Objective: To assess in a cross-sectional study whether there are changes in sagittal balance in patients with adolescent idiopathic scoliosis Lenke types 1 and 5 compared with patients without pathology of the spine and compare the values of the parameters of normal subjects with the parameters found in the literature. Methods: We measured the values of the parameters of sagittal balance of 21 patients with scoliosis and 14 patients without scoliosis in panoramic radiographs or simply collected data previously measured from the medical records. We compared the mean values of normal subjects, the mean values found in the literature, and the means between normal subjects and patients with scoliosis. For this, we used the Student t test. Results: Using a confidence interval of 5% (p < 0.05) and the Student t test we obtained statistical significance in the comparison of two parameters of sagittal balance between normal subjects and patients with scoliosis. We observed similarities in the measurements of the average parameters of normal subjects with regard to the work already published. Conclusions: The adolescent idiopathic scoliosis causes changes in two parameters of sagittal balance with statistical significance but suggests changes in all other parameters. As for comparison with previously published work, the results were similar.

Keywords: Scoliosis; Spinal curvatures; Posture.

ABSTRACT

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Keywords: Scoliosis; Spinal curvatures; Posture.

OBJECTIVE

The objective of studying sagittal balance is to evaluate the global, regional, and local parameters of the axial skeleton and pelvis. To access global balance, which is the alignment of the spine as a whole, the center of C7 and the sacrum or pelvis are used as proximal and distal references, respectively. There is a correlation between the pelvic, lumbar, thoracic, and cervical parameters in maintaining the individual erect. Some pathologies, such as scoliosis, can cause changes to these parameters, resulting in changes in sagittal balance and in the individual’s energy expenditure.

ADOLESCENT IDIOPATHIC SCOLIOSIS

Adolescent idiopathic scoliosis (AIS) is a classic orthopedic problem of unresolved cause, characterized by deformity of the sagittal (thoracic lordosis), frontal (lateral curve), and transversal (vertebral rotation) planes of the spine. The Lenke classification, with six curve patterns and their sagittal and lumbar modifiers, is one of the most commonly used for AIS, and provides us with criteria for surgical planning.

The objective of this study is to assess whether scoliosis causes
changes in the following sagittal balance parameters: lumbar lordosis (L(L1-S1)), thoracic kyphosis (K(T2-T15)), plumb line (PL), pelvic incidence (PI), sacral slope (SS), pelvic tilt (PT), S1 projection (SP), spino-sacral angle (SSA), and spinal inclination (SI) in Lenke’s curve types 1 and 5. The values found in this study will be compared with the scientific study by Mac-Thiong et al.13 (Figure 1)

Figure 1. Sagittal balance parameters.

METHODS

Once the project had been evaluated and approved by the Ethics Committee, the informed consent and confidentiality forms were duly signed and filed.

A cross-section of patients in follow-up and treatment for AIS by the Spine Surgery Group of the Instituto de Ortopedia e Traumatologia de Joinville, Joinville, SC, Brazil, was selected and their medical records and radiographs taken during treatment were evaluated. Patients aged between 10 and 18 years, with a diagnosis of AIS classified into Lenke groups 1 and 5, who had not used a brace or whose last radiograph was taken prior to using the vest and whose vest was used for more than 1 year, were included. Other types of scoliosis and AIS classified as Lenke types 1 and 5. The values found in this study will be compared with the scientific study by Mac-Thiong et al.13 (Figure 1)

RESULTS

The results obtained demonstrate statistical significance in two of the parameters analyzed, PT and SS (p < 0.05). Table 1 shows examples of the graphs of the dispersion between the average of the sagittal balance parameters. PI, PT, and SS, between patients with scoliosis and normal individuals. Although the other variables do not show statistical significance in the Student’s t-test, a considerable increase in all the averages of the sagittal balance parameters can be observed by studying the graphs of the variables, suggesting that scoliosis causes changes in all these parameters. (Figure 2)

The data collected from the 14 normal individuals yielded results similar to the normal values cited in the study by Mac-Thiong et al.13 (Table 2)

Table 1. Correlation of the sagittal balance parameters between patients with and without scoliosis.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>0.06</td>
</tr>
<tr>
<td>PT</td>
<td>0.033</td>
</tr>
<tr>
<td>SS</td>
<td>0.033</td>
</tr>
<tr>
<td>SSA</td>
<td>0.12</td>
</tr>
<tr>
<td>SI</td>
<td>0.07</td>
</tr>
<tr>
<td>SP</td>
<td>0.08</td>
</tr>
<tr>
<td>L</td>
<td>0.17</td>
</tr>
<tr>
<td>K</td>
<td>0.60</td>
</tr>
<tr>
<td>PL</td>
<td>0.20</td>
</tr>
</tbody>
</table>

DISCUSSION

Even with the large difference in the number of normal individuals, 14 versus 709 in the study of Mac-Thiong et al.13 this study showed a statistical similarity between the averages of the samples was obtained. Using the Student’s t-test for comparison, as the null hypothesis (H0) that there would be no difference between the averages of the samples, and as the alternate hypothesis (H1) that there would be a difference between the average sample values, with a statistical significance of 5%. A calculated significance (p) less than 0.05 (p < 0.05) for a parameter would refute H0 and H1 would be accepted, indicating that scoliosis would cause a change in this sagittal balance parameter. Otherwise, H0 would be accepted and there would be no statistical difference between the samples. The age and sex of the patients was not considered in the statistical calculation. Regarding the study of Mac-Thiong et al.13 only the statistical similarity between the averages of the results was evaluated. The data for the patients of two surgeons was collected by two resident doctors in spine surgery.
pelvic incidence: um parâmetro fundamental


