International Journal of
Digital Rehabilitation & Therapy
e-ISSN:
https://ndpapublishing.com/index.php/ijdrt

Comprehensive Rehabilitation Approaches for Spinal Dysfunction Associated with Congenital Scoliosis in Middle-Aged Working Women : A Case Report

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Keywords

Congenital Scoliosis
Physiotherapy
Core Strengthening
Manual Therapy
Pain Management
Range of Motion

ABSTRACT

Congenital scoliosis is a rare spinal deformity caused by vertebral malformations during fetal development. This case report presents a 35-year-old female diagnosed with congenital lumbar scoliosis, experiencing persistent lower back pain and functional limitations. The patient underwent a four-week physiotherapy rehabilitation program focused on active range of motion exercises, core strengthening, abdominal bracing, and manual therapy techniques to improve mobility and reduce pain. Pre- and post-treatment assessments included Manual Muscle Testing (MMT), Range of Motion (ROM), and Visual Analogue Scale (VAS) for pain measurement. Post-treatment results demonstrated significant improvements in pain reduction (VAS from 7/10 to 4/10 at rest, 9/10 to 5/10 on activity), increased muscle strength, and enhanced range of motion in the lumbar spine and lower limbs. This case highlights the effectiveness of physiotherapy interventions in managing congenital scoliosis, reducing pain, and improving functional mobility. Early physiotherapy rehabilitation plays a crucial role in delaying surgical interventions, minimizing complications, and enhancing the patient's quality of life. Further studies with long-term follow-ups are recommended to assess the sustainability of these improvements.

1. INTRODUCTION

Congenital scoliosis is the common congenital spinal deformity. Congenital curvatures occur as a result of abnormal vertebral development [1]. In addition to appearance deformities, it raises the risk of low back pain and reduces spinal flexibility [2]. It is defined by lateral spinal curvature and has a population incidence of less than 1% [3].

Congenital scoliosis is typically not hereditary. Congenital scoliosis is thought to be caused by an insult to the fetus during spine embryological development (between the fifth and eighth weeks of pregnancy). As a consequence, other abnormalities such as congenital heart defects may occur, spinal cord dysraphism, and kidney malformations are frequently linked [1]. Traction (whether with a halo or instrumental) in severe congenital scoliosis has been shown to increase the risk of neurological complications. Traction for severe scoliosis, whether with a halo or instrument, can lead to neurological complications [4]. Without therapy, Children with congenital thoracic scoliosis, featuring fused ribs and a unilateral unsegmented bar adjacent to a convex hemivertebra, are likely to experience progression of the curvature [5]. The increasing deformity, which was mostly visible on the frontal plane, was caused by this abnormality [6].

Spinal congenital abnormalities typically result from (toxic) pregnancy-related disruptions. Rarely, there are inherited varieties. These are distinguished by the existence of several abnormalities [7]. The degree of correction achieved and sustained, trunk alignment and balance, pelvic obliquity alterations, and related comorbidities were assessed [8]. Hemi vertebral excision was necessary for curve rectification, and this was done in a single surgical event utilizing successive anterior and posterior procedures [9].

We looked back at patients' spine arthrodesis and anterior and posterior hemi vertebral excisions

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How to cite this article

Patrekar, S., Aphale, S., and Shinde, S. (2024). Comprehensive Rehabilitation Approaches for Spinal Dysfunction Associated with Congenital Scoliosis in Middle-Aged Working Women : A Case Report. *Int. J.* Digital Rehabilitation & Therapy, *1(1), 19-24.*

