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Research Article

Adolescent Idiopathic Scoliosis: Angle of Enguer

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Abstract

Objective: To create a method to measure the overall coronal plane of the spine, called the Sacral Clavicular Angle (SCA).

Methods: To measure the SCA, a line is made at the base of the sacrum, a second central line is made perpendicular to the first, following the proximal extension of the column. A third line is made passing through the intersection of the upper clavicle points with the two second ribs, forming two angles, the largest one is measured, so the degrees exceeding the 90° will be the SCA value. Five cases of Adolescent Idiopathic Scoliosis (AIS) were reported, which were measured before and after surgery.

Resulte: The new measurement method was used in the reported cases.

Conclusion: This "new tool" to measure the SCA allowed us to quantify the balance of the coronal plane of the spine mathematically, before and after the correction of scoliosis.

Keywords: *Scoliosis; Coronal Plane; Measure; Tool*

Introduction

Adolescent Idiopathic Scoliosis (AIS) is defined as a lateral and rotational curve of the spine, measuring at least 10 degrees, as determined by the Cobb method [1].

The evaluation of scoliosis has as a fundamental tool the study of the radiographs, being the previous posteral anterior incidence to measure these curves. The Cobb [2] and Ferguson [3] methods, which allow the quantification of the curve, are the most commonly used for the measurement of scoliosis [4,5] for the follow-up and observation of the patient's case and evaluation of the progression of deformity, recommended by the Scoliosis Research Society and widely used in clinical practice [4] as a "gold standard" method to plan treatment and evaluate outcomes [6].

The Cobb technique measures the amplitude of the curve by measuring and calculating the angle between the lines, respectively traced, that touch the upper terminal plate of the cranial vertebra and the lower terminal plate of the caudal vertebra, the scoliotic curve to be measured [6,7]. Several studies have shown that the Cobb method is error prone and unreliable [4,8-10].

Garcia., *et al*. created a new principle of instrumentation in the surgical treatment of Adolescent Idiopathic Scoliosis (AIS) and the like, using short, apical, single or multiple fixations that presented excellent correction [11].

The objective is to create a method to globally measure the coronal plane of the scoliotic spine, called SCA.

Materials and Methods

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The specialists of the Institute of the Vertebral Spine of Belo Horizonte, created a new tool to globally measure the coronal plane of the vertebral spine called SCA.

To measure SCA, panoramic radiographs of the vertebral spine in anterior posterus, orthostatic or seated position, a line parallel to the base of the sacrum [12] is made, a second central line is made and perpendicular to the first, in the cranial direction of the column. A third line is made passing through the intersection of the the points where the superior portion of the clavicle encounters with the two second ribs, thus forming two angles, which in non-scoliotic persons, the measurement is 90° by 90°. It was standardized to measure with the goniometer the largest angle on the side that exceeds 90°, so the degrees exceeding 90° is the value of the SCA, see figure 1.

