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Review article

Otitis media with effusion in children with cleft lip and palate: A narrative review

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ABSTRACT

Objective: Repair surgery of cleft lip and palate (CLP) can produce satisfactory cosmetic results but the problem of recurrent otitis media with effusion (OME) secondary to CLP may persist. This can cause long-term hearing loss and affect linguistic, academic, and personal development. The aim of this review is to provide the most recent information regarding OME in children with CLP.
Methods: All papers referring to children with CLP and OME were identified from searches in Medline, PubMed, Cochrane Library, and Web of Science. Abstracts were read and relevant papers were obtained. Additional studies were obtained from the references of the selected articles.
Results: Both current and previous research on OME in children with CLP focused on the controversy over treatment strategies. Evidence on the optimal treatment for OME in CLP children was lacking. Ventilation tube surgery using the same anesthetic as lip or palate procedures was not well-supported. After summarizing the literature review, a flowchart of management guidance for such patients is also recommended. Updated reviews such as this will provide clinicians and patients/parents with a valuable reference.
Conclusions: The lack of evidence on the optimal treatment for OME in children with CLP should prompt a relatively conservative approach. However, only a consensus between patients/parents and surgeons regarding the most suitable treatment strategy for OME can ensure the greatest benefit to individual patients.

Contents

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1. Introduction

Cleft lip and palate (CLP) is a congenital oro-facial anomaly that may be psychologically stressful for family members and debilitating for patients. In children, this involves a series of major invasive surgeries following birth, including cleft lip repair, cleft palate repair, bone grafting, and dental implant surgery [1]. Otitis media with effusion (OME) involves the collection of fluid in the middle ear for three or more months, often causing damage to the eardrums or acute middle ear infection [2]. Unfortunately, its clinical significance as a complication of CLP is often overlooked and very few studies have explored this condition in depth. Compared to healthy children, children with CLP are more susceptible to recurrent OME [3].

The present study reviews the epidemiology, etiology, clinical symptoms, and physical examination techniques related to OME in children with CLP. Controversies regarding treatment are also discussed.

2. Materials and methods

All papers referring to children with CLP and OME were identified from Medline via OVID (1948 to December 2012), EMBASE via OVID (1980 to December 2012), PubMed (to December 2012), Cochrane Library (to December 2012), ISI Web of Science: Science Citation Index Expanded (1970 to December 2012) and ISI Web of Science: Conference Proceedings Citation Index-Science (1990 to December 2012) using the following search terms: cleft palate, cranio-facial anomalies, maxilla-facial anomalies, jaw abnormalities, stomatognathic diseases, congenital anomalies, otitis media with effusion, middle ear effusion, conductive hearing loss, grommet tube, ventilation tube, tympanostomy tube, myringotomy tube, T-tube, ear tube, pressure equalization tube, vent, middle ear ventilation, and children. Abstracts were read and relevant papers were obtained. Additional studies were obtained from the references of the selected articles. All papers included were written in English or Chinese. The searches were conducted in November and December 2012 and updated in May 2013.

3. Results

3.1. Epidemiology

In the general population, about 50% of infants will develop OME during the first year of life, increasing to about 60% by the age of two years. Most episodes resolve spontaneously within three months, and only 5% to 10% of episodes last one year or longer. About 30% to 40% of children will have recurrent OME [4]. In contrast, although the vast majority of infants born with CLP (about 82%) do not have OME at birth [5], OME is often present within the first six months of life [6]. Furthermore, OME has been reported to occur at least once before the first birthday in up to 90% of the CLP population [7], increasing to 97% by the age of two years [8]. Even though the likelihood of OME is reduced when this population reaches adulthood, about 50% will have permanent conductive hearing loss [9,10].

3.2. After-effects of OME

Children with CLP may suffer recurrent or continuous OME, causing atelectasis, ossicular fixation, and tympanosclerosis [7,11,12] that can result in conductive hearing loss of up to 30 decibels (dB). Previous research shows that with or without cleft palate repair surgery, up to 90–96% of children with CLP suffer from OME or conductive hearing loss, which is usually bilateral [9], while 50% suffer from recurrent otitis media [7,8,13–15]. In comparison, the prevalence of conductive hearing loss is about 12.9% among children without CLP [16].

The toxins produced by long-term inflammation can pass through the round window or the oval window into the inner ear, causing permanent sensori-neural hearing loss [12,17]. Moreover, 0.9–5.9% of patients with CLP develop primary acquired cholesteatoma. Children with CLP have a 100- to 200-fold higher probability of developing cholesteatoma than children without CLP [18,19].

Many studies indicate that even though reconstructive surgery for CLP improves linguistic ability, language development depends on the extent by which hearing ability is maintained [18,20]. If OME is not treated properly, long-term hearing loss can negatively influence the language development of children [4]. Hearing loss in children with CLP may also affect their academic comprehension and learning performance. Bess et al. indicated that even if children only suffer unilateral hearing loss, academic performance can still be seriously affected in up to 33% of patients. Furthermore, up to 40% of patients are unable to participate in regular activities or interactions due to hearing loss. Children suffering from this condition may also display behavioral difficulties due to feelings of isolation [21].

3.3. Pathogenesis of OME

There are many causes of OME in children with CLP. This study explores the condition from the perspective of anatomic abnormalities. However, because the Eustachian tube has three important functions (i.e., ventilation, protection, and clearance) [22], its immature development plays an important role in OME formation [23].

3.3.1. Abnormalities in the anatomic structure

A cleft palate can affect the velo-pharyngeal function due to anatomic or structural defects. In children with CLP, the abnormal reflux of food and fluid from the mouth into the nasal cavity due to velo-pharyngeal insufficiency can result in inflammation and edema of the Eustachian orifices and hypertrophy of the adenoid pads, leading to tubal obstruction and secondary OME [24].

In addition, the orifice of the Eustachian tube in CLP patients is smaller and located postero-inferiorly such that the levator sling obstructs rather than lifts the opening during phonation or swallowing, resulting in subsequent OME [25,26]. Moreover, the development of the tensor veli palatini (TVP) and levator veli palatini muscles is abnormal in children with CLP, thereby causing maladjustment in the regular opening function of the Eustachian tube [3,22]. When atmospheric pressure in the environment changes (e.g., during a plane landing) or the gas in the middle ear is absorbed by the mucosa, the Eustachian tube is unable to open and