Head Posture and Facial Profile of Mouth Breathing Children Caused by Nasal Obstruction

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Abstract

Mouth breathing children are often associated with an obstruction of the upper respiratory tract caused by adenoid hypertrophy, allergic rhinitis, nasal polyps, sinusitis, or obstructive sleep apnea. The body will respond to nasal obstruction by changing the head posture to increase the permeability of the oropharyngeal. Mouth breathing also alters the tension of the muscle on the maxilla and mandible, which results in changes to facial profile. The objective of this study is to analyze the change in head posture and facial profile caused by nasal obstruction. A cross-sectional descriptive study was conducted in the Pediatric Respirology and Pediatric Immunology Allergy Outpatient Clinic Kiara Maternal and Child Health Center at Cipto Mangunkusumo Hospital with a consecutive sampling method on children aged 7–18 years. Lateral cephalometry was performed to determine the head posture and facial profile. This study showed that a mouth breathing habit caused by nasal obstruction may contribute to a change in head posture and facial profile.

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Introduction

Mouth breathing children are often associated with an obstruction of the upper respiratory tract caused by adenoid hypertrophy, allergic rhinitis, nasal polyps, sinusitis, or obstructive sleep apnea. Associations have been noted between the mode of breathing, head posture, and facial profile. It has been indicated that the mode of breathing may influence craniofacial morphology indirectly through a change in head posture.

Oral breathing has been reported to cause changes in human head posture (cranio cervical posture). The changes represent a functional answer that facilitates mouth breathing in order to compensate for nasal obstruction by increasing the airway dimension and oropharyngeal permeability.[1,2]

Cranio cervical posture is related to skeletal development of the face. In an extended cranio cervical posture increased anterior facial height, reduced sagittal jaw dimensions, and a steeper inclination of the mandible are generally observed, whereas when the head is flexed in relation to the cervical column there is, on average, a shorter anterior facial height, larger sagittal jaw dimensions, and a less steep inclination of the mandible.[3]

It has likewise been demonstrated that growth changes in cranio cervical posture are related to corresponding changes in the growth pattern of the facial skeleton.[4]

The objective of this study is to provide information about the importance of early detection and to analyze the influence in mouth breathing children of nasal obstruction on head posture and facial profile for growing children aged 7–18 years.

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Method

The study was designed as a cross-sectional descriptive study to investigate the change in head posture and facial profile of mouth breathing children. The study was conducted in the Pediatric Respirology and

Pediatric Immunology Allergy Outpatient Clinic Kiara Maternal and Child Health Center at Cipto Mangunkusumo Hospital using a consecutive sampling method on children aged 7–18 years from September 2016 to October 2016.

The inclusion criteria are mouth breathing children associated with nasal obstruction caused by adenoid hypertrophy, allergic rhinitis, nasal polyps, sinusitis, or obstructive sleep apnea. The subject must be in class I malocclusion. The exclusion criteria include children with neurologic disorders and syndromes, children with a non-nutritive sucking habit for more than three years, children with craniofacial deformities, and children with previous or ongoing orthodontic treatment.

A lateral cephalometry was taken of each subject in the NHP using the ‘self-balancing method’. Informed consent was obtained and the procedures were conducted in accordance with the ethical standards of the Committee on Human Experimentation of the Faculty of Medicine at the University of Indonesia in which the experiments were conducted.

The radiographs were taken using amotorized and vertically adjustable Panoura 15 series. The vertical adjustability of the machine permits the recording of standing subjects. The transverse adjustment of the head in the cephalostat is made using the ear rods and a vertical line through the median plane of the head holder. The focus median plane distance was 150 cm, and the film median plane distance was 10 cm for the lateral cephalometric. All lateral cephalograms were traced using Image Tool, which was developed the UT Health Science Center, School of Dentistry, San Antonio. The measurements were made three times to reduce the chance of errors. The benchmarks and reference layouts as well as the angles used in the cephalometric (Figure 1) analysis are shown in Table1.

