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Quality of Life and Perception of Visual Deformity in Adolescents with Mild Idiopathic Scoliosis

Ilımlı Şiddetli İdiyopatik Skolyozlu Adölesanlarda Yaşam Kalitesi ve Görsel Deformite Algısı

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Abstract

Objective: The aim of this study was to determine the relationship among the degree of spinal curvature, the perception of visual deformity, quality of life, the severity of pain in adolescents with mild idiopathic scoliosis.

Materials and Methods: Cases with an established diagnosis of adolescent idiopathic scoliosis having Cobb angles ranging between 10 and 25 degrees were included in the study. Their sociodemographic data were recorded. Additionally, the degree of curvature was determined by the Cobb method, visual deformity perceptions by Walter Read Visual Assessment scale (WRVAS), health-related quality of life (HRQoL) by Scoliosis Research Society-22 questionnaire, (SRS-22), and pain evaluations by visual analog scale.

Results: The study sample comprised 72 patients (48 female, and 24 male cases) with adolescent idiopathic scoliosis. The mean age (14.59±18.4 years), Cobb angle (20.77±3.57°) were determined as indicated. Mean scores of the SRS-22 HRQoL questionnaire (3.86±0.68), and WRVAS (12.58±2.85) were also recorded. A statistically significant positive correlation was detected between Cobb angles, and WRVAS scores (r=0.290 p=0.042). Statistically significant negative correlations were detected between Cobb angles, SRS-22 pain (r=-0.294, p=0.012), and SRS-22 spinal function (r=-0.238 p=0.044) scores, between SRS-22-General body image and WRVAS total scores (r=-0.260 p=0.027); and between SRS-22 mental health and WRVAS body curvatures (r=-0.233 p=0.049).

Conclusion: This study reminds us that mild AIS affects vertebral alignment as well as quality of life, and perceived body alignment.

Keywords: Adolescent idiopathic scoliosis, health-related quality of life, perception of visual deformity

Öz

Amaç: Bu çalışmanın amacı, ılımlı şiddetteki idiyopatik skolyozlu adölesanlarda eğrilik derecesi, görsel deformite algısı, yaşam kalitesi, ağrı düzeyleri arasındaki ilişkiyi belirlemektir.

Gereç ve Yöntem: Çalışmaya Cobb açısı 10-25 derece olan idiyopatik skolyoz tanılı adölesanlar alındı. Sosyodemografik veriler kaydedildi. Ayrıca eğrilik derecesi Cobb yöntemi, görsel deformite algıları Walter Reed Görsel Değerlendirme ölçeği (WRGDÖ), yaşam kalitesi Skolyoz Araştırma Derneği-22 anketi (SSR-22) ve ağrı değerlendirmeleri görsel analog ölçeği ile belirlendi.

Bulgular: Çalışma örneklemi adölesan idiyopatik skolyozu (AİS) olan 72 hastadan (48 kız, 24 erkek) oluşturuldu. Hastaların yaş ortalaması 14,59±18,4 yıl, ortalama Cobb açısı 20,77±3,57° (13-25°) olarak hesaplandı. SRS-22 yaşam kalitesi anketi puanları ortalama skor 3,86±0,68 (0,45-4,81), ortalama WRGDÖ skor 12,58±2,85 (7,00-18,00) idi. Çalışmaya dahil edilen AİS'li bireylerin Cobb dereceleri ile WRGDÖ skoru arasında istatistiksel olarak anlamlı bir ilişki saptandı (r=0,290 p=0,042). Cobb dereceleri ile SRS-22 ağrı (r=-0,294 p=0,012), SRS-22 omurga fonksiyonları (r=-0,238 p=0,044) arasında negatif yönlü istatistiksel olarak anlamlı bir ilişki bulundu. SRS-22 genel vücut imajı ile WRGDÖ-toplam skor (r=-0,260 p=0,027), SRS-22 ruh sağlığı ile WRGDÖ-vücut eğriliği arasında negatif yönlü istatistiksel olarak anlamlı bir ilişki saptandı (r=-0,233 p=0,049).

Sonuç: Bu çalışma sonucuna göre ılımlı şiddetteki AİS'nin vertebra diziliminin yanı sıra yaşam kalitesi, algılanan vücut dizilimini de etkilediğini düşünüyoruz.

