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Research Article

Frontal Cephalometry Analysis: A New Proposal for the Diagnosis of Facial Asymmetries

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Keywords: Facial Asymmetry; Frontal Cephalometric Analysis; Craniofacial Study

Abstract

Aim: A new proposal about a frontal cephalometric analysis for the diagnosis of facial asymmetries.

Methods: Forty cases of both sexes with aged between nine and twelve years old were selected and divided into two groups A for asymmetries and B for apparent normality. Frontal cephalograms were performed for both groups. The exposure was 20mAs, and linear and angular measurements were made for the cephalograms of both groups and compared the differences. Before the cephalometric study, a photographic study was carried out where the height of the lower edge of the orbital cavities with respect to the middle plane, the vertical lines of the inner edges of the left and right eye, and the line of the labial commissural were evaluated.

Results: In 80% of the cases studied with facial asymmetries that presented cross bites and lateral deviations of the jaw towards the crossed side. In 60% of the cases studied, the angle formed between the basic plane and the plane of the Yugal crest was diminished on the crossed side. In 100% of the cases of unilateral crossbite, the plane of the lower central incisors did not coincide with the central plane.

Statistical results: The comparison of the averages between groups A (with facial asymmetry) and B (without facial asymmetry) concerning altered linear or angular values were significantly different, with the p-value = 0.0001. Conclusion: Conclusion: There are several factors that influence facial asymmetry. When several craniofacial elements are involved, the asymmetry is more severe.

Keywords: Frontal; Diagnosis; Facial Asymmetries

Introduction

Facial asymmetries have an origin in several factors. When these asymmetries do not involve several craniofacial structures or the discrepancies do not have significant values they can be subclinical. Analyzing the etiological factors and the degree of disharmony allows one to select the steps for its possible treatment. Perfect bilateral symmetry is rarely found [1].

Many cases of facial asymmetries are not properly diagnosed. There are many therapeutic techniques used such as: tooth extractions, orthodontics or surgery that seeks to produce good results [2].

There are several techniques that allow addressing the diagnosis of facial asymmetries such as tomography, panoramic radiographs, cone bean, and frontal cephalometric study.

Facial symmetry refers to a complete match in size, location, shape, and arrangement of each facial component about the sagittal plane. Facial asymmetry refers to the bilateral difference between such components [3].

The objective of this study is to propose a new frontal cephalometric analysis that allows diagnosing the craniofacial elements involved in facial asymmetry.

Materials and Methods

The sample

Forty cases of both sexes with aged between nine and twelve years old were selected. Twenty cases presented facial asymmetries and twenty cases with apparent normality of the faces. For asymmetries and B for apparent normality were divided into two groups.

Inclusion and exclusion criteria

Only cases of perceptible facial asymmetries were taken into account (Figure 1). That is, cases with *in situ* asymmetries where only a single facial point seemed affected were excluded.

Radiographic technique used

The radiographic procedure was performed on the same equipment for all cases. The position of the head was glued to the chassis; the incidence of the x-ray was perpendicular to the plate. The exhibition was 20 mAs. To ensure that the same position was repeated in all the cases studied, a cephalostat was used.

The following lines were used for this study

- Planes between sphenoparietal suture and Apophysis crista Galli (black's arrowhead)
- Planes of orbital cavities (Red lines are marked with green arrows)
- Plane of the Yugal crest (Red lines marked with yellow arrows)
- Distance between the left and right infra-orbital points to the Yugal crest (marked with lightning shapes)
- Glenoid fossa (blue lines marked with yellow arrowhead)
- Anterior nasal spine and apophysis crista galli (basic plane marked with red arrows)
- Depth point of the mandibular antegonial notch and chin point (lines marked with brown arrows)
- Ramus of the mandible line (red lines marked with blue arrows)
- Central point of the anterior nasal spine and right chin point (marked with orange arrows)
- Central point of anterior nasal spine to right antegonial notch (marked with curve white arrow)
- Central point of anterior nasal spine to left antegonial notch (marked with curve white arrow)
- Central point of the anterior nasal spine to left chin point (marked with orange arrows)
- Left and right upper molar occlusal point to basic plane (orange lines)
- Vestibular point of the first left and right upper molars to the basic plane (black lines)
- The vertical plane of lower molars (marked with white arrows)
- The plane between the upper central incisors and the anterior nasal spine (blue line marked with a black arrow)
- The plane between the lower central incisors parallel to the basic plane (double yellow arrow)
- The plane of the height of the upper alveolar bone (blacks line marked with blue arrowheads).
- The plane of the height of the jaw condyle (green lines marked with green arrows)

Linear measurements

- Plane of the sphenoparietal suture to the apophysis Crista Galli, it allows evaluating the transverse longevity of each hemi frontal.

