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CLINICAL PHOTOGRAPHIC AND RADIOLOGICAL CORRELATION IN PATIENTS WITH SCOLIOSIS

CORRELAÇÃO CLÍNICA FOTOGRÁFICA E RADIOLÓGICA EM PACIENTES COM ESCOLIOSE

CORRELACIÓN CLÍNICA FOTOGRÁFICA Y RADIOLÓGICA EM PACIENTES COM ESCOLIOSIS

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ABSTRACT

Objective: The study correlates angular radiographic measurements and measurements from photographs of the trunk of patients with adolescent idiopathic scoliosis. Methods: a cross-sectional study of 10 patients with adolescent idiopathic scoliosis and indication for surgical treatment in follow-up in the spine sector of HCRFMRP-USP. They were evaluated through measurements taken from clinical photographs of the patient's torso and angles on panoramic radiographs of the spine. Results: only the correlation between the axilla angle (AHA) and the proximal thoracic curve and main thoracic curve was observed in the sample studied. No correlation was observed between the other compared variables. The study was carried out in a sample with a small number of patients, whose objective was to carry out a pilot study to explore this topic. Conclusion: the analysis of deformities should consider the aesthetic aspect and radiographic evaluation; however, in this study, no statistical correlation was observed between these parameters. ***Level of Evidence IV; Case Series Study.***

Descriptors: *Scoliosis; Photograph; Radiography.*

RESUMO

Objetivo: O estudo correlaciona as mensurações radiográficas angulares e as mensurações oriundas das fotografias do tronco de pacientes com escoliose idiopática do adolescente. Métodos: estudo transversal de 10 pacientes com escoliose idiopática do adolescente e com indicação de tratamento cirúrgico, em seguimento no setor de coluna vertebral do HCRFMRP-USP. Foram avaliados por meio de mensurações das fotografias clínicas do tronco dos pacientes e mensurações dos ângulos nas radiografias panorâmicas da coluna. Resultados: na amostra estudada foi observada somente a correlação entre o ângulo axila (AHA) e a curva torácica proximal e curva torácica principal. Não foi observado correlação entre as demais variáveis comparadas. O estudo foi realizado em amostra com pequeno número de pacientes, cujo objetivo era a realização de estudo piloto para explorar esse tópico. Conclusão: a análise das deformidades deve considerar o aspecto estético e avaliação radiográfica, porem neste estudo não foi observado correlação estatística entre estes parâmetros. ***Nível de Evidência IV; Estudo de Série de Casos.***

Descritores: *Escoliose; Fotografia; Radiografia.*

RESUMEN

Objetivo: El estudio correlaciona medidas radiográficas angulares y medidas de fotografías del tronco de pacientes con escoliosis idiopática del adolescente. Métodos: estudio transversal de 10 pacientes con escoliosis idiopática del adolescente y con indicación de tratamiento quirúrgico, en seguimiento en el sector de columna del HCRFMRP-USP. Se evaluaron mediante medidas tomadas de fotografías clínicas del torso de los pacientes y medidas de ángulos en radiografías panorámicas de la columna vertebral. Resultados: en la muestra estudiada solo se observó la correlación entre el ángulo axilar (AHA) y la curva torácica proximal y torácica principal. No se observó correlación entre las otras variables comparadas. El estudio se realizó en una muestra con un número reducido de pacientes, cuyo objetivo fue realizar un estudio piloto para explorar este tema. Conclusión: el análisis de las deformidades debe considerar el aspecto estético y la evaluación radiográfica, sin embargo, en este estudio no se observó correlación estadística entre estos parámetros. ***Nivel de Evidencia IV; Estudio de Serie de Casos.***

Descriptores: *Escoliosis; Fotografía; Radiografía.*

INTRODUCTION

Spinal deformities are evaluated employing clinical parameters related to the asymmetry of the trunk surface references and radiographic parameters that evaluate angular measurements of the scoliotic curve.[1,2] Scoliosis classifications have been carried out based on angular measurements and the location of the scoliotic curves, and in our midst, the classification proposed by Lenke stands out.[3]

Assessment through photographs of the trunk has been used to evaluate posture and trunk deformities in idiopathic scoliosis.[4] Shoulder and waist asymmetries have been evaluated utilizing photographs, and different parameters have been developed for the evaluation of deformities based on the parameters obtained by using trunk photography.[5,6]

Studies have been conducted to validate the measurements made in the photographs and their correlation with radiographic measurements, aiming to identify the best correlation between clinical and radiographic trunk deformities.[7-10]

Study conducted by the Universidade de São Paulo, Medical School of Ribeirão Preto, Department of Orthopedics and Traumatology, Ribeirão Preto, SP, Brazil.
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The study aimed to correlate the angular radiographic measurements with the measurements derived from photographs of the trunk of patients with adolescent idiopathic scoliosis.

