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The effect of adenoidectomy on occlusal development and nasal cavity volume in children with recurrent middle ear infection

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ABSTRACT

Objectives: The aim of the study was to examine the effect of adenoidectomy on occlusal/dentoalveolar development and nasal cavity volume in children who underwent tympanostomy tube insertion with or without adenoidectomy due to recurrent episodes of middle ear infection.
Methods: This prospective controlled study consisted of two randomly allocated treatment groups of children, younger than 2 years, who had underwent more than 3–5 events of middle ear infection during the last 6 months or 4–6 events during the last year. At the mean age of 17 months tympanostomy tube placement without adenoidectomy (Group I, $n = 63$) tympanostomy tube placement with adenoidectomy (Group II, $n = 74$) was performed. At the age of 5 years 41 children of the original Group I (14 females, 27 males, mean age 5.2 yrs, SD 0.17) and 59 children of the original Group II (17 females, 42 males, mean age 5.2 yrs, SD 0.18) participated in the re-examination, which included clinical orthodontic examination defining morphological and functional craniofacial status and occlusal bite index to measure upper dental arch dimensions. Acoustic rhinometry and anterior rhinomanometry was made by otorhinolaryngologist at the same day.
Results: No statistically significant differences were found between the groups in the frequencies of morphological or functional characteristics or upper dental arch measurements or in the minimal cross-sectional areas or inspiratory nasal airway resistance measurements.
Conclusion: Combining adenoidectomy with tympanostomy tube insertion in the treatment of recurrent middle ear infection at an early age (under the age of 2 years) does not seem to make any difference in occlusal development in primary dentition at the age of 5 years as compared to tympanostomy tube insertion only. Since adenoid size was not evaluated, the findings do not allow interpretation that hypertrophic adenoids should not be removed in children with continuous mouth breathing or sleep disordered breathing.

1. Introduction

Early childhood is important period to craniofacial and occlusal growth and development. More craniofacial growth in absolute terms takes place during this time than in any other period of life. In occlusal development the primary dentition is fully developed by the age of five years. Early deviations from normal craniofacial and occlusal growth and development may be expressed as skeleto-dental malocclusions later in life [1]. The growth and anatomic restructuring of the vocal tract also change oral and pharyngeal region in children [2].

Breathing function is considered as one of the factors affecting/controlling craniofacial and occlusal development [3–5]. Nasal obstruction is thought to lead to complete or partial mouth breathing, which necessitates the tongue to occupy a lower position in the oral cavity. As a consequence maxillary transversal growth is adversely affected, and mandibular forward displacement is

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directed predominantly downwards leading to increased lower facial height [5–16].

Large adenoids and tonsils in children are found to be associated with mouth breathing, snoring, and more severe expressions of sleep disordered breathing, i.e. sleep apnea. First-line therapy in these conditions is adenoidectomy or tonsillectomy [17]. After adenoidectomy and facilitation of nasal breathing, accelerated mandibular growth and closure of the mandibular plane angle have been reported, however, with a large variation in response [11,18,19]. Transversal growth of the upper dental arch has also been found to be greater in children with adenoids removed than in the un-operated control children [20,21], but opposite findings have also been reported [22,23].

Less attention has been placed to middle ear and upper airway infection as an etiological factor to obstruct nasal breathing. Repeated and frequent infections with pain may disturb normal sleep pattern of a child [24] and prevent normal nighttime endocrinological function as seen in reduced growth in children with sleep apnea [25,26].

The first-line surgical intervention for recurrent middle ear infection is tympanostomy tube placement with or without adenoidectomy. Several randomized studies conclude that routine concurrent adenoidectomy during tympanostomy tube insertion does not add any clinically significant advantage over tympanostomy tube insertion alone in prevention of middle ear infection in young children [27–30]. It is worth noting that for example in the study by Hammarén-Malmi et al. [29] children with adenoid hypertrophy were excluded. On the other hand, the study by Nguyen et al. [31] concluded that otitis media children with adenoids obstructing mechanically the eustachian tube may benefit from adjuvant adenoidectomy.

