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SCOLIOSIS RECOVERY USING THE SCHROTH METHOD

Mircea OLTEANU[1]

Abstract: *Scoliosis is a three-dimensional deformation of the spine that can affect the posture, mobility and quality of life of patients. Medical rehabilitation of scoliosis involves complex and multidisciplinary methods, including therapeutic exercises, physiotherapy, the use of corsets and, in severe cases, surgical interventions. The aim of this study is to analyse the effectiveness of rehabilitation methods in correcting the curvature of the spine and creating patient activity. The rehabilitation program includes specific postural re-education exercises, methods such as Schroth and SEAS, electrostimulation and hydrokinetotherapy. The results of the studies show that personalized interventions, applied in the long term, contribute significantly to increasing spinal alignment and reducing associated symptoms. In conclusion, a combined approach, adapting each patient, is essential for achieving optimal results in the management of scoliosis.*

Key words: *Scoliosis, recovery, schroth method, medical rehabilitation*

1. Introduction

The word “scoliosis” comes from the Greek language and means “bend/bend” or “bend”, like a path in the heart of a rocky mountain, or the image of a tree trunk that has been deformed during growth due to multiple injuries, despite which it always tries to maintain its vertical axis.

This was a remarkable observation because Hippocrates realized that many of the deviations occurred in patients who were otherwise in good health, but he also realized the errors in diagnosis in early cases [8].

Physical therapy is the main means of recovery along with other specific therapeutic means, such as massage, electrotherapy, and hydrotherapy [5].

The spine, also called the "axial skeleton", is an important segment of the locomotor apparatus due to its verticality, with an important role in supporting the body and protecting the contents of the spinal canal during the most complex movements, through muscular, bone and ligamentous structures.

Structure of the spine:

- 7 cervical vertebrae;
- 12 thoracic vertebrae;
- 5 lumbar vertebrae;
- 5 sacral vertebrae united to form the sacrum;

[1] Department of Physical education and special motor skills, *Transilvania* University of Braşov.

• 4-5 coccygeal vertebrae [4].

Thus, the spine is made up of 33-34 vertebrae that can be grouped into two categories:

• Proper (true) vertebrae;

• False vertebrae [12].

The human spine is an extremely complex three-dimensional structure made up of over 100 joints that provide stability to the trunk and act as a lever to support the head during movements and physical activities. The spine also protects the spinal cord, nerve roots, and vertebral arteries [9].

2. Symptomatology

The symptoms of scoliosis vary depending on the severity of the spinal curvature, the patient's age, and the type of scoliosis (idiopathic, congenital, neuromuscular, etc.). Here are the main symptoms associated with scoliosis:

- Asymmetry of the shoulders and hips.
- Protrusion of one shoulder blade.
- Abnormal curvature visible when bending forward.
- In severe cases, difficulty breathing due to chest compression [11].

2.1. Objectives

In physical therapy, the following basic objectives are pursued:

- General and mental relaxation;
- Correction of body alignment and posture;
- Increasing joint mobility;
- Increasing muscle endurance and strength;
- Increasing muscle coordination;
- Restoring balance and coordination;
- Training for exertion;
- Respiratory and sensitivity re-education [3].

Medical recovery highlights the individualized goals of each patient.

The main goals of recovery are:

• Avoiding surgery;

•Slowing or preventing further progression;

•Stabilizing three-dimensional spinal corrections;

•Improving thoracic mobility and functional breathing;

•Trunk symmetry – aesthetic improvements;

•Postural awareness and postural changes;

•Home exercise program (HEP) [6].

2.2. Diagnosis

The objective examination includes height measurement, gait and foot shape examination, skin inspection, pubertal development assessment, shoulder and iliac crest symmetry, neurological examination, and the Adams test.

Imaging investigations, including plain frontal and sagittal radiography, represent the “gold standard” for the radiological diagnosis of scoliosis [7].

2.3. Treatment

The treatment of idiopathic scoliosis requires specific, individualized, three-dimensional physiotherapy.

