SCOLIOSIS IN PEDIATRIC PATIENTS: CLINICAL AND RADIOLOGICAL EVOLUTION AFTER SURGICAL TREATMENT

ESCOLIOSE EM PACIENTES PEDIÁTRICOS: EVOLUÇÃO CLÍNICA E RADIOLÓGICA APÓS TRATAMENTO CIRÚRGICO

ESCOLIOSIS EN PACIENTES PEDIÁTRICOS: EVOLUCIÓN CLÍNICA Y RADIOLÓGICA DESPUÉS DEL TRATAMIENTO QUIRÚRGICO

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ABSTRACT
Introduction: The term "scoliosis" means curvature. It is not actually a disease, but rather a three-dimensional deformity characterized by vertebral rotation, resulting in a lateral curvature of the spine.

Objective: To evaluate the clinical course and radiographic outcomes of pediatric patients who underwent surgery for scoliosis at a fourth level pediatric center.

Methodology: A quantitative, descriptive, retrospective study was conducted, using medical records as the population. A sample of 82 pediatric patients diagnosed with scoliosis who underwent surgical treatment was selected, taking into account pre- and post-surgical Cobb angle measurements to determine anatomical and functional improvement.

Results: The Cobb angle decreased from 72.7° preoperatively to 18.40° post-surgically. Normal pulmonary function was confirmed. In males, 16% of children presented with mild restriction, while in females, moderate restriction was observed in 15.7%.

Conclusions: Surgical treatment in pediatric patients with scoliosis, when clearly indicated, substantially improved clinical, structural, and functional outcomes.

Keywords: Pediatric Patients. Scoliosis. Cobb Angle.

RESUMO
Introdução: O termo "escoliose" significa curvatura. Não se trata propriamente de uma doença, mas sim de uma deformidade tridimensional caracterizada pela rotação vertebral, resultando em uma curvatura lateral da coluna vertebral.

Objetivo: Avaliar a evolução clínica e os resultados radiográficos de pacientes pediátricos

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submetidos à cirurgia para correção de escoliose em um centro pediátrico de nível terciário.

Metodologia: Foi realizado um estudo quantitativo, descritivo e retrospectivo, utilizando prontuários médicos como população. Uma amostra de 82 pacientes pediátricos com diagnóstico de escoliose submetidos a tratamento cirúrgico foi selecionada, levando-se em consideração as medidas do ângulo de Cobb pré e pós-operatórias para determinar a melhora anatômica e funcional.

Resultados: O ângulo de Cobb diminuiu de 72,7° no pré-operatório para 18,40° no pós-operatório. A função pulmonar normal foi confirmada. Nos meninos, 16% das crianças apresentaram restrição leve, enquanto nas meninas, a restrição moderada foi observada em 15,7%.

Conclusões: O tratamento cirúrgico em pacientes pediátricos com escoliose, quando claramente indicado, melhorou substancialmente os resultados clínicos, estruturais e funcionais

Palavras-chave: Pacientes Pediátricos. Escoliose. Ângulo de Cobb.

RESUMEN
Introducción: El término "escoliosis" significa curvatura. No se trata propiamente de una enfermedad, sino de una deformidad tridimensional caracterizada por la rotación vertebral, que resulta en una curvatura lateral de la columna vertebral.

Objetivo: Evaluar la evolución clínica y los resultados radiográficos de pacientes pediátricos sometidos a cirugía para la corrección de la escoliosis en un centro pediátrico de nivel terciario.

Metodología: Se realizó un estudio cuantitativo, descriptivo y retrospectivo, utilizando historias clínicas como población. Se seleccionó una muestra de 82 pacientes pediátricos con diagnóstico de escoliosis sometidos a tratamiento quirúrgico, considerando las mediciones del ángulo de Cobb pre y postoperatorias para determinar la mejoría anatómica y funcional.

Resultados: El ángulo de Cobb disminuyó de 72,7° en el preoperatorio a 18,40° en el postoperatorio. La función pulmonar normal fue confirmada. En los niños, el 16% presentó restricción leve, mientras que en las niñas se observó restricción moderada en el 15,7%.

Conclusiones: El tratamiento quirúrgico en pacientes pediátricos con escoliosis, cuando está claramente indicado, mejoró sustancialmente los resultados clínicos, estructurales y funcionales.