Head posture is classified into three categories, namely lordosis, straight, and kyphosis. The lordosis posture shows an arrangement of the cervical spine that is curved anteriorly with the angle NSL/OPT at 82°–93°. A straight posture shows an arrangement of the cervical spine that is upright with the angle NSL/OPT at 94°–102°. The kyphosis posture shows an arrangement of the cervical spine that is curved toward the rear with the angle NSL/OPT at 102°–112°. Down’s analysis for cephalometry states that the value for NAPog for a straight profile is 7°±3°, for a concave profile it is below 4°, and for a convex profile it is above 10°.

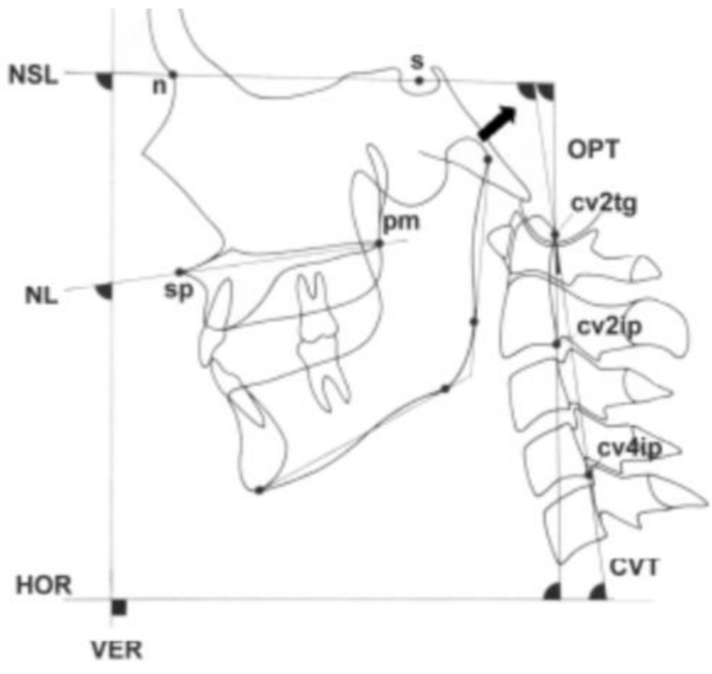


Figure 1. Cranio cervical and facial profile references.[5,6]

Table 1. Cranio cervical and facial profile references.[7–10]

References	Definition
S	Sella: the midpoint of the pituitary fossa
N	Nasion: the most anterior point of the fronto nasal suture in the median plane
Cv2tg	The tangent point at the superior posterior extremity of the odontoid process of the second cervical vertebra
Cv2ip	The most inferior and posterior point on the second cervical vertebra corpus
NSL	Nasion-Sellan Line: an extended line from N to S
OPT	A line connecting the tangent point at the superior/posterior extremity of the odontoid process of CV2tg and the most inferior/posterior point on the corpus of CV2ip
NSL/OPT	Head position in relation to the second cervical vertebra, intersection of NSL and OPT
NAPg	Convexity of facial profile

Results

From September 2016 to October 2016, there were seven children who matched the criteria for inclusion as a subject in this study. Distribution by gender, of seven children, six were boys representing 86% and one was a girl representing 14% (Chart 1). Regarding the age of the patients, two were seven years old, one was 12 years old, one was16 years old, and three were 14 years old (Chart 2).

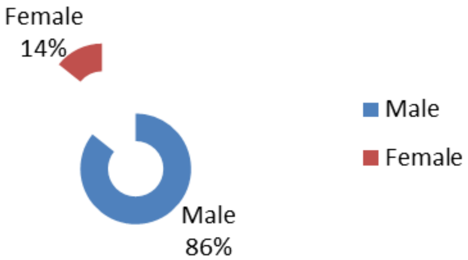


Chart 1. Distribution of mouth-breathers by gender

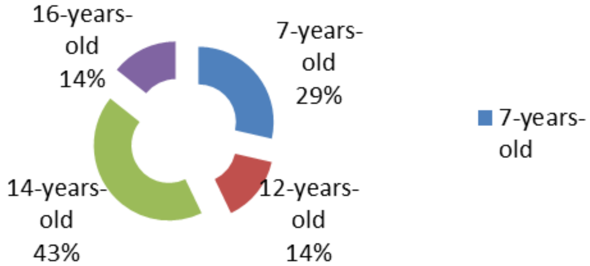


Chart 2. Distribution of mouth breathing children by age.

