CORRELATION OF UPPER AIRWAY SPACE AND MAXILLARY INTERMOLAR WIDTH

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ABSTRACT

Objective: To access the relation between upper airway space and maxillary intermolar width.

Study Design: A descriptive study.

Place and duration of Study: The study was carried out at the orthodontics department of Armed Forces Institute of Dentistry Rawalpindi.

Patients and Methods: The study was conducted at orthodontics department, Armed Forces Institute of Dentistry. Study casts and lateral cephalograms of 12 to 14 years old skeletal Class II patients with no previous history of orthodontic treatment or air way related surgery were included in the study. Upper airway space was measured on the cephalograms as described by McNamara Jr. Maxillary inter molar width was measured on the corresponding study casts using a digital caliper.

Results: Pearson's correlation i.e r=0.18 showed a direct (r = 0.21) but insignificant (P > 0.05) correlation between upper airway space and maxillary intermolar width.

Conclusion: This study failed to show any correlation between maxillary intermolar width and upper airway space, as has been postulated by some researchers.

Keywords: Upper airway space, maxillary arch width, intermolar width.

INTRODUCTION

The growth of the nasal cavities, nasopharyngeal space and oropharyngeal space have an important bearing on the growth of the craniofacial complex. Mouth breathing has often been associated with long faces, anterior open bites and posterior cross bites [1, 2]. Specifically, decreased nasal air flow has been associated with "adenoid facies". Even allergic phenomenon such as rhinitis and asthma have been associated with development of malocclusions [3].

Behlfelt [4] observed that children who suffered from adenoidal hypertrophy had greater extensions in head posture and lower positions of the hyoid bone associated with low tongue posture. This led to speculation that the inferior hyoid and/ or tongue posture was the response to a physiologic reflex to increase oropharyngeal capacity. It is postulated that in the presence of mouth breathing, the mandible is lowered and the lips are parted. This results in alteration in forces acting on the facial skeleton, with the tongue unable to assume its normal position in the palate thus reducing its expansion effect on the maxillary arch. Furthermore, the constraining effect on the maxillary incisors of the lower lip is lost and no maxillomandibular contact occurs during swallowing, permitting unimpeded vertical growth of the alveolar arches.

Some authors believe that evaluation of the soft tissues, such as tonsils, adenoids, nasal polyps, neuromuscular functional jaw patterns, and facial contours, should be an integral part of treatment planning to aid in the stability and esthetics of the orthodontic or orthopedic results [5-7]. The upper airway space can be measured utilizing a standard lateral cephalograms, as described by McNamara [8].

However, not all studies have found an association between mouth breathing and dentofacial form. Many current concepts regarding the role of respiration in the etiology of malocclusion are based on subjective impressions and anecdotal reports that form a significant part of literature on this subject [9]. Thus the purpose of this study was to assess the relationship between upper airway space and maxillary intermolar width.

PATIENTS AND METHODS

The study was conducted at the Orthodontics Department, Armed Forces

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Institute of Dentistry from July 2008 to December 2008, a tertiary care facility. Informed written consent was obtained from all the participants. Only twelve to fourteen years old, skeletal Class II patients with no previous history of orthodontic treatment or nasal allergies were selected for the study. Patients who had undergone adenoidectomy or any other nasopharyngeal surgery were excluded from the study. Also patients with a history of abnormal pressure habits, craniofacial trauma and generalized growth disorders were excluded from the study. Based on these criteria a total of sixty three patients, thirty one males and thirty two females were selected. Standard lateral cephalograms were recorded for all the patients on a Yoshida Panoura 15C. Impressions of the same patients were recorded using fast setting alginate. Study casts were made from orthodontic plaster having a maximum expansion of 0.2%. A vacuum mixer was utilized for greater accuracy. Trimming of casts was done. Soaping of models affects the overall dimensions of the models, hence it was avoided.

The upper airway (UA) was measured as the minimum distance between the posterior pharyngeal wall and the anterior half of the soft palate. The intermolar width (IMW) was measured as the distance between the mesiobuccal cusp tips of the first permanent maxillary molars. All measurements were done using a digital caliper for greater accuracy. For inter examiner reliability, measurements for 15 randomly selected patients were repeated by an equally trained examiner, two weeks from the original measurements. For intra examiner reliability, the same examiner repeated the measurements for 15 randomly selected patients almost one month after the first measurements.

The data was analyzed in SPSS version 16. Means and standard deviations for the intermolar width and upper airway space were calculated. Paired t – test was used to assess inter and intra examiner reliability. Pearson's correlation was used to assess the correlation between upper airway space and maxillary intermolar width.

RESULTS

The mean age of the sample was 13.2 years. Mean airway dimension for the sample was 15.27 ± 3.32 mm and mean intermolar width was 50.24 ± 2.94mm.(Table - 1) Paired t – test did not yield a significant result ($P > 0.05$) for inter examiner and intra examiner reliability.

Pearson's correlation showed an insignificant ($P > 0.05$) correlation between upper airway space and maxillary intermolar width. This was true for both genders (Table-2).

Table - 1: Mean values for airway space and maxillary intermolar width

Parameter	Mean						Min. (mm)	Max. (mm)
	Sample	SD	Males	SD	Females	SD		
Airway	15.27	3.32	13.10	3.07	17.38	1.90	7	21
Intermolar width	50.24	2.94	50.00	2.90	50.48	3.01	43.75	56.07

Table 2: Results of Pearson's correlation test

Parameter	r		
	Sample	Males	Females
Value	0.18	0.29	-0.02

*P – value < 0.05 is significant

DISCUSSION

After more than a century of controversy, the orthodontic relevance of nasal obstruction and its assumed effect on facial growth continues to be debated. Oral respiration disrupts those muscle forces exerted by tongue, cheeks and lips upon the maxillary arch. The main characteristics of the respiratory obstruction syndrome are presence of hypertrophied tonsils or adenoids, mouth breathing, open- bite, cross-bite, excessive anterior face height, incompetent lip posture, excessive appearance of maxillary anterior teeth, narrow external nares, "V" shaped maxillary arch.

The main objective of this study was to ascertain the truth about the assumption that mouth breathing due to upper airway constriction causes a constriction of the maxillary arch. Only skeletal Class II patients were included in the study to exclude the confounding effect of sagittal discrepancies on maxillary arch width. Patients with previous orthodontic treatment or nasopharyngeal surgeries were also excluded because of the iatrogenic change in arch width and airway space respectively. Only the upper airway space was studied as McNamara's lower airway dimension has been shown to be independent of other variables such as arch width [10].

Although the effect of airway obstruction on dentofacial morphology has been extensively studied, most studied solely utilized lateral cephalometric films. Thus most of the data available on the subject primarily focuses on the sagittal and vertical parameters which can easily be measured on a lateral cephalometric film. Only a few studies have assessed the correlation between maxillary arch width and airway space.

Kristina and Algis [11] in 2002 analyzed the records of 49 children with pronounced difficulty in nasal breathing. Both patients and their parents were interviewed and examined. Their results showed a significant correlation between nasal airway resistance and over jet, open bite, maxillary crowding and posterior cross bite. These results are in agreement with our results that we also found a direct correlation between upper airway space and intermolar width.

In a study Shanker et al [12] found a significantly greater palatal arch width in oral breathers as compared to nasal breathers. However they commented that this difference was clinically insignificant (2mm). These results are in contrast to our results.

CONCLUSION

In our study we did not find any statistically significant correlation between upper airway space and maxillary intermolar width.

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