Survey of pediatric otolaryngologists: Clinical practice trends used to prevent and treat blocked ventilation ear tubes in children

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Summary

Objective: To estimate clinical impact of blocked tubes in children and to identify prevention/treatment trends.

Methods: A survey was sent to American Society of Pediatric Otolaryngology (ASPO) members via Internet.

Results: One hundred twenty two members of ASPO members responded (58%). Most clinicians saw their patients 4—8 weeks after surgery. The estimated blockage rate was between 0 and 9% (despite the use of prophylactic drops applied perioperatively including those with antibiotics only (55%), antibiotic with steroids (36%) or decongestant drops (14%), respectively). Most clinicians opted to treat blocked tube with a course of drops applied at home (73% used drops over half the time). Those drops most commonly used included the following either alone or in combination for up to 14 days: antibiotics with steroids, antibiotics alone, or either 1.5 or 3% hydrogen peroxide. Fewer clinicians used suction and/or debridement under microscopic guidance to unblock the tube at the office visit. However, most clinicians agreed that microscopic debridement was more effective than a course of drops in opening blocked tubes (80% versus 70% estimated median success rate, respectively, \( p = 0.0003 \)).

Conclusions: Approximately one half million sets of tubes (1,000,000 total tubes) are placed per year in North America. Based on results of this survey and those from the literature, 50,000 patients require treatment postoperatively because their tubes blocked (despite the use of prophylactic eardrops). This study identifies that a variety of treatments exist and confirms that further study is warranted to prevent postoperative tube blockage.

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1. Introduction

Tympanostomy tube (TT) insertion is one of the most common procedures performed on children and is the primary reason that children require general anesthetic in North America [1]. The function of tube is to prevent infection by providing constant ventilation of the middle ear and to allow for drainage if infection occurs despite the presence of a tube. Postoperative blockage has been estimated to occur in up to 10% of cases causing the tube to become ineffective. In most instances, the blockage occurs in the early postoperative period and may be associated with the transient otorrhea that occurs in 16% of patients [1]. Most report that mucin, or less often blood, causes the blockage. Tubes may also block with granulation tissue or wax, but this appears to occur more commonly when the tubes have been in place for longer periods of time. Although a well-described clinical problem, only a few methods have been described to prevent and treat blocked tubes [2]. The purpose of this study is to identify practice patterns among pediatric otolaryngologists and to determine what types of treatments are used and if consensus exists over prevention and therapeutic choices routinely used.

2. Methods

A web-based survey was constructed to assess beliefs and practices of pediatric otolaryngologists regarding blockage of tubes and its treatment and prevention (Fig. 1). After the survey was piloted with a small number of physicians, North American members of the American Society of Pediatric Otolaryngology (ASPO) were contacted by email and asked to complete the survey. A reminder was sent several days later.

Some questions solicited numeric responses, for example question 5 asks, “What percentage of patients has blocked tubes at the first follow-up visit?” If a respondent replied with a range, such as “5—10%,” “recommend was coded as the midpoint of the range, 7.5% in this case. “Less than” and “greater than” responses were coded as one unit more extreme. Thus, “<10%” was coded as 9 and “90%” coded as 91%. There was one exception; “<1%” was coded as 0.5%. Such data are imprecise; first, because of recall bias, second because the investigators approximated the respondents’ estimates. They should be considered as measures of belief and not as measures of patient characteristics.

Data regarding the respondent’s estimates of frequency of use of specific therapies and estimates of success rates for each therapy were analyzed in terms of percentages. The questions were phrased so that the respondents would not exclude one choice over the other because it was assumed that the respondent may have chosen to use different therapies at different times. The absolute number of respondents was similar for all of these questions except for the estimate of success with suction or debridement under microscopic guidance. Twenty-four percent of the respondents chose not to answer this question and were assumed to be the same respondents who had reported that they never use this therapy. The p value comparing estimates of success for each therapy was calculated based on absolute numbers of respondents who answered each of these two questions.