Anahtar kelimeler: Adölesan idiyopatik skolyoz, yaşam kalitesi, skolyoz algısı

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Introduction

Sideways spinal curvature of more than 10 degrees in the coronal plane. Is defined as scoliosis. According to The International Society on Scoliosis Orthopedic and Rehabilitation Treatment (SOSART) guidelines scoliosis is a complicated three-dimensional malformation of the spine and trunk especially noticed during or after the fast growth period in healthy children that can deteriorate due to unfavorable factors (1). Adolescent idiopathic scoliosis (AIS) is a complicated and progressive deformity that can cause back discomfort, poor body image, low self-esteem, as well as social and psychological stress in growing teenagers (2,3).

These patients closely observe the changes in their bodies during adolescent development, which leads to a variety of negative reactions such as dissatisfaction with their bodies, unfavorable perceptions of their body image, and worry about their body shapes and sizes (4). Body image provides the most essential link between these worries and AIS (5).

Body image is also an important parameter that affects health-related quality of life (HRQoL) in AIS (6). Nonetheless, according to the SOSART consensus document, just a few studies in the literature have investigated the issues of quality of life and body image in AIS (7).

Thus, we aimed to describe the degree of curvature, visual deformity perception, quality of life, pain, and to investigate the relationship between these values in adolescents with mild idiopathic scoliosis (Cobb angle: ≤25 and without corset).

Materials and Methods

This study was conducted with adolescent patients who were admitted to Physical Medicine and Rehabilitation outpatient clinics at University of Health Sciences Turkey, İzmir Dr. Behçet Uz Child Disease and Surgery Training and Research Hospital between May and October 2021. A formal approval for this study was granted from The Ethical Committee of University of Health Sciences Turkey, İzmir Dr. Behçet Uz Child Disease and Surgery Training and Research Hospital (decision no: 2021/08-04, date: 22.04.2021). The study was conducted according to the WMA Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Subjects and the parents gave their informed consent for participation of their children in this study.

Study Design

Age, weight, height, body mass indexes [BMIs: kg/m²)] were recorded as for the demographic data. In addition, for participants with scoliosis, we recorded clinical data as the Cobb angle of the major curve, location of the apex of the major curve, and also individuals' perceptions of their body awareness, and HRQoL.

The inclusion criteria: Ten to 18-year-old male, and female participants with Cobb angles ranging between 10° and 25° were included in the study. All subjects with AIS were diagnosed according to the guideline of the Scoliosis Research Society (SRS) (4) and enrolled based on the following inclusion criteria: (1) adolescents aged 10 to 18 years diagnosed with AIS (2) Cobb angles >10° with axial rotation and (3) unknown etiology of scoliosis.

The exclusion criteria: Patients were excluded from this study if they had a Cobb angle over 25°, accompanying mental, neuromuscular or neurological problems, congenital malformation(s), trauma-related comorbidity (ies), cervical scoliosis, non-idiopathic scoliosis or history of previous spinal surgery.

The degree of scoliosis was graded by measuring the Cobb angle, which is the "gold standard" in the assessment of scoliosis (8). All Cobb angles of major curves, and location of the apex of the major curve were determined digitally by the same experienced physiatrist. The subjects with scoliosis were classified into three groups for further analysis according to the location of the major Cobb angles of lateral curves of thoracic (T2-T11/12 disc), lumbar (L1/L2 disc-L4) and thoracolumbar (T12-L1) vertebrae.

Visual analogue scale (VAS) which is a reliable and validated scale was used to evaluate the severity of pain felt by the patients on 10 cm line scored between 0 (no pain), and 10 (the most severe pain) (9). Individuals were asked to mark a place on the scale according to the severity of pain they felt at rest and during activity, and the marked values were recorded.

In our study, participants indicated their perceptions of their body image on this validated, brief and practical Walter Reed Visual Assessment scale (WRVAS) created, and designed by Pineda et al. (10) and used for clinical assessments. This scale has figures representing seven different aspects of the deformity (spinal deformity, rib prominence, lumbar prominence, thoracic deformity, trunk imbalance, shoulder asymmetry, and scapular asymmetry), and increasing levels of severity of each deformity are scored from 1 (minimum) to 5 (maximum). Validity and reliability studies of this questionnaire have been conducted for Turkish society (11). The questionnaires were completed by all the subjects by themselves under the supervision of one of the authors.

The participants' HRQoL was evaluated using the "SRS-22" questionnaire. The SRS-22 consists of 22 items with scores ranging from 1 (worst) to 5 (best) amounting to a final summary score ranging from 1 (very poor quality of life) to 5 (optimal quality of life) (12). The validity and reliability study of the Turkish version was conducted by Alanay et al. (13).

