



## AN OVERVIEW ON IDIOPATHIC SCOLIOSIS DIAGNOSIS AND MANAGEMENT IN ORTHOPEDIC CARE

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### ABSTRACT

Spinal deformities since ancient times have been diagnosed and managed by Hippocrates and Galen and were discussed and described based on scientific fundamental principles that are often experimented theories that focused on logical analysis and observation that led to impressive ways of management using spinal traction and manipulation. The different etiological roots of scoliosis suggested that there was no standardized or systemic classification for the etiology of scoliosis. Thus, certain conservative and surgical interventions were imposed and were considered as the optimal disease therapeutic and assessment measures especially in cases of idiopathic scoliosis. The SOSORT (the Society in Scoliosis Orthopedic and Rehabilitation Treatment) project was first introduced back in 2005 and is renewed every 3 to 5 years under the guidance of high-quality clinical trials to provide new descriptive and informative guidelines for professionals involving conservative idiopathic scoliosis management. To highlight the importance of SOSORT and the scoliosis research society in orthopedic care. A systematic review of MEDLINE and PubMed databases was collected to identify published relevant articles, documents, and multiple literature reviews using the following keywords: "adult scoliosis surgery," "Idiopathic scoliosis," "adult spine deformity surgery," "Treatment," "Guidelines" "outcomes," and "complications". The therapeutic goals for treating scoliosis rely on adopting conservative and intraoperative maneuvers to correct the deformity and prevent further deterioration. The SOSORT guidelines have always been a big offer to overview for the developed evidence on scoliosis field in specific.

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### Introduction

Spinal deformities since ancient times have been diagnosed and managed by Hippocrates and Galen and were discussed and described based on scientific fundamental principles that are often experimented theories that focused on logical analysis and observation that led to impressive ways of management using spinal traction and manipulation. Moreover, little was known in terms of scoliosis but often was assumed to be one of the spinal deformities that can be caused by complications related to tuberculosis [1, 2]. However, these ancient principles inspired and influenced further medical studies and research for more than 1500 years [3]. In present times, scoliosis remains a tremendous controversy genetically and pathologically, although clinical theories regarding scoliosis defined the causes of scoliosis into five types: idiopathic, neuromuscular, congenital, thoracogenic, and syndromic [4].

The different etiological roots of scoliosis suggested that there was no standardized or systemic classification for the etiology of scoliosis. Thus, certain conservative and surgical interventions were imposed and were considered as the optimal disease

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therapeutic and assessment measures especially in cases of idiopathic scoliosis. Moreover, scoliosis progressive conditions have always been a challenge to laid out and discussed among orthopedic surgeons in terms of currently available therapeutic options and their benefits. The SOSORT (the Society in Scoliosis Orthopedic and Rehabilitation Treatment) project was first introduced back in 2005 and is renewed every 3 to 5 years under the guidance of high-quality clinical trials to provide new descriptive and informative guidelines for professionals involving conservative idiopathic scoliosis management. However, that does not exclude the possibility of operative corrections for curves that require a surgical approach regarding life-threatening conditions or early-onset scoliosis [5].

This review will highlight updates in a conservative and surgical approach that will assist orthopedics in better understanding scoliosis to improve patient care.

## Materials and Methods

A systematic review of MEDLINE and PubMed databases was collected to identify published relevant articles, documents, and multiple literature reviews using the following keywords: “adult scoliosis surgery,” “adult spine deformity surgery,” “outcomes,” and “complications.” Only English documents, articles, and literature reviews were included after they were evaluated and met the needed criteria for this review.

### Review

#### Definitions

In general, scoliosis is often defined as an abnormal heterogeneous group of illnesses that represents a complex 3D deformity of the spinal segment, changing the position and shape of the trunk, spine, and thorax. Scoliosis syndrome as described by ancient physicians such as Hippocrates and Galen. However, Galen was the first to name and define the term ‘scoliosis’ which means curved or crooked [3]. Furthermore, most of the presented scoliosis are idiopathic of unknown origin and some manifests several causes mainly clinical signs related to tuberculous spondylitis [6]. The Scoliosis Research society suggests confirming the disease after observing Cobb angle changes starting from 10° or higher and measurement of axial rotations at the apical vertebra [7].

#### Epidemiology

About 20% of the cases presented with scoliosis are secondary, and the remaining 80% are of idiopathic origin. The prevalence of adolescent idiopathic scoliosis with a spinal Cobb angle deformity in the general population ranges from 0.93% in girls and 0.25% in boys. However, the progression of the disease is seen in females [8].

About 10% of these cases require a conservative regimen and about 0.1%-0.3% require operative intervention for correction. In girls and boys, the ratio of spinal Cobb angle deformity of 10°-20° is merely (1:3:1), in between 20° to 30° it increased to (5:4:1), and when the angle values exceed 30° the ratio is 7:1. If the spinal Cobb angle deformity exceeds 30° -50° there is a high risk of developing critical disabilities, cosmetic obstacles, and progressive physical pains later in adult life [9, 10].

