

The skeletal features of Iraqi adult nasal obstruction sample (A posteroanterior cephalometric comparative study)

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ABSTRACT

Background: Chronic respiratory obstruction can be produced by prolonged inflammation of the nasal mucosa associated with allergies or chronic infection. It can also be produced by mechanical obstruction any where within the nasorespiratory system from the nares to the posterior nasal change. There may be a relation between the skeletal features of the facial skeleton and the respiratory pattern and this relation should be studied carefully. This study aimed to study and compare the relation between the nasal obstruction and the skeletal features of the facial skeleton in adults between the sample and control groups and to find the Pearson correlation coefficient between the variables related to the nasomaxillary complex for the sample and control groups.

Materials and methods: The sample is composed of 50 Iraqi Arab adult patients out of 167 with age range from 18-35 years, having nasal obstruction had been examined in Tikrit general hospital and identified by the E.N.T. specialist. The control group will be 50 subjects out of 150 in the same age group and also had been examined and identified by the E.N.T specialist in Tikrit general hospital as having no nasal obstruction. Twelve linear measurements and a ratio were determined on each radiograph. For each variable, the arithmetic mean, the standard deviation, and the standard error were calculated. For statistical evaluation, an independent-samples t-test was performed. The Pearson correlation coefficient was calculated to indicate the relationship between nasal and maxillary variables.

Results: There was no significant difference between the sample and control groups for the skeletal features of the facial skeleton except the ramal height of the right and left sides and there was weak correlation between the nasal and maxillary variables for the sample and control groups.

Conclusion: There is no effect of the nasal obstruction on the skeletal features of the facial skeleton in Iraqi adult sample.

Key words: Nasal obstruction, posteroanterior cephalometrics. (J Bagh Coll Dentistry 2012;24(1):127-132).

INTRODUCTION

Chronic respiratory obstruction can be produced by prolonged inflammation of the nasal mucosa associated with allergies or chronic infection. It can also be produced by mechanical obstruction any where within the nasorespiratory system, from the nares to the posterior nasal choanae. Under normal conditions, the size of the nostril is the limiting factor in nasal airflow. The pharyngeal tonsils or adenoids normally are large in children, and partial obstruction from this source may contribute to mouth breathing in children. Individuals who have had chronic nasal obstruction may continue to breathe partially through the mouth even after the obstruction has been relieved. In this sense, mouth breathing can sometimes be considered a habit ⁽¹⁾. Respiratory needs are the primary determinant of the posture of the jaws and tongue (and of the head itself, to a lesser extent). Therefore it seems entirely reasonable that an altered respiratory pattern, such as breathing through the mouth rather than the nose, could change the posture of the head, jaw, and tongue. This in turn could alter the equilibrium of pressures on the jaws and teeth and affect both jaw growth and tooth position.

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In order to breathe through the mouth, it is necessary to lower the mandible and tongue, and extend (tip back) the head. If these postural changes were maintained, face height would increase, and posterior teeth would super-erupt; unless there was unusual vertical growth of the ramus, the mandible would rotate down and back, opening the bite anteriorly and increasing overjet; and increased pressure from the stretched cheeks might cause a narrower maxillary dental arch ⁽¹⁾. There may be a relation between the skeletal features of the facial skeleton and the respiratory pattern and this relation should be studied carefully.

The posteroanterior cephalometrics are measuring the variables in the transverse dimension may provide more precise information about this relation.

Similar studies of the relation between the skeletal features and the nasal obstruction in adults have not been reported in Iraq. For these reasons, this study was conducted using the posteroanterior cephalometrics.

MATERIALS AND METHODS

Sample

The study group

The sample is composed of 50 Iraqi Arab adult patients out of 167 with age range from 18-35 years, having nasal obstruction had been

examined in Tikrit general hospital and identified by the E.N.T. specialist (figure 1)

The control group

The control group will be 50 subjects out of 150 in the same age group and also had been examined and identified by the E.N.T specialist in Tikrit general hospital as having no nasal obstruction.

The entire control group had full set of teeth and bilateral molar according to Angle ⁽²⁾ classification and class I canine relationship. Also they were class I skeletally through the clinical examination ⁽³⁾.