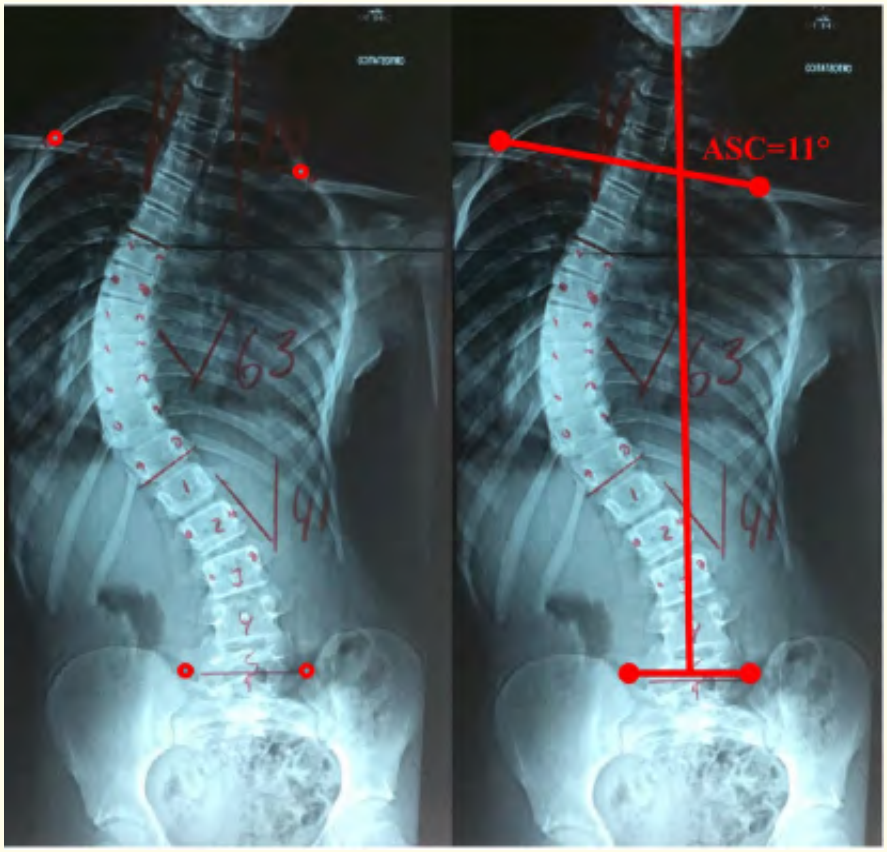

Figure 1: *The Rx on the left shows the strategic points to measure the SCA. The image on the right shows the two angles measured. The right angle measured 101°, minus 90° that would be normal value, so the difference is the SCA value, in this case equal to 11°.*

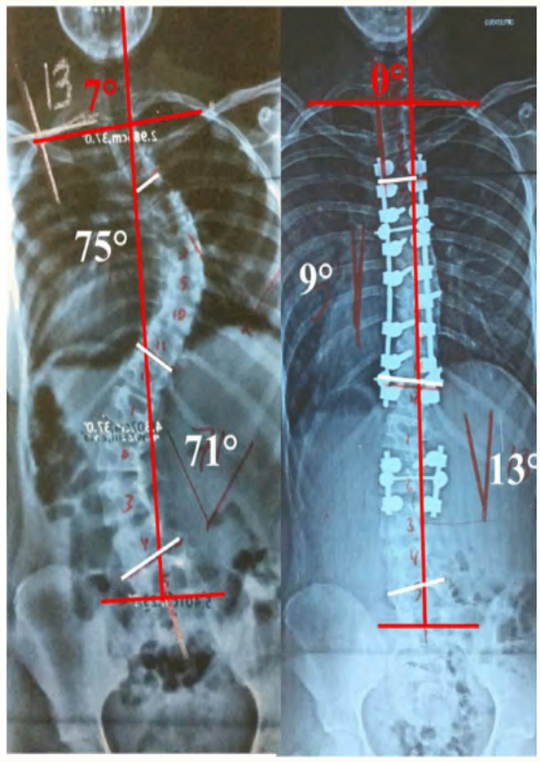

Figure 2: *A 14-year-old female patient with AIS. In the X ray to the left, in the preoperative the SCA measured 7°. In the right image, after the surgical correction with short, apical and multiple fixations, the SCA corrected to 0°.*

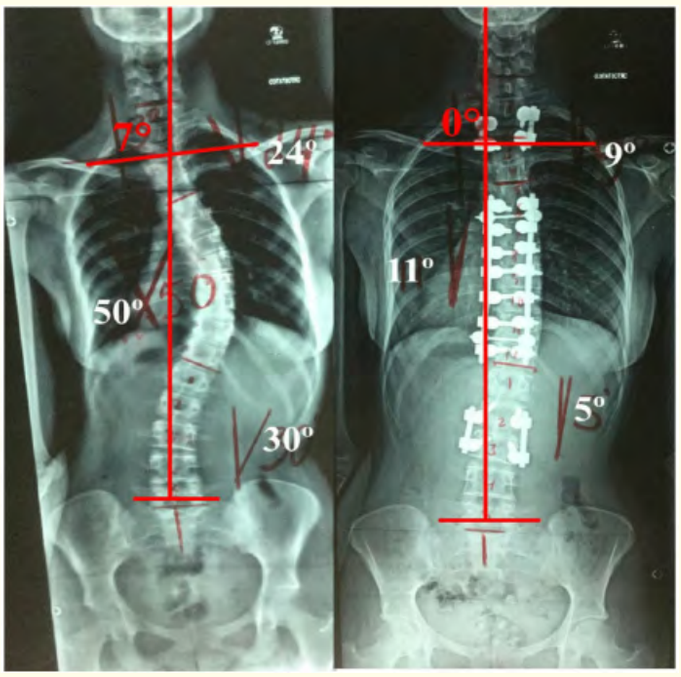

Figure 3: *Patient, 14 years old, female, with AIS. The left image with ASC of 7°. It was submitted to surgical correction with short, apical and multiple fixations. X ray is displayed to the right, ASC is corrected to 0°.*