Statistical Analysis

A priori power analysis for two-tailed Spearman's r to find a moderate effect size (q=0.4), alpha error of 0.05, and statistical power of 0.80 determined the necessary sample size to be 72 patients (G*power v.3.1.9.4) (14). All statistical analyzes were performed using IBM SPSS version 25.0 (SPSS Inc Chicago, Illinois, USA). Continuous variables are presented as median (minimum-maximum) in the tables, while categorical variables are given as numbers (n) and percentages (%). The data of the study did not fulfill the terms of normality assumptions.

Therefore, Spearman correlation analysis was used to determine

the relationship between age, BMI, Cobb angles, VAS variables and WRVAS and SRS-22 scores. The Mann-Whitney U test was used to compare VAS, SRS-22 and WRVAS scores with gender. The level of significance was determined as $p<0.05$ in all analyzes. As a non-parametric test The Kruskall-Wallis H test was used to determine a significant difference (if any) between the WRVAS and SRS-22 scores and the groups with major curve apexes. As a post-hoc test Games-Howell analysis was used to determine the groups which differed significantly.

Results

The study sample comprised 72 patients (48 females, 24 males) with AIS. The demographic data and the mean Cobb angle, VAS-pain at rest, VAS- pain at activity WRVAS, SRS-22 HRQoL values of the subjects included in our study are shown in Table 1. Major curve apexes were located at thoracic (T2-11) thoracolumbar (T12, L1) and lumbar (L2-5) vertebras in 34 (47.22%), 23 (31.84%), 15 (20.83%) patients, respectively.

As indicated by Spearman correlation coefficient, for all 72 patients, a significant positive correlation was found between the main Cobb angle, VAS-activity ($r=0.27$, $p=0.019$) and WRVAS scores ($r=0.29$, $p=0.04$). A significant negative correlation was found between the main Cobb angle and the SRS-22-pain ($r=-0.294$, $p=0.012$) and SSR-22 function/activity ($r=-0.238$, $p=0.044$) (Table 2).

Measurements of Cobb angles did not differ significantly between female and male patients. The mean SRS-22-pain, mental health and SRS-22-total scores were higher for males than females (Table 3).

Table 1. Demographic and clinical data of the participants (n=72)

	Median	Min	Max	$\bar{x}$ ± SD
Age (years)	14.00	10.00	18.00	14.59±1.84
BMI (kg/m²)	19.13	14.00	28.36	19.46±2.76
Cobb angle (°)	20.00	13.00	25.00	20.77±3.57
VAS-pain at rest	3.00	0.00	7.00	2.65±2.28
VAS-pain at activity	5.00	0.00	9.00	3.97±2.98
WRVAS-total score	12.00	7.00	19.00	12.58±2.85
SRS-22-total score	3.97	0.45	4.82	3.86±0.68

Values are presented as mean ± standard deviation. WRVAS: The Walter Reed Visual Assessment scale, SRS-22: The Scoliosis Research Society-22, VAS: Visual analogue scale, min: Minimum, max: Maximum, SD: Standard deviation, BMI: Body mass index

Table 2. Correlations among Cobb angle, VAS, WRVAS and SRS-22 scale scores in participants with scoliosis

		Cobb	VAS-at rest	VAS-at activity
Cobb angle	r	1	-	-
	p			
VAS-pain at rest	r	0.225	1	-
	p	0.058		
VAS-pain at activity	r	0.275*	0.647**	1
	p	0.019	<0.001	
SRS-22 pain	r	-0.294*	-0.486**	-0.667**
	p	0.012	<0.001	<0.001
SRS-22 self-image/appearance	r	-0.015	-0.175	-0.264*
	p	0.898	0.140	0.025
SRS-22 function/activity	r	-0.238*	-0.485**	-0.490**
	p	0.044	<0.001	<0.001
SRS-22 mental health	r	-0.010	-0.130	-0.172
	p	0.936	0.275	0.149
SRS-22 satisfaction with management	r	0.086	0.025	-0.102
	p	0.472	0.838	0.394
SRS-22 total score	r	-0.152	-0.384**	-0.503**
	p	0.202	0.001	<0.001
WRVAS-total score	r	0.290	0.199	0.139
	p	0.042*	0.094	0.243

*Correlation significant at 0.05, **Correlation significant 0.001. VAS: Visual analogue scale, WRVAS: The Walter Reed Visual Assessment scale, SRS-22: The Scoliosis Research Society-22