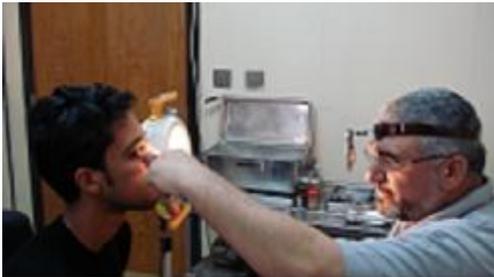


Figure 1: Examination of the patient by the ENT specialist

Exclusion criteria

Some certain cases had to be excluded from the sample, also any projection errors of the radiograph ^(4,5,6) :

1. Facial deformities of a pathologic nature for example, cleft lip and palate cases- because the morphology and respiration would not have the same freedom of interaction.
2. History of tonsillectomy or adenoidecomy or any other oral, nose and throat surgery.
3. Previous orthodontic treatment.
4. Previous orthognathic surgery.
5. A history of thumb or digit sucking.
6. Radiographic error such as blurred image, technical artifacts, and nonoccluding teeth on radiograph.
7. Allergy

Examination materials

a. For the orthodontist

1. A set of 7 plane mouth mirrors.
2. Two Kidney dishes one for carrying the mirrors and the other for the cotton.
3. Disinfectant solution.
4. Cotton.
5. Disposable gloves.
6. Cheek retractors

b. For the E.N.T. specialist

1. Speculums.
2. Kidney dish for carrying the speculums.

The cephalometric machine

All radiographs were taken in the Radiology department at Tikrit general hospital, by the use of Belmax-cm (Belmont) (digital cephalometric machine). For frontal cephalometric Radiograph was automatically set on 12MA, 78 KV. The exposure time was set automatically on 0.8 sec. (Figure 2)



Figure 2: The digital cephalometric machine

Digitizing Equipments

- Personal laptop computer (FUJITSU SIEMENS/Centrino)
- Mass storage device/ USB ported (RAM = 2 gega Byte)
- Analyzing software program (AutoCAD 2011)

Methods

Clinical Examination

Each patient was examined by the ENT specialist to include or exclude the presence of any nasal obstruction. This all was done by the same E.N.T. specialist.

Each patient from the control group was examined by the orthodontist to diagnose the skeletal relationship of the upper and lower jaws and the molar and canine relationship.

Positioning of the patient for taking the posteroanterior radiograph

It is the same in manual posteroanterior cephalometric technique. The subject was directed towards the cassette by rotating the cephalostat horizontally at 90° to the lateral cephalometric view position. The infra orbital pointer wood was placed the same horizontal level with ear rod level to maintain parallelism of the Frankfort plane with the floor the subject was in the position of maximum intercuspation ⁽⁷⁾

The central x-ray beam is perpendicular to cassette passing through the head and midway between the ear rods ⁽⁸⁾

Digitization

Every posteroanterior cephalometric radiograph was digitized by AutoCAD computer program (2011) to calculate the measurements.

First of all for every radiograph, I correct the magnification of the radiographic image by multiplying the linear measurements by the magnification factor which is obtained from a ratio between the real distance measurement for a scale and the distance measurement for the same scale from a radiographic image.

Then cephalometric points were located for each one and then joined to form lines. Twelve linear measurements and a ratio were recorded for each radiograph for the sample and control groups (figure 3)



Figure 3: The radiographic image in AUTOCAD program

Cephalometric landmarks

The following landmarks were used (figure 4)

1. Anterior Nasal Spine (ANS):the center of intersection of the nasal septum and the palate. ⁽⁹⁾
2. Crista Galli (CG): - the center of the crista galli. ⁽¹⁰⁾
3. Point NC: the point located on the widest area of the outline of the nasal cavity.(L. and R.) ⁽¹¹⁾
4. Point J: point jugale: the most superior depression on the lateral contour of the maxilla. Corresponds to the intersection of the buccal outline of the alveolar process in the vicinity of the tuberosity and the outline of the zygomatic process at the inferior surface of the jugular process. (L. and R.) ⁽¹²⁾
5. Condyle superior (Cs): the most superior aspect of the condyle. (L. and R.) ⁽¹³⁾
6. Point Ag :antegonion:the highest point in the antegonial notch (L. and R.) ⁽¹¹⁾
7. Point Go:gonion:the most outward inferior point of the angle of the mandible(L. and R.) ⁽¹⁰⁾
8. Point Me:menton:The center point on the inferior border of the mandibular symphysis directly inferior to mental protuberance and inferior to of trigonum mentali. ⁽¹⁴⁾

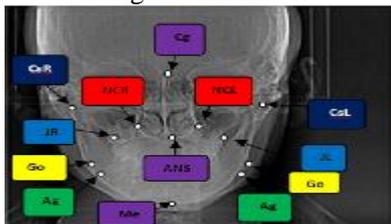


Figure 4: Frontal cephalometric landmarks

Measurements

The following measurements were used (figure 3)

