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Middle-ear disease in children with cleft palate

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ABSTRACT

Objective: The objective of this review is to summarize all aspects of middle ear diseases in children with cleft palate (CP).
Methods: PubMed, Scopus, The Cumulative Index to Nursing and Allied Health Literature (CINAHL) and The Cochrane Library were searched for English-language randomized control trials (RCTs), meta-analyses, systematic reviews and observational studies published through 31st July 2017.
Results: Epidemiology and pathogenesis of middle ear diseases in children with cleft palate have been discussed in this review. Methods of Evaluation, CP surgeries, complications and follow up have been detailed for the same.
Conclusion: Evaluation of middle-ear disease in children with CP begins at birth by a newborn hearing screen. Tympanometry and otoscopy helps screen for middle-ear disease during follow-up visits. Ventilation tube may be placed when indicated based on the patient's clinical course and presentation. Long-term follow up should be provided to look for the development of cholesteatoma.

1. Introduction

Cleft palate (CP) is a congenital disorder that occurs when secondary palatal shelves fail to fuse during embryogenesis. CP is a relatively common disorder with an overall incidence of 1 in 700 live births [1]. Approximately 97% of children with CP develop otitis media with effusion (OME) in first 24 months [2], which may cause speech, language, intellectual, or emotional disability [3]. The purpose of this review is to provide an evidence-based update on epidemiology, pathophysiology, methods of evaluation and treatment options for middle-ear diseases in children with CP.

2. Methods

PubMed, Scopus, The Cumulative Index to Nursing and Allied Health Literature (CINAHL) and The Cochrane Library were searched for English-language randomized control trials (RCTs), meta-analyses, systematic reviews and observational studies published through 31st July 2017. The Boolean phrase used for search was '("otitis media" OR "middle ear disease") AND ("cleft palate") AND ("pediatric" OR "paediatric" OR "children")'. Duplicate studies were removed, and relevant articles were examined in detail to include in this review (Fig. 1).

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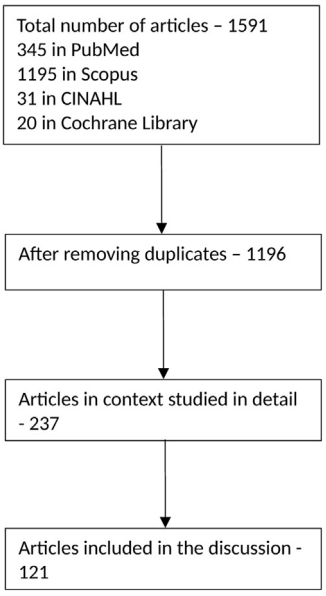

Fig. 1. Literature search flow chart.

3. Results and discussion

3.1. Epidemiology

The incidence of middle-ear disease in children with CP appears to vary by country of origin of the study. Tables 1 and 2 summarize the studies conducted to determine the incidence or prevalence of middle ear disease in children with cleft palate, based on the country of origin. Though some authors have proved it to be a near universal occurrence [3], low incidence found in Chinese population have been claimed to be due to racial influence on facial anatomy by other authors [4]. The incidence was highest (82–97.4%) in studies from the United Kingdom [3,5], and lowest (17–64.2%) in studies from China [4,6]. Studies conducted in India, Japan, Malaysia, Taiwan, Thailand, the United States and Sweden reported incidence ranging between 55% and 80% [7–15].

There was no observed gender difference in incidence of middle-ear disease or hearing loss in children [4,6,16,17].

One of the factors that determines the incidence of hearing loss is age. 82% of infants born with CP have hearing loss [5], with an estimate of 76.1% at 2 years of age [11]. The incidence at the end of the second and third year of life is 45% [18]. Hearing is shown to improve thereafter, up to 16 years of age [19–22]. Children with CP may develop a permanent conductive hearing loss later in life [19,23,24], with worsened hearing at high frequencies [19,23] ranging from 11 to 20 dB HL [24]. Hearing loss at high frequencies has been attributed to the continued episodes of OME seen in children with CP [19]. Adults with CP are reported to have a high incidence of hearing loss ranging between 30% and 50% [21,22,25], which is mostly of conductive type and mild in severity [22]. At all ages, incidence of hearing loss and middle-ear disease remained significantly higher than in children with CP (repaired or unrepaired) versus children without CP [25–27].

The severity of the cleft appears to affect the incidence of hearing loss and middle-ear disease in children [28,29]. More severe clefting was correlated with a greater incidence of deafness [29] as well as an increased incidence of ventilation tube (VT) insertion [30]. There was a higher incidence of otitis media with effusion (OME) in children who had a cleft lip in addition to CP (76%) compared to children with an isolated CP (68%) [28]. Incidence of deafness was less in children with submucous CP compared to children with other types of CP [29]. Additionally, children with CP had higher incidence of OME when compared to cleft lip alone [31].

Middle-ear disease was also found in asymptomatic CP children, with incidence estimates ranging from 37% to 88% [12,39,32].

3.2. Pathophysiology

Middle-ear disease in children with CP occurs because of inadequate drainage and infection of middle-ear secretions as a result of eustachian tube dysfunction (ETD) [33–40]. In a child without CP, the eustachian tube (ET) is relatively straight

Table 1
Incidence/Prevalence of otitis media with effusion in children with cleft palate according to the place of origin, arranged in an alphabetical order.

Incidence of otitis media with effusion in children with cleft palate according to the place of origin					
Country	Incidence/ Prevalence	Age	Sample size	Method of diagnosis	Reference
China	23.7%	All ages	180	Tympanometry	Chu et al. [4]
India	>55%	1 to 5 years	50	Otomicroscopy, tympanometry	Zingade et al. [14]
Japan	70.9%	1 to an average of 9.42 years	108	Otomicroscopy	Kobayashi et al. [10]
Malaysia	57.6%	Less than 10 years	66	Symptoms, Otomicroscopy, PTA and tympanogram	Lokman et al. [12]
Sweden	74.7%	1 to 5 years	22	Otomicroscopy, tympanometry,	Flynn et al. [15]
Taiwan	71.92%	1 year	319	Aspiration from tympanic membrane	Chen et al. [7]
Taiwan	76.1%	1 to 2 years	104	Otomicroscopy, tympanometry	Kwan et al. [11]
Thailand	72.67%	All ages	234	Tympanometry	Thanawirattananit et al. [13]
United Kingdom	97.4%	2 to 20 months	55	Myringotomy	Grant et al. [3]
USA	57% to 68%	Children	34	PTA, acoustic impedance and pneumatic otoscopy	Bess et al. [8]