Table 3. Differences between male and female participants with scoliosis in terms of Cobb angle, VAS, WRVAS and SRS-22 scale scores

	Gender	N	Median (min-max)	p
Cobb angle (°)	Female	48	20 (12-25)	0.080
	Male	24	19 (12-22)	
SRS-22 pain	Female	48	19 (10-25)	0.027
	Male	24	21.5 (9-25)	
SRS-22 self-image/appearance	Female	48	17 (7-25)	0.274
	Male	24	19 (10-25)	
SRS-22 function/activity	Female	48	23 (12-28)	0.266
	Male	24	24 (17-25)	
SRS-22 mental health	Female	48	17 (6-29)	0.035
	Male	24	20.5 (5-23)	
SRS-22 satisfaction with management	Female	48	8 (2-10)	0.596
	Male	24	8 (7-10)	
SRS-22 total score	Female	48	85.5 (10-105)	0.006
	Male	24	92.5 (42-106)	
VAS-pain at activity	Female	48	5 (0-9)	0.322
	Male	24	4.5 (0-7)	
VAS-pain at rest	Female	48	3 (0-7)	0.274
	Male	24	2.5 (0-6)	
WRVAS-total score	Female	48	13 (7-19)	0.048
	Male	24	11 (7-18)	

WRVAS: Walter Reed Visual Analog scale, SRS-22: Scoliosis Research Society-22, VAS: Visual analogue scale, Mann-Whitney U test, $p<0.05$

Discussion

In this cross-sectional study, we aimed to determine the degree of curvature, participants' perceptions of visual deformity, HRQoL, and pain, and to evaluate the relationship between these scores in adolescents with idiopathic scoliosis. Our results showed significantly weak correlation between Cobb angle and pain, HRQoL, perceived body alignment in patients with AIS as a main outcome of the present study.

Scoliosis is an abnormal lateral curvature of the spine, and thoracic lordosis, lumbar asymmetry, shoulder balance, BMI, Cobb angle and hump deformity all affect the extemal appearance of an individual. It is not possible to explain the deformity of the entire body surface in terms of Cobb angle alone (15). Therefore, the clinical evaluation of the patient should include cosmetic trunk deformities. Adolescents sometimes complain of difficulty with clothing that does not fit symmetrically due to bilateral breast asymmetries and inequalities in the heights of both shoulders and the left and right sides of the waist. In this regard, individuals with AIS may experience social isolation, low participation in activities and non-compliance (16). During the period of adolescence, people closely monitor the changes in their bodies displaying various reactions such as dissatisfaction with one's own body image, negative perception of one's physical appearance (4).

Pineda et al. (10) compared the SRS-22 spinal function with the WRVAS scores, and concluded that the two scales are not mutually exclusive but complementary, and that using both scales together provides a better assessment of body image because they compensate for each other's deficiencies. Therefore, we investigated both the health-related quality life and body perception of our adolescents with mild idiopathic scoliosis.

Some researchers have found that increasing Cobb angle negatively affected individual's perception of his/her body image (17,18) However Matamalas et al. (6) reported lack of any correlation between the Cobb angles and the S-22 self image scores in a young group of patients but a correlation was detected between body image, pain, function and mental health domains of the SRS-22 scale.

Individual perceptions of body image may not match or correspond to objective assesments of one's body by others, with frequent discrepancies between clinical assessments of scoliosis severity (2). Rainoldi et al. (19) reported the presence of a very weak correlation between severity of deformity, and perception of body image and small differences in HRQoL were detected

between patients having extemely small and large curvatures. Although our study participants also had mild curvatures, their HRQoL was impaired. Perhaps not the degree of the Cobb angle, but the diagnosis of scoliosis affects the quality of life of an adolescent more deeply.

When diagnosed with AIS, patients are usually quite healthy and are unaware of the natural history of untreated scoliosis. When adolescents with idiopathic scoliosis receive treatment, they may experience social isolation, depression, and spare little time for leisure activities (20). We think that the emotional and psychological factors of the adolescent period will put even more strain on the individual. Telling the individual that his/her body image can be corrected is one of the factors that can help him accept the treatment.

In our study, an association was found between the WRVAS and the SRS-22 scores related to the domains of sell-image, pain, function and mental health. Schwieger et al. (21) concluded that increases in negative body image perceptions were associated with poor quality of life in adolescents with moderate-severe scoliosis (Cobb angles: 20°-40°).