Palabras clave: Pacientes Pediátricos. Escoliosis. Ángulo de Cobb.

1 INTRODUCTION

Scoliosis is a spinal deformity that can cause mobility impairment, cardiopulmonary disease, and even death (1). It is more common in female patients between the ages of 10 and 14, with a prevalence of 0.6% to 4% in the general population (2). An important aspect of this deformity is the distinction between dystrophic and non-dystrophic scoliosis. Theoretical analysis indicates that some patients with dystrophic scoliosis may require surgery, which is a determining factor in their prognosis (3). In Latin America, particularly in Ecuador, the Adams test is the primary clinical diagnostic tool for evaluating patients suspected of having scoliosis. The most widely accepted definition of curve progression is an increase of more than 5° in the Cobb angle measurement. Generally, curves between 10° and 20° are considered mild, between 20° and 40° moderate, and greater than 50° or greater than 40° in skeletally immature patients. Treatment varies depending on factors such as the individual's age, cardiopulmonary abnormalities, progression of the deformity, and pain, among others. Surgical treatment has shown positive results and has seen significant advancements in recent years (4).

It is necessary to demonstrate the results of surgical treatment regarding the recovery of lung capacity and whether there is improvement in the cardiac responses of those who underwent surgery. Since the Cobb angle is currently the objective method for assessing scoliosis in pediatric patients, it is important to evaluate it pre- and post-surgery, as well as to correlate its change after treatment with clinical outcomes in surgically treated pediatric patients.

This is a retrospective, descriptive, non-analytical case series study that reports the anatomical and functional outcomes of pediatric patients with scoliosis treated surgically by measuring the Cobb angle before and after surgery, as well as their clinical evolution.

2 METHODOLOGY

A case series was conducted at a fourth level pediatric center in Guayaquil, Ecuador, between January 2019 and January 2021. Patients under 18 years of age with clinically diagnosed scoliosis, assessed by radiographic studies (calculating the Cobbs angle), who required surgical treatment were included. Pre- and post-surgical Cobbs angle values were analyzed to demonstrate the outcome of the anatomical surgical treatment, as well as pulmonary function to demonstrate the functional impact. Inclusion criteria: patients under 18 years of age with scoliosis treated surgically, and whose medical records contained all

relevant variables. Exclusion criteria: patients whose medical records did not contain all relevant variables.

Demographic, clinical, and postoperative outcome variables were collected and analyzed.

Statistical analysis: Analyses were performed using the IBM SPSS version 24 statistical package. Normality tests were used to determine the distribution type of quantitative data and describe them using mean and standard deviation, or median and quartiles for normal or skewed distributions. For analysis between groups, the chi-square test or Fisher's exact test was used for comparing qualitative variables, or the t-Student test for quantitative and qualitative variables when the distribution was normal, and the Mann-Whitney test for nonparametric distributions. A p-value <0.05 was considered statistically significant.

This work was carried out following the principles of the Declaration of Helsinki and has the approval of the center in which it was developed.

3 RESULTS AND DISCUSSION

A total of 82 patients were included in the case series during the study period.

Females predominated, comprising 69.5% of the individuals. The most common age group was between 12 and 14 years, representing 49% of the population. Groups were established according to the type of scoliosis, with idiopathic scoliosis being the most prevalent, occurring in 68 of the 82 patients. There was no significant difference between groups (p=0.34) (Table 1).

Table 1

Demographic data

		Congenital Scoliosis		Idiopathic Scoliosis		Neuromuscular Scoliosis		Total		P-Value
		N°	%	N°	%	N°	%	N°	%	
Gender	**Male**	0	0	19	76	6	24	25	30.5	0.341
	Female	1	1.8	49	86	7	12.2	57	69.5	

Sources: The authors.

Similar to what was reported in this series, idiopathic scoliosis is considered by several different series to be the most frequent, as suggested by LeFever et al. in their work (5), However, different etiologies must be considered in the etiological diagnosis of this entity

in order to identify an underlying cause that may require treatment for the correction of scoliosis, especially in childhood due to the aesthetic and functional repercussions that scoliosis entails. (6).