Based on the etiology of mouth-breathing, three of five etiologies were found: there were five subjects (72%) with Rhinitis, one subject (14%) with adenoid hypertrophy, and one subject (14%) with rhino sinusitis (Chart3).

Regarding the distribution by time span of mouth breathing, the subjects divided into three categories: 1–2 years, 2–3 years, and more than 3 years. Of the seven subjects, three (43%) had nasal obstruction for 1–2 years, one (14%) had nasal obstruction for 2–3 years, and three (43%) had nasal obstruction for more than three years (Chart4).

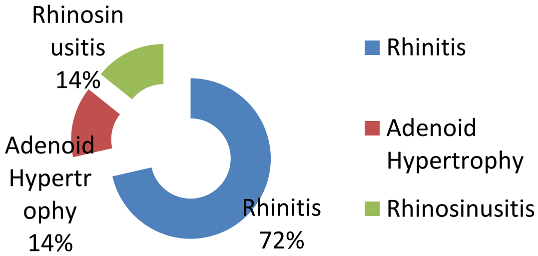


Chart 3. Distribution of mouth breathing by etiology

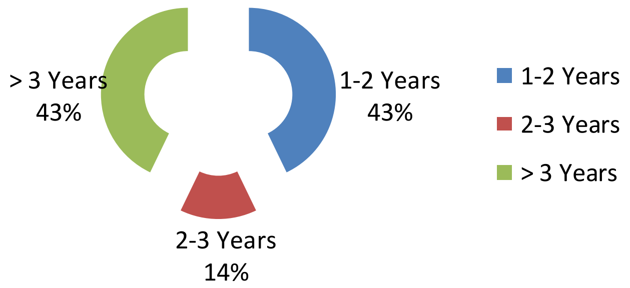


Chart 4. Distribution by time span of mouth breathing

The study found that for head posture, of the seven subjects, one (14%) was lordosis, one (14%) was straight, and five(72%) were kyphosis (Chart5).Regarding facial profile, of the seven subjects, one (14%) was concave, three (43%) were normal, and three (43%) were convex (Chart 6).

From the study, head posture and facial profile may be related to the period of time that the patient had been breathing using their mouths. It was found that 60% of subjects with kyphosis posture and 75% of subjects with a convex profile have breathed using their mouth for more than three years (Chart 7).

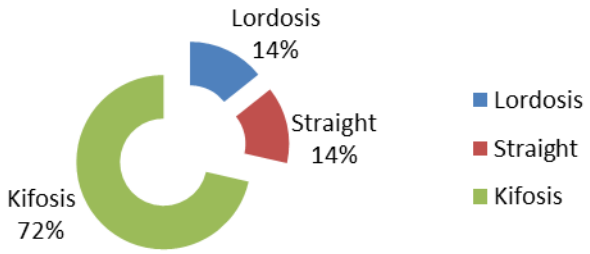


Chart 5. Distribution of head posture.