Gender also affects quality of life, with boys having a higher quality of life and girls having lower self-image. Aulisa et al. (20) found that boys scored higher than girls in areas such as mood, social relationships, social functioning, perception of their own health status, emotional functioning, esthetic sensation, and pain level. Another study found that girls with AIS perceived their body image as more disturbing than boys and had lower levels of happiness and life safistaction compared to the healthy population (22). In our study, SSR-22 scores for psychological quality of life were lower in girls than in boys. Therefore, a better understanding of disease-related psychological aspects is needed so as to inform clinical practice.

Théroux et al. (23), found that spinal pain was common in individuals with AIS and that greater spinal deformity was associated with more severe pain. In another study examining the relationship between the radiological scoring system and patents' HRQoL, any significant relationship could not be found between the degree of Cobb angle and severity of pain (24). As a result of the literature review, Balagué and Pellisé (25) found that adolescents with idiopathic scoliosis mostly complained of pain. However, as in most studies the pain was not strongly associated with the Cobb angle, but it was related to the self-perception of the affected individuals. There is no clarity on the relationship between the degree of spinal curvature in scoliosis and severity of pain. In our study, patients complained of pain of varying severity, they had lower VAS scores, and a significant correlation was found between patients' pain at rest and Cobb angle measurements. A correlation between Cobb angles, and SRS-22 pain scores was also observed.

A significant negative correlation existed between the pain scores of participants with scoliosis and SRS-22 scores related to function/activity, pain, and overall quality of life. These results should be considered when planning rehabilitation programs for patients with idiopathic scoliosis, as improved body awareness regarding the back region may help patients experience less pain and perceive a better quality of life. As a limitation of our study, we did not analyze these parameters in study participants and in those who did not use a corset and having scoliosis of >25°. Therefore, we can not draw conclusions about the relationship between the Cobb angle and other parameters in individuals with greater spinal curvature. Finally, the present study was conducted in only one clinic; thus the sample may not be representative of the entire population with AIS.

Conclusion

A weak correlation was detected between Cobb angle and pain, HRQoL, perceived body alignment in patients with mild AIS. We believe that scoliosis affects the body image of the individuals participating in the study and that cosmetic deformity has a negative impact on the quality of life of these individuals during the adolescent period. Negative body image caused by scoliosis should be prevented, constant interactive communication with adolescents should be maintained, and the patients should be given clear and adequate information about the natural course of scoliosis.

Ethics

Ethics Committee Approval: A formal approval for this study was granted from the Ethical Committee of University of Health Sciences Turkey, İzmir Dr. Behçet Uz Child Disease and Surgery Training and Research Hospital (decision no: 2021/08-04, date: 22.04.2021).

Informed Consent: The parents gave their informed consent for participation of their children in this study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: D.Ç., İ.B., Concept: D.Ç., Design: D.Ç., Data Collection or Processing: D.Ç., İ.B., Analysis or Interpretation: D.Ç., İ.B., Literature Search: D.Ç., İ.B., Writing: D.Ç., İ.B.

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References

1. Negrini S, Hresko M, O'Brien P, Price N, Bettany-Saltikov J, De Mauroy C, et al. Recommendations for research studies on treatment of idiopathic scoliosis: Consensus 2014 between SOSORT and SRS nonoperative management committee. Scoliosis 2015;10:1-12.
2. Misterska E, Glowacki M, Latuszewska J, Adamczyk K. Perception of stress level, trunk appearance, body function and mental health in females with adolescent idiopathic scoliosis treated conservatively: a longitudinal analysis. Qual Life Res 2013;22:1633-45.
3. Choi JH, Oh EG, Lee HJ. Comparisons of postural habits, body image, and peer attachment for adolescents with idiopathic

scoliosis and healthy adolescents. J Korean Acad Child Health Nurs 2011;17:167-73.