The aim of the study was to examine the effect of adenoidectomy on occlusal/dentoalveolar development and nasal cavity volume in children who underwent tympanostomy tube insertion with or without adenoidectomy due to recurrent episodes of middle ear infection. It was hypothesed that children with tympanostomy tube insertion with adenoidectomy will have more optimal occlusal development of primary dentition than children with tympanostomy tube insertion alone.

2. Material and methods

Subjects consisted of children, younger than 2 years, who had underwent more than 3–5 events of middle ear infection during the last 6 months or 4–6 events during the last year. All the infections were diagnosed at the Department of Otorhinolaryngology, Tampere University Hospital, Finland. There were initially 306 children eligible for the study. The children were randomly allocated to one of the two treatment groups: tympanostomy tube placement without adenoidectomy or tympanostomy tube placement with adenoidectomy before the treatment of choice was exposed to the parents. Once the allocation was revealed, the parents were offered an option to change the allocated group or chance not to participate. Of the 306 randomized children, 137 were enrolled in the trial: 63 children in the Group I (tympanostomy tube placement without adenoidectomy), and 74 children in the Group II (tympanostomy tube placement with adenoidectomy). An informed consent was obtained from parents of all the children. The study protocol was approved by the ethical committees of the National Public Health Institute and Tampere University Hospital (see detailed description of the study protocol in Mattila et al. [27]).

At the age of 5 years the children were re-examined. Ethical approval was obtained from the Joint Municipal Authority of the Pirkanmaa Hospital District. Of the original Group I 41 children (14 females, 27 males, mean age 5.2 yrs, SD 0.17) and of the original Group II 59 children (17 females, 42 males, mean age 5.2 yrs, SD 0.18) participated in the re-examination. Study protocol is presented in Fig. 1.

Re-examination included clinical orthodontic examination defining morphological (overjet, overbite, molar relationship, crowding, crossbite) and functional (nose/mouth breathing, lip seal, snoring) status. In addition, occlusal bite index (Yellow Bite Wax Sheets, 018–0.22 cm Thick, Modern Materials) was obtained to measure upper dental arch dimensions. Measurements were made with a digital sliding calliper (Somet PM 160 digi s hl.d 1,6 Typ: 14016458KS), and included inter-canine width measured between upper primary canine cusp tips (dd. 53–63), inter-molar width measured between mesio-palatal cusps of upper second

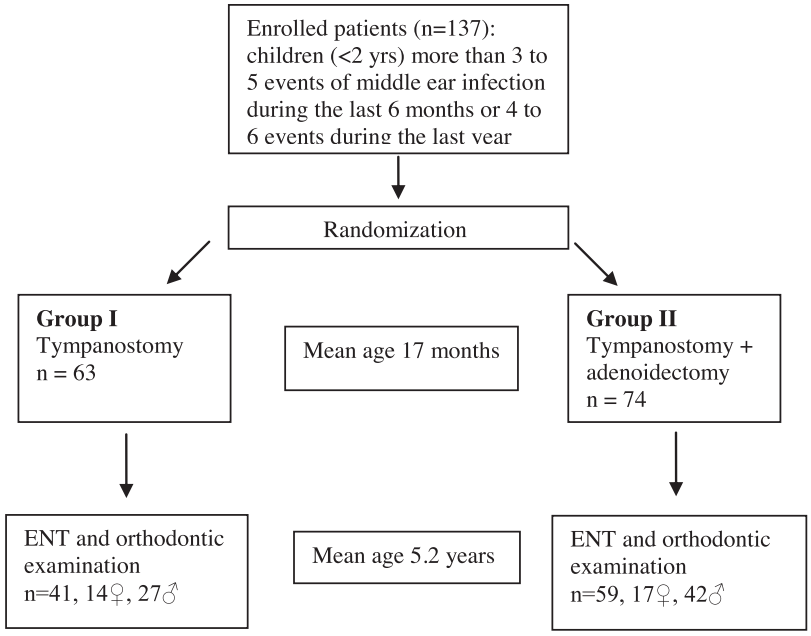

Fig. 1. Flow chart of the research protocol. In the present study orthodontic and ENT examination was performed on the same day.