DOI: 10.26717/BJSTR.2018.02.000770

Francesco Roberto Evola. Biomed J Sci & Tech Res

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574-1241

Mini Review Open Access

Adolescent Idiopathic Scoliosis: A Minireview

Maria Elena Cucuzza[1], Giuseppe Evola[2] and Francesco Roberto Evola*[3]

[1]*Pediatric Clinic, University of Catania, Italy*

[2]*Surgery clinic, University of catania, Italy*

[3]*Orthopaedic Clinic, University of Catania, Italy*

Received: February 07, 2018; **Published:** February 16, 2018

***Corresponding author:** Francesco Roberto Evola, University of Catania, Via Plebiscito 628, Catania, Italy, Email: robertoevola@virgilio.it

Keywords: Adolescent idiopathic scoliosis; Children; Review

Introduction

Idiopathic scoliosis is a complex three-dimensional skeletal disorder with multifactorial etiology frequently encountered in childhood. Idiopathic scoliosis, discovered around 10 years of age or older, is defined as a lateral curvature of the spine in the frontal plane greater than 10 degrees with vertebral rotation in horizontal plane on a standing radiography. True scoliosis is different by false scoliosis. False scoliosis or paramorphism, where the rotation is not present, is caused by different length of the lower limbs, radiculopathy of spine, postural disorders, or inflammation. Clinical examination allows differentiating children with minimally progressive scoliosis from children at high risk for progression of deformity. Curve progress in two-thirds of patients with idiopathic scoliosis before skeletal maturity. Risk factors of curve progression are female gender, time of menarche, age of 10-12 years, thoracic curves, multiple curves, skeletal immaturity and a large curve magnitude [1]. Females have a risk of progression 10 times higher than males. Scoliosis can be diagnosed by the Adam's forward bend test during physical examination. X-ray examination in orthostatic position allows to measure the inclination angles of the curve using the Cobb method and to assess skeletal growth using Risser grading. The treatment consists of observation, physical therapy, brace, and surgery. Nowadays the optimal treatment of idiopathic scoliosis remains controversial. Idiopathic scoliosis produces psychological, social and economic problems in children and their families. No direct evidence was found for a benefit of universal screening of idiopathic scoliosis on long-term health outcomes [2].

Classification

Scoliosis is classified in idiopathic and secondary: in the idiopathic form there is not a clear underlying cause; the secondary form is due to diseases of connective tissue, neurologic and musculoskeletal disorders. The idiopathic scoliosis is the most common form of scoliosis with a prevalence of 1-3% [2]. The Scoliosis Research Society classifies idiopathic scoliosis based on the age of the patients when it is first identified: the infantile form before 3 year of age, the juvenile form between 3and 10 years of age, the adolescent form, with the majority of cases, between 10 and 18 years of age. In 2001 Lenke published a new classification system for idiopathic scoliosis, defining six type of curve through the use of sagittal plane in radiographic exam [3].

Clinical Examination

Idiopathic scoliosis is mainly a diagnosis of exclusion. Children with mild curves do not appear to have clinically symptoms, while large curve may be associated adverse health outcome, like back pain, cosmetic deformities, shortness of breath, reduced lung volumes and impaired cardiac and pulmonary function [2] Clinical examination permits to exclude secondary causes for spinal deformity. The patient should be asked about family history of scoliosis, pain at rest and during movement, neurologic dysfunction. Clinical examination must be performed with the patient standing and the operator behind the shoulders of patients. Initially, an asymmetry of the shoulders, scapular profiles, and pelvis should be evaluated. The Adam's forward bend test can help to identify scoliosis: the patients, with arms extended, bends forward until the spine is parallel to the horizontal plane, while the examiner observes an asymmetry in the contour of the spine known as a "rib hump", that indicates the presence of a curve greater than 10 degree. This results in the posterior elevation of the rib cage on the convex side of the curve and a depression on the concave side. The majority of scoliotic curves affect the thoracic and lumbar region, and ninety percent are single and to the right. The rib hump is evaluated over time with scoliometer or humpometer at regular intervals. Normal rib hump values are up to 5-7° in adolescenties.