1. Mandibular width:measured from Ag to Ag (at trihedral eminence above notch). ⁽¹¹⁾
2. Maxillary width:width between the JL and JR points ^(14,15)
3. MidsagittalLine(MSL)(Verticaldistance):it's a line that runs vertically from the Cg through ANS to the chin area(Me),it is the distance measurement from Cg to ANS and from ANS to Me ^(7,16)
4. NC-MSL:a perpendicular distance that runs from NC point perpendicular to the MSL. And this is for the right and left sides.(NCR-MSL,NCL-MSL). So total NC- MSL represents the nasal width. ⁽⁸⁾
5. J-MSL: a perpendicular distance that runs from J point perpendicular to the MSL. And this is for the right and left side. (JR-MSL, JL-MSL). ⁽¹⁷⁾
6. Cs-MSL: a perpendicular distance that runs from Cs point perpendicular to the MSL and this is for the left and right sides. (CsR-MSL, CsL-MSL). ⁽¹⁶⁾
7. J-J/Ag-Ag:the ratio between maxillary and mandibular width. ⁽¹⁵⁾
8. Bigonial width (Go-Go): widest distance between right and left gonions. ⁽¹⁸⁾
9. Ramal height (RH): the distance between Cs and Go for the right and left sides. ⁽¹⁹⁾

Statistical analyses

All the data of the sample and control groups were subjected to computerized statistical analysis using SPSS (Statistical Packages for Social Sciences) computer program version 11.5. The statistical analyses included :

Descriptive Statistics

- Mean, Standard deviation and standard error.
- Statistical tables and Graphical presentation (Bar-charts).

Inferential Statistics

- Paired t-test: For intra and inter-examiner calibrations .
- Student t-test: To detect the differences of the cephalometric measurements between the sample and control groups.
- Pearson correlation coefficient test: To detect the statistically significant correlation between NCR and JR in the sample group and the control group and to detect the statistically significant correlation between NCL and JL in the sample and control groups.

RESULTS AND DISCUSSION

All the results of the following variables are listed in (Table 1)

MSL (vertical distance)

A. For the sample group: the mean was 132.12mm; the mean was slightly higher than the control group. It gave no significant difference.

B. For the control group: the mean was 131.76mm.

This disagrees with *Kesso*⁽²⁰⁾. It means that there is no effect of the nasal obstruction on the midsagittal line (vertical distance) in adults between 18 and 35 years old.

CsR-MSL

A. For the sample group: the mean was 56.7mm, the mean was lower than the control group. It gave no significant difference.

B. For the control group: the mean was 57.2mm

CsL-MSL

A. For the sample group: the mean was 51.4mm, the mean was lower than the control group. It gave no significant difference.

B. For the control group: the mean was 52.4mm
This agrees with *Kesso*⁽²⁰⁾; in which it revealed that the condyle was not affected by the nasal obstruction in adults between 18 and 35 years old for the above two variables.

NCR-MSL

A. For the sample group: the mean was 19.3mm, the mean was slightly higher than the control group. It gave no significant difference.

B. For the control group: the mean was 18.8mm

NCL-MSL

A. For the sample group: the mean was 18.14mm, the mean was slightly higher than the control group. It gave no significant difference.

B. For the control group: the mean was 18.07mm. These two variables (NCR, NCL) were not affected by the nasal obstruction. In which it disagrees with *Yamada et al*⁽²¹⁾ in which they found that the adaptive or compensatory responses to nasal respiratory obstruction, was shown by a significant increase in the nasal cavity area evaluated on the posteroanterior cephalogram.

JR-MSL

A. For the sample group: the mean was 33.19mm, the mean was lower than the control group. It gave no significant difference.

B. For the control group: the mean was 33.35mm

JL-MSL

A. For the sample group: the mean was 30.9mm, the mean was slightly lower than the control group. It gave no significant difference.

B. For the control group: the mean was 31.3mm

JR-JL

A. For the sample group: the mean was 64.33mm, the mean was lower than the control group. It gave no significant difference.

B. For the control group: the mean was 64.58mm.

The mean for the control group was (64.58 mm) while the mean in Turkish adults was (66.59mm), the mean JL-JR distance was (63.81mm) for Turkish women and (69.86 mm) for Turkish men as found by *Uysal and Sari*⁽¹⁴⁾. Then in relation to the sample group in this study which is the nasal obstruction group, there was no significant difference between the control and sample groups.

Ag-Ag

A. For the sample group: the mean was 87.96mm, the mean was lower than the control group. It gave no significant difference.

