

Letter to the Editor

Early Onset Scoliosis - Time for Consensus



The International Congress on Early Onset Scoliosis and Growing Spine (ICEOS) has increasingly become a rich environment for collaborative research efforts that focus on the population of young children with scoliosis. As this sub-specialty has evolved, there have been great strides towards unifying our approach towards the study of this field of research.

During the 8th Annual ICEOS meeting in Warsaw in November of 2014, both the Children's Spine Study Group (formerly known as the Chest Wall and Spine Deformity Study Group) and the Growing Spine Study Group had their third annual combined study group meeting. The cooperation between these two major study groups strengthened with previous combined meetings at the 6th and 7th Annual ICEOS meeting in Dublin, Ireland and in San Diego, California. During the 2013 combined meeting, a terminology sub-committee comprised of members from both study groups was created with the goal of building consensus and promoting consistency with the terms that are commonly used in relation to early onset scoliosis. In addition to the authors of this editorial, the sub-committee consisted of Charles Johnston, Michael Vitale, David Skaggs, Laurel Blakemore, Jim Sanders, Paul Sponseller, and Randal Betz. This group came to consensus on three major topics: The definition of "early onset scoliosis", the terminology used for the classification of early onset scoliosis, and the terminology used for the treatment of early onset scoliosis.

Over the past decade, the term "early onset scoliosis" has increasingly been used in the medical literature. Despite its recent popularized use, it is based upon a concept that is over 60 years old [1]. In 1950, Ponseti and Friedman sub-divided idiopathic scoliosis into 4 major groups according to the age at which the scoliosis was first noticed: Before the age of ten years, between ten and twelve years, between twelve and fourteen years, and after fourteen years of age. It was determined that there was a worse prognosis for the children in which scoliosis was first noticed prior to the age of ten years. In those patients, there was a tendency towards rapid

progression of the curve to greater than 80 degrees [1]. A sub-division of idiopathic scoliosis based upon age of onset was described by James in 1954: Infantile - present before age 3 years; juvenile - present between ages 4 and 9 years; and adolescent - present between age 10 years until maturity. These three time periods relate to periods of rapid, quiescent, and rapid spine growth, respectively [2].

In the 1980's, Dickson supported and quoted Ponseti's two categories of idiopathic scoliosis: Early-onset and late-onset. He wrote that "the prevalence rate, natural history and the consequences of untreated scoliosis, as well as the strategy for treatment and its efficacy, differ very considerably between early and late-onset types" [3,4]. However, a decade later, he wrote that "idiopathic scoliosis should be divided into two subgroups: early onset (0-5 years) and late onset (after the age of 5)" [5]. More recently, several authors have used this definition and included all etiologies of scoliosis with a revised definition of "the presence of scoliosis of all etiologies by age 5 years" [6,7].

Although we recognize that patients with scoliosis presenting under the age of five years have unique characteristics related to the immaturity of their respiratory system [8]; our group feels that the treatment principles for children between the ages of five and ten years more closely resemble those used for children under the age of five years (growth friendly surgery) than they do for children over the age of ten years (fusion surgery). Based upon natural history and treatment of scoliosis, ten years of age appears to be a logical age to differentiate between early and late onset scoliosis. Earlier this year, Skaggs et al. published a classification of growth friendly spine implants in which they defined early-onset scoliosis as "scoliosis of any etiology developing before the age of 10" [9]. This new definition built upon Ponseti's definition, but also included patients with non-idiopathic etiologies of scoliosis.

Also this year, a multi-center group led by Vitale developed and validated a classification for early onset scoliosis in which they added further support to the inclusion of all etiologies of scoliosis [10]. The definition used

in that publication is based upon the consensus from the study groups' terminology sub-committee which defines early onset scoliosis as “**scoliosis with onset less than the age of ten years, regardless of etiology**”. Furthermore; broad international consensus and input into this definition was obtained as the executive of the Children's Spine Study Group, the executive of the Growing Spine Study Group, the Growing Spine Committee of the Scoliosis Research Society, and the Pediatric Orthopaedic Society of North America have all endorsed this definition for use in scientific meetings and scientific journals. The use of this unified definition should increase the consistency and the validity of studies related to early onset scoliosis. Additional details on this definition can be found within this edition of *Spine Deformity* as the Early Onset Scoliosis Consensus Statement from the Scoliosis Research Society Growing Spine Committee has also been published.

We stress that our statement is not a recommendation for a specific type of treatment for children under the age of ten years. We recognize that early onset scoliosis consists of a heterogeneous population of children and that treatment should be individualized based on the available evidence and surgeon's experience.

Additionally, the terminology sub-committee urges the consistent use of scoliosis etiologies as defined in the classification for early onset scoliosis (C-EOS). These include the four main etiologic categories of congenital, neuromuscular, syndromic, and idiopathic [10]. Consistent recording of these etiologies in the scientific literature should allow for more reliable interpretation of studies on this heterogeneous population.

Our sub-committee also endorses the term “growth friendly” for the classification of the implants that are used for the treatment of early onset scoliosis [9]. Prior to its publication, this growth friendly classification system was approved by the Children's Spine Study Group, the Growing Spine Study Group, Pediatric Orthopaedic Society of North America, and the Growing Spine Committee of the Scoliosis Research Society. The classification includes descriptions of implants including distraction-based systems (spine-based, rib-based, hybrid, and remotely expandable devices), compression-based systems (vertebral staples and tethers), and guided growth systems (i.e. Luque Trolley and Shilla) [9].

By utilizing consistent nomenclature related to the definition, classification, and treatment of early onset

scoliosis, we feel confident that significant progress in the study of this condition will be more readily possible in the future.

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