

Pain assessment in patients with adolescent idiopathic scoliosis at different stages of disease evolution

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OBJECTIVE: The correlation between pain complaints and the severity of the spinal curvature in adolescent idiopathic scoliosis remains controversial. The aim of this study was to evaluate the presence and intensity of back pain in adolescent idiopathic scoliosis patients at different stages of the disease.

METHODS: Sixty-four individuals participated in this study with scoliotic curves (Cobb angles) between 20 and 90 degrees. Patients were divided into four groups according to the scoliotic curves: Group 1 (with 20 to 45 degrees) Group 2 (curves greater than 45 degrees before surgery), Group 3 (curves greater than 45 degrees one year after posterior spinal arthrodesis with pedicle screws) and Group 4 (healthy adolescents between 11 and 18 years of age; control group).

RESULTS: The scores obtained from the pain domain of the SRS-30 questionnaire (specifically developed for the assessment of adolescent scoliosis) were significantly worse for patients with scoliosis, regardless of the evolutionary phase of the disease. Patients who underwent surgical treatment presented statistically better results one year after surgery than did the group of patients with moderate Cobb angles.

CONCLUSION: Patients with adolescent idiopathic scoliosis had a higher intensity of back pain than healthy individuals. Pain was reduced one year after spinal arthrodesis.

KEYWORDS: scoliosis; adolescent; pain.

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■ INTRODUCTION

The clinical and functional repercussions of adolescent idiopathic scoliosis (AIS) have been increasingly recognized in recent decades. Several of the deleterious effects of the disease have been described, such as esthetic, psychological and pulmonary changes¹⁻⁴. However, the correlation between pain complaints and the severity of the curve in AIS remains controversial.

The natural evolution of AIS often includes asymmetric mechanical loading of the spine, which causes premature degeneration of the intervertebral discs and facet joints^{5,6}. These phenomena are accompanied by the shortening of the lumbar musculature and are related to the presence of chronic pain, which usually manifests itself decades after the diagnosis of the disease⁷. However, the prevalence of back pain during adolescence in patients with idiopathic scoliosis is not well established in the literature. This symptom is often related to differential diagnoses, such as

spinal tumors, syringomyelia, inflammatory processes or visceral disorders⁵.

Although preliminary studies have demonstrated that adolescents with idiopathic scoliosis have more pain complaints than control populations^{8,9}, there has been no previous research, to our knowledge, on the influence of disease severity on pain intensity. Thus, the aim of this study was to evaluate the presence and intensity of back pain in AIS patients at different stages of the disease.

■ METHODS

This was a cross-sectional study approved by the Institutional Committee for Research in Ethics (Number 33/11) of Faculdade de Medicina do ABC. All participants signed an informed consent form or had it signed by their legal guardians. The inclusion criteria were as follows: a diagnosis of AIS; scoliotic curves between 20 and 90 degrees (Cobb method)¹⁰; age between 11 and 25 years; posterior surgical approach (only for the patients who underwent surgery). We excluded patients with atypical curves and with perioperative complications, including infections requiring surgical

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drainage, failure or loosening of implants, previous spine surgeries and reoperations. In total, 64 individuals participated in this study. The participants were divided into four groups: Group 1 included patients with moderate Cobb angle (20 to 45 degrees) (n = 22); Group 2 included patients with curves greater than 45 degrees, therefore with an indication for surgery, but who were evaluated preoperatively (n = 21); Group 3 included patients with curves greater than 45 degrees, who had already been treated using posterior spinal arthrodesis with pedicle screws, and who were evaluated postoperatively for a minimum of 1 year (n = 21); Group 4 was composed of healthy adolescents between 11 and 18 years of age (control group; n = 21). Groups 2 and 3 comprised the same patients, with surgery indication, who were interviewed at different times: Group 2 preoperatively and Group 3 one year postoperatively.

The translated version of the Faces Pain Scale by Hicks et al.¹¹, validated for use in Portuguese by Silva and Thuler, 2008¹², was used to assess back pain complaints. The assessment tool consists of six figures with facial expressions ranging from “the happiest possible” to “the saddest possible”, which are correlated with a numeric pain scale that ranges from zero to five points. In the absence of pain, the score is zero; the greatest possible pain receives five points (Fig. 1).

