



Effect of Schroth-specific exercises on postural alignment and functional outcomes following posterior lumbar fixation in a patient with thoracolumbar scoliosis: A case report

Dr. Aditi Vijay Kadam¹, Dr. Ruturaj Shete²

¹ Department of Musculoskeletal Physiotherapy, TMV's Lokmanya Tilak College of Physiotherapy, Navi Mumbai, Maharashtra, India

² Associate Professor, Department of Musculoskeletal Physiotherapy, TMV's Lokmanya Tilak College of Physiotherapy, Navi Mumbai, Maharashtra, India

Corresponding Author: Dr. Aditi Vijay Kadam

Abstract

Introduction: Scoliosis is an abnormal curvature of the spine that may lead to back pain, restricted mobility, and respiratory impairment. Thoracolumbar scoliosis persisting after posterior lumbar fixation with lumbar prolapsed intervertebral disc (PIVD) is a remarkable challenge in postoperative rehabilitation. Posterior Lumbar fixation with laminectomy provides spinal stability, decreases the neural symptoms however few functional impairments and postural imbalance may remain.

Objective: To describe the effect of Schroth method on pain, posture, core strength, chest expansion, functional outcome in a patient with thoracolumbar scoliosis following posterior lumbar fixation with laminectomy.

Methodology: The patient was a 53-year-old woman with thoracolumbar scoliosis who underwent posterior lumbar fixation with laminectomy surgery in August 2025. Postoperative assessment revealed pain (VAS 4/10), limited trunk range of motion, postural deviations, decreased core strength, breathing asymmetry and impaired activities of daily living. The physiotherapy program consisted of Schroth-specific exercises administered over 5 treatment sessions per week.

Results: After the implementation of the Schroth-specific exercise regimen, the patient exhibited considerable improvements in posture, evident by decreased trunk asymmetry, better spinal alignment. Pain levels saw a significant reduction, with Visual Analog Scale scores falling from 4/10 to 0/10. Outcomes related to functionality showed marked improvement, including enhanced performance in daily activities, increased walking endurance, and better trunk control and balance. Furthermore, advancements were noted in core muscle activation, respiratory function through the effective use of rotational angular breathing, and overall quality of life. These results indicate that the Schroth-specific exercises had a beneficial impact on the patient's recovery following surgery.

Conclusion: Schroth-based physiotherapy initiated in the late postoperative phase can effectively improve posture, breathing mechanics, and functional outcomes in patients with thoracolumbar scoliosis following posterior lumbar fixation and laminectomy. This case supports the inclusion of scoliosis-specific exercises as an adjunct to conventional postoperative rehabilitation.

Keywords: Schroth exercises, thoracolumbar scoliosis, posterior lumbar fixation, laminectomy, PIVD, physiotherapy rehabilitation

Introduction

Poor posture in daily routine, such as prolonged sitting, carrying bag on one shoulder, increased BMI, standing with uneven weight distribution over prolonged time disrupts normal biomechanics and overtime leads to back pain and postural asymmetry.^[1] One such deformity is scoliosis, defined as a three dimensional spinal curvature with a Cobb angle greater than 10°, accompanied by vertebral rotation. This condition may result in postural abnormalities, musculoskeletal pain, restricted mobility, and respiratory impairment, ultimately affecting quality of life^[1, 2].

Particularly in middle-aged individuals lumbar prolapsed intervertebral disc (PIVD) frequently coexists with spinal deformities such as thoracolumbar scoliosis. Surgical management includes posterior lumbar fixation and laminectomy aims to relieve neural compression and restore spinal stability.

However, surgery does not address three-dimensional postural deviations associated with scoliosis. Physiotherapeutic scoliosis-specific exercises (PSSE) have gained increasing recognition as evidence-based conservative interventions for Scoliosis. Among these, the

Schroth method is one of the most widely studied and clinically applied approaches. The Schroth method and other physiotherapeutic scoliosis-specific exercises (PSSE) place a strong emphasis on spine elongation, de-rotation, and corrective breathing techniques. There is still little data to support Schroth exercises in patients who have had lumbar fixation surgery.

Multiple randomized controlled trials and systematic reviews have shown that Schroth based PSSE can decrease the Cobb angle, reduce pain, improve trunk symmetry, boost respiratory function, and positively impact quality of life for individuals with scoliosis. Additionally, it has been demonstrated that incorporating postural education in everyday activities enhances treatment and long-term postural control. Comprehensive clinical case reports that detail tailored conservative management techniques and their multifaceted results are still needed, despite mounting evidence.