The Schroth method is the oldest and most complex form of conservative scoliosis therapy. The SEAS (Scientific Exercises Approach to Scoliosis) approach is also another internationally recognized method in the three-dimensional treatment of scoliosis.

Detecting scoliosis at an early stage is an essential component in ensuring the

success of the treatment.

From 10 degrees Cobb, structural idiopathic scoliosis requires three-dimensional physiotherapy treatment. The most complex and most widely used method worldwide is Schroth therapy.

Below 20°, regular three-dimensional physiotherapy is recommended (e.g. Schroth therapy, SEAS therapy), between 20-40° Cobb, in addition to three-dimensional Schroth physiotherapy, SEAS, it is necessary to wear a corset.

In some cases, a corset is also indicated for scoliosis below 20°. For example, scoliosis with a pronounced progression or its installation under the age of 10.

Above 40-50° Cobb, the patient must be evaluated by a team of specialist surgeons to discuss the need for surgical intervention.

Conservative treatment of scoliosis requires permanent collaboration between the patient (parents) - physiotherapist - doctor and other specialists. [10]

2.4. Recovery objectives

Complex physiotherapy treatment involves well-defined objectives, means and working methods, all subordinate to the main objectives which are:

- Softening of the spine;
- Straightening of scoliotic curves;
- Concentric toning of the muscles on the convex side of the curvature;
- Eccentric toning of the muscles on the concave side of the curvature;
- Active detorsion of the spine;
- Correction of shoulder and pelvic asymmetries;
- Correction of chest asymmetries;
- Formation of the correct body posture reflex;
- Improvement of respiratory function [2]

3. Materials and Method

Schroth therapy is a special method of gymnastics based on three-dimensional breathing. Thus, a positioning, an adjustment of the patient in a corrective direction is performed to self-correct through breathing and retrain the brain to send corrective impulses back to the muscles.

The Schroth exercise program is the only one that addresses scoliosis three-dimensionally, in the 3 planes: frontal, sagittal, transverse.

The Schroth method uses postures according to the model of three parallel rectangles. The first of the rectangles includes the pelvis, lumbar spine and abdomen, after the navel and ribs. The second, includes the upper portion of the abdomen and chest. The lower limit is determined by the 3rd and 12th thoracic vertebrae. The third rectangle is outlined by the line of the limbs and shoulders. [9]

The method is distinguished by the following exercises:

- Ventilation – Known as “rotation with blowing angle”. In these breathing exercises, the air is voluntarily directed towards the areas of curvature with concavity. The inhalation is made ample, the exhalation is deep with pressure on the area with hump for the almost total elimination of gases simultaneously with the contraction of the muscles in the area. The action is accompanied by the rotation of the corresponding segments of the chest;
- Mobilization – They are intended to improve the motor function of the joints, especially at the level of the spine and the

shoulder girdle;

• Modeling- Derotation aims at the correction of vertebral and costal rotations; while maintaining the fixed pelvis, the correction being made with maximum muscle tension. Breathing is an essential element in modeling;

• Traction-energetic – derotation also occurs during passive stretches, the musculo-ligamentous apparatus significantly modifying its position and tension, acting on the spine and all affected components, especially in the transverse plane;

• Elongation- They mainly impact on passive joint elements (joint capsules, ligaments) [5].

New, current methods applied in orthopedic treatment:

• BioScanner Biosculptor is one of the CAD (Computer-Aided Design)-CAM (Computer-Aided Manufacturing) systems. It combines CAD, laser scanning, three-dimensional imaging and motion detection technology, allowing the specialist to choose the clinical techniques suitable for patients. Using this technology, the specialist can position the body horizontally for TLSO orthoses;

• Bone stimulation. Today, several types of bone stimulation are used, some of which are used in parallel with spinal orthoses, without interfering with the control that an orthosis provides.

This treatment has been shown to improve the healing rate by 21%, compared to cases where a stimulator was not used [1].