Schematic drawings of the human body map with both anterior and posterior views were used to locate pain. The patients were asked to mark the areas that best represented the location of their pain, if present. For classification purposes, the authors divided the map of the human body into four regions: cervical (above the clavicle); thoracic (located between the clavicle and the 12th rib); thoracolumbar transition (near the 12th rib); lumbar (between the 12th rib and the gluteal fold).

The questionnaire SRS-30, developed by the Scoliosis Research Society specifically for the functional assessment of AIS, was also used. This questionnaire consists of 30 questions divided into 5 domains. The present study analyzed only Questions 1, 2, 8, 11 and 17, which refer to the “Pain” domain and are scored from 5 (worst possible outcome) to 25 points (best result possible). A culturally adapted Brazilian Portuguese version of the SRS-30 was used¹³.

The data were analyzed with the statistics program SPSS, Version 17.0 (SPSS, Inc., Chicago, IL, USA). The descriptive analysis results are presented as the mean and standard deviation, minimums and maximums and percentages. The variables were tested for normality using the Kolmogorov-Smirnov test. Analyses between groups were performed using one-way analysis of variance (ANOVA) with a

post-hoc test using Bonferroni’s coefficient. In all the analyses, a significance level of 5% was adopted as significant.

■ RESULTS

The patients’ ages ranged from 11 to 26 years (Group 1 = 14.3 ± 1.9; Groups 2 and 3 = 16.8 ± 3.3; and Group 4 = 13.2 ± 1.9). There was a predominance of females in all the study groups (Group 1 = 86%; Groups 2 and 3 = 81%; and Group 4 = 86%).

The intensity of pain complaints based on the Hicks et al. scale is shown in Fig. 2. Groups 1, 3 and 4 were compared for this variable. Fig. 2 shows statistically significant differences in the number of patients who had no pain (score zero) between Group 4 (control) and Groups 1 and 3. Among those with pain complaints, the patients in Groups 2 and 3 had significantly worse outcomes than those in group 4, as determined by the post-hoc test. No significant differences were found for group 1.

The analyses of the “Pain” domain from the SRS-30 questionnaire are shown in Tables 1 to 3. Table 1 shows that scoliosis patients of Group 1, with a moderate Cobb angle (curves between 20 and 45 degrees), presented statistically worse results than patients in the Group 4, control (p = 0.005). Table 2 shows that patients of Group 3, who underwent surgical treatment presented statistically better results one year after surgery than did the group of patients of Group 1, with moderate Cobb angles (p = 0.024). Table 3 compares the values for the “Pain” domain of the SRS-30 questionnaire among patients with indications for surgery during the preoperative period (Group 2) and one year after surgery (Group 3). These data indicate a statistically significant improvement in pain complaints after surgery (p = 0.002).

The frequency distribution of the anatomic location of pain is shown in Table 4. Patients with scoliosis most frequently indicated the thoracic region as the site of pain. The patients in the control group had predominantly lumbar-based complaints.

■ DISCUSSION

Pain measurement is complex and is often influenced by psychological and social factors.^{9,14} Because it is a subjective symptom, it is difficult to compare its intensity and the attendant disability between different individuals. Visual scales of pain and quality of life questionnaires can be used for this purpose¹⁵.

Several questionnaires are available to assess quality of life in patients with spinal diseases. Most of them are targeted at

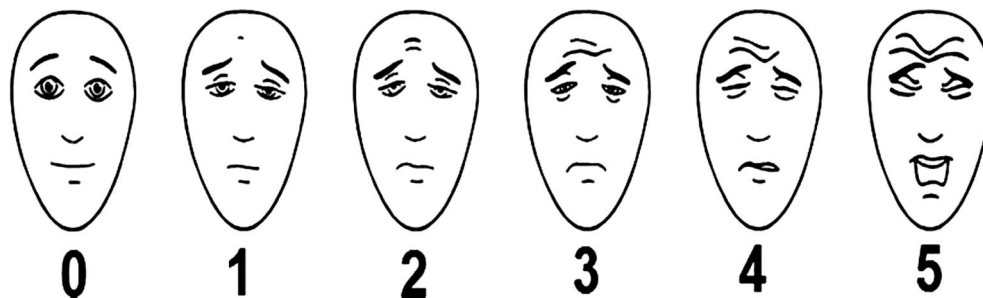


Figure 1 - Pain scale by Hicks et al.