Diagnostic Exams

Abnormalities of spine require a standard radiographic evaluation in orthostatic position. The curve consists of three vertebrae in radiography: upper and lower apical vertebrae, apex vertebra with major rotation. X-ray exam allows measurement of the curve using the Cobb method, assessment of skeletal immaturity by Risser grading of the iliac aphophysis, assessment of vertebral rotation through Nash and Moe classification. The Cobb method permits to estimate the magnitude of the curve through radiographic posterioranterior view. The Cobb angle is formed by a perpendicular line to the top of the superior vertebrae and a perpendicular line to the bottom of the inferior vertebrae of major scoliotic curve. The value of the Cobb angle allows to the orthopedic to determine and to follow the treatment and to assess the risk of progression of scoliotic curve.

Curves less than 30 degree at skeletal maturity are unlikely to progress, while curves greater than 30 degree worsen over a lifetime and may be associated with adverse health outcomes. The Risser grade, from zero to five, gives a useful evaluation of growth potential by grading the progress of bony fusion of iliac aphophysis that occurs from anterolateral to posteromedial direction. Risser grade 0 suggests no ossification, while grade 5 shows complete bone fusion of the aphophysis. Recently Sanders developed a new method based on ossification of the physes in metacarpals and phalanges [4] vertebral rotation is quantified by the Nash and Moe method: degree 0 indicates no rotation, grade 4 a complete rotation of the vertebrae.

Treatment

Nearly 10% of people with idiopathic scoliosis will require some form of treatment, and 0,1% will eventually require surgery [5]. Skeletal maturity plays a critical role in guiding treatment options for idiopathic scoliosis. The conservative treatment is focused on slowing curve progression before skeletal maturity, in restoring trunk asymmetry and balance, in reducing morbidity and pain. This treatment consists of observation, physical therapy, and brace. Physical therapy, including auto-correction, stretching, strengthening, and respiratory exercises, have been used to treat musculoskeletal problem associated with idiopathic scoliosis [6]. The forces of the brace permit to de-rotate the pelvis and the shoulders and to bring the body into normal alignment [5]. Physical therapy has not been show to improve the scoliotic curve, whereas brace has been proven to improve the curve [1]. Scoliotic curves below 20 degrees require observation, curves between 20 and 25 degrees require the use of a brace and observation, curves between 26 and 45 degree require basically the use of brace. Surgery should be performed for curves greater 45 degree when there is growth remaining to stop the progression of the curvature. The literature describes a large variety of interventions, but posterior fusion has long been a standard procedure for treatment of idiopathic scoliosis. Spinal fusion surgery is associated with significant risk in the short (5%) and long term (6-25%) [5].

Conclusion

The etiology of idiopathic scoliosis is unknown and multifactorial. Bracing and possibly exercise treatment can interrupt or slow progression of scoliosis in children. The presence of heterogeneity in exercise protocols and poor methodological quality limit the validity of studies. There is little or no evidence on long-term outcome for the treatment in adolescence or effect on adult health outcomes. Prospective study on the potential harms of screening, including psychosocial effects and radiation exposure estimates for screened, is needed.

References

1. Anwer S, Alghadir A, Abu Shaphe M, Anwar D (2015) Effects of Exercise on Spinal Deformities and Quality of Life in Patients with Adolescent Idiopathic Scoliosis. Biomed Research International 2015: 123848.
2. Dunn J, Henrikson NB, Morrison CC, Blasi PR, Nguyen M, et al. (2018) Screening for Adolescent Idiopathic Scoliosis: Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA 319(2): 173-187.
3. Tavares Junior MCM, Ledur FR, Letaif OB, Marcon RM, Cristante AF, et al. (2017) Anatomical and radiological characteristics in adolescent idiopathic scoliosis with surgical indication. Rev Bras Ortop Apr 52(3): 344-348.
4. Minkara A, Bainton N, Tanaka M, Kung J, DeAllie C, et al. (2018) High Risk of Mismatch Between Sanders and Risser Staging in Adolescent Idiopathic Scoliosis: Are We Guiding Treatment Using the Wrong Classification? Journal of Pediatric Orthopedics 22: 3.
5. Bettany Saltikov J, Weiss HR, Chockalingam N, Taranu R, Srinivas S, et al. (2015) Surgical versus non-surgical interventions in people with adolescent idiopathic scoliosis. The Cochrane Database of Systematic Reviews 24(4): CD010663.
6. Yagci G, Yakut Y, Simsek E (2018) The effects of exercise on perception of verticality in adolescent idiopathic scoliosis. Physiotherapy Theory and Practice 8: 1-10.