METHODS

This was a cross-sectional study of patients with adolescent idiopathic scoliosis and indication for surgical treatment, being followed up at the spine sector of the HCRFMRP-USP. The Research Ethics Committee of HCFMRP-USP approved the study under number: 68156423.5.0000.5440. Ten patients with adolescent idiopathic scoliosis and an indication for surgical treatment were randomly selected. The patients were evaluated by measuring the radiographic parameters of the scoliotic curves and the photographs of the patients.

The parameters selected for measurement on the radiographs were: proximal thoracic curve (PTC), main thoracic curve (MTC), thoracolumbar/lumbar curve (TL/L), T1 angulation (T1 tilt) (Figure 1). Panoramic spine radiographs were taken with the patient standing in AP and profile. The measurements were performed using the Surgimap imaging program with the "Coronal Wizard" tool to define the terminal vertebra, the projection of the curves, and the "Cobb Angle" option for measuring the analyzed values.

The photography of the patients was done on the same day as the radiographs, always by the same examiner, using the same camera and environment. The patients were positioned at 130 cm from the examiner, in the orthostatic position, with arms extended along the body in the anatomical position and with complete visualization of the shoulders, talus triangle, pelvic girdle, and lower limbs.

The angles selected for evaluation in the photographs were: shoulder height angle (SHA), armpit height angle (AHA), waist height angle (WHA), and area. (Figure 2)

Shoulder height angle. (SHA): is defined as the angle between the upper border of the shoulder acromion, bilaterally related to the horizontal. (Figure 2)

Axillary height angle. (AHA): corresponds to the angle between the upper edge of the axillary fold and a horizontal line. (Figure 2)

Waist height angle (WHA): is defined as the angle between the line joining the apex of the right and left side carving tringulum and the horizontal. (Figure 2)

Right and left waist angle (R. WHA and L. WHA): is defined as the angle between the line tangent to the lateral chest wall up to the concavity of the waist and another line from the apex of the waist tangent to the iliac crest on the respective right and left sides of the patient. (Figure 2)

The anatomical landmarks: superior border of the acromion, axillary fold, and apex of the waist connected form the image of a polygon on which it is possible to calculate the occupied area. (Figure 2)

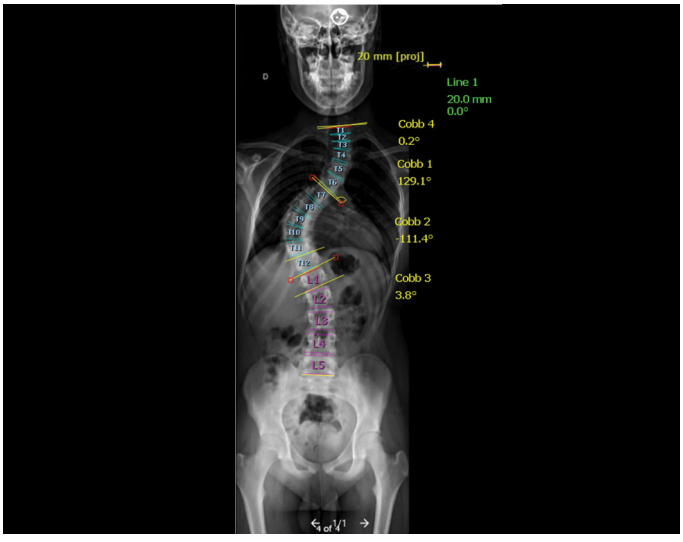

Figure 1. Anteroposterior panoramic radiograph illustrating: Cobb 1 corresponds to the proximal thoracic curve (PTC). Cobb 2 to the main chest curve (MTC). Cobb 3: thoracolumbar/lumbar (TL/L) curve. Cobb 4: T1 angulation.