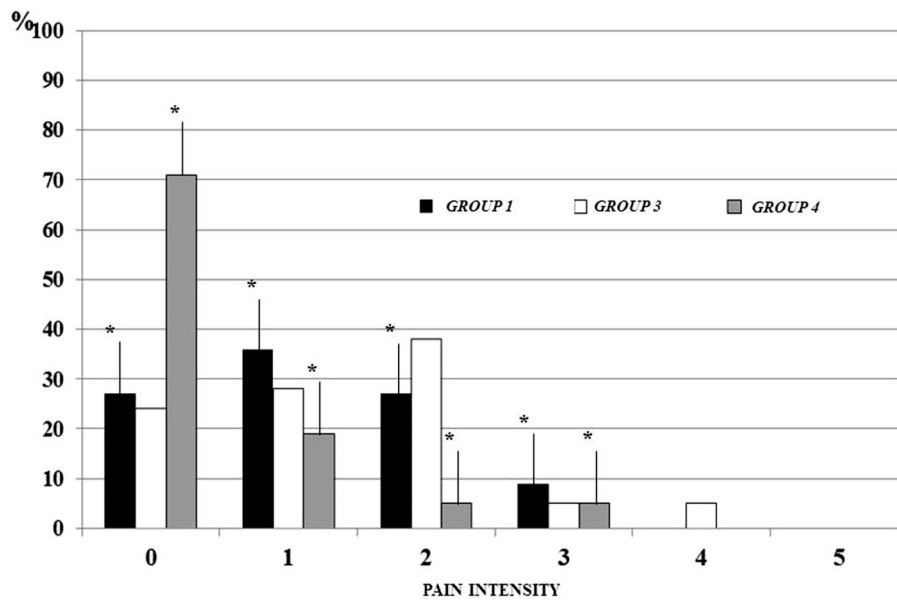


Figure 2 - Results of the evaluation of pain intensity. Group 1: scoliotic curves 20° to 45°; Group 3: scoliotic curves 45° to 90° one year after surgery; Group 4: healthy controls. *: significant differences within group compared to pain intensity zero (no pain).

Table 1 - Results of the “Pain” domain from the SRS-30 questionnaire for Groups 1 and 4.

	Mean (SD)	Minimum	Maximum	p-value
Group 4	23 (2.9)	15	25	0.005
Group 1	19 (3.3)	12	25	

Table 2 - Results of the “Pain” domain from the SRS-30 questionnaire for Groups 1 and 3.

	Mean (SD)	Minimum	Maximum	p-value
Group 1	19*(3.3)	12	25	0.024
Group 3, one year postoperatively	23*(4.5)	15	25	

Table 3 - Results for the “Pain” domain of the SRS-30 questionnaire for Groups 2 and 3.

	Mean (SD)	Minimum	Maximum	p-value
Group 2 (preoperatively)	20*(2.7)	16	25	0.002
Group 3 (one year postoperatively)	23*(4.5)	15	25	

Table 4 - Frequency distribution of the anatomical location of pain, based on the illustration of the human body.

Painful region	Control group (%)	Low Cobb angle group (%)	One-year postoperative group (%)
Thoracic	13	50	43
Lumbar	15	18	19
Thoracolumbar transition	0	0	10
Other regions	0	32	5
No pain	72	0	23

adults and include questions related to work and/or sex life. Therefore, they are not suitable for use with children and adolescents. In patients with AIS, we used the SRS-30 questionnaire¹³, which was developed specifically for adolescents. The questionnaire has 30 questions, which are divided into five different domains: “Pain,” “Self-Esteem,” “Satisfaction,” “Appearance” and “Mental Health.” The present study analyzed only Questions 1, 2, 8, 11 and 17 to assess the impact of pain on the patients’ daily activities.

The results of the SRS-30 questionnaire show worse scores for patients with scoliosis, regardless of the evolutionary phase of the disease. This finding is contrary to health professionals’ commonly held belief that idiopathic scoliosis does not cause pain, but that pain is related only to other causes of deformities, such as syringomyelia or spinal tumors. In fact, these diseases are accompanied by pain, but their pain patterns differ from those of idiopathic scoliosis because the pain does not improve with rest and because it occurs predominantly at night. In AIS, back pain is very frequent and associated with a lower quality of life^{14,15}; it is greater in more rigid curves and lower in patients using braces¹⁵.