This case report study details the conservative physiotherapy treatment of a 53-year-old woman with moderate thoracolumbar scoliosis through adjunctive exercises based on Schroth-based PSSE. With its focus on

pain, functional outcomes, postural symmetry, respiratory function, and radiological changes, the report adds evidence to the body of literature that is clinically relevant.

Case Presentation

A 53-year-old female arrived at the outpatient physiotherapy department reporting issues of postural asymmetry, persistent low back pain, feelings of trunk imbalance, and trouble sustaining an upright posture. She had a history of lumbar prolapsed intervertebral disc along with related low back pain and radiculopathy, for which posterior lumbar fixation with laminectomy was carried out in August 2025. The surgery proceeded without complications; nevertheless, the patient still exhibited thoracolumbar scoliosis deformity and functional restrictions. Her medical history revealed notable hypertension over the last 10 years, for which she was prescribed Telma 40 mg daily. She underwent a hysterectomy in 2017 as well. During the initial physiotherapy evaluation, the patient expressed experiencing mild to moderate discomfort in the lower back, especially when standing for extended periods, accompanied by a feeling of trunk instability and early fatigue during everyday tasks. She rated her pain intensity as 4 out of 10 on the Visual Analogue Scale (VAS). During the objective examination, a noticeable thoracolumbar spinal curvature with a shift in the trunk and a rib hump during forward bending was noted. Chest expansion was diminished on the concave side, and the patient exhibited weak deep core muscles with a strength grading of 3+/5. Her breathing was mainly apical, and she faced challenges with extended periods of sitting and standing.

The patient participated in a modified Schroth-inspired physiotherapy regimen that included physiotherapeutic scoliosis-specific exercises (PSSE), focusing on three-dimensional self-correction, postural training while sitting and standing, rotational breathing, core activation, and functional postural coordination. The intervention was tailored to suit the patient's past spinal fixation and post-laminectomy restrictions. Physiotherapy was administered five times a week in the outpatient department from September 2025 to January 2026, resulting in a total intervention duration of five months. [3, 6]

In the first phase, spanning weeks 1-2, the treatment concentrated on raising postural awareness and making corrections. Sessions took place five days each week for about 30-40 minutes. The patient was instructed on her scoliosis condition and spinal safety while undergoing training in both passive and active spinal elongation in supine and side-lying positions. Three-dimensional autocorrection support, subtle rotational angular breathing focused on the concave thoracolumbar areas, and isometric abdominal bracing for core engagement were implemented. Advancement to the subsequent stage was deemed appropriate once the patient showed comprehension of her deformity pattern and could execute basic spinal elongation on her own.

In the second phase, spanning weeks 3-4, the emphasis transitioned to corrective Schroth exercises. Therapy was administered five days a week for 40-45 minutes. Mirror feedback was utilized to enhance postural awareness, alongside adjusted Schroth exercises in a seated position, assymetric trunk stabilization, pelvic adjustment, and upkeep of a neutral lumbar posture. Breathing-focused postural adjustments and walking training with postural prompts were also implemented. Advancement relied on the

patient's capacity to hold the adjusted posture for about 10-15 seconds and exhibit enhanced breathing towards the concave side. [7, 8]

In the third phase, which included weeks 5-6, the exercises advanced towards functional integration. Sessions persisted five days a week for 40-45 minutes and featured Schroth correction in supported standing, dynamic balance activities while upholding postural adjustment, and task-oriented functional training. A home program routine was also recommended to help maintain the corrected posture throughout daily tasks. Advancement was determined by the patient's capacity to autonomously execute postural adjustments while standing and walking, along with her capability to engage in complex dynamic balance and task-oriented activities.

Radiograph:

Standing radiographs of anteroposterior and lateral radiograph were taken with patient in upright, weight-bearing and in a neutral position. It revealed lumbar scoliosis with convexity to left.