- Basic plane (central plane) represents the sagittal middle plane that divides the face into two symmetrical areas.
- Plane of the Yugal crest represents the height of the left and right Yugal crest.
- Planes of orbital cavities allow measuring the vertical position of the lower edge of the ocular orbits.
- Planes of the glenoid fossa allow us to know the vertical position of each cavity by the location of its deepest point.
- Depth point of the mandibular antegonial notch and chin point, it allows knowing the measurement of the mandibular body of the left and right side, and it does not take into account the region of the chin.
- The plane of the mandibular ramus allows comparing the vertical measurement of the left with the right.
- The plane of the nasal anterior spine to the points of union between the lateral edges of the right and left region of the chin with the body of the mandible allows measuring the vertical position of each region of the chin.
- Left and right upper molar occlusal point to basic plane these planes allow evaluating the vertical position of the upper molars.
- Vestibular point of the first left and right upper molars to the basic plane allows analyzing the transverse position of the upper molars of both sides.
- The vertical plane of the lower molars allows analyzing the height of the lower molars.
- The plane between the upper central incisors and the anterior nasal spine allows observing whether the point between the upper central incisors coincides with the basic plane.
- The plane between the lower central incisors parallel to the basic plane allows you to observe whether the point between the lower central incisors coincides with the basic plane.
- The plane of the height of the upper alveolar bone allows measuring the height of the alveolar bone of the upper jaw.
- The plane of the height of the condyle of the jaw allows measuring the differences with the heights of the left and right condyle.

Angle measurements

Angle formed between the sphenoparietal plane and Crista Galli process and the basic plane. It allows determining the vertical position of the left and right segments of the frontal bone.

Angle formed between the basic plane and the plane of the Yugal crest allows evaluating the transverse position of the Yugal crest with concerning the middle sagittal plane.

Comparative study

The base measurements used to consider growth or non-harmonic position of some craniofacial structures were three or more millimeters for linear measurements and two or more degrees for angle measurements. These measurements are obtained after comparing the variations of linear and angular craniofacial measurements for the side and right in the symmetrical group.

Cases of asymmetries with linear or angular variations equal to or greater than 3 millimeters or two degrees were classified as type 1 and cases of symmetry with this same type of linear or angular measurements were classified as type 2. All cases of symmetries within the values considered normal were also classified as type two.

Photo studio in the front plane

Before the cephalometric study, a photographic study was carried out where the height of the lower edge of the orbital cavities with respect to the middle plane, the vertical lines of the inner edges of the left and right eye, and the line of the labial commissural were evaluated (Figure 1).

Statistical procedure

To determine the significant differences between groups one and two, the Student's T- test was selected.

Results

In 80% of the cases studied with facial asymmetries that presented cross bites and lateral deviations of the jaw towards the crossed side, the length of the jaw ramus was longer on the non-crossed side. In the same way, in these cases, the orbital cavity on the non-crossed side had a lower position. Only in 20% of cases was the orbital cavity on the non-crossed side higher than the crossed side. In cases where the ramus of the jaw was longer, the glenoid cavities were higher.

In all those cases where the orbital plane was lower, the angle formed by the Sphenoparietal plane and the Crista Galli process and the basic plane (central plane) was smaller.

The distance between the plane of the ocular orbit and the Yugal crest was greater in 80% of cases on the non-crossed side.

In 60% of the cases studied, the angle formed between the basic plane and the plane of the Yugal crest was diminished on the crossed side.

Regarding the height of the Yugal crest was slightly higher in 60% of cases on the crossed side.

In 60% of cases with crossbite and deviation of the mandible to the crossed side, a slightly higher occlusal height of the molars was observed than on the non-crossed side.

In 100% of the cases of unilateral crossbite, the plane of the lower central incisors did not coincide with the central plane. In all these cases, the plane of the lower incisors deviated towards the crossed side.

It was observed in 80% of cases that the plane of the point of attachment between the chin and the body of the jaw to the anterior nasal spine was considerably longer on the crossed side.

