



## Untreated Thoracic Curve in Adult Idiopathic Scoliosis: What Are Patients' Concerns?

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### Abstract

**Study Design:** Retrospective two-cohort comparative analysis of data collected prospectively.

**Objectives:** To analyze a cohort of patients with untreated thoracic curves of an adult multicenter deformity database [European spine study group (ESSG)], describe patient characteristics and concerns, and establish the rate and motivations for surgical intervention.

**Summary of Background Data:** Idiopathic thoracic curves have a significant clinical and socioeconomic impact during adolescence. However, little attention has been given to adult thoracic scoliosis. The complaints of patients that have reached adulthood with an untreated thoracic curve are still not well studied.

**Methods:** The database of 1,142 prospective consecutive adult patients with deformity was searched to identify patients with untreated thoracic idiopathic curves: Schwab Type T curves, and Schwab Type D with thoracolumbar/lumbar (TL/L) curves  $<40^\circ$  and a difference between main thoracic (MT) and the TL/L  $\geq 15^\circ$ . Demographic data, different radiologic preoperative parameters, and health-related quality of life questionnaires were assessed.

**Results:** Forty-two patients met inclusion criteria, showing the following characteristics: age,  $30.9 \pm 12.5$  years; thoracic Cobb,  $55.6 \pm 10.8^\circ$ ; lumbar Cobb,  $28.1 \pm 7.3^\circ$ ; sagittal vertical axis,  $2.9 \pm 19.3$  cm; Core Outcome Measures Index (COMI),  $4 \pm 2.5$ ; Oswestry

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Disability Index (ODI),  $20.4 \pm 17.4$ ; Scoliosis Research Society–22 questionnaire (SRS-22) subtotal,  $3.6 \pm 0.7$ ; 36-Item Short Form Health Survey (SF-36) mental health,  $46.1 \pm 10.1$ ; SF-36 physical health,  $47.3 \pm 11.1$ . Only 13 of these patients underwent surgery. Compared with nonoperated patients, they were younger ( $24.3 \pm 7.3$  vs.  $33.8 \pm 13.4$  years;  $p = .009$ ), had larger MT curves ( $58.7^\circ \pm 9.6$  vs.  $50.6^\circ \pm 8.3$ ;  $p = .012$ ), and had worse SRS-22 self-image scores ( $2.9 \pm 0.8$  vs.  $3.5 \pm 0.8$ ;  $p = .042$ ). No patients older than 50 years underwent surgery, despite having worse SRS-22 function ( $3.0 \pm 0.9$  vs.  $4.1 \pm 0.9$ ,  $p = .032$ ) and worse ODI scores ( $42.4 \pm 19.9$  vs.  $18.7 \pm 18.0$ ,  $p = .026$ ).

**Conclusions:** Very few adult deformity patients sought treatment because of untreated thoracic scoliotic curve. The probability of undergoing surgery was low (13/42), and it was associated with youth, curve magnitude, and poor self-image. The rate of surgical treatment of the thoracic curve appears to diminish with age, despite its being associated with poorer function and greater disability in the older patient. © 2016 Scoliosis Research Society. All rights reserved.

**Keywords:** Untreated scoliosis; Adult spine deformity; Adult scoliosis; Adult thoracic curves; Untreated thoracic scoliosis

## Introduction

Idiopathic thoracic curves have a significant clinical and socioeconomic impact during adolescence. Adolescent idiopathic scoliosis patients exhibit a higher prevalence of thoracic (Lenke Type 1 and 2 curves) than lumbar scoliosis [1,2] especially those with bigger curves requiring surgical treatment [3–5]. If left untreated, thoracic curves with Cobb angles greater than  $50^\circ$  progress the most after skeletal maturity [6–10], and with Cobb angles higher than  $80^\circ$  can induce shortness of breath [8,10,11] and cause restrictive pulmonary disease [12–14]. Surgery is therefore recommended in patients with idiopathic thoracic progressive curves greater than  $50^\circ$  to try to avoid these potential consequences [7,15,16].

On the contrary, adult deformity literature, which is nowadays in the spotlight, is basically centered on thoracolumbar deformity, mainly because these curves become symptomatic in adulthood. Lumbar curves progress as disc degeneration appears, decreasing quality of life and function in adulthood [17], and surgical treatment has demonstrated to significantly improve patient's quality of life [18–20]. However, little attention has been given to adult thoracic scoliosis. The complaints of patients who have reached adulthood with an untreated thoracic curve are still not well studied. The few available long-term follow-up studies mix thoracic with lumbar and with double or triple curves, reporting that, in general, untreated scoliosis can produce functional impairment, psychologic disturbances [6,7,10], chronic back pain [8,11,12,21], and can influence self-image even 50 years after the initial diagnosis [11].

However, we could not find any literature reporting the behavior of only pure thoracic untreated curves. There is no transversal study that can provide a picture of the amount of untreated thoracic patients who seek consultation because of their deformity, the concerns that these patient present in adulthood, or the motivations to undergo surgery. These data are difficult to find without a historical cohort or a big updated database.

The aim of this study was to analyze the cohort of patients with untreated thoracic curves of an adult multicenter deformity database, describe patient characteristics and

concerns, and establish the rate and motivations for surgical intervention.

## Material and Methods

We conducted a retrospective analysis of data collected prospectively in an adult multicenter deformity database, the European spine study group (ESSG) that includes patients  $\geq 18$  years of age, having a coronal spinal curvature  $\geq 20^\circ$  or sagittal vertical axis  $> 5$  cm, or a pelvic tilt  $> 25^\circ$  or thoracic kyphosis  $> 60^\circ$ .

From all of the consecutively enrolled adult patients on the database, we searched to identify patients with untreated main thoracic idiopathic curves, defined as follows: Schwab Type T (thoracic curves with lumbar curves less than  $30^\circ$ ), and Schwab Type D curves (both curves over  $30^\circ$ ) in which the thoracolumbar/lumbar (TL/L) curves were  $< 40^\circ$  and the difference between the main thoracic (MT) and the TL/L Cobb was  $\geq 15^\circ$ . These criteria were used in order to extract only the true main thoracic deformities (the equivalent of adolescent Lenke Type 1 and 2 curves), in which the TL segment or the sagittal imbalance could not play a role in patient's symptoms. We excluded patients with previous surgery, with adult main sagittal deformity (sagittal vertical axis  $> 5$  cm, pelvic tilt [PT] higher than  $25^\circ$ , even with coronal criteria), etiology other than idiopathic/degenerative, main lumbar or TL curves, and double or triple curves not fulfilling the above parameters.

Demographic data and different coronal and sagittal radiologic preoperative parameters were assessed: the proximal thoracic (PTh), the MT, and the TL/L Cobb angle; the MT apical translation to C7; the TL translation to CSVL; the coronal balance; the thoracic trunk shift; the thoracic (T2–T12, T2–T5, and T5–T12) kyphosis; the T10–L2 thoracolumbar angle; the lumbar (L1–S1) lordosis; the sagittal balance; and the global tilt, as well as pelvic parameters (pelvic incidence [PI], sacral slope [SS], and pelvic tilt [PT]). Preoperative health-related quality of life questionnaires (ODI, Core Outcome Measures Index [COMI], 36-Item Short Form Health Survey [SF-36], and Scoliosis Research Society–22 questionnaire [SRS-22]) of all patients were evaluated.

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