The effect of mouth breathing on SNA angle and maxillary arch dimensions

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Abstract:

Mouth breathing is associated with many dental and facial problems and thought of as having a bad effect on orthodontic treatment.

The aim of this study was to study the effect of mouth breathing on SNA angle maxillary incisor to SN angle and dental arch dimensions. And to compare these values with those of nasal breathers. A study sample of 17 mouth breathers were compared with 17 nasal breathers. Results showed for the mouth breather's very small increase in SNA angle with marked proclination of upper incisors, and constriction of upper arch which is more in the posterior segment.

Key words:

Mouth breathers, Arch dimensions, SNA angle.

Introduction:

Mouth breathing was associated by many researchers with various orthodontic problems which include dental and facial characteristics, such as retrognathic mandible , proclined maxillary incisors, high -v-shaped palatal vault, constricted maxillary arch , flaccid short upper lip, flaccid perioral musculature [1,2,3], class II malocclusion , buccal crossbite, low tongue position and vertical growth problems [4].

Also mouth breathing was considered to be an obstacle to successful orthodontic treatment, so early diagnosis and treatment of the problem is important. In one study open bite was induced in monkeys by closing off the nasal airway artificially [5,6]. In some studies it was assumed that long - face syndrom originates from mouth breathing due to high nasal resistance to air flow [7,8]. Linder-Aronson [9] found the following problems in mouth breathers, there was an increase in both upper and lower facial heights, with narrow upper arch and a tendency to posterior cross bite with anterior open bite. Following restoration of normal respiration Linder -Aronson found a tendency for the dental abnormalities, to be self correcting.

There are three possible etiological factors for mouth breathing [4] enlarged adenoids, inadequate nasal airway development and soft tissue obstruction and swelling.

The purposes of this study are:

1- The assessment of maxillary arch dimensions in a group of mouth breathers.

2- Comparison of maxillary arch dimensions of nasal breathers with mouth breathers

3- Measurements of SNA angle and maxillary incisor to SN angle (U1: SN°) to assess if the proclination of incisors is due to skeletal factors and forward placement of maxilla or due to an increase in (U1:SN°).

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Material and method:

The sample in this study consisted of (17) patients (10) boys and (7) girls. The age range of the sample was 13-16 years all of these patients have been diagnosed to be mouth breathers due to the presence of adenoids.The diagnosis of the cases was made by two otolaryngologists.

Another sample of (17) subjects who are nasal breathers of the same age range (13-16 years) were used as control sample to compare with the results obtained from the sample of mouth breathers.

The following records were taken for each patient of the study sample as well as the subjects of the control group.

1- Standardized cephalograms.
2- Maxillary study models.

The cephalograms were traced and the following landmarks were identified: points S,N,A. SN plane, then, SNA angle , and maxillary incisor to SN plane angle (U1: SN°) were measured. Fig (1).