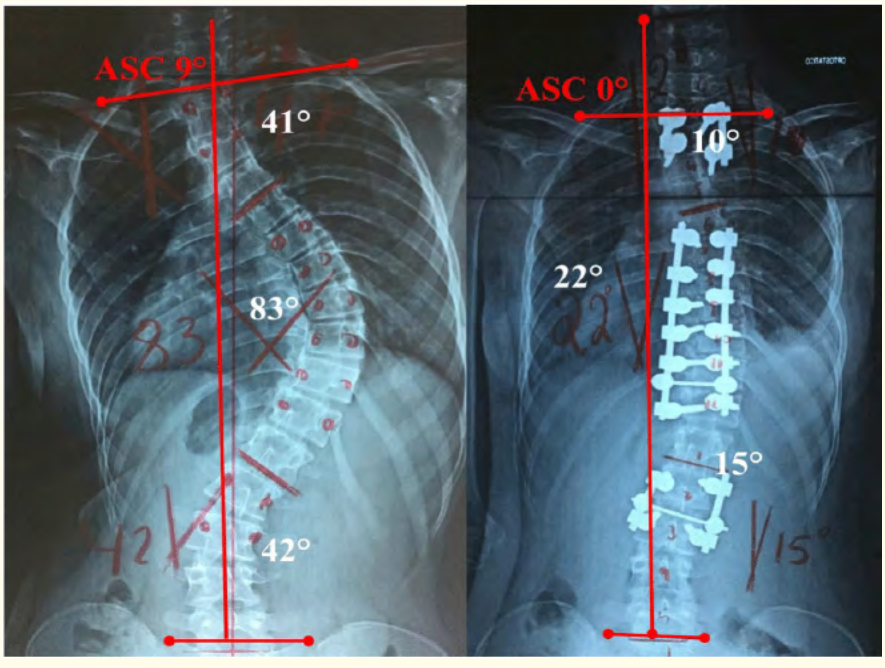

Figure 4: *A 14-year-old female patient with an AIS. On the preoperative radiograph the left was ASC of 9°. Image to the right of the postoperative period, submitted to the fixations, apical, short and multiple, measured ASC of 0°.*

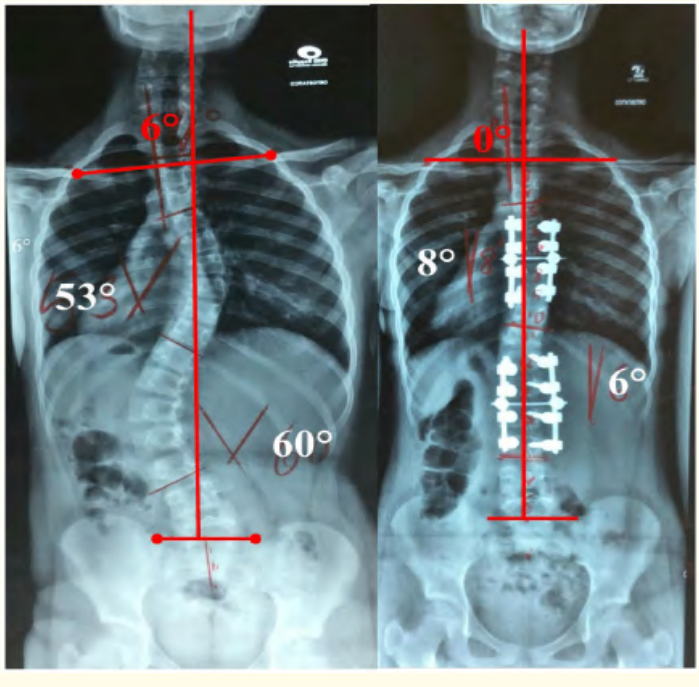

Figure 5: *11-year-old female patient with AIS. surgical treatment with fixations, apical, short and multiple. In the image to the left of the preoperative, the SCA was 6°. In the X ray of the postoperative right, the SCA corrected to 0°.*

