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A Cephalometric Study of Breathing Mode Influence on Dentofacial Morphology in Children of 6 To 12 Years

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Abstract

Background Mouth breathing is seen to cause facial and structural growth alterations, especially during childhood and has been discussed in medical and dental literature, since ages. The change in mode of respiration causes postural adaptations of the structures in the head and neck region producing the effect on the positional relationship of the jaws, teeth and perioral structures. The magnitude of the skeletal changes should be recognized early and the habit treated according to its aetiology, at the earliest, so that the postural changes do not cause permanent damage on the developing child.

Aim and objectives To cephalometrically evaluate the effect of mouth breathing on the SN-Go.Gn and IMPA values and to compare these values in children who are nasal breathers.

Material and methods 80 children aged between 6-12 years, following Otolaryngological examination to rule out obstructions, were divided into two groups. Group 1was mouth breathers, consisting of 40 children, and Group 2 was nasal breathers consisting of 40 children as control. Digital Lateral Cephalogram was taken of each subject in a standardized manner. Skeletal parameters were analyzed . Comparisons of groups were done by paired't' test of the SPSS software.

Results The SN-Go.Gn was found to be much higher in children who were mouth breathers. When comparing the IMPA values between mouth breathers and nasal breathers, mouth breathers showed greater angles than nasal breathers . The increase in values of SN-Go.Gn and IMPA suggest a development towards bimaxillary protrusion or mandibular prognathism in these children, if the mouth breathing habit is not intervened at the earliest.

Conclusion The early recognition of such facial patterns may be utilized to identify breathing compromised individuals who are likely to develop aberrant growth patterns and various types of malocclusions.

Keywords: Mouth breathing, Nasal breathing, Dentofacial complex, Cephalometry

Introduction

Breathing is one of the most vital functions of the human body. Every breath we take can have a positive or negative impact on our bodies depending on how it is performed. It has been well established that normal breathing should be achieved mostly through the nose. [1] Mouth breathing is a common oral habit in children and one of the most serious public health problems. A series of structural and functional changes in the stomatognathic system can occur along with various psychological, physical, and social effects.

The prime physiological functions of the oro- facial region include respiration, swallowing, suckling, mastication and speech. All these functions should be balanced. A disturbance in any one oral function can result in

abnormal growth and development of bony and soft tissue structures of the craniofacial complex.[2]

During normal breathing, the abdomen gently expands and contracts with each inhalation and exhalation and there is no effort involved. The breath is regular ,silent and most importantly, through the nose. Abnormal breathing or mouth breathing however is often faster than normal, audible, and involves visible movements of the upper chest. This type of breathing is normally only seen when a person is under stress and those who habitually breathe through their mouths. The negative side effects of stress and over-breathing become chronic.[3] Habitual mouth breathing has serious implications on an individual's lifelong health, including the development of the cranio-facial structures. [4]

Clinical symptoms such as short upper lip, increased overjet, overbite, maxillary excess, mandibular excess /deficiency, bimaxillary protrusion ,everted lower lip and a lip trap can cause proclincation and diastema in children and thus increase the severity of mouth breathing. It can cause considerable amount of pschycological impact in way of poor performance, lack of confidence in school and many systemic effects on the head and neck region and the body of a mouth breather.[5]

Aim of the study

To evaluate the vertical skeletal relationship:

- SN-GoGn angle- the degree of the mandibular plane inclination to the anterior cranial base formed by the intersection of the mandibular plane angle (GoGn) with SN.

To Evaluate the Dental Relationship

- **IMPA** Mandibular incisor inclination to mandibular plane and it measures the proclination or retroclination of the mandibular molars.

Methodology

After getting due clearance from institutional ethics committee the present study was conducted in the Department of Pedodontics and Preventive dentistry, on children coming for interceptive orthodontic treatment. Children, who came to the department with the complaint of proclined teeth were categorized as nasal breathers and mouth breathers. Forty children who were found to have mouth breathing habit, were included in the study. Forty children who were nasal breathers were taken as control. Parental consent was obtained from children of parents who were willing to pariticipate in the study in the age group of 6 -12 years.

Inclusion criteria of mouth breathers

1. Water holding test and Jweven's butterfly test positive
2. Nasopharyngeal obstruction greater than 30% and lesser than 60% as evaluated by an ENT Surgeon.
3. History of open mouth posture, from parents, during waking and sleeping hours.
4. Children from whom written parental consent could be taken.

Exclusion Criteria

1. Children with history of birth injuries and past illnesses.
2. Medically compromised, mentally or physically challenged children.
3. Previous history of nasal respiratory complex surgery or orthodontic treatment.

