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Curve Magnitude in Patients Referred for Evaluation of Adolescent Idiopathic Scoliosis: Five Years' Experience From a System Without School Screening

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Abstract

Study design: Retrospective cross-sectional study.
Objectives: To analyze the referral pattern of patients with adolescent idiopathic scoliosis (AIS) in a tertiary hospital in a nationalized health care system without school screening and to compare curve magnitude on referral with results reported in the literature.
Summary of background data: In Denmark, school screening for AIS has not been in effect for more than two decades, and there is limited knowledge of curve magnitude and pattern of referral to specialized treatment in our country. Other studies, however, have assessed the effectiveness of school scoliosis screening. Our tertiary institution receives referrals for evaluation of AIS from general practitioners (GPs) and other hospitals or private specialists.
Method: A review was conducted on all patients diagnosed with AIS between 2010 and 2015. Data collection included age, gender, menarchal status, recommended treatment, and major curve Cobb angle for all patients aged 10–19 years referred for evaluation of AIS. Major curve magnitude was categorized as 10–19, 20–39, or ⩾40 degrees, and the distribution of categories was compared to a screened population reported in the litterature.
Results: A total of 166 of 460 newly referred AIS patients were referred from GP. Mean age was 15 years (standard deviation = 2) and median Cobb angle was 35 degrees. Overall, 33% were initially recommended treatment with a brace. This group had a median curve size of 41 degrees, and 28% presented more than 1 year past menarche. We found a significantly larger curve magnitude at the time of referral in our GP cohort compared to a screened population ($p < .001$), and 22% versus 8% had a Cobb angle >40 degrees ($p < .001$).
Conclusion: The present study confirms that in a health care system without school screening, patients with AIS referred for evaluation by GPs have larger curve sizes compared to systems with school screening.
Level of Evidence: III

Keywords: Scoliosis; Adolescent; Screening; General practitioner

Introduction

Adolescent idiopathic scoliosis (AIS) is the most common three-dimensional spinal deformity with an overall prevalence between 0.47% and 5.2% [1], and for 20-degree curves, the female-to-male ratio is 5:1, which increases substantially with increasing age and Cobb angle [2]. Treatment of AIS involves bracing or surgical deformity correction and fusion of the spine. The goal of bracing is to prevent curve progression, whereas the goal of surgical treatment is to obtain curve correction [3-5]. Early detection of AIS allows for monitoring of the development of the deformity, and bracing

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can be initiated while significant growth potential remains. A recent randomized controlled clinical trial concluded that bracing for 18 hours/day was superior to observation [5].

The use of school screening for AIS is still a subject of controversy, and recommendations vary around the world. In Denmark, school screening has not been in effect for two decades, and there is little knowledge about the consequences and of the pattern of referral to specialized treatment in our country. The goal of screening is to initiate an early treatment strategy, thereby lowering the curve magnitude at skeletal maturity and thus the frequency of surgery. In the current literature, different designs have been adopted in order to compare a population submitted to a screening protocol with an unscreened population. Adobor et al. [6] compared patient outcome during a period of mandatory screening with a period without screening and found a significant increase in Cobb angle at presentation approaching the upper limit for brace treatment indications. Also, the frequency of brace treatment was reduced and the frequency of surgery was increased in the nonscreened population. Other studies with a comparable design have shown similar findings [7]. A gender- and age-matched case-control study by Bunge et al. [8] found no evidence that screening for AIS reduced the risk of surgery. However, as suggested by Fong et al. [9], this type of case-control study comparing exposure to screening would appear to be equivalent to comparing the participation rate rather than the screening accuracy.

In 2010, Luk et al. [10] conducted a retrospective cohort study evaluating the clinical effectiveness of school scoliosis screening in Hong Kong. More than 100,000 students were screened at age 10 and followed until skeletal maturity. The prevalence of AIS was 1.6% corresponding to the existing literature [1]. In the unscreened population, the prevalence of AIS was 0.2%, indicating that a considerable number of adolescent individuals had undetected scoliosis. This study is novel in its size and in the fact that all patients were followed until 19 years of age. The healthcare system in Denmark is comparable to that of Hong Kong with a centralized surgical treatment of patients with AIS and a population of the same magnitude. Furthermore, Denmark is characterized by having a national healthcare system. The major difference from Hong Kong is the lack of school screening for scoliosis, and patients are either referred by a general practitioner on the clinical suspicion of AIS or by an orthopedic or pediatric specialist.

The primary purpose of the present study was to analyze the referral pattern of patients with AIS to a tertiary hospital in a nationalized health care system without school screening and to compare curve magnitude on referral with results reported in the literature.

Material and Methods

A retrospective cross-sectional study was conducted on all patients seen at their first consult in the outpatient clinic at the Spine Unit, Rigshospitalet, in the period January 1, 2010, to December 31, 2014, corresponding to a study period of five years.

Patients who met the following criteria were classified as having AIS and were included in the study:

a coronal curvature of the spine of more than 10 degrees measured by the Cobb technique on a plain long standing antero-posterior X-ray image;

no comorbidity associated with spinal deformity such as inherited disorders of connective tissue, neurologic disorders, or other musculoskeletal disorders; and age of 10–19 years.

Experienced orthopedic spinal surgeons conducted the initial scoliosis evaluations. The medical records were reviewed, and measurements of long-standing radiographs were conducted. The following study variables were registered: age, gender, time since menarche, medical history, major Cobb angle, apical vertebral body or disc, and way of referral. Way of referral was categorized into two groups: (1) general practitioner (GP) and (2) hospital or specialist in pediatrics or orthopedic surgery (H/S) (Fig. 1). The Cobb angle of the major curve was measured on a long-standing radiograph taken at the first outpatient visit. The apex of the curve was defined according to Lenke et al. [11] as the most horizontal and laterally placed vertebral body or disc. Based on the location of the apical vertebra, the curve type was defined as follows:

thoracic curve if apex was from T2 to the T11–T12 disc,

thoracolumbar curve if apex was from T12 to L1, and

lumbar curve if apex was from L1–L2 disc to L4

To ensure comparability with Luk et al., patients were categorized by curve magnitude as 10–19, 20–39, or ⩾40 degrees.

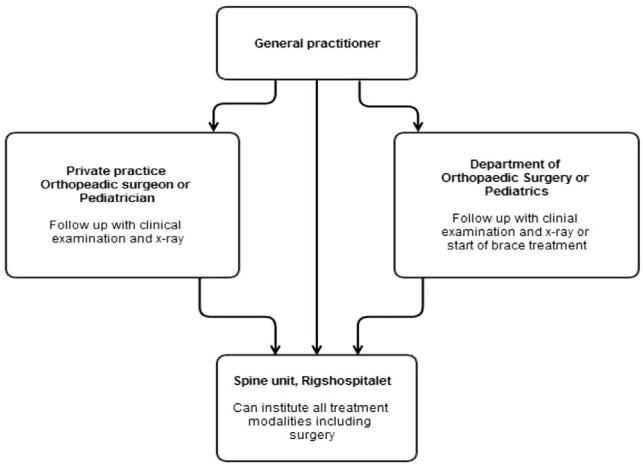

Fig. 1. Flowchart of the referral pattern to our facility for patients with adolescent idiopathic scoliosis.