

## Psychological Profile of Children Who Require Repetitive Surgical Procedures for Early Onset Scoliosis: Is a Poorer Quality of Life the Cost of a Straighter Spine?

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### Abstract

**Study Design:** Cross-sectional study.

**Objective:** Assess the psychosocial status of children with early-onset scoliosis (EOS) undergoing multiple procedures and evaluate associations with other variables.

**Summary of Background Data:** EOS may require repetitive surgical procedures to control deformity and preserve growth. These procedures impact patients' psychosocial status because of the repetitive surgeries.

**Methods:** EOS patients 6–18 years, undergoing traditional growing rod treatment with more than 5 surgical procedures, and neurologically/mentally intact were included. Patients were screened for psychiatric disorders before inclusion. The Quality of Life Scale for Children (PedsQL), Strengths and Difficulties Questionnaire (SDQ) self-report form, Beck Depression Inventory, Children Depression Inventory (CDI), Beck Anxiety Inventory (BAI), and the Self-Report for Childhood Anxiety Related Disorders (SCARED) were completed by the children. PedsQL Parental Form and SDQ Parent Form were completed by their parents.

**Results:** Twenty-one patients (9 male, 12 female) met the inclusion criteria. Average age was 6.4 years (4–10.5) at index surgery, and 13.5 years (8–17) at final follow-up. The mean number of procedures was 13 (6–18). Mean follow-up was 83.9 months (36–122). Depression was observed in 23.8% of patients, and generalized anxiety disorder in 42.8%. Patients in the study group were more likely than the general population to have a psychiatric diagnosis. Number of procedures undergone was found to correlate negatively with BAI, SCARED, and the behavioral difficulties domain of SDQ parent form score and positively with emotional functioning, psychosocial health summary score, PedsQL total score, and increased social and physical functioning. Nonidiopathic etiology was found to be related to increased behavioral difficulties and lower functioning.

**Conclusion:** A higher prevalence of depressive and anxiety symptoms was observed in patients with EOS along with dysfunctional areas of daily life. Other comorbidities may also contribute to dysfunction and difficulties. Determination of the aspects of EOS treatment that have a negative impact on psychosocial functioning may allow for more competent help for these patients.

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*Level of Evidence:* Level III (Cross-sectional study)

*Keywords:* Early-onset scoliosis; Growing rods; Traditional growing rod; Psychosocial; Psychology; Behavior; Repetitive surgery

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### Introduction

Early-onset scoliosis (EOS) often presents with severe and progressive curves that may require surgical treatment. Currently, EOS treatment is undergoing a paradigm shift with the introduction of magnetically controlled growing

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rods [1,2]. However, the standard of care in the past decade for children with EOS was the traditional growing rod (TGR) construct, and there are many children worldwide with ongoing treatments. TGR treatment consists of implantation at index surgery, followed by repetitive lengthening procedures every 6 months. Index surgery is similar to posterior fusion surgery for other causes of scoliosis, with a 2–3-day hospital stay, whereas lengthening procedures are generally performed on an outpatient basis, do not cause excessive blood loss, and the operative time is short.

Good orthopedic and radiologic results are reported routinely with TGR treatment [3–5]. However, concern has arisen recently regarding the lesser known effects of repetitive surgeries on children: the psychosocial aspect. Previous studies have established that psychological ramifications manifest after surgery and trauma in children. It has also been determined that repetitive surgeries as part of EOS treatment have an effect on the psychosocial functioning of children [6,7]. These past studies were limited in that they consisted of a small number of heterogeneous patients, and employed few psychiatric tools. With this study, we hope to improve upon prior data by including a more homogenous group of patients and using more comprehensive outcome instruments. We aim to assess the psychosocial status of children who have undergone or are currently undergoing repetitive surgical procedures related to the TGR treatment and evaluate associations between these outcomes with etiology of disease and surgical variables.

## Materials and Methods

A cross-sectional study was performed at the Departments of Orthopaedics and Traumatology and Child and Adolescent Mental Health at Hacettepe University Hospitals, Ankara, Turkey, after obtaining institutional review board approval (reference number 16969557-236, decision number GO 16/119-27). The Growing Spine Patient Database at our institution, which includes demographic and clinical information on 64 patients, was used for the study sample. Inclusion criteria for patients were the following: (1) diagnosis of EOS of any etiology; (2) age between 6 and 18 years; (3) treatment with the TGR construct; (4) more than 5 surgical procedures undergone including index surgery; (5) no diagnosis of neurologic disorders; (6) able to stand and walk unassisted; and (7) with normal intellectual functioning as determined by the Wechsler Intelligence Scale for Children—Revised (WISC-R). Patients and parents were informed of the study at one of their routine follow-up visits at the hospital's orthopedic spine clinic. Informed consent was obtained from the parents and patients older than six years who chose to participate.

Data collected included demographic information, clinical and surgical information as noted in the patients'

medical records, and psychosocial variables. Orthopedic variables included were etiology (idiopathic vs. non-idiopathic), total number of surgical procedures undergone, complications in the form of unplanned surgery, and treatment status (ongoing vs. completed). Psychosocial variables were obtained with a combination of methods including questionnaires, self-rating scales, and structured/semistructured interviews. The psychiatric tools used for the patients in this study and brief descriptions thereof are listed in Table 1. The Turkish versions of these tools, which have been assessed for reliability and validity in previous research, were used in this study.

## Data collection

Patients were informed of the study at their routine orthopedic follow-up by the orthopedic resident. Once informed consent was obtained, the resident administered the Sociodemographic Information Form to the patient and his or her parents. The patient was then seen at a later visit by a child and adolescent psychiatrist, who administered Kiddie Schedule for Affective Disorders and Schizophrenia for School Age Children—Present and Lifetime Version (K-SADS PL). This tool is used to screen patients for psychiatric diagnoses by questioning symptoms present currently and those recalled by patient/family in the past. WISC-R was then administered by an experienced clinical psychologist to evaluate intellectual disability. The subjects personally completed the forms for Pediatric Quality of Life Questionnaire (PedsQL), Strengths and Difficulties Questionnaire (SDQ), Beck Anxiety Inventory (BAI), and Screen for Child Anxiety-Related Disorders (SCARED). Subjects' depressive symptoms were evaluated using Children's Depression Inventory (CDI) for those younger than 15, and Beck Depression Inventory (BDI) for those older. One parent for each patient completed the SDQ Parent Form and PedsQL Parent Form. Evaluations were completed in separate sessions, at least 2 months before or after the surgical interventions.

## Data evaluation

Statistical analysis of the study data was performed using SPSS Windows 22 software package (IBM Corp., Armonk, NY). Data were divided into groups based on orthopedic variables. Independent sample *t* test and two-way analysis of variance were used for the analysis of continuous data between these groups. Two-way analysis of variance was used to collectively evaluate the statistical significance of the differences between the mean values above the scale scores of group and gender factors. Statistical significance level was determined to be  $p < .05$ .

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