3.1. Physiotherapy program

Exercise 1

From a standing position, the patient simultaneously raises the upper limbs forward to shoulder level with knee flexion. On inspiration, we tense the abdominal and lumbar muscles, maintaining the basic position.

Dosage: 5 sets – 7 reps

Exercise 2

Lying on the left side with the left arm in extension of the head, the right arm positioned at hip level, the left lower limb flexed 90 degrees forward.

Under the left hip we position a roller to reach a corrected middle position for the lumbar spine. The upper lower limb extends and the footrests on the floor - the upper hand on the hip to help move the pelvis in a posterior caudal direction.

Elongation of the spine during normal breathing - exhale before the corrective breath.

Dosage: 5 sets – 7 reps

Exercise 3

Supine, knees bent 90 degrees, feet flat on the floor.

Repetitive anterior movements will be performed with segments oriented mostly posteriorly around the lumbar apex, during normal breathing.

Patients maintain core tension while moving.

The therapist may provide tactile support under the spinous processes to sense emergent movement.

Exercise 4

Face-lying with arms slightly obliquely up

Corrected posture, prone on chair/foam block. In the case of L-type, push with the flexed knee of the T-side into the floor to activate the psoas muscle with an isometric contraction in hip flexion. Rice bags placed under the ventral prominence to derotate the rib cage and under the shoulder on the

T-side. Two soft rollers under both shoulders (for adults), the shoulder on the T-side more supported to derotate the shoulder block, for L-type under the hemibasin on the T-side. For T-type, the rib cage should be moved to the L-side, the head aligned. On the T-side the arm is horizontal and at a right angle; on the L-side the arm is slightly diagonal to stretch.

Exercise 5

Supine, knees bent, feet on the ground

The patient is asked to push the right side into the bag while exhaling, and the left side to be relaxed.

Exercise 6

Sitting on a stool, left arm with elbow bent and tilted to the side supported by the bar of the bar, right arm extended upwards grasping a band.

Corrected position in sitting position with L side towards the bar. L side arm extended with internal rotation. Band fixed approximately 2 or 3 bars above the head. T side arm with elbow flexed, shoulder slightly raised and externally rotated fixed in a loop of the band; hand holds the band.
Elongate the spine while breathing normally - exhale before corrective breathing

While exhaling, pull the band down until the arm reaches 90° (concentric muscle activity). Thoracic hunchback should be corrected ventrally and medially.

Throughout the exercise, maintain the movement of the thoracic block towards the L side.

While inhaling, raise the T side arm again until you reach a raised position and try to maintain the thoracic corrections (eccentric activity). The left arm helps to keep the thorax displaced to the side. Raising the T side arm more than 90° should help generate the correction for the cervicothoracic curvature.

Exercise 7

On the knees, the left arm is held under the bars of the trellis at shoulder level, the right arm is held by a stick with the elbow at shoulder level to the side.
During inspiration, the patient is asked to pull the left hand into the trellis, and with the right to push down on the stick.

Exercise 8

Seated on a stool with arms attached to the bar at shoulder level
Right arm attached 3 slats higher than the left arm, with lateral displacement of the chest in hypercorrection towards the L side; L side forearm on a step to stabilize the diagonal position. T side arm adjusted to the cervicothoracic curvature. Head aligned or in lateral flexion towards the L side.

Exercise 9

Standing, knees slightly bent, torso tilted at 45 degrees, arms gripping the pole at shoulder level, pole secured to an elastic band on the bar.

Elongation (down) while breathing normally - exhale before corrective breathing (breathing focuses mainly on the back direction for the weak side).

Activation of the ventral muscles (oblique and transversus muscles, anterior thigh muscles) to derotate the rib cage through the ventral prominence and facilitate thoracic flexion to restore thoracic kyphosis.

T-side hand pulls the bar, L-side hand pushes into the bar - The weak area opens posteriorly.

