag injury, or penetrating injury by objects such as cotton swabs (Q-tips; Unilever, Englewood Cliffs, NJ). Created in 1923 by Leo Gerstenzang to clean his child's ears, Q-tips eventually became a popular American household commodity by the 1950s.¹ Physicians began to question the efficacy of cotton swabs in 1972 on the observation of the association

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between TMP and Q-tip use.^{2,3} Minor complications resulting from TMP included conductive hearing loss, infection, bleeding from the ear canal, and otorrhea. A more severe complication of TMP from a cotton swab is a perilymphatic fistula that can manifest as sudden onset sensorineural hearing loss, fluctuating sensorineural hearing loss, balance disturbances, vertigo, tinnitus, or Meniere's type presentation (ear fullness, tinnitus, vertigo, and hearing loss).

Forty years later, the general population continues to clean their ears with cotton swabs despite knowing the commonly preached adage "nothing smaller than your elbow in your ears." Immediate treatment for cotton swab injury includes observation or surgery (i.e., myringoplasty or tympanoplasty). Previous studies have suggested a watchful waiting period from 3 to 6 months for the management of traumatic TMP.^{4,5} The purpose of this study was to evaluate the indications for observation versus surgery in the management of cotton swab-induced TMP.

MATERIALS AND METHODS

The Henry Ford Health System institutional review board approved this study. Charts of all patients diagnosed with TMP from 2001 to 2010 by the Department of Otolaryngology at Henry Ford Hospital, a tertiary care center, were reviewed. Inclusion criteria were patients older than 18 years of age with a TMP secondary to cotton swab use. Data collected from

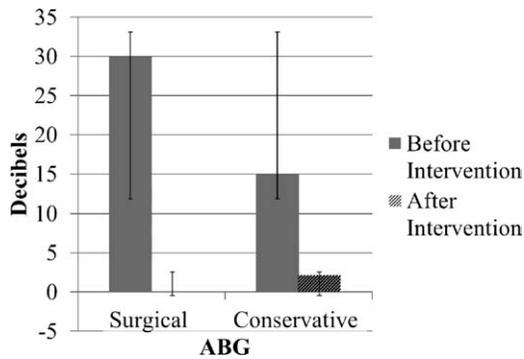


Fig. 1. Average air-bone gap (ABG) in each of the groups before and after intervention. Error bars indicate 1 standard deviation.

qualifying subjects included age, race, gender, past medical history, past surgical history, date of injury, size of initial TMP, clinical findings on initial and follow-up otologic exams, pre- and postintervention otologic and vestibular symptoms, pre- and postintervention audiometry, date and type of surgery (if performed), along with any postoperative complications and time to tympanic membrane closure.

Successful outcomes were defined as healed tympanic membrane, resolution or improvement of vertigo, tinnitus, or facial nerve paralysis, and/or closure of the air-bone gap (ABG).

RESULTS

There were a total of 1,540 subjects who presented to the Henry Ford Health System's Department of Otolaryngology from 2001 to 2010 with the diagnosis of TMP. Fifty-four of these subjects suffered a TMP secondary to cotton swab use, which represented 3.5% of the subject population.

There were four subjects (7.4%) who underwent surgery to repair the TMP, with all four having successful closures of their TMP. The average size of the TMP was 37%. Three subjects underwent a tympanoplasty, and one had repair with a paper patch. Surgical intervention

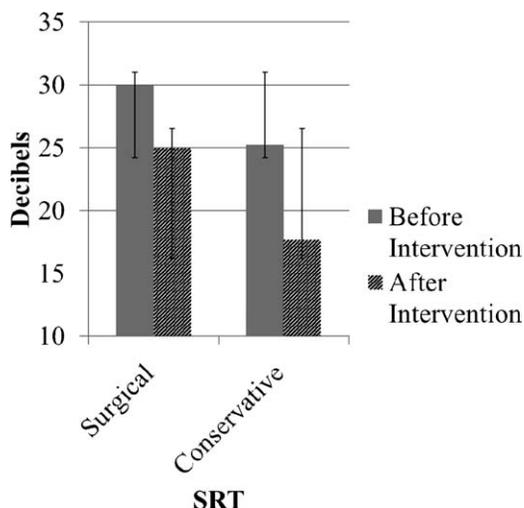


Fig. 2. Average speech reception threshold (SRT) in each of the groups before and after intervention. Error bars indicate 1 standard deviation.

was performed within 5 days to 5 months of initial injury. Average follow-up time for the four subjects was 6.5 months. Two of the three subjects who underwent a tympanoplasty had severe vestibular symptoms, with suspected perilymphatic fistula with surgical repair of confirmed perilymphatic fistula. One subject who had a suspected perilymphatic fistula had facial nerve paralysis prior to surgery. Three of the four subjects underwent initial audiometry, which revealed an average ABG of 43.3 dB, average speech reception threshold (SRT) of 37, and average word recognition score of 75% (Figs. 1–3). Following surgical repair, only one subject had closure of the ABG, an improvement of 30 dB (Fig. 1); the two other subjects had postoperative audiometric testing, which revealed an average SRT of 25 and an average word recognition score of 92% (Figs. 2-3). Both subjects with the perilymphatic fistulas had improved or resolved vestibular symptoms following surgical repair, and the subject with facial nerve paralysis regained function after surgical repair. During surgical repair of the subject with facial nerve paralysis, the facial nerve was explored in the tympanic segment, which was dehiscent, but there was no disruption of the facial nerve.