3. Results

One hundred and twenty two ASPO members responded (58% response rate). Eighty-four percent insert more than 20 sets of tubes per month. Fig. 2 shows the distribution of the more commonly used tubes based on their component materials. Most physicians use tubes that are composed of plastic material (including polyethylene, fluoroplastic material or silicone) and only 5% use specially treated or coated tubes.

3.1. Prevention of blocked tubes

Eighty percent of respondents always place eardrops at the time of surgery. Eleven percent of respondents apply drops only when discharge is present and 7% only when thick mucin or blood is present. Two percent of respondents never administer drops. The most commonly used drops contain antibiotic alone (56%) or a combination of antibiotic/steroids (35%). Thirteen percent apply decongestant drops containing oxymetazoline or xyolmetazoline. Nearly all (94%) of the physicians instruct their patients to use ear drops postoperatively two to three times per day for a range of 2—7 days.

3.2. Treatment of blocked tubes

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Most physicians see their patients within 8 weeks of surgery (29% 1—3 weeks and 66% 4—8 postoperatively, respectively). Most respondents estimated their blockage rates to be in the range of 2—9% of patients, with a median estimate of 4%. There was nearly universal (98%) agreement that blockage is usually unilateral. Fifteen percent of physicians always confirm the finding using a tympanogram, but the majority (87%) only order a tympanogram if the diagnosis is not certain; the remaining 13% never
Fig. 1 "Survey of pediatric otolaryngologists: tympanostomy tube blockage." The survey was administered online. This figure omits the online instructions and formatting. For items with responses marked with circles, such as question 3, only one choice was permitted. Multiple responses were accepted for choices marked with checkboxes, e.g., question 11.
confirm blockage with tympanometry. Ninety-nine percent of physicians opt to treat the blocked tube when fluid is present in middle ear, but only 76% choose to treat the tube when the middle ear is clear.

The therapies most commonly chosen to unblock tubes are a course of eardrops to be applied at home or, less often, suctioning and/or debridement with or without an ear pick using microscopic guidance performed in the office. The data are displayed in terms of proportions because an almost equal number of physicians answered each question. (Fig. 3A and B) Although drops are more commonly used as a therapy, a greater percentage of physicians reported better overall success rate with debridement (70% versus 80% median estimated success rate, $p = 0.0003$) (Fig. 3C and D). Similar to preventative therapy, most physicians prescribe drops containing antibiotics with or without steroids (see Fig. 4: 42 and 45%,

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Fig. 2  Distribution of materials composing the most frequently used tubes. Plastic and silicone are by far the most widely used.

Fig. 3  Treatment choices for management of blocked tubes. For most respondents, the preferred treatment was the use of drops at home—62% report this choice in at least three quarters of their cases (A). Only 22% rely on suction or microdebridement (e.g., with a pick), in at least 75% of cases (B). Other treatments, not shown in this figure, were used only rarely. When suction or microdebridement is used, it is perceived as more effective than drops; only 47% of respondents find that drops are effective in 75% of cases or more (C), compared to 70% of respondents for suction and microdebridement (D).

Fig. 4  Type of otic drop chosen to treat block tubes. Antibiotic drops, with or without steroids, are by far the most widely used. Responses total more than 100% because many respondents use more than one kind of drop.
respectively). In some instances, respondents commented that they are more likely to treat with drops containing steroids if the ears are inflamed or granulation tissue is seen in or around the tube. Full strength (3%) or half strength (1.5%) hydrogen peroxide is used alone or in combination with the antibiotoic drops (with or without steroids) by 32% of the respondents. Vinegar (a weak solution of acetic acid) and baking soda (sodium bicarbonate) solutions are used much less frequently (8% and 2% of the time, respectively). Most prescribe drops for a period of 1—14 days. The majority of physicians see patients back between 1 and 3 weeks.