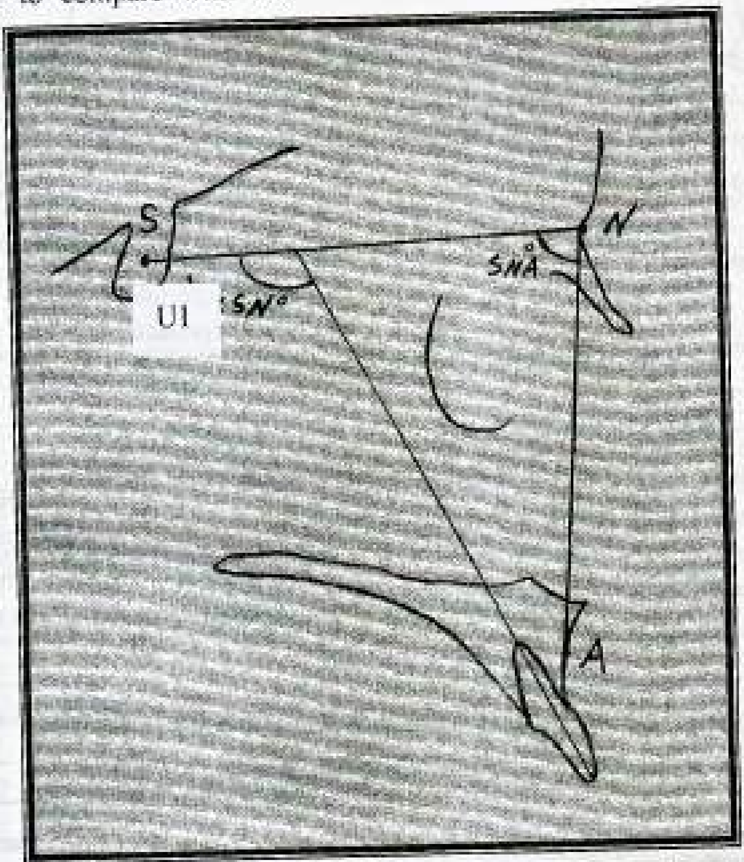

Fig (1): U1: SN° = Maxillary incisor to SN plane angle

On the dental cast maxillary inter canine distance (ICD) Fig (2), was measured according Younes [10].
The maxillary inter molar distance (IMD). Fig (2), was measured according to Hojensgaard and Wenzel [11].

The instrument used for measurement was a modified sliding caliper gauge with avernier scale permitting readings to the nearest 0.1mm.

Statistical analysis involved the use of means and standard deviations for SNA°, maxillary incisor SN angle , maxillary inter canine distance and maxillary inter molar distance.

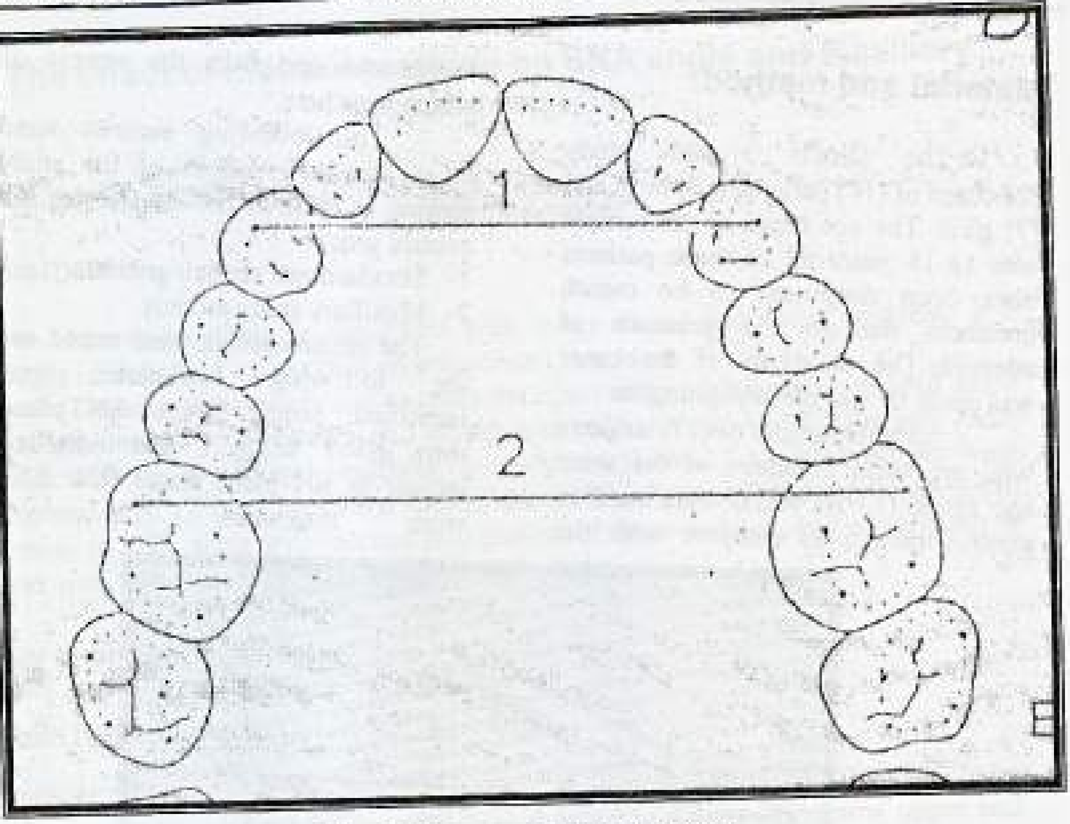

Fig (2): Dental cast measurements
1, inter canine distance
2, inter molar distance

The paired t-test was applied at $P< 0.05$ level to test the presence or absence of any significant difference between mean values of the control group and the study group.

Results:

The data in Table (1) showed that the study sample had a mild class II skeletal pattern which had an effect on the analysis of the results obtained.

Table (1): Study group Cephalometric values.