#### Classification of Idiopathic Scoliosis and Grading of Deformity

Few classifications relevant to conservative plans are used apart from research work. James classification approach is the preferred credited classification of idiopathic scoliosis [11, 12]. Angular recognition and the 3D dimensional topographic findings are mostly used in classifications of idiopathic scoliosis. The table below will present a relevant classification suggested by the SOSORT guidelines after an in-depth analysis of standard and digital radiography (**Table 1**) [13].

**Table 1.** Classification of Idiopathic Scoliosis and Grading of Deformity [13]

Stages	Age when diagnosed	Angular	Cobb degrees	Topographic	Apex	
					From	To
Infants	0-2	Low	Up to 20°	Cervical	---	Disc C6-7
Juvenile	3-9	Moderate	21°-35°	Cervico-thoracic	C7	T1
Adolescent	10-17	Moderate or Severe	36°-40°	Thoracic	DiscT1-2	Disc T11-12
Adulthood		-Severe	- 41°-50°	-Thoraco-lumbar - Lumbar	-T12	- L1
		-Severe to advanced severity	- 51°-55°		-T12	- L1 to L2
		-Advanced severity	-56° or more			

#### Treatment

The therapeutic goals for treating scoliosis rely on adopting conservative and intraoperative maneuvers to correct the deformity and prevent further deterioration. Conservative treatment is considered for patients of early-onset scoliosis according to SOSORT 2018 guidelines recommendations. These guidelines aim to provide evidence-based and high-quality knowledge to be embraced in clinical practice [13].

*The goal of Conservative Treatment*

The goals of conservative therapy are mainly subdivided into two groups: functional and morphological. In the recent guidelines, 80% of the goals agreed upon are listed in the table below and recorded according to their importance (**Table 2**) [14].

**Table 2.** Goals of Conservative Treatment Suggested by the SOSORT Consensus Paper [14]

Goals of conservative treatment
Beauty and Esthetics
Evaluation of the negative and positive aspects and Quality of life
Disability
Signs Back pain
The psychological scale of well-being
Evolution of the disease in adulthood
Breathing ability
Cobb degrees' deformity
Further therapy needed in adulthood

*Conservative Treatment Options*

Non-operative treatment is widely agreed upon as a golden standard for early-onset scoliosis treatment and is considered beneficial in patients who can tolerate noninvasive procedures. Initially, it has proved to be the most effective with satisfactory correction achievements. However, all forms of non-operative therapy should be delivered actively with the participation of the patient and caregiver. Nevertheless, the need for an experienced multi-disciplinary approach and monitoring method of therapy and outcomes is crucial in conservative treatment.

Nonoperative therapy may involve Physiotherapeutic Scoliosis-specific Exercises (PSSE), Special Inpatient Rehabilitation (SIR), serial casting, and bracing. Some of these treatments such as (PSSE) remain controversial, but others can delay or replace the need for surgical therapy. Observation remains the first step of management [13].

PSSE includes outpatient follow-up twice to 7 days per week, depending on the therapeutic method, ability of the patient, and motivation to carry on with the treatment. PSSE usually depends on the character of the preferred therapeutic methods. However, special inpatient rehabilitation includes intensive hospitalized follow-up of patients 3 to 6 weeks and depends on the recommended hospital department protocols [13, 15].

Bracing and casting are considered the most common beneficial conservative treatment for idiopathic scoliosis. Braces halts the progression of scoliosis but is not as efficient as casting according to some practiced clinical trials. On the other hand, casting techniques require general anesthesia and are scheduled for replacement every 2-3 months following the growth of the patient [16, 17].

*Operative Treatment*

Operative therapies are recommended in cases of forced correction. It is categorized based on the amount of force applied for correction into distraction-based, growth-guided, and compression-based. In the distraction-based method, a distractive mechanical force is applied on the ribs or pelvic region and spinal segments, it includes traditional growing rods, vertical expandable prosthesis titanium ribs, and magnetically controlled growing rods. In growth-guided method, the apical vertebrae and the end are anchored, were the spine slides down along with the rod, this method includes modern Luque trolley and Shilla system. In compressive based method the applied force is located on the convex side causing inhibited growth of the ipsilateral side, this method includes vertebral body stapling and vertebral body tethering. However, growth-guided method is commonly known to have high complication rates. Moreover, operative treatment is expected to be costly and has long follow up timeline [5].

**Conclusion**

The therapeutic goals for treating scoliosis rely on adopting conservative and intraoperative maneuvers to correct the deformity and prevent further deterioration. The SOSORT guidelines have always been a big offer to overview for the developed evidence on scoliosis field in specific. According to these guidelines, conservative treatment should always be the first line of management. For curves requiring invasive corrections, surgical techniques may vary depending on the patient's deformity, and the ability of the surgical team to make these corrections possible.

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