B. For the control group: the mean was 88.43mm.
The mean of the control group was (88.43mm). While the mean for Turkish adults was (98.03mm), the mean Ag-Ag distance was (101.34mm) for Turkish men and (95.21mm) for Turkish women as found by *Uysal and Sari*⁽¹⁴⁾. Then in relation to the sample group in this study which is the nasal obstruction group, there was no significant difference between the control and sample groups.

JR-JL/Ag-Ag

A. For the sample group: the mean was 0.731mm, the mean was slightly lower than the control group. It gave no significant difference.

B. For the control group: the mean was 0.73mm.
The mean of the control group was 73%. *Cortella et al*⁽¹⁵⁾ found that the ratio at 18 years old was 74.9%, so this finding is lower than their finding.

Go-Go

A. For the sample group: the mean was 104.18mm, the mean was lower than the control group. It gave no significant difference.

B. For the control group: the mean was 104.6mm.
The mean of the control group was (104.6). The mean in Palestinian adults was (98.82mm), the mean was (102.7mm) for Palestinian men and (95.81mm) for Palestinian women as found by *Al Taki et al*⁽¹⁸⁾.

The mean of Iraqi adults is higher than the mean of Palestinian adults. Then in relation to the sample group in this study which is the nasal obstruction group, there was no significant difference between the control and sample groups.

RH-R

A. For the sample group: the mean was 62.2mm, the mean was higher than the control group. It gave high significant difference.

B. For the control group: the mean was 59.04mm

RH-L

A. For the sample group: the mean was 62.98mm; the mean was higher than the control group. It gave high significant difference.

B. For the control group: the mean was 59.4mm.

The mean in Turkish adults was (57.84)mm for the right side and (57.57)mm for the left side as found by *Kiki et al.*⁽¹⁹⁾. The mean of Iraqi adults is higher than the mean of Turkish adults. (for the above two variables). Then in relation to the sample group in this study which is the nasal obstruction group, there was high significant difference between the control and sample groups for the right and left sides and this may be due to nasal obstruction or other factors in adults between 18 and 35 years old.

Pearson correlation coefficient between the NCR and JR for the sample and control groups

A. For the sample group: the coefficient was 0.585, so there was a weak positive correlation between these two variables in the sample group.

B. For the control group: the coefficient was 0.684, so there was a stronger and positive correlation between these two variables in the control group than the sample group.

Pearson correlation coefficient between the NCL and JL for the sample and control groups

A. For the sample group: the coefficient was 0.286, so there was a weak positive correlation between these two variables in the sample group.

B. For the control group: the coefficient was 0.499, so there was a weak positive correlation but still stronger than the sample group.

In general there was no significant difference between the sample and control groups for the skeletal features of the facial skeleton except the ramal height of the right and left sides and there was weak correlation between the nasal and maxillary variables for the sample and control groups.

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Table 1: Descriptive and inferential statistics of the cephalometric measurements for the sample and control groups

	Descriptive statistics						Inferential statistics	
	Sample group(n=50)			Control group(n=50)			(d.f.=98)	
	MEAN	S.D.	S.E.	MEAN	S.D.	S.E.	t-test	P-value
MSL	132.12	6.39	0.9	131.76	7.49	1.05	0.165	0.869(NS)
CsR-msl	56.7	2.67	0.37	57.2	3.92	0.55	0.695	0.489(NS)
CsL-msl	51.4	3.09	0.43	52.4	5.1	0.72	1.204	0.232(NS)
NCR-msl	19.3	2.35	0.33	18.8	2.01	0.28	1.164	0.247(NS)
NCL-msl	18.14	2.2	0.31	18.07	2.17	0.3	0.164	0.87(NS)
JR-msl	33.19	2.52	0.35	33.35	2.14	0.3	0.353	0.725(NS)
JL-msl	30.9	2.24	0.31	31.3	2.22	0.31	0.901	0.37(NS)
J-J	64.33	3.49	0.49	64.58	3.8	0.53	0.325	0.746(NS)
Ag-Ag	87.96	3.83	0.54	88.43	5.4	0.76	0.497	0.620(NS)
J-J/Ag-Ag	0.731	0.035	0.005	0.73	0.04	0.005	0.360	0.720(NS)
Go-Go	104.18	7.66	1.08	104.6	5.68	0.8	0.314	0.754(NS)
RH-R	62.2	6.15	0.87	59.04	4.53	0.64	3.220	0.002**
RH-L	62.98	6.08	0.86	59.4	5.36	0.76	3.06	0.003**

The measurements were in millimeters
(NS) Statistically non significant at $p > 0.05$
* Significant at $p \leq 0.05$
** High Significant at $p \leq 0.01$
*** Very high Significant at $p \leq 0.001$