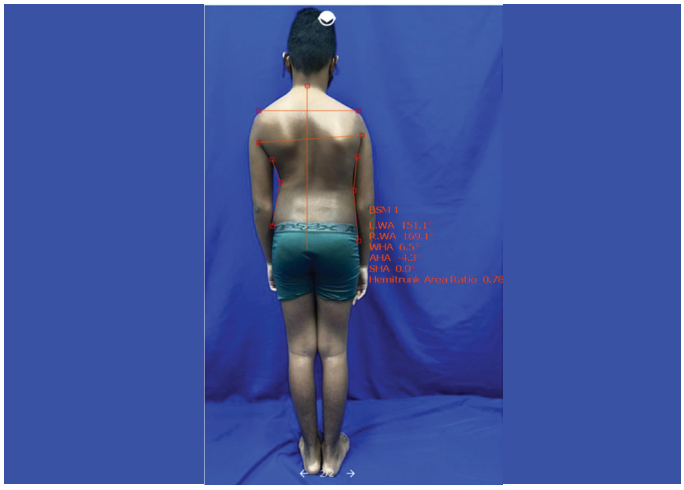

Figure 2. Photograph illustrating the parameters evaluated in the photographs of patients 1. L.WA corresponds to the angle of the waist to the left. R. WA to the angle of the waist on the right. WHA angle between the apex of the right and left waist. AHA to the angle between the axillary folds. SHA to the angle between shoulder heights.

The angles were measured based on the anatomical references according to the "Back Surface Metrics" tool of the Surgimap program.

Descriptive statistics were performed, the Kolmogorov-Smirnov test was used to evaluate the normality of the samples, and Sperman's test was used to evaluate the correlation between the study parameters. The significance level was set at 5% ($p<0.05$).

RESULTS

The demographics of the patients are shown in Table 1.

The values of the radiographic parameters measured in the ten patients selected for the study are illustrated in Table 2.

The values of the parameters measured in the photographs are shown in Table 3.

The correlation values between the parameters studied are shown in Table 4.

The correlation between shoulder angle (SHA) and radiographic parameters (proximal chest curve, main chest curve, thoracolumbar/lumbar curve, and T1 tilt) are depicted in Figure 3. No correlation was observed between the parameters evaluated.

The correlation between axillary angle (AHA) and radiographic parameters is illustrated in Figure 4. Only a correlation was observed between the axillary angle (AHA) and the proximal thoracic curve (PTC), and the main thoracic curve (MTC).

The waist angle ranged from 1.1 to 26.7° and showed a statistical correlation with the main chest curve. (Figure 5)

The area ranged from 0.59 to 1.1, with an average of 0.79. It showed a statistical correlation between the main thoracic curve. (Figure 6)

DISCUSSION

The results of the study showed that the radiographic parameters of patients with idiopathic scoliosis did not correlate with the parameters measured in the photographs.

In statistics, the term correlation denotes the situation in which two variables vary. The correlation analysis employs the correlation coefficient ranging from -1 to + 1. These two extreme values express perfect inverse correlation (-1) and perfect positive correlation (+1), while zero means no correlation. The analysis of the correlation between the two variables is also presented, considering the significance

Table 1. Values of the individual parameters evaluated.

Patient	Age	Shoulder angle -sha	Axilla angle - aha	Waist angle -wha	Right waist angle	Left waist angle	Area	Ptc	Mtc	TI/I	T1 tilt	Lenke
1	12	0	-4.3	6.5	169.1	151.1	0.78	51	69	3.8	0	2AN
2	12	-2.9	-5.9	8.3	133.5	150.4	0.72	19	49	52	3.4	6CN
3	14	-5	-5.5	7.8	151.4	140.8	0.8	47	75	63	3.2	4BN
4	16	0.3	-7.6	20.9	142.8	129.2	0.75	45	88	33	0	4CN
5	22	-0.4	-0.4	1.1	140.1	163.2	0.75	7.9	67	96	5.7	6CN
6	15	0.6	3.5	13.5	152	150	0.73	23	57	39	1.7	3BN
7	14	0.8	1.7	11.5	180	136	0.82	24	72	49	0.5	3AN
8	17	-2.4	-5.1	26.7	164.2	130.8	0.59	23	104	42	4.4	3AN
9	26	0.5	2.4	12.2	150	146	1.15	14	46	23	5.7	1CN
10	17	1.3	5.2	55.3	142	154	0.9	1.4	38	31	10.7	3AN

Table 2. Analysis of the radiographic measurements.

	PTC	MTC	TL/L	TI TILT
Average°	25.5	66.5	43.18	3.5
Variation°	48.6	66.0	92.2	10.7
Coefficient % variation	66.2	30.1	57.3	94.0

Table 3. Analysis of the photographic measurements.