Regarding the patients in Group 1, we believe that their use of orthotics might be a possible cause of worse outcomes: it is known that braces are associated with frequent complaints of aesthetic dissatisfaction and problems with self-esteem^{14,16}, facts that may contribute to their relationship with worse pain scores. In addition, AIS can also promote muscle imbalances that result in complaints of back pain, most frequently in the region of thoracic hump.⁵ However, a recent study has shown that AIS patients with braces had significantly lower pain scores.¹⁵ Therefore, only an appropriate study of pain comparing patients with and without braces could clarify this.

In this study, patients with AIS predominantly had pain in the dorsal region, similar to what was previously reported by Danielsson et al.⁷ We believe this may be caused by local anatomical changes, such as muscle strain and changes in the

distribution of forces on the intervertebral discs. Furthermore, it has been shown that patients with AIS present biochemical changes in their back rotator muscles, a histological pattern similar to certain types of muscular dystrophy¹⁷.

Most of the patients in the control group did not complain of pain. When pain was present, it was predominantly localized to the lumbar region. This finding is consistent with those of Pellisé et al.¹⁸, who observed a low back pain incidence of up to 39% in healthy adolescents; the lower back was the anatomical region most affected by pain in this population in our study.

One year after surgery, patients experienced improvements in preoperative pain. We believe this was caused, in part, by the re-equilibration of trunk decompensation, which is frequently seen in patients who have undergone surgery. Moreover, the satisfaction resulting from surgical treatment, in part by the esthetic improvements, may have been reflected in the improved pain scores in the SRS-30 questionnaire, something already noted by others with the SRS-22¹⁴.

The main limitation of this study is the short (one year) follow-up after surgery. Future research may help elucidate the long-term effect of surgery and the consequences of degenerative phenomena of the spine secondary to disease.

■ CONCLUSION

Based on the results obtained in this study, it can be concluded that patients with adolescent idiopathic scoliosis had a higher intensity of back pain than healthy individuals did. Spinal arthrodesis reduced this pain one year after the procedure.

■ COMPETING INTEREST

We declare no conflict of interest.

■ ACKNOWLEDGEMENTS

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■ AUTHOR CONTRIBUTIONS

All authors participated in the acquisition of data and revision of the manuscript. All authors conceived the study, determined the design, performed the statistical analysis, interpreted the data and drafted the manuscript. All authors read and gave final approval for the version submitted for publication.

■ RESUMO

OBJETIVO: A correlação entre as queixas de dor e a gravidade da curva na escoliose idiopática do adolescente permanece controversa. O objetivo deste estudo foi avaliar a presença e intensidade de dor nas costas em pacientes portadores de escoliose idiopática do adolescente em diferentes estágios da doença.

MÉTODOS: Sessenta e quatro indivíduos participaram deste estudo com curvas de escoliose (ângulo de Cobb) entre 20 e 90 graus. Os pacientes foram divididos em quatro grupos de acordo com as curvas de escoliose: Grupo 1 (20-45 graus) Grupo 2 (maior que 45 graus antes da cirurgia), Grupo 3 (maior

que 45 graus, um ano após artrodese posterior da coluna vertebral com parafusos pediculados) e Grupo 4 (adolescentes saudáveis entre 11 e 18 anos de idade - grupo controle).

RESULTADOS: Os escores obtidos a partir do domínio dor do questionário SRS -30 (desenvolvido especificamente para a avaliação da escoliose do adolescente) foram significativamente piores para pacientes com escoliose, independentemente da fase evolutiva da doença. Os pacientes submetidos a tratamento cirúrgico apresentaram resultados estatisticamente melhores um ano após a cirurgia do que o grupo de pacientes com ângulos de Cobb moderados.

CONCLUSÃO: Os pacientes com escoliose idiopática do adolescente apresentaram maior intensidade de dor dorsal do que os indivíduos saudáveis. A dor apresentou-se reduzida um ano após a artrodese da coluna vertebral.

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