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Tympanostomy Tube Sequelae in Down Syndrome Children with Chronic Otitis Media

Jennifer F[2], Emily L[2] and Syed K[1]*

[1]Department of General Pediatric Otolaryngology, University of Massachusetts Medical School, USA

[2]Department of Pediatrics, University of Massachusetts Medical School, USA

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***Corresponding author:** Syed Kamil, Department of General Pediatric Otolaryngology, Clinical Associate Professor, University of Massachusetts Medical School, 55 Lake Avenue North Worcester, MA 01655, USA, Tel: 508-856-2963; E-mail: Syed.Kamil@umassmemorial.org

Abstract

The management of otorrhea and hearing loss due to tympanic membrane perforation can be challenging in patients with Down Syndrome (DS) due to their narrow ear canals and developmental delays. Management of chronic otitis media in children with DS has been debated in the literature, as insertion of tympanostomy tubes may be associated with higher risk of complications. We observed a higher rate of tympanic membrane perforation in Down syndrome patients than in typically developing patients after first ventilation tube placement surgery. Follow up clinic notes were reviewed to determine if the patients were found to have a tympanic membrane perforation. Only the first-time tube insertion for patients who had bilateral myringotomies with tympanostomy tubes was included. Of the DS patients, tympanic membrane perforations rate was 27.8%, compared to a rate of 5.6% in typically developing children. We hope that a more conservative approach to the management of chronic otitis media and using ventilation tubes with smaller diameters will prevent tympanic membrane perforations in Down syndrome patients.

Keywords: Down syndrome; Otitis media with effusion; Ventilation tubes; Tympanic membrane perforation

Abbreviations: DS: Down Syndrome

Introduction

While Down syndrome (DS) is more commonly known for developmental manifestations, there are multiple otolaryngologic associations with the condition, including higher risk of chronic otitis media [1]. The otolaryngologist plays an important role in providing health care to children with DS. Sometimes this care continues in to the adult life. Children with DS have an increased incidence of ear disease due to their craniofacial anatomy and adenotonsillar hypertrophy causing eustachian tube dysfunction. They are also more prone to recurrent upper respiratory tract infections causing repeated ear infections. Chronic middle ear with effusion may be responsible for the high prevalence of conductive hearing loss in children with DS [2]. Management of chronic otitis media in children with DS

has been debated in the literature, as insertion of tympanostomy tubes may be associated with higher risk of complications and is not always effective in ameliorating hearing loss [3,4]. Most DS children have very narrow and stenotic external ear canals, which makes the diagnosis and the management of ear pathology very challenging. It is important for the otolaryngologist to prevent any surgical complications in children with DS. One of the complications of ventilation tube surgery is tympanic membrane perforation. The management of this complication is more challenging in patients with DS. We wanted to compare the rate of this complication in our patients. This retrospective review compares the rates of perforation following ventilation tube insertion in children with Down syndrome and typically developing children to further guide effective and safe management of this common condition.

Methods

Patients were identified through review of charts from the University of Massachusetts Memorial Medical Center electronic health record. Down syndrome (DS) patients were identified from the Genetics clinic. Typically developing patients were selected randomly from the Pediatric Otolaryngology clinic. Charts were reviewed to identify patients who had bilateral myringotomies with tympanostomy tube insertion. Follow up clinic notes were reviewed to determine if the patients were found to have a tympanic membrane perforation.

Only the first-time tube insertion for patients who had bilateral myringotomies with tympanostomy tubes was included. Patients were excluded if they did not have good follow-up or if their tympanic membranes could not be definitively visualized.

IRB approval and written consent were not necessary because of the retrospective nature of the study. Only age, gender, otolaryngology procedure notes, and otolaryngology physical exam notes were obtained. No identifiable information was collected.

The Fisher's exact test was performed to compare the tympanic membrane perforation rate between children with and without DS.

Results

There were 18 patients in the Down Syndrome (DS) arm and 36 patients in the typically developing arm. All patients had bilateral myringotomies with tympanostomy tube insertion performed as children. The DS arm was composed of 7 females (38.9%) and 11 males (61.1%) and the typically developing arm was composed of 17 females (47.2%) and 19 males (52.8%) (Table 1&2).

Of the DS patients, 5 had resulting tympanic membrane perforations, which is 27.8%. Of the typically developing patients, 2 had tympanic membrane perforations, which is 5.6%. Although the rate of tympanic membrane perforation was higher in DS patients, it was not found to be statistically significant (p=0.087 by Fisher exact test) (Table 1&2).

	Down Syndrome	**Typically Developing**
	Children (n=18)	Children (n=36)
Gender (M/F)	11-Jul	17/19
Perforation	5 (27.8%)	2 (5.6%)

	Perforation
Down Syndrome Children	5 (27.8%)
Typically Developing Children	2 (5.6%)
p-value	0.087

Table 1&2: Tympanic membrane perforation rates in Down syndrome children and typically developing children Down Syndrome.

Discussion

In this patient population, we observed a higher rate of tympanic membrane perforation in Down Syndrome (DS) patients than in typically developing patients after first ventilation tube placement. Although the otologic abnormalities in DS patients and the potential complications of ventilation tube placement have been studied extensively, the differences in complications in DS patients have not been elucidated.

One prior study did compare rates of perforation between DS and typically developing children. They determined a perforation rate of 18% of ears in DS patients with just one perforation in their typically developing patients [3]. However, they did not differentiate based on the number of times ventilation tubes were placed. Similarly, Manickam, et al. [5] determined a rate of 17% of ears of DS patients with a perforation after ventilation tube insertion; they also did not differentiate based on the number of sets of tubes and

some of their patients had more than nine sets of tubes [5]. Paulson, et al, also analyzed complications of ventilation tubes in DS patients and noted a perforation rate of 8.2% with fewer than three sets of tubes and 36.6% with greater than three sets of tubes [4]. While this confirms that rates of complications increase with greater number of ventilation tubes, there was not a comparison to typically developing children.

The management of tympanic membrane perforation can be difficult and is particularly challenging in patients with DS. The consequences of tympanic perforation include recurrent otorrhea and hearing loss. Children with DS are already more prone to otorrhea because of anatomical abnormalities of the craniofacial region and higher incidence of recurrent upper respiratory infections and allergies.

Management of otorrhea is particularly difficult in these children. Due to their narrow ear canals, ear examination can be very challenging. Because of their development delays, they are less likely to cooperate for ear examination or cleaning by microscopy. It is also more difficult to treat otorrhea with ear drops because the narrow ear canals will prevent the drops getting in appropriately. Hearing loss caused by a perforation can negatively affect speech and language development. This is particularly important for these patients who already have developmental delays. Post-operative management can also be difficult due to developmental delays. Thus, it is important to attempt to prevent perforations in these patients.

We do not know the exact cause of the higher rate of perforations in DS patients. It is possible that it is due to a difference in the actual structure or the size of the tympanic membrane. It also could be due to a difference in the healing of the incision.

The best possible outcome would be to avoid the complications resulting from placement of ventilation tubes. We have noticed that the ventilation tube size makes a difference. Ventilation tubes with 1mm lumens are better in preventing perforations. We hope that a more conservative approach to the management of chronic otitis media and using ventilation tubes with smaller diameters will prevent tympanic membrane perforations in Down syndrome patients.

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