Exercise 10

Standing, arms at shoulder level on the bar, elbows bent at shoulder level.
Squats with extension will be performed with normal breathing - exhalations before corrective breathing

- Change position during exhalation, monitoring corrections in motion;
- Maintain basic corrections and basic tension;
- Check basic corrections and basic tension.

4. Results and Discussions

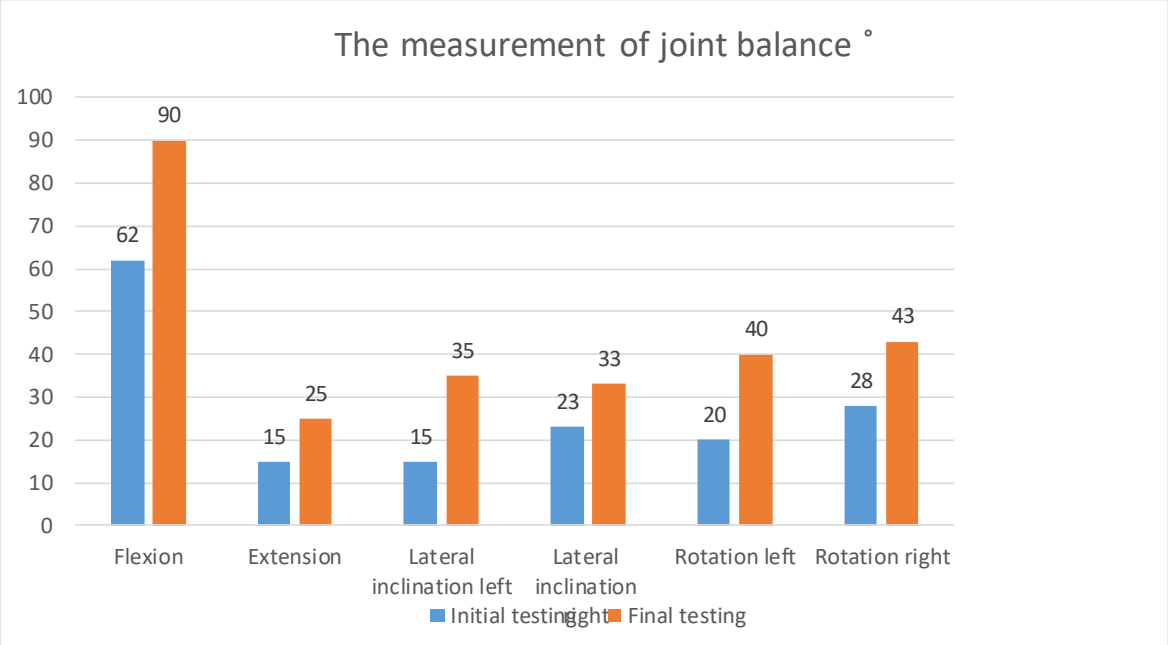

Fig. 1. *Joint balance chart °*

Table regarding the measurement of joint balance ° Table 1

Movement	**Initial testing °**	**Final testing °**
Flexion	62 °	90 °
Extension	15 °	25 °
Lateral inclination left	15 °	35 °
Lateral inclination right	23 °	33 °
Rotation left	20 °	40 °
Rotation right	28 °	43 °

The evaluation of trunk range of motion revealed a significant improvement in mobility in all planes of motion, following the application of the three-dimensional

physiotherapy program. The values recorded at the final testing indicate a considerable increase compared to the initial moment: flexion increased from 62° to 90°, extension from 15° to 25°, left lateral tilt from 15° to 35°, and right lateral tilt from 23° to 33°. Trunk rotation also recorded a notable evolution, with an increase from 20° to 40° on the left side and from 28° to 43° on the right side.

These results reflect a global improvement in segmental mobility of the spine, a reduction in paravertebral muscle stiffness, and an optimization of three-dimensional postural control.

The progress recorded confirms the effectiveness of the physiotherapy exercise program in restoring muscle balance and increasing the functional flexibility of the spine, essential aspects in the conservative treatment of idiopathic scoliosis.