Assessment of nasal function

Children whose parents gave a positive history of open mouth posture while sleeping and during day time, snoring and nasal obstruction were chosen, for the study. Mouth breathing was confirmed in these children through water holding test and jwevens butterfly test to check the patency of their nares. They were then referred for ENT consultation, where detailed clinical and physical

examination was done to assess the degree of their nasal obstruction. children who were free from enlarged adenoids and enlarged tonsils,with nasopharyngeal obstruction more than 60 % were excluded from the study. 80 patients of which 40 were nasal breathers and 40 month breathers were chosen for the study.

Assessment of dentofacial changes

After selecting the mouth breathers, Digital Lateral Cephalogram was taken of the subjects in a standardized manner. The children were made to stand on the cephalostat (rotagraph plus) with the Frankfort Horizontal plane parallel to the floor and teeth in centric occlusion with relaxed lips (profit). Planmeca digital X-ray film (8" x 10") speed E exposed at 72 kvp, 10 MA and 0.8s, from fixed distance of 60 inches was carried out in the Department of oral medicine and radiology.

The same clinician using the same device performed the procedure under standardized techniques.

The various dental, soft tissue and skeletal anatomic land marks were located and used for the angular and linear measurements. The measurements were recorded for both nasal breathers, as control, and mouth breathers for comparison with cephalometric variables. Cephalometric assessment was made by means of both manual and computerized methods. The points were demarcated and cephalometric values were measured using the nemosoftware.

Result

The SN-Go.Gn was found to be much higher in children who were mouth breathers. When comparing the SN-Go.Gn values between mouth breathers and nasal breathers, mouth breathers showed much greater values than nasal breathers. The highest value was 54.20 and the lowest value was 30.20 which shows that change in SN-Go.Gn angle is evident in mouth breathers. The normal value is 31.98 ± 2.441. Our study showed the mouth breathers to be having an almost normal angle of 30^0 to 35^0 only in nine subjects of the 40 children examined. The rest of the children with mouth breathing showed an increase of more than 10^0 to 15^0. The mean value obtained was 43.37^0 which is well above the normal for children of this age group . Nasal breathers showed an average of 31.98^0 .

The normal value of IMPA according to Steiners is 90^0+/- 2 in normal growth pattern. When comparing the IMPA values between mouth breathers and nasal breathers, mouth breathers showed greater angles than nasal breathers. The highest value was 111.6^0 and the angle was increased in 27 of the 40 children with mouth breathing. The average value seen was 96.92^0 which is much higher than the normal for that age. It remained normal only in 5 of the mouth breathers. The IMPA angle in nasal breathers however remained lower than normal or normal with, an average of 88.17, in the 40 children examined. The change in the IMPA angle was also evident in majority of the mouth breathers.

Table: 1

Cephalometric Parameters	Group	Mean	Std Deviation	T Value	P Value
Sn-Go.Gn	Mouth Breathers	43.37	6.236	10.754	P <0.001 Hs
	Nasal Breathers	31.98	2.411		
Imp a	Mouth Breathers	96.92	7.152	7.032	P <0.001 Hs
	Nasal Breathers	88.17	3.293		

Figure 1: Comparison OF SN-Go.Gn values between mouth breathers and nasal breathers

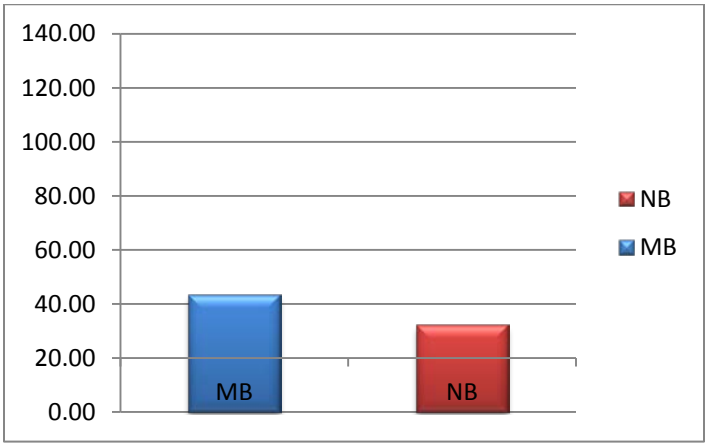
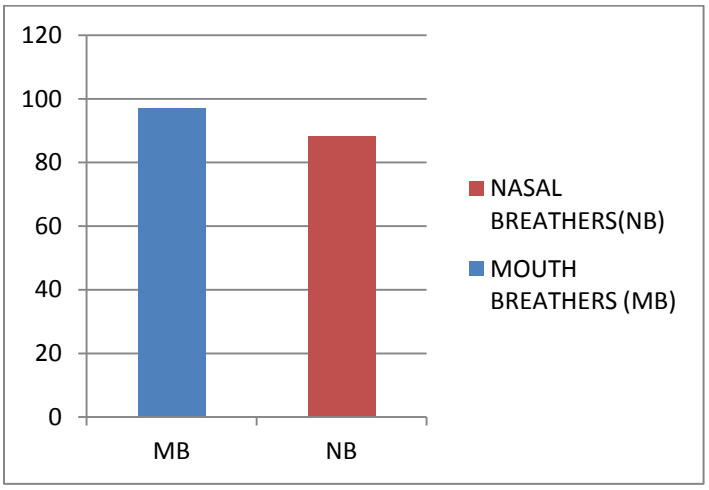