Fifty subjects (92.6%) did not undergo surgery for their TMP, with the average initial size of the TMP being 19%. Thirty-five of the 50 subjects were followed up after the initial visit, and only their data was used for pre- and post-treatment comparison. At initial presentation, two subjects described mild vestibular symptoms, and 33 subjects did not have vestibular symptoms. Audiometric testing revealed a pretreatment average ABG of 15, average SRT of 25.2, and an average word recognition score of 90.79% (Figs. 1–3). Thirty-four subjects (97%) had spontaneous tympanic membrane closure. The subject who did not have complete closure had a course complicated by otitis externa and did not follow up for further treatment. The average time for spontaneous TM closure was 1.75 months, ranging from 1 week to 7 months. The average follow-up time after

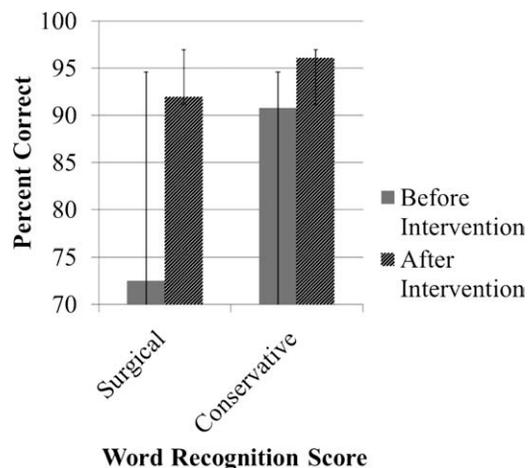


Fig. 3. Average word recognition score in each of the groups before and after intervention. Error bars indicate 1 standard deviation.

initial presentation was 2.5 months. Post-treatment audiometric testing revealed an ABG of 2.11, average SRT of 17.68, and an average word recognition score of 96.08% (Figs. 1–3). The average improvement in ABG was 15 dB. Thirty-four out of 35 subjects did not have vestibular symptoms following tympanic membrane closure. The subject who had mild vertigo noted significant improvement after the TMP healed.

DISCUSSION

Many etiologies of traumatic TMP exist, with foreign-body puncture secondary to cotton swab use being common. Over half of the patients seen in otolaryngology clinics, regardless of their primary complaint, admit to cotton swab usage to clean their ear canals.⁶ Reasons patients express the need to use cotton swabs include physician advice, familial use, advertising, or because they thought it was a good idea.⁶ No study has quantitatively measured the prevalence of cotton swab use within the ear canal, but the dangerous misconception that cotton swabs should be used to remove wax from the ear canal remains. It is evident from this and previous studies,^{2,3,7–9} that use of cotton swabs can cause ear canal lacerations and TMP. Thus, the old adage prevails: don't put anything smaller than your elbow in your ear.

Initial evaluation of traumatic TMP should include otologic symptoms, evaluation of neurologic deficits, and audiometry. In patients with severe vertigo and hearing loss following injury, otolaryngologists must suspect the presence of perilymphatic fistula and surgical intervention is recommended to not only repair TMP, but to repair the perilymphatic fistula. In this study, surgical intervention resulted in complete resolution of symptoms.

If the TMP is not associated with severe symptoms (vertigo, facial nerve paralysis and/or sensorineural hearing loss), observation is appropriate. Amadasun found a closure rate of 72.7% to 86.7% of traumatic TMPs, which were observed and nonsurgically treated.⁷ We observed a closure rate of 97% with an average time for closure of the tympanic membrane to be <2 months. Proper follow-up with audiometry after healed TMP is essential to confirm that any conductive loss has resolved; if not, the concern for ossicular chain discontinuity must be considered.

A limitation of this study is that 30% of the subjects were lost to follow-up. Although it is unlikely that all 15 of these subjects may not have spontaneously healed, if that were the case, then our spontaneous healing rate would be reduced to 68%. Likewise, it could also have been the case that all 15 healed on their own, and our spontaneous healing rate would actually be 98%. The actual rate would be somewhere in this range and we

are confident that most, if not all, of the missing patients spontaneously healed, and the rate is near the 97.1% that we report.

Although this study focused on the adult population (subjects >18 years of age), cotton swab usage is equally prevalent within the pediatric population. Macknin et al. found that 62% of pediatric patients presenting to a general pediatric clinic admitted (either themselves or via their parents) to cotton swab use within the past 2 months.¹⁰ The rate of tympanic membrane perforation secondary to cotton swab use can be assumed to be similar between the two sets of ages, if not higher in the pediatric population, due to inappropriate handling of the cotton swab. Orji and Agu found that the spontaneous closure rate of traumatic TMP (not specifically secondary to cotton swab injury) was inversely correlated with age, with complete healing of the tympanic perforation in all subjects <20 years of age.¹¹ As with other types of epithelial injury, increased protein turnover is thought to be the reason for faster healing rates among the pediatric population.¹²

CONCLUSION

Despite appropriate warnings, people continue to use cotton swabs to remove wax from their external auditory canal and are at risk of causing a TMP. Otolaryngologists and primary care physicians need to continue to educate patients on the risks associated with cotton swab use. Most traumatic TMP secondary to cotton swab use can be observed, with most healing spontaneously within 2 months. When severe vertigo, sensorineural hearing loss, or neural deficit is present, surgical exploration and repair is the preferred modality.

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