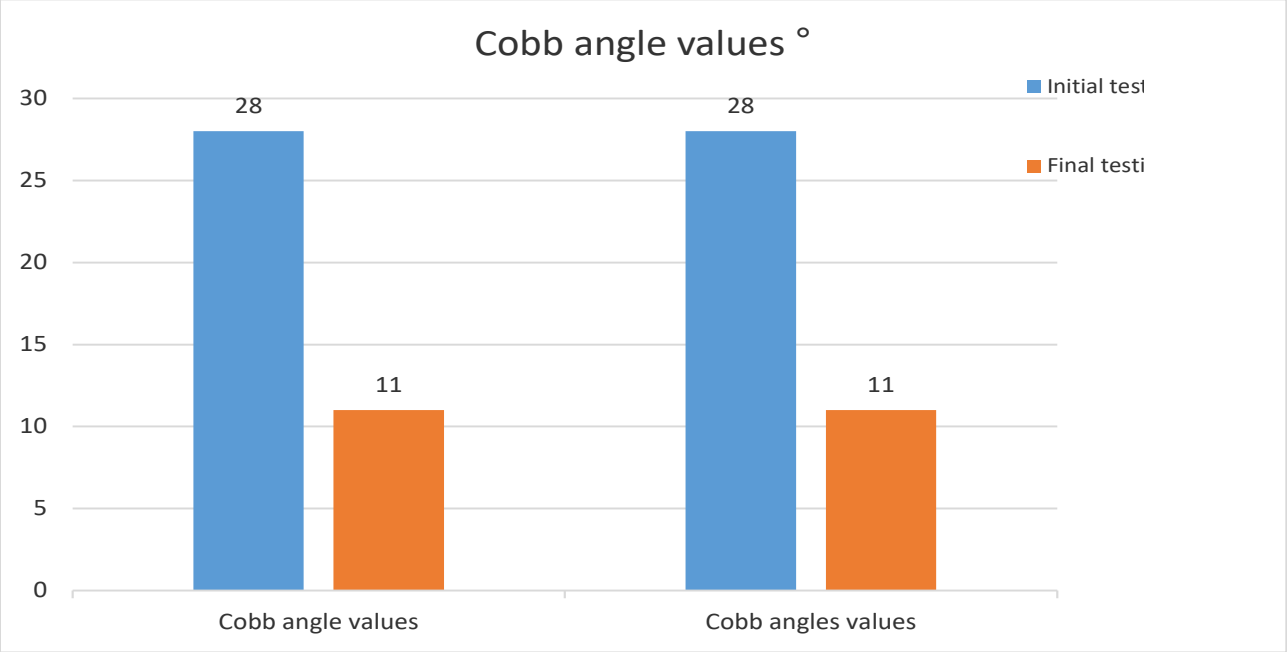

Fig. 2. *The Cobb angle values °*

Table regarding the Cobb angle values ° Table 2

Cobb angle values °	**Initial testing °**	**Final testing °**
	28 °	11 °

Radiological evaluation of the Cobb angle revealed a significant reduction in the degree of spinal deviation between the initial and final testing. The initial value, of 28°, was reduced to 11° at the end of the three-dimensional physiotherapy program, indicating a 17° decrease in the scoliotic curvature.

This decrease represents a relevant clinical and functional improvement, confirming the effectiveness of the conservative treatment applied.

The results obtained suggest that the consistent application of specific three-dimensional exercises (such as the Schroth method or SEAS) can contribute to the partial correction of the scoliotic deviation, to the improvement of muscle balance and to the optimization of the postural alignment of the spine.

The significant reduction of the Cobb angle demonstrates the positive impact of the physiotherapy intervention on the stability and symmetry of the spine, supporting the importance of an early and individualized approach in the treatment of idiopathic scoliosis.