Fig 1: Standing Posterior View (Pre Physiotherapy Treatment)

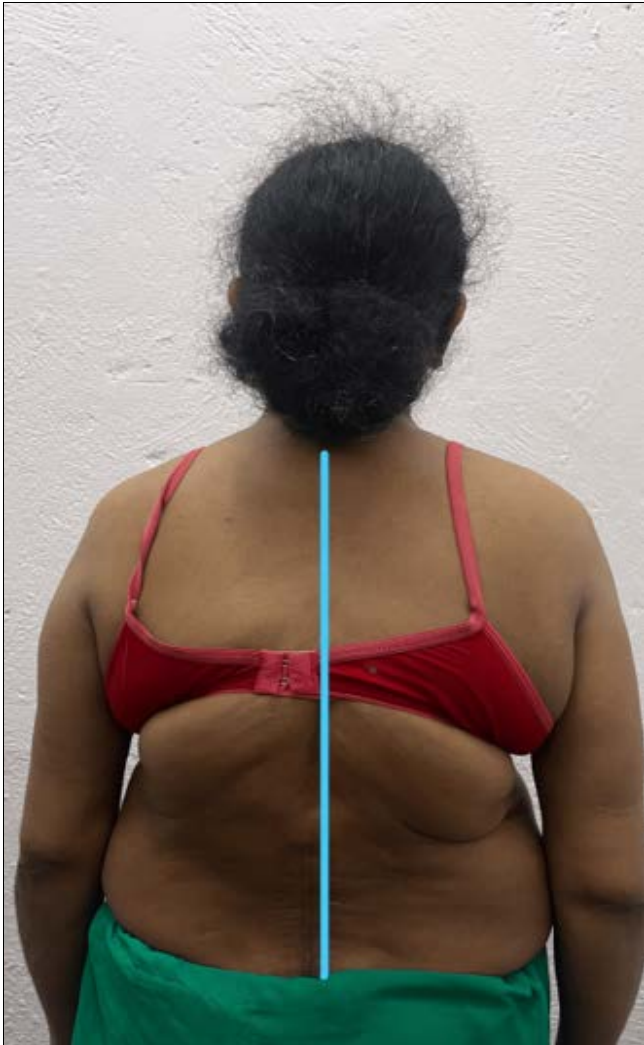


Fig 2: Standing Posterior View (Post Physiotherapy Treatment)



Fig 4: Standing AP/Lateral View X-Ray of Lumbar Spine Post Physiotherapy Treatment



Fig 3: Standing AP/Lateral View X-ray of Lumbar Spine Pre Physiotherapy Treatment

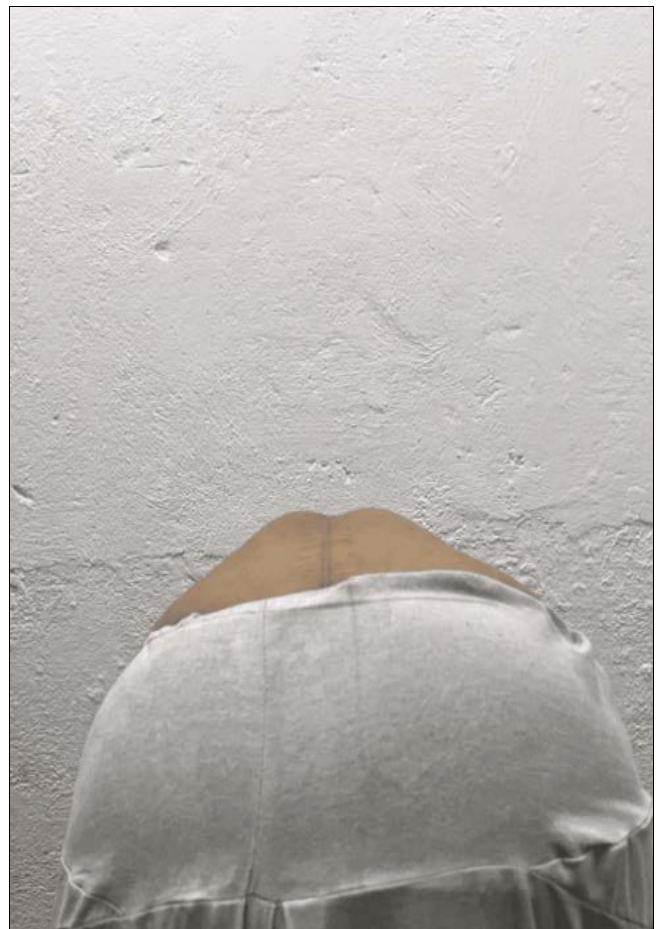


Fig 5: Adam's Forward Bend Test (Pre Physiotherapy Treatment)



Fig 6: Adam's Forward Bend Test (Post Physiotherapy Treatment)

Following the intervention, the patient's pain intensity decreased from VAS 4/10 at baseline to VAS 0/10 post-treatment, indicating a clinically meaningful reduction in low back pain. The overall intervention was associated with improvement in postural control and functional performance, with the patient demonstrating better ability to maintain an erect and corrected posture during functional activities.