In 60% of cases, the plane of the jaw body was slightly longer on the non-crossed side.

The variations in the length of both condyles were very small.

The distance between the antegonial notch and the anterior nasal spine was longer in 60% of cases on the crossed side.

Statistical results

The comparison of the averages between groups A (with facial asymmetry) and B (without facial asymmetry) concerning altered linear or angular values were significantly different, with the p-value = 0.0001.

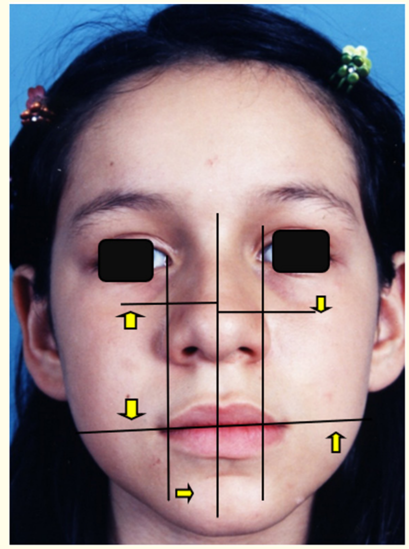

Figure 1

Figure 2 The photograph shows the difference in the height of the lower edges of the orbital cavities, the difference in the projection of the inner edges of both eyes with respect to the labial corners and the difference in the height of the left and right labial commissure.

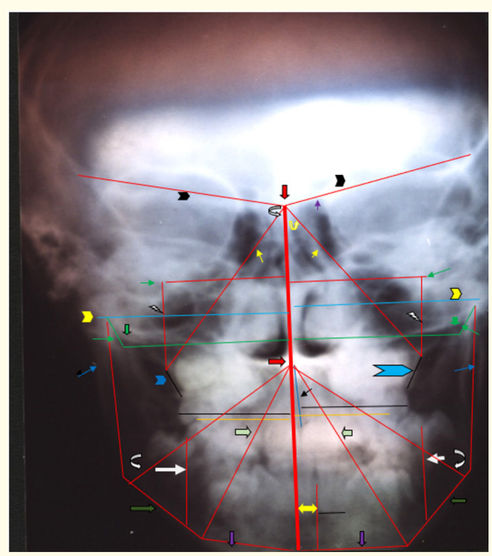

Figure 2

Discussion

The importance of this study and its findings is to provide craniofacial measurements that are not taken into account by other analyses, this group of linear and angular measurements, helps in the diagnosis of etiological factors of facial asymmetries.

Although there is the mixture of the difficulty of obtaining one hundred percent pure human races, which limits the possibility of establishing norms on facial growth, it is possible to analyze the parameters of symmetry for each facial biotype.

The findings in this study show that the greatest compromise of facial asymmetry occurs in those cases of unilateral non-dental crossbites, where there are deviations of the jaw, asymmetrical growth of the branches of the jaw, disharmony of the position of the orbital cavities, and unilateral compressions of the alveolar bone of the crossed side. In these cases, it is possible to observe a facial rotation towards the crossed side with a variable deviation of the dental midlines. Some authors consider that in addition to genetic alterations, facial asymmetries may be the product of functional, skeletal disorders including disorders of the temporomandibular joints, dental and all at once [4].

Craniofacial asymmetries have a diverse etiology. Groups of alterations that occur due to the persistence of muscle disorders during growth have been described. Among the most frequent alterations are the reduction of the vertical facial height of the affected side, the eye of the unaffected side is higher, and posterior displacement of the ear of the affected side. Inclination of the commissural towards the affected side and inclination of the occlusal plane have also been described [5].

Much of the findings of this study coincide with Frontal Morphological Rotation Syndrome, which is a sum of the effects of morphological imbalance on rotational growth [6].

Although the results of the study demonstrate the diverse craniofacial alterations that occur in cases of facial asymmetry due to unilateral crossbites, and deviation of the jaw, being a small sample it is advisable to carry out new studies to clarify this matter.

Conclusion

There are several factors that influence facial asymmetry. When several craniofacial elements are involved, the asymmetry is more severe. The frontal cephalogram is a tool that helps diagnose the linear and angular factors that are involved in facial asymmetries.

Ethical Aspects

The study was approved by the ethics committee of the college of dentists of the state of Mérida in Venezuela.

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