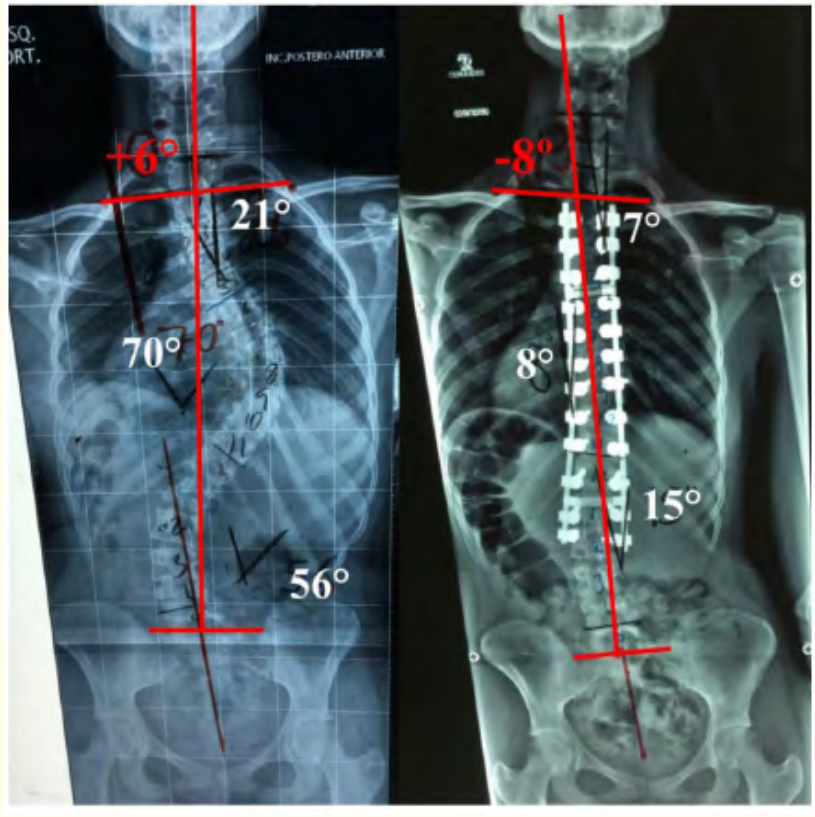

Figure 6: *A 15-year-old female patient presented AIS. She underwent surgical treatment with short, single, and selective fixation. In the left Rx of the preoperative, it showed an ASC of + 6°. In the right postoperative image, the ASC obtained was - 8°.*

Discussion

The purpose of the short and selective fixation in the AIS correction was reached with the 3rd Generation Instrumental. However, by the present authors, as well as by many other authors [13-17], the frequent presence of trunk imbalance has been observed. So the creation of this new tool to measure the ASC can be seen as very timely.

Considering the worldwide lack of a tool that can mathematically and globally measure the coronal plane of the spine, to ensure that corrective scoliosis surgeries with 3rd generation instruments are actually balancing or unbalancing the trunk, for this purpose the SCA was created.

To accurately measure the SCA, a quality image is needed to specify the strategic points of the measurement, see image to the left of figure 1. Much accuracy when plotting and measuring the angle is required. However, to assert that the trunk is unbalanced, mathematical quantification is indispensable.

The option to take the base of the sacrum for SCA measurement is utilized, as it is believed by the authors that this base is the point of support and balance of the spine. When this column support is tilted in relation to coronal plane, scoliosis will occur, or the trunk will unbalance. The option to start with the central sacral line from the coccyx is difficult, because the images at this level are often of poor quality, due to gases, fecalomas and X-rays not covering this follow-up. Considering also the possible deformities of the sacro coccyx in follow-up.

To perform the third line to measure SCA, referring to the points of the intersection of the upper clavicle with the two second ribs, seems to be quite pertinent. These points accompany the balance of the shoulders, which is always emphasized in cases of unbalanced trunk.