For the assessment of pulmonary function, the degree of respiratory restriction was used based on lung capacities and was categorized as normal function, mild restriction, moderate restriction, severe restriction, mixed restriction; the majority of individuals presented preserved function, however, in the moderate restriction there was a male predominance with 16% vs 1.8% compared to the female gender, this relationship is reversed in the moderate restriction category, present in 15.7% in the female gender vs 8% in the male; the greatest impact on pulmonary function evidenced by moderate restriction was identified in the group of 10-year-old individuals, given that 50% of them presented this degree of respiratory dysfunction; however, these differences did not reach statistical significance p=0.11 (Table 2).

Table 2

Assessment of pulmonary function

		Normal		Mild Restriction		Moderate Restriction		Severe Restriction		Mixed Restriction		Total		p.
		N°	%	N°	%	N°	%	N°	%	N°	%	N°	%	
Gend	Male	19	76	4	16	2	8	0	0	0	0	25	30.5	0.113
	Fem.	45	78.9	1	1.8	9	15.7	1	1.8	1	1.8	57	69.5	

Sources: The authors.

Li et al. have described and analyzed the risk factors that lead to a deterioration of pulmonary function in patients with scoliosis (7); In addition, there may be co-occurrence of bronchial tract involvement that perpetuates the deterioration of overall lung function. (8).

For anatomical assessment, angle values were used before and after surgical treatment. Overall, the mean Cobb angle before treatment was 72.7 (SD ±21) with a minimum value of 40 and a maximum of 126; a significant decrease in the Cobb angle was shown, with a mean of 18.4 (SD ±15) with a minimum value of 3 and a maximum of 65 (Table 2).

There are various imaging methods that allow the diagnosis and assessment of the degree of spinal involvement due to scoliosis, all with their advantages and disadvantages, which is why it is important to assess not only by imaging but also by clinical and functional involvement (9,10).

Lechner et al. have documented the assessment of the Cobb angle as a determining

factor for diagnosis and evaluation of severity, as well as its usefulness for surgical treatment decisions. (11).

Table 3

*Cobb angle assessment pre- and post-surgical treatment*

	PRE-operative Cobb Angle	POST-operative Cobb Angle
Mean	72.70	18.40
Standard Deviation	21.007	15.894
Minimum	40	3
Maximum	126	65

Sources: The authors.

This reduction in the mean and dispersion of the Cobb angle measurements (Figure 1) translates not only into an aesthetic improvement but also into improved function with stabilization of the coronary balance and potential benefits in pulmonary and/or cardiac function; given that a correction greater than 50% has been considered a clinical success.

Figure 1

Box plot comparing pre- and post-surgical Cobb angles
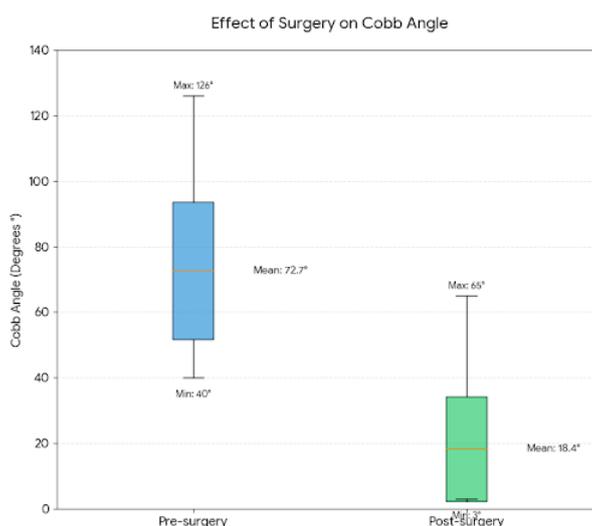
Sources: The authors.

The primary treatment for scoliosis is multimodal, with surgical treatment being the last option after a conservative therapeutic strategy has failed. (12). The degree of structural and functional improvement of scoliosis after surgical treatment has been analyzed and

documented by Labrada et al., in their work showing their surgical results (13). However, surgical treatment must be accompanied by rehabilitation through a program of targeted exercises to ensure an improvement in lung function (14,15).

4 CONCLUSION

Surgical treatment of scoliosis has specific indications in which it has demonstrated structural and functional benefit when appropriate.

One strength of this study is its assessment of the structural and functional impact on the population; however, its weaknesses lie in its single-center and retrospective nature. Larger, multicenter studies are needed to corroborate the findings of this case series.

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