	SHA	AHA	WHA	AREA
Average°	-0.72	-1.6	11.3	0.79
Variation°	6.3	12.8	25.6	0.56
Coefficient % variation	282.3	287.0	66.7	18.3

Table 4. Correlation coefficient values between the parameters selected for the study.

	PTC	MTC	TL/L	T1 TILT
SHA	0.3535	0.3389	0.3747	0.0806
AHA	0.6893 *	0.6410 *	0.0448	0.0886
WHA	0.2410	0.6740 *	0.3038	0.3077
AREA	0.2621	0.6385*	0.2958	0.3446

The asterisk indicates the statistical relationship between the values evaluated in the radiographs: proximal thoracic curve (PTC), main thoracic curve (MTC), thoracolumbar/lumbar curve (TL/L), T1 angulation (T1 TILT) and the values evaluated in the images: SHA: shoulder-height angle. AHA: angle between the axillary folds, WHA: angle between the apex of the right and left waist, Trunk Area.

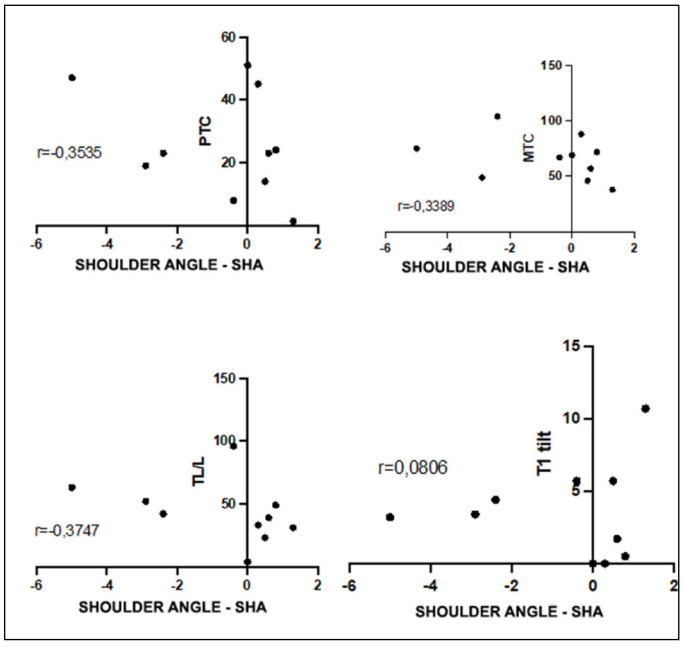

Figure 3. Graphs illustrating the correlation of the shoulder angle (SHA) and the radiographic parameters. No correlation was observed between the parameters studied.

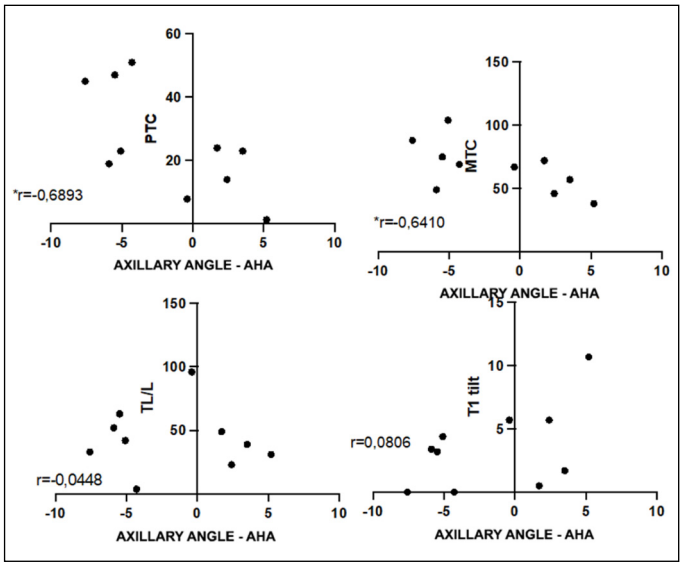

Figure 4. Graphs illustrating the correlation of axillary angle (AHA) and radiographic parameters.

level (P). The P value tests the null hypothesis, which considers that the correlation between the two variables is zero. We observed in the sample studied that there is only a correlation between the axillary angle (AHA) and the proximal thoracic and main thoracic curves. No correlation was observed among the other variables compared.