Measurement	Mean	SD
SNA°	81	3.2
U1: SN°	106	2.2

SD= Standard deviation

SNA°: The data in Table (1) and (2) showed a slight increase in SNA° values in the study group which was significant at $P< 0.05$ when compared with the control group, table (5).

Table (2): control group Cephalometric values.

Measurement	Mean	SD
SNA°	80°	0.5
U1 : SN°	102°	1.7

SD= Standard deviation

Incisor Inclination: As for this parameter there was a marked difference between the study and the control group which was significant a (P< 0.001), table (5).

Data obtained from dental cast analysis:

Maxillary inter canine distance (ICD):

As shown in Table (3) and table (4) the mouth breathers group showed constriction in the anterior part of the maxillary arch as displayed by intercanine distance values, there was a significant difference in (ICD) between study and control groups which was significant at ($P < 0.01$), table (5).

Maxillary inter molar distance (IMD):
Table (3) and Table (4) showed the maxillary arch in mouth breathers to be constricted in the posterior part as displayed by (IMD) values, in which there was a significant difference between the values of this parameter when compared with the control group , this difference was highly significant at ($P<$ 0.001), table (5).

Table (3): Study group dental cast values.

Measurement	Mean (mm)	SD
Maxillary ICD	32.1	2.67
Maxillary IMD	42.1	2.01

ICD= inter canine distance
IMD= inter molar distance
SD= Standard deviation

Table (4): Control group dental cast values.

Measurement	Mean (mm)	SD
Maxillary ICD	34.4	1.43
Maxillary IMD	46.8	2.85

ICD= inter canine distance
IMD= inter molar distance
SD= Standard deviation

Table (5): paired t-test between the control and study group values.

Variable	t-value	Significance
SNA°	2.21	S
U1: SN°	4.39	HS
Maxillary ICD (mm)	3.94	S
Maxillary IMD (mm)	4.57	HS

Discussion:

The results of the study will be discussed in relation to the parameters studied.

As for the SNA angle, a slight increase in SNA angle was found in the study group over the control group (one degree).

Applying here the functional matrix theory of Moss (12) it was assumed that point N Fig (1) may have a slight backward position compared with point N of the control group. As for point A Fig(1) amore forward position of this point in the study group could be explained on the basis of a study by Song and Pae (13) that showed an increase in the activity of alaenasi muscle and orbicularis oris muscle during increase in the resistance of the nasal airway this increased activity may cause point A to take a slightly more forward position than in the nasal breathers group where resistance in the airway is less and muscle activity is less and this slight backward position of point N and slight forward position of point A will open angle SNA and increase its value in mouth breathers yet this hypothesis need to be tested on a larger sample. As for maxillary incisor SN angle the difference between the study and control group was highly significant which indicates amore proclined position of the upper incisors, as was shown by other studies (3,4,8), this proclined position could be explained on the basis of increased muscle activity of orbicularis oris muscle(13) which keeps the mouth open thus liberating the upper incisors from the pressure of upper lip which tend to keep them in a rather neutral position between it and the tongue.

Also increase in muscle activity of mylohyoid and genioglossus muscles which is associated with increase in resistance in the upper airway in the mouth breathers, this increase in muscle activity will bring the tongue down ward and forward opening the mouth for better respiration (13,14), and this opening of the mouth will lead to more proclination of the incisors.

As for the findings in the dental cast measurements , the difference between inter canine distance of the study group and the control group was significant at ($P< 0.01$), table(5), this could again be attributed to the increase in muscle activity of mylohyoid and genioglossus muscles in mouth breathers that takes the tongue down ward and forward (13,14), this down ward position of the tongue together with oral breathing tend to make the upper arch collapse being affected only by the cheek with no neutralizing pressure from the tongue. The inter molar distance in this study suffered from more collapse than the inter canine distance, in one study it was shown that there is an increased activity of tensor palatini and levator palatini muscles in mouth breathers (15), this increased activity may have an effect on the posterior segment of the upper arch causing more collapse than the anterior segments.

Conclusion:

Oral breathing in this study was associated with features of mild skeletal and dental class II relation ship.

The upper arch suffered from reduced inter canine and inter molar distances, this reduction can lead to problems like crowding due to reduced arch length and unilateral or bilateral crossbite. So we recommend noticing this problem in children and try to restore nasal breathing as soon as possible. Although the sample was small which will not allow establishing a clear cause and effect relation ship between these problems and oral breathing but the link is strong, so other studies on a larger sample are recommended.

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