Results

Pain intensity reduced from VAS 4/10 pre-treatment to 0/10 post-treatment, indicating a clinically meaningful improvement.

Outcome Measures

Table 1: Outcome Measures

Parameter	Pre-Treatment	Post- Treatment
VAS	4/10	0/10
Trunk Asymmetry	Moderate	Mild
Chest Expansion	Reduced	Improved
Core Muscle Strength	3+/5	4+/5
Functional Endurance	Limited	Improved

Discussion

This case illustrates significant clinical enhancements in pain, postural alignment, respiratory function, core strength, and functional endurance after a tailored Schroth-specific exercise regimen in a 53-year-old woman with thoracolumbar scoliosis, who had earlier received posterior lumbar fixation with laminectomy. At the initial assessment, the patient exhibited a VAS pain score of 4/10, noticeable trunk asymmetry, decreased chest expansion, weakened deep core muscle strength (3+/5), modified breathing patterns, and restrictions during extended sitting and standing. After five months of supervised physiotherapy, pain reduced to 0/10, trunk asymmetry went from moderate to mild, chest expansion enhanced, core muscle strength

rose to 4+/5, and functional endurance increased. These results indicate that rehabilitation tailored for scoliosis could play a significant role in managing ongoing functional and postural issues that may remain after surgical stabilization.

The decrease in pain noted in this case is clinically significant. The patient's VAS score reduced from 4/10 prior to treatment to 0/10 following the intervention. While pain alleviation in an individual instance cannot be solely linked to Schroth exercises, the observation aligns with the wider research indicating that exercises tailored for scoliosis may enhance pain relief and other outcomes reported by patients. Comprehensive review and meta-analysis of scoliosis-specific exercises in physiotherapy indicated enhancements in pain relief and mental wellbeing relative to traditional methods in adolescents with idiopathic scoliosis. Likewise, earlier meta-analytic research has shown positive impacts of Schroth exercise on various clinical results linked to scoliosis. [9, 11]

A potential reason for the decrease in pain is the enhancement in postural control and the distribution of mechanical stress. The approach utilized in this case focused on three-dimensional auto correction, spinal elongation, educational posture training, breathing-integrated correction, asymmetric trunk stabilisation, and functional postural exercises. These elements might have assisted the patient in attaining a more balanced and mechanically effective posture while sitting, standing, and walking. Enhanced trunk control might have led to decreased excessive strain on the lumbar and Paraspinal structures during functional tasks. Nevertheless, since the current research lacked objective assessments of spinal loading or muscle activity, this suggested mechanism should be seen as a potential explanation instead of a confirmed mechanism.

Another significant finding is the enhancement in trunk asymmetry. The visible trunk asymmetry in the patient reduced from moderate to mild after the intervention. PSSE based on Schroth specifically addresses the three-dimensional aspects of scoliosis by utilizing elongation, derotation, lateral correction, and corrective breathing. Recent systematic reviews provide evidence that PSSE is effective for enhancing spinal deformity and trunk rotation. A metaanalysis focused on Schroth 3D exercise indicated enhancements in Cobb angle, trunk rotation, quality of life, and lumbar extensor strength. [12]

The enhancement in trunk symmetry in this patient might thus be linked to consistent practice of active three-dimensional self-correction. [13] The intervention evolved from postural awareness and basic stretching to corrective exercises in seated and standing positions, then to dynamic balance and activities tailored to specific tasks. This incremental method might have allowed the patient to apply the corrected posture from a structured therapeutic setting to everyday activities. Mirror feedback was included during the corrective phase, possibly enhancing the patient's understanding of uneven posture and boosting the capability to actively replicate the intended correction. However, one should interpret radiological changes with caution as this case mainly reports clinical improvement in posture rather than a quantitatively assessed alteration in Cobb angle.