In spinal deformities, trunk asymmetry greatly impacts patients' aesthetics, representing the main complaint of young patients, unlike adults with deformities, whose complaint is related to pain and functional disability.[11] Although the photographic record of patients allows only a two-dimensional analysis of trunk asymmetry, this evaluation method has been reported to be reliable in demonstrating spinal asymmetries and deformities.[6,12,13]

According to Lenke's classification, the different types of scoliosis showed different types of trunk deformity.[14] The parameters analyzed did not show similar behavior. The asymmetry of the upper trunk was not specific for the Lenke classification curve types, and the parameters related to the lower trunk best allowed the curves' discrimination.[14]

The discrepancy between the radiographic and the cosmetic evaluation of adolescent idiopathic scoliosis has been reported in the literature,[15,16] contrasting with reports showing a correlation between radiographic and cosmetic evaluation.[14,17]

The study aimed to observe the correlation between radiographic and photographic parameters. The correlation between the parameters from the photographs and the radiographic ones showed a statistical difference in the correlation coefficient in only one of the parameters analyzed. However, the study was conducted on a sample with a small number of patients to conduct a pilot study to explore this topic.

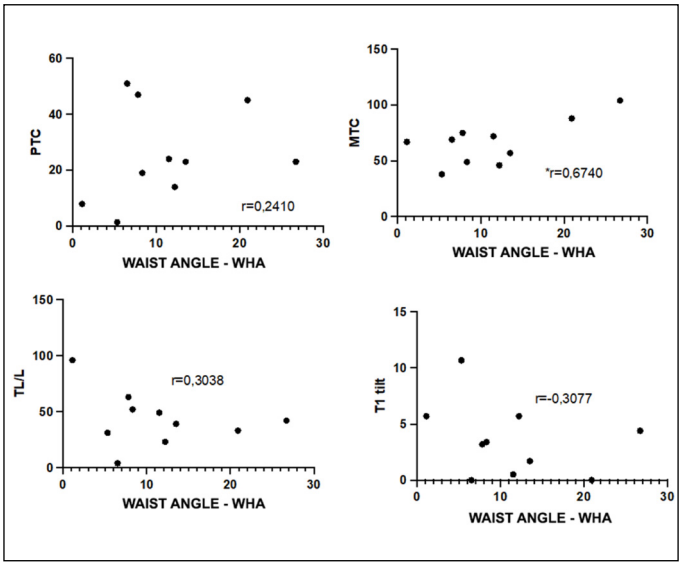

Figure 5. Graphs illustrating the correlation of waist angle (WHA) and radiographic parameters.

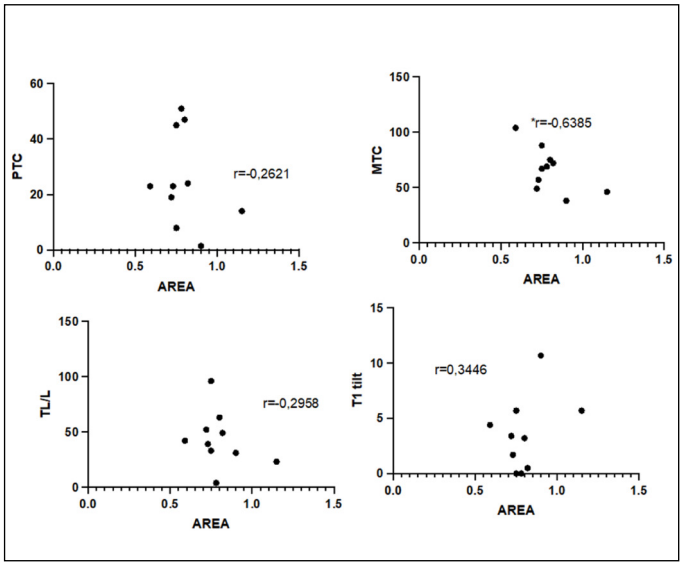

Figure 6. Graphs illustrating the correlation of area and radiographic parameters.

The observed results indicate the discrepancy between cosmetic and radiographic evaluation, already mentioned in other studies. Therefore, the analysis of deformities should consider the aesthetic aspect, which does not correlate with the radiographic evaluation that is highly valued in the surgical approach to deformities.

CONCLUSION

The analysis of spinal deformities should be evaluated using clinical parameters related to the asymmetry of the trunk surface references and radiographic parameters that evaluate angular measurements of the scoliotic curve. However, the results observed in this study indicate no statistical correlation between the parameters measured in the clinical evaluation and the angular parameters evaluated in the radiographs of patients with scoliosis.

All authors declare no potential conflict of interest related to this article.

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