Figure 2 Comparison OF IMPA values between mouth breathers and nasal breathers



Discussion

The present study demonstrated that the cephalometric values of mouth breathing children, differs greatly from nasal breathers as concluded in many studies done globally.[6] Children who breathe predominantly through their mouth pose difficult problems for health care professionals and for themselves.

On evaluation of craniofacial growth pattern, determined by SN-Go.Gn, the values were statistically significantly much higher in mouth breathers (MB) ($p<.001$) when compared to nasal breathers (NB). The mandibular plane angle of MB (43.37 ± 6.236) indicated a vertical growing pattern. The nasal breathers presented with average SN.Go.Gn (31.98 ± 2.441) . This finding in the present study indicated more accentuated inclination of mandible which agrees with results obtained by various authors ,who also found that the SN.Go.Gn angle were more accentuated in mouth breathers.[7,14,15,16] This could result in the child developing a long face with mandibular excess if the mouth breathing is not identified and intervened at an early age.

Faria PT et al. indicated that changed mode of breathing was associated with maxillo-mandibular retrusion in relation to the cranial base in the mouth breathers and the SN-GoGn and NSGn angles were greater in the mouth-breathing group.[8] Malhotra, et al conducted a study on the skeletal relationship of MB and NB children. The mean SN-GoGn ($P<0.001$) for mouth breathers was significantly higher, which agreed with our finding, and concluded that changed mode of respiration was associated with increased facial height, mandibular plane angle and gonial angle. [2]

Upper and lower incisor proclination and increased soft tissue convexity leading to a developing bimaxillary protrusion was seen in mouth breathing children in our study. Interincisal Mandibular Plane Angle (IMPA) was significantly higher in mouth breathing group by $p<0.001$. Lower incisor proclination can increase the soft tissue convexity and can lead to a developing bimaxillary protrusion in mouth breathers. The importance of intervening this habit at the earliest to prevent this condition is significant here. The result found in literature about the inclination of the maxillary incisors are unlike that found in our study, because various authors concluded that maxillary incisor protruded in the mouth breathers, because of the interposition of the hypertonic lower lip between maxillary and mandibular incisors, provoking labioversion of maxillary incisors.[8,9] In our study of mouth breathers, the incidence of lip trap was considerably less

due to a smaller overjet and an increased IMPA value. However, various studies concluded that maxillary incisors are found retroclined in these patients in relation to the S-N line.[10,11,12] Tarvonen and Koski reported that the mandibular incisor presented retroclination in relation to mandibular plane in patient with hypertrophic adenoids.[13] It is important to note that the increase in SN-GO-GN and IMPA angles in young children can considerably change the craniofacial growth pattern in mouth breathers if the habit is not intervened at the earliest. Since there are limitations in orthopedic interventions for skeletal remodeling, these children with mouth breathing habit will have to undergo surgical intervention to correct the malformity.

Conclusion

The effect of mouth breathing on facial and structural growth alterations especially during childhood has been discussed in medical and dental literature since ages. However, the relevance of airway obstruction and its assumed effect on facial growth continues to be debated. The purpose of this cephalometric study was to evaluate the effect of mouth breathing on the dentofacial structures of a growing child. And to evaluate the morphological pattern of the dentofacial skeleton through side cephalometric radiographs and to compare the differences in morphology between nasal and mouth breathing pediatric patients. A multidisciplinary team should work to have early diagnosis and appropriate treatment, preventing the consequent disorders of chronic mouth breathing. From our study, it was concluded that the presence of chronic mouth breathing during the period of growth of a child can affect both the normal development of facial skeleton and the general health.The early recognition of such facial patterns may be utilized to identify breathing compromised individuals who are likely to develop aberrant growth patterns and various types of malocclusions. Hence a joint effort by the Pedodontist, Orthodontist, Otorhinolaryngologist and pediatrician is thus required for reducing continuing detrimental effects of breathing impairments on facial characteristics which can psychologically and physically affect the overall well being of the child.

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