The elevated frequency of treatment might have also played a role in the noted enhancements. The patient underwent physiotherapy five days a week from September 2025 to January 2026, totalling around five months of intervention. Recent findings indicate that therapist oversight and suitable

exercise recommendations could impact the success of PSSE. A systematic review and meta-analysis from 2025 indicated that supervised PSSE was linked to notable enhancements in Cobb angle and trunk rotation angle, though heterogeneity and bias risk were still issues. Therefore, the regular supervised sessions in this instance might have enabled precise execution of three-dimensional correction and permitted the therapist to gradually adjust the exercises based on the patient's feedback.^[14]

Conclusion

Schroth-based physiotherapy initiated in the late postoperative phase can effectively improve posture, breathing mechanics, and functional outcomes in patients with thoracolumbar scoliosis following posterior lumbar fixation and laminectomy. This case supports the inclusion of scoliosis-specific exercises as an adjunct to conventional postoperative rehabilitation.

References

1. <https://ejournal2.unud.ac.id/index.php/mifi/article/view/1231>.
2. Meng F, *et al.* Comparative efficacy of schroth and core training for early postoperative recovery in adolescent idiopathic scoliosis: A single blind randomized controlled trial. *PLoS One*,2026;7:0340585. 10.1371/journal.pone.0340585
3. Park J, So WY. The Effect of the Schroth Rehabilitation Exercise Program on Spinal and Feet alignment in Adolescent Patients with Idiopathic Scoliosis: A Pilot Study. *Healthcare (Basel)*,2022;20:398. 10.3390/healthcare10020398
4. Park JH, Jeon HS, Park HW. Effects of the Schroth exercise on idiopathic scoliosis: a meta-analysis . *Eur J Phys Rehabil Med*,2018;54:440-449. 10.23736/S1973-9087.17.04461-6.
5. Schreiber S, Whibley D, Somers EC. Schroth Physiotherapeutic Scoliosis-Specific Exercisen(PSSE) Trials—Systematic Review of Methods and Recommendations for Future Research. *Children*,2023;10:954.
6. Kwan KYH, Cheng ACS, Koh HY, Chiu AYY, Cheung KMC. Effectiveness of Schroth exercises during bracing in adolescent idiopathic scoliosis: results from a preliminary study-SOSORT Award 2017 Winner. *Scoliosis Spinal Disord*,2017;16:32. 10.1186/s13013-017-0139-6.
7. Hagit B. A preliminary report on applying the Schroth method principle after surgical fusion for scoliosis in a 23-year-old female with adolescent idiopathic scoliosis: a case report. *Scoliosis*,2013;18:9. 10.1186/1748-7161-8-S2-O9
8. Schreiber *et al.* The effect of Schroth exercises added to the standard of care on the quality of life and muscle endurance in adolescents with idiopathic. scoliosis—an assessor and statistician blinded randomized controlled trial: “SOSORT,2015;10:24.
9. Chen C, Xu J, Li H. Effects of Schroth 3D Exercise on Adolescent Idiopathic Scoliosis: A Systematic Review and Meta-Analysis. *Children*,2024;11:806.
10. Jevtić N, *et al.* The Effect of Schroth Exercises and Orthotic Bracing on Changes in Sagittal Balance and Sagittal Index in Patients with Adolescent Idiopathic Scoliosis. *Exercise and Quality of Life*, 17:104-113.
11. Ma K, Wang C, Huang Y, Wang Y, Li D, He G. The effects of physiotherapeutic scoliosis-specific exercise on idiopathic scoliosis in children and adolescents: a systematic review and meta-analysis. *Physiotherapy*,2023;121:46-57. 10.1016/j.physio.2023.07.005
12. Park JH, Jeon HS, Park HW. Effects of the Schroth exercise on idiopathic scoliosis: a meta-analysis . *Eur J Phys Rehabil Med*,2018;54:440-449. 10.23736/S1973-9087.17.04461-6
13. Mills M, *et al.* The effectiveness of Schroth exercises in adolescents with idiopathic scoliosis: a systematic review and meta-analysis.
14. Dong H, *et al.* Physiotherapeutic scoliosis-specific exercise for the treatment of adolescent idiopathic scoliosis: a systematic review and network meta-analysis. *Am J Phys Med Rehabil*,2024;104:14-25. 10