4. Dixit S, Agarwal G, Singh J, Kant S, Singh N. A study on consciousness of adolescent girls about their body image. Indian J Community Med 2011;36:197-202.
5. Sanders JO, Polly DW Jr, Cats-Baril W, Jones J, Lenke LG, O'Brien MF, et al. Analysis of patient and parent assessment of deformity in idiopathic scoliosis using the Walter Reed Visual Assessment Scale. Spine (Phila Pa 1976) 2003;28:2158-63.
6. Matamalas A, Bagó J, D'Agata E, Pellisé F. Body image in idiopathic scoliosis: a comparison study of psychometric properties between four patient-reported outcome instruments. Health Qual Life Outcomes 2014;12:81.
7. Negrini S, Grivas TB, Kotwicki T, Maruyama T, Rigo M, Weiss HR, et al. Why do we treat adolescent idiopathic scoliosis? What we want to obtain and to avoid for our patients. SOSORT 2005 Consensus paper. Scoliosis 2006;1:4.
8. Pruijs JE, Hageman MA, Keessen W, van der Meer R, van Wieringen JC. Variation in Cobb angle measurements in scoliosis. Skeletal Radiol 1994;23:517-20.
9. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. Acad Emerg Med 2001;8:1153-7.
10. Pineda S, Bago J, Gilperez C, Climent JM. Validity of the Walter Reed Visual Assessment Scale to measure subjective perception of spine deformity in patients with idiopathic scoliosis. Scoliosis 2006;1:18.
11. Çolak İ, Çolak TK. A study of the relıabılıty and valıdıty of the Turkısh versıon of the walter reed vısual assessment scale ın adolescents wıth ıdıopathıc scolıosıs. J Turk Spinal Surg 2020;31:125-9.
12. Asher M, Min Lai S, Burton D, Manna B. The reliability and concurrent validity of the scoliosis research society-22 patient questionnaire for idiopathic scoliosis. Spine (Phila Pa 1976) 2003;28:63-9.
13. Alanay A, Cil A, Berk H, Acaroglu RE, Yazici M, Akcali O, et al. Reliability and validity of adapted Turkish Version of Scoliosis Research Society-22 (SRS-22) questionnaire. Spine (Phila Pa 1976) 2005;30:2464-8.
14. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. Behav Res Methods 2009;41:1149-60.
15. Goldberg CJ, Kaliszer M, Moore DP, Fogarty EE, Dowling FE. Surface topography, Cobb angles, and cosmetic change in scoliosis. Spine (Phila Pa 1976) 2001;26:E55-63.
16. Altaf F, Gibson A, Dannawi Z, Noordeen H. Adolescent idiopathic scoliosis. BMJ 2013;346:f2508.
17. Piatek E, Zawadzka D, Ostrowska B. Correlation between clinical condition of scoliosis and perception of one's body image by girls with adolescent idiopathic scoliosis. Physiother Q 2018;26:34-8.
18. Watanabe K, Hasegawa K, Hirano T, Uchiyama S, Endo N. Use of the scoliosis research society outcomes instrument to evaluate patient outcome in untreated idiopathic scoliosis patients in Japan: part I: comparison with nonscoliosis group: preliminary/limited review in a Japanese population. Spine (Phila Pa 1976) 2005;30:1197-201.
19. Rainoldi L, Zaina F, Villafañe JH, Donzelli S, Negrini S. Quality of life in normal and idiopathic scoliosis adolescents before diagnosis: reference values and discriminative validity of the SRS-22. A cross-sectional study of 1,205 pupils. Spine J 2015;15:662-7.
20. Aulisa AG, Guzzanti V, Perisano C, Marzetti E, Specchia A, Galli M, et al. Determination of quality of life in adolescents with idiopathic scoliosis subjected to conservative treatment. Scoliosis 2010;5:21.
21. Schwieger T, Campo S, Weinstein SL, Dolan LA, Ashida S, Steuber KR. Body Image and Quality-of-Life in Untreated Versus Brace-Treated Females With Adolescent Idiopathic Scoliosis. Spine (Phila Pa 1976) 2016;41:311-9.
22. Sapountzi-Krepia DS, Valavanis J, Panteleakis GP, Zangana DT, Vlachojiannis PC, Sapkas GS. Perceptions of body image, happiness and satisfaction in adolescents wearing a Boston brace for scoliosis treatment. J Adv Nurs 2001;35:683-90.
23. Théroux J, Le May S, Hebert JJ, Labelle H. Back Pain Prevalence Is Associated With Curve-type and Severity in Adolescents With Idiopathic Scoliosis: A Cross-sectional Study. Spine (Phila Pa 1976) 2017;42:E914-9.
24. Wilson PL, Newton PO, Wenger DR, Haher T, Merola A, Lenke L, et al. A multicenter study analyzing the relationship of a standardized radiographic scoring system of adolescent idiopathic scoliosis and the Scoliosis Research Society outcomes instrument. Spine (Phila Pa 1976) 2002;27:2036-40.
25. Balagué F, Pellisé F. Adolescent idiopathic scoliosis and back pain. Scoliosis Spinal Disord 2016;11:27.