The authors believe it is praiseworthy to correct and stabilize scoliosis with evolutive tendencies by aligning their curvatures, but are concerned that this may cause a greater imbalance of the trunk.

SCA may initially be positive, and become negative postoperatively and vice versa, see figure 6.

The Cobb method is considered the "gold standard" to plan the treatment of deformity and to evaluate the results [6], "measuring the magnitude of each curve separately".

Therefore, there is an open gap for a "new tool" that can measure the coronal plane globally, before and after the treatment of scoliosis, whether clinical or surgical.

It is precisely in this demand that the SCA comes together, "measuring the spine globally", allowing us to provide more information on the balance of the trunk.

Finally, the authors evaluate whether the surgical corrections of scoliosis are actually producing gold standard results in relation to the coronal plane balance.

Conclusion

This "new tool" to measure SCA allowed the quantification of the overall balance of the coronal plane of the spine mathematically.

Conflict of Interest

No conflict of interest.

Bibliography

1. Bunnell W. "Selective Screening for Scoliosis". *Clinical Orthopaedics and Related Research* 434 (2005): 40-45.

2. Cobb J. "Outline for the study of scoliosis". *Instructional Course Lectures* 5 (1948): 261.

3. Ferguson AB. "The study and treatment of scoliosis". *Southern Medical Journal* 23.2 (1930): 116-120.

4. He JW., *et al*. "Accuracy and repeatability of a new method for measuring scoliosis curvature". *Spine (Phila Pa 1976)* 34.9 (2009): E323-E329.

5. Srinivasalu S., *et al*. "Cobb angle measurement of scoliosis using computer measurement of digitally acquired radiographs-intraobserver and interobserver variability". *Asian Spine Journal* 2.2 (2008): 90-93.

6. Mehta SS., *et al*. "Interobserver and intraobserver reliability of Cobb angle measurement: endplate versus pedicle as bony landmarks for measurement: a statistical analysis". *Journal of Pediatric Orthopaedics* 29.7 (2009): 749-754.

7. Zhang J., *et al*. "Automatic Cobb measurement of scoliosis based on fuzzy Hough Transform with vertebral shape prior". *Journal of Digital Imaging* 22.5 (2009): 463-472.

8. Allen S., *et al*. "Validity and reliability of active shape models for the estimation of cobb angle in patients with adolescent idiopathic scoliosis". *Journal of Digital Imaging* 21.2 (2008): 208-218.

9. Sperandio FF., *et al*. "Intra and interobserver reproducibility in the Cobb angle in scoliotic individuals". *Revista Brasileira de Crescimento e Desenvolvimento Humano* 21.1 (2011): 21-29.

10. GodinhoI RRS., *et al*. "Measurement of the scoliotic curve by the intraobserver and interobserver cobb technique and its clinical importance". *Coluna/Columna* 10.3 (2011): 216-220.

11. Garcia EB., *et al*. "Adolescent idiopathic sclerosis: short, apical, single or multiple attachments". *EC Orthopaedics* 9.3 (2018): 147-153.

12. Paulsen F and Waschke J. "General Anatomy Muscular System". Sobotta, Atlas of Human Anatomy. 3rd edition. Guanabara KOOGAN, Volume 1, Chapter 2 (2012): 39-126.

13. Koch GG., *et al*. "The general methodology for the analysis of experiments with repeated measurement of categorical data". *Biometrics* 33.1 (1977): 133-158.

14. Frez R., *et al*. "Longitudinal changes in trunkal balance after selective fusion of King II curves in adolescent idiopathic scoliosis". *Spine (Phila Pa 1976)* 25.11 (2000): 1352-1359.

15. Richards BS. "Lumbar curve response in type II idiopathic scoliosis after posterior instrumentation of the thoracic curve". *Spine (Phila Pa 1976)* 17.8 (1992): S282-S286.

16. Li M., *et al*. "Coronal and sagittal plane correction in patients with Lenke 1 adolescent idiopathic scoliosis: a comparison of consecutive versus interval pedicle screw placement". *Journal of Spinal Disorders and Techniques* 22.4 (2009): 251-256.

17. Richards BS., *et al*. "Assessment of trunk balance in thoracic scoliosis". *Spine (Phila Pa 1976)* 30.14 (2005): 1621-1626.

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