4. Discussion

The finding of a blocked tympanostomy tube postoperatively leads to significant disappointment by parents and physicians, especially when the child has ongoing symptoms. Compared with the literature, physicians in this study reported a lower rate of blocked tubes (median of 4% compared with a reported rate of postoperatively blocked tubes of 7—10.5% in the literature) [1,2]. Most of our respondents saw their patients within 8 weeks of surgery and describe the plugs as being composed of dried mucin or blood. Our survey did not address tubes that had been in place for long periods of time that may be more difficult to unblock [2,3]. The main purpose of the study was to identify practice patterns and to identify the more commonly used treatments used to unblock them in the postoperative period. Given that the results collected were obtained from a survey, the data in this paper are subject to bias because the answers reported by the respondents were based on estimates and recall. The majority of our respondents reported that they used tubes composed of silicone or other plastic including polyethylene or fluoroplastic material, which have been designed to create smooth, polished surfaces that decrease biofilm formation and mucin plugging. Only a small proportion of physicians use coated tubes that have been marketed to decrease the rate of plugging (i.e. ion bombarded tubes or phosphorylcholine tubes that create a smoother surface or silver oxide coated tubes that may decrease the bacterial load on tubes) [4,5]. Data were not collected to determine if respondents had bias regarding the type or brand of tube chosen in preventing blockage.

To prevent blockage, the majority of the otolaryngologists in our study (80%) applied drops to the ears at the time of surgery (mostly antibiotic drops) and almost all (94%) prescribed a course of postoperative antibiotic with or without steroid drops. The literature supports the use of antibiotic drops because they have been shown to reduce the incidence of postoperative otorrhea (and presumably mucin plugs) in patients who had one ear treated with antibiotic/steroid drops (Betnesol-N) compared with the other ear which had no treatment \((p = 0.01)\) [6]. However, there was no significant difference in the rate of tube blockage caused by dried blood [6]. Two other studies demonstrated that treating ears with decongestant drops reduces plug formation caused by dried blood. Specifically, Jamal stated that 60 ears treated with xylometazoline HCL (Otrivin) had no postoperative plugging seen at 3 months follow up compared with the 10.5% of 76 ears that had no treatment [7]. Altman et al. found that a combination of antibiotic and decongestant drops was most successful in decreasing the rate of tube blockage compared with controls or antibiotics alone (2.3% versus 8.6% blockage rate, respectively, \(p = 0.02)\) [8].

The choice made by most of the physicians in this study to use an antibiotic drop with or without steroid alone may reflect concerns regarding ototoxicity. The ototoxicity of commercial antibiotic drops is well known, but that of decongestant drops has not been well studied [8—10].

Similar to preventative treatment, our respondents were more likely to treat existing plugs with antibiotic drops with or without steroids, and those containing steroids were prescribed more often if granulation tissue were present. However, these clinicians felt the drops were significantly less successful in unblocking tubes than suction and/or debridement under microscopic guidance \((p = 0.0003)\). It is assumed that the preference of the clinicians in this study to use a trial of drops applied at home rather than restraining the patient relates to the age of the patient. Specifically, restraining a child in the office can be difficult for both the parent and the child and debridement under microscopic guidance requires time and may result in local trauma to the ear.

Several nonpharmaceutical drops were used as remedies by our respondents alone or in combination with commercial antibiotic drops. The more commonly used agents were those containing weak solutions of acetic acid, including vinegar and Vosol (Denver Chemical Co., Humacao), half strength/full strength hydrogen peroxide, and less often sodium bicarbonate solution, all of which have been described in the literature [2,11—13]. However, the effectiveness and potential ototoxicity of these drops remain uncertain.

Overall, our study has demonstrated that pediatric otolaryngologists would prefer to use a course of drops to treat blocked tubes postoperatively rather than mechanically debride the ear under microscopic...
guidance even though they feel that drops are less effective. These clinicians are more comfortable using commercial antibiotic drops perioperatively, but one third of our respondents use hydrogen peroxide and fewer use solutions of acetic acid to achieve this goal.

References