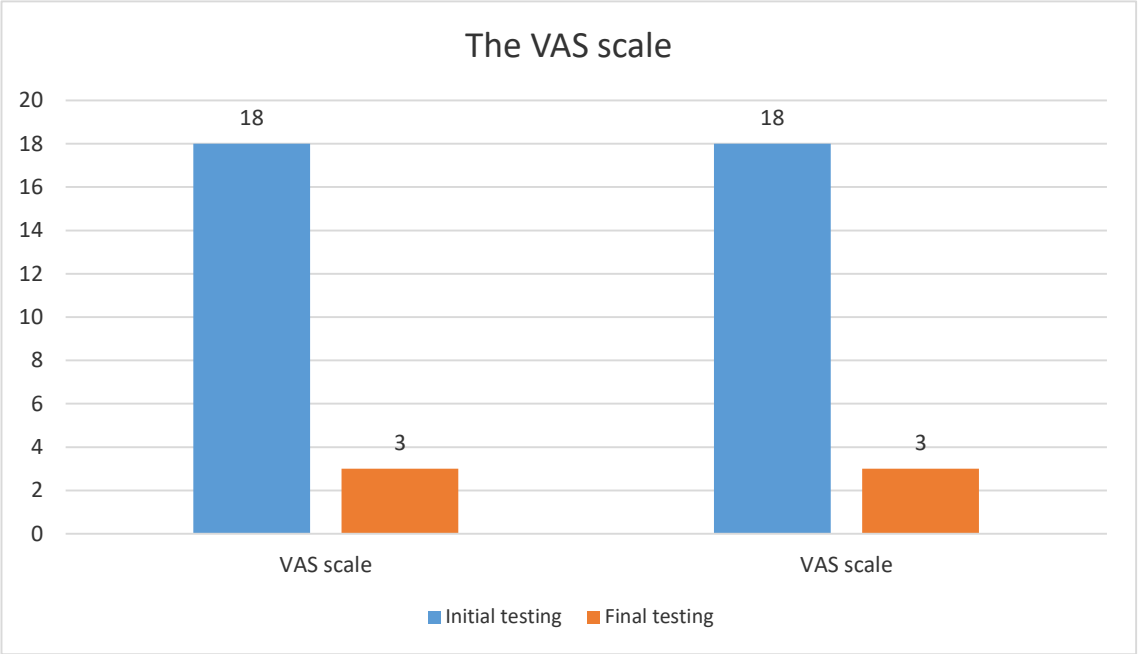

Fig. 3. *The VAS scale*

Table regarding the VAS scale Table 3

The VAS scale	**Initial testing**	**Final testing**
	18 points	3 points

The assessment of the intensity of pain perceived by the patient, performed using the visual analog scale (VAS), revealed a significant reduction in pain discomfort between the initial and final testing. The initial value of 18 points decreased to 3 points after completing the three-dimensional physiotherapy program.

This decrease reflects a substantial improvement in functional status and physical comfort, suggesting a decrease in paravertebral muscle tension and an improvement in postural balance.

The results obtained confirm the effectiveness of the physiotherapy intervention in reducing pain associated with scoliotic deviation, highlighting the importance of specific exercises aimed at postural correction, increasing mobility and re-education of three-dimensional breathing.

The significant decrease in the VAS score demonstrates the positive impact of the treatment on the patient's quality of life and exercise tolerance.

5. Conclusions

Complex scoliosis therapy, although it requires time, skill and knowledge from the physiotherapist, is very important for the patient, for leading a normal life from a socio-economic point of view, by restoring him to society, by performing daily activities and increasing work capacity.

The therapeutic approach in the recovery of patients with scoliosis must be complex, include all physiopathogenic links and require associated means of recovery.

Through the main therapeutic means: Schroth Method, there was a decrease in pain when the patient performs various movements, the functional assessment of the spine in terms of mobility, had a favourable prognosis.

It can also be noted that functional recovery had significant effects and benefits, also highlighted by radiological assessment with Cobb angle measurement.

One fact is certain in the evolution of scoliosis: untreated or insufficiently treated, it shortens the patient's life.

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