Evaluation of craniocervical morphology and cervical spine in relation with malocclusion and position of the condyle by CBCT

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Abstract
According to the relation between the morphology of the craniofacial complex and the vertebral spine with Angle's Class II, the objective of this study was be evaluate the relation of the craniofacial complex and the vertebral spine measures through Cone Beam Computed Tomography (CBCT). 93 images of CBCT were evaluated from FOP-UNICAMP Radiologic clinic, from individuals from both genders, in ages between 18 and 35 years old. For craniofacial evaluation, reference points, lines and angles were used to define the posture of the head according to Solow and Tallgren (1976). After the evaluation, the data was tabulated and was conducted the Intraclass Correlation Coefficient (ICC) with a confidence interval of 95% and, to the association of the data normally distributed, were tested through the Pearson Correlation Coefficient. It was concluded that there is a relation between the cervical skull and the facial development. More studies should be done to patients with Obstructive Sleep Apnea, Angle's Class I and III.

Key words: craniofacial morphology, cervical spine, Cone Beam Computed Tomography

Introduction
The cervical vertebrae has been the subject of studies in the area of Radiology and Orthodontics with the aim to evaluate morphologic alterations related to malocclusions dental-skeletal, craniofacial syndromes and with the Obstructive Sleep Apnea (OSA). The posture of the head and neck has been closely related to the craniofacial morphology. Therefore the study evaluated the craniofacial complex related to the cervical spine curvature.

Results and Discussion
It was conducted a descriptive analysis of the data, and then was conducted the ICC with a confidence interval of 95%, where the results were excellent (ICC $\geq 0.75$). For the correlation between the cervical curvature and cervical skull angles and measures, horizontal skull and skull base, it was conducted the Pearson Correlation (Table 1). It is noticed a negative correlation of the cervical curvature with angles and measures NSL/OPT, NL/OPT and n/s/ba. In other words, if the cervical curvature decreases, the cervical skull angles increases, generating mandibular retrognathism, which reinforces the relationship of cervical skull posture with facial development. The mandibular retrognathism/prognathism can cause muscular disorders, affecting the stomatognathic system, which leads to a postural readaptation of the cervical vertebrae. In the outcome of this study was observed that there was correlation with the cervical skull angles with the second cervical vertebrae (OPT). It can be observed a negative correlation between the n/s/ba angle and the cervical spine curvature. Reduced angles on the skull base are responsible for the obstruction of the airways.

Table 1: Intraclass correlation, average and standard deviation, and Pearson Correlation.

<table>
<thead>
<tr>
<th>Measures</th>
<th>ICC</th>
<th>95% CI</th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Correlation of measures</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSL/OPT</td>
<td>0.95</td>
<td>0.91-0.97</td>
<td>85.6</td>
<td>10.5</td>
<td>0.92</td>
<td>0.001</td>
</tr>
<tr>
<td>NL/OPT</td>
<td>0.97</td>
<td>0.95-0.98</td>
<td>68.9</td>
<td>8.4</td>
<td>0.87</td>
<td>0.007</td>
</tr>
<tr>
<td>OPT</td>
<td>0.95</td>
<td>0.92-0.98</td>
<td>61.2</td>
<td>8.4</td>
<td>0.89</td>
<td>0.001</td>
</tr>
<tr>
<td>N/S/Ba</td>
<td>0.94</td>
<td>0.92-0.96</td>
<td>55.3</td>
<td>7.2</td>
<td>0.13</td>
<td>0.201</td>
</tr>
</tbody>
</table>

Conclusions
Little has been studied about the relationship between the curvature of the cervical spine with measures and cervical skull angles and horizontals and skull base. It is known that reduced angles on the skull base is responsible for the obstruction of the airways, and higher cervical skull angle provides an anterior tilt of the cervical spine and posterior rotation of the mandible. More studies should be done to patients with Obstructive Sleep Apnea, Angle's Class I and III.

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