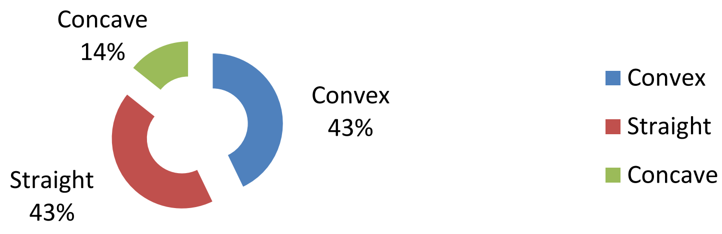
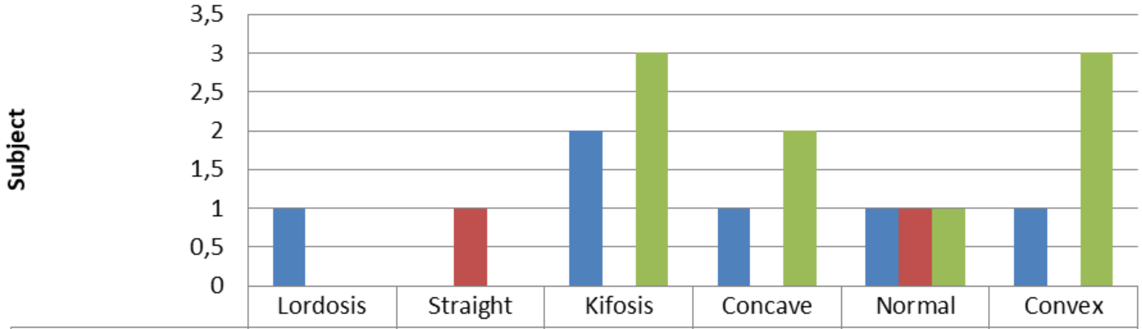


Chart 6. Distribution of facial profile.



	Lordosis	Straight	Kifosis	Concave	Normal	Convex
1-2 Years	1	0	2	1	1	1
2-3 Years	0	1	0	0	1	0
More than 3 Years	0	0	3	2	1	3

Chart 7. Head posture and facial profile related to time span

Discussion

Respiration is the primary determinant for the posture of the jaws and tongue (and of the head itself, to a lesser extent). Therefore, an altered mode of respiration, such as breathing through the mouth rather than the nose, could change head posture. An abnormal posture of the head changes the load in several joints of the cranio vertebral region, resulting in unfavorable dento facial and craniofacial growth. The purpose of this study was to assess whether a mouth breathing habit caused by nasal obstruction might influence head posture and facial profile.[2]

From the study, NSL/OPT on cephalometry as a cranio cervical angulation, is a representative of the head posture. In 72% of the subjects with mouth breathing caused by nasal obstruction, NSL/OPT was found to be increased, which means there is an upward and backward rotation of the head and a cervical flexion (Chart1).

Several studies have shown that mouth breathing caused by nasal obstruction is connected with a variation in head posture and an increased cranio cervical extension, which increase the dimensions of the airways and the oropharyngeal permeability with mandibular and lingual postural modifications, and of the soft palate as well.[2]

This study also shows that there are changes in the facial profile, particularly in the facial convexity or NAPog angle in cephalometry. Of the seven subjects, almost half (43%) were convex. It is obtained by using Down's analysis for cephalometry.

A large cranio cervical angle (NSL/OPT<102°) is associated with the growth of the face vertically, which is shown by an increase in the height of the anterior face, the limited length of the maxilla so that the growth of the face is small in the antero posterior direction, mandibular retrognatism, and a smaller mandible. This will be seen as an increasing curvature of the face.[5,11-14]

Head posture and facial profile may be related to the period of time that the patient has been breathing using their mouth. It was found that more than half of the subjects with kyphosis posture and with a convex profile had breathed using their mouth for more than three years. Based on these findings, we can conclude that children with a longer duration of nasal obstruction could develop a more extended head posture and convex facial profile than children with less severe obstruction of as horter duration. However, further research is needed to prove this statement.

Conclusion

Mouth breathing children are more likely to have a higher degree of head extension related to the cervical spine; in our study, we found a frequency of 72%. We also found that mouth breathing children tend to have a convex facial profile, which was found in 43% of our subjects. In our study, the most common etiology is Rhinitis.

The duration of mouth breathing may also play a role in the extended head posture and convex facial profile that occurs in subjects, particularly for periods of more than three years.

The breathing pattern, head posture, and facial profile are only three factors that should be taken into considerations when elaborating the plan of treatment.

Acknowledgment

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