ORIGINAL RESEARCH PAPER

Dental Science

Ricketts's cephalometric evaluation of nasopharynx in Chilean patients with unilateral cleft lip and operated palate.

KEY WORDS: Nasopharynx, Cephalometric, Cleft Lip Palate.

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ABSTRACT

Objective: Determine the dimensions of the nasopharynx according to cephalometric evaluation of Ricketts, in patients with unilateral cleft lip and operated palate, comparing them with the non cleft patients.
Materials/Methods: Cephalometric x-rays of 30 patients with unilateral cleft lip palate. It was carried out Ricketts's cephalometric; to determine vertical dimensions of the nasopharynx, size of its soft tissue, angle of the base of the skull, distance between the front arch of the atlas and the palatine plane, angle of the palate and length/width of the soft palate.
Results: The front and rear cranial bases are more obtuse on cleft palate patients. The linear distance between the atlas and the rear nasal spine and the vertical dimension of the nasopharynx is lesser on cleft patients.
Conclusion: There are many significant differences between the nasopharynx of non cleft and unilateral cleft lip palate operated patients, with the latter being smaller in all dimensions.

1.-INTRODUCTION

The lack of fusion between the palatal and maxillary processes during the embryogenesis in cleft lip palate patients develops a heterogeneous amount of alterations, compromising many structures. One of this is the Nasopharynx, a fibromuscular tube in front of the spine, behind the nose, mouth and larynx; which is closely related with many vital functions such as deglution, respiration and speech[1].

Most of these patients develop secondary deformities beyond cleft lip and palate, due to the defect itself or the many surgeries that they go through. One of these alterations is the compromise of the upper airway, whose dimensions are usually decreased due to nasal deformities, mucosal hypertrophy, atresia and folds in nostrils and sagittal and transverse maxillary deficiencies. As a consequence of this factor, the patients develop Obstructive Sleep Apnea Hypopnea Syndrome, alterations of the respiration mode, abnormal facial form, malocclusions and disturbances in velopharyngeal mechanisms[2]; impacting the speech production due to hypernasality[3].

The nasopharynx's morphology has been evaluated with several methods. One of this studies was published by Professor R. Ricketts[5], in which he developed a cephalometric analysis that interprets the different sizes and shapes of the nasopharynx among normal individuals, proposing the maximum and minimum ranges to be compared with cephalometric studies from cleft lip palate children.

The aim of this study is to compare the cephalogram measurements of Professor Ricketts on soft tissue with operated cleft lip palate children in our medium.

2.-MATERIALS AND METHODS

From a total of Ninety patients with unilateral cleft lip and palate (UCLP) treated at the Unit of Craniofacial Malformation of University of Chile Dental School, a sample of thirty patients from both sexes (equal number for each sex) between eight and fourteen years old (mean age 11.13 ± 1.4) was selected according to the following inclusion criteria:

1. UCLP that had been under primary surgery.
2. Otorhinolaryngologist clinical evaluation to verify the surgical closing of the hard and soft palate.
3. Haven't received Orthodontic treatment or any surgery that compromises nasopharynx tissue such as pharyngoplasty or tonsils and adenoids surgery.
4. Informed consent acceptance by the patient and tutors.
5. Requiring a lateral teleradiography, if need be, was obtained from each individual using a Lysholm precision craniograph, with Kodak 18x24 films, at 65 Kv and exposure time of 0.5-0.8 seconds on a scale of 160 mA per second.

Cephalometric analysis was performed by a calibrated professional (Kappa: 0.85) according to Professor Ricketts's technique, over a Dentaurum sheet of acetate. To this, the cephalometrics points used are detailed in Table N°1 and seen it in Figure N°1.

Table N°1: Cephalometric point and variables measured.

Cephalometric Points	Abbreviation
Posterior border of magnum foramen.	M
Basion - Anterior border of magnum foramen.	Ba
Sella - Center of the sella turcica.	S
Nasion - Frontonasal joint.	N
Esfenoccipital joint.	SOS
Posterior limit of hard palate.	PNS
Anterior extension of maxilar.	ANS
Point of greater curve angle, anterior arch of atlas.	AA
Vertex of soft palate.	SP
Nasopharynx Limphoid tissue	L
Hyoid bone.	H
Vomer	V
Inside extension of the nasopharinx	IN

2.1 Variables

1.- Skull's Base Angle:

- Posterior Angle: Determinated by a line that joins points M-Ba and a line that joins points Ba-S , creating the posterior angle of the base of the skull; M-Ba-S.

- Anterior Angle: A line laid out from N to S and Ba-S determines the anterior angle of the skull, Ba-S-N.

2.- Ante-posterior dimension of the nasopharynx:

Drawing a line that joins points S and PNS and a line Ba-S, an angle is created wich determines the angular ante-posterior dimension of the nasopharynx, Ba-S-PNS. A line from PNS to AA determines the longitudinal dimension in the same direction, PNS-AA.

3.- Vertical dimension of the nasopharynx.

- With the layout of the N-Ba and using the roof of the nasopharynx as a parallel parameter, a perpendicular line was laid out to N-Ba from the center of the sphenooccipital suture, SOS, and when intersects the plane PNS-AA creates the point IN. The length of this segment is the vertical dimension of the nasopharynx, SOS-IN.

- The angle formed by points S-Ba-PNS represents the vertical angular dimension of the nasopharynx, S-Ba-PNS.

4.- Soft Tissue Extension.

- The amount of adenoidal tissue is represented by the percentage that it fills on line SOS-IN, %SOS- IN.

- A line is drawn that joins points PNS-ANS (palatine plane) and it`s extended backwards. A perpendicular one from this plane to point AA is used to measure the variation in the position of the anterior arch of the atlas with regards to the palatine plane, (PNS - ANS) AA.

5.- Soft palate variation.

- A line is drawn from PNS to the lowest point of the soft palate to determine its length, PNS – SP.

- The thick of the velum is measured at the half point of the fore mentioned line. (P.B.L.)

- The palatine plane, with a line drawn alongside the velum creates an angle which represents the velum`s position ANS – PNS – SP.

2.2 Statistical Analysis

The obtained results from the data of the cleft patients were tabulated and compared with the data gathered by Professor Ricketts in non cleft patients. A T' test statistical analysis was performed after a Shapiro Wilk test.

3.- RESULTS

It can be seen that only two of the variables do not have any significant difference comparing cleft and non cleft patients. These variables are Ba-S-PNS (Anteposterior angular dimension of the nasopharynx) and (PNS-ANS) AA (Variation in the position of the anterior arch of the atlas regarding the palatine plane).

Four of the studied variables present a significant difference meanwhile the other five have a highly significant difference. The results are shown on Table N°2.

TABLE N°2: P Value after t'test statistical analisys

	Cleft Patients	Mean Non Cleft Patients	σ2	P Value
M-Ba-S	134,7°	128°	33,11	p<0.001**
Ba-S-N	132,86°	130°	23,29	p<0.05*
Ba-S-PNS	62,26°	61°	14,89	p>005
PNS-AA	34,66	42	16,02	p<0.001**
SOS-IN	23	27	7,17	p<0.001**
S-Ba-PNS	59,46°	63°	32,94	p<0.05*
%SOS-IN	64,08	56	217,42	p<0.05*
(PNS-ANS)AA	10,86	10	37,68	p>005
PNS-SP	25,46	37	25,22	p<0.001**
Diameter PBL (mm)	4,91 mm	9,5 mm	1,58	p<0.001**
ANS-PNS-SP	47,5°	39°	194,94	p<0.05*

* Significant Difference**
Highly Significant Difference

4.-DISCUSSION

Many studies have reported differences in the nasopharynx between patients with cleft lip and palate and non cleft patients. The last studies mainly use 3D exams such as Computed Tomography (CT) and Cone Beam (CBCT) because they provide a better evaluation of the pharyngeal airway than 2D cephalometrics studies[2], better anatomical landmarks and it has a spatial (not plane) representation of the structures. Despite that, lateral cephalometric analysis has many advantages that make it the most used method, such as simple analysis method, availability, simplicity and low cost[2,4,6].

Among the analysis methods is Dr. Ricketts' cephalometric for airway study. The results of this work show the differences between cleft and non cleft patients according to Dr. Rickets cephalometric study of nasopharynx. Two of these are the increased angles for M-Ba-S and Ba-S-N, which are more obtuse. This could be explained because of a major inclination of the basisphenoid plane.

The lineal distance between the atlas (AA) and the posterior nasal spine (PNS) is lesser in CLP patients, which speak of a minor sagittal distance of the nasopharynx. This is opposed to what was published by Zainul et al[1] and Osborne et al [7], whom speak of a higher anteroposterior diameter of the nasopharynx than normal control patients. The vertical dimension of the nasopharynx is lesser on CLP patients, both lineal and angular measurements.

There is a higher percentage of the nasopharynx space filled up by adenoidal tissue on CLP patients than non cleft ones. This measure could be relative because it is a percentage of the vertical length of the nasopharynx, which was lower in cleft patients in this same work. In spite of that, other authors have reported a significantly larger adenoidal tissue on cleft lip patients compared with non cleft patients[8].

The soft palate tissue of the CLP patients is shorter, thinner and more vertical than non cleft patients. This could have a direct relation with the primary surgery, it has been proposed that this surgery limits the growth of the facial second third[9], so a shorter soft palate may be due to the scar of the primary surgery. Rajion et al [1] postulate that insufficient velopharyngeal closure is consistent with a greater anteroposterior diameter of the nasopharynx. In our case, we found a slightly higher but not significant difference in the anteroposterior diameter, but a very significant difference in the characteristics of the soft palate, which also could explain the insufficient velopharyngeal closure.

5.- CONCLUSIONS

According to Dr. Ricketts's cephalometric analysis for soft tissue and nasopharynx, the nasopharynx is shorter in anteroposterior and vertical dimensions in cleft lip palate (CLP) than non cleft patients, with a front and rear cranial bases more obtuse, higher percentage of nasopharynx space filled up with adenoidal tissue and a soft palate thinner, shorter and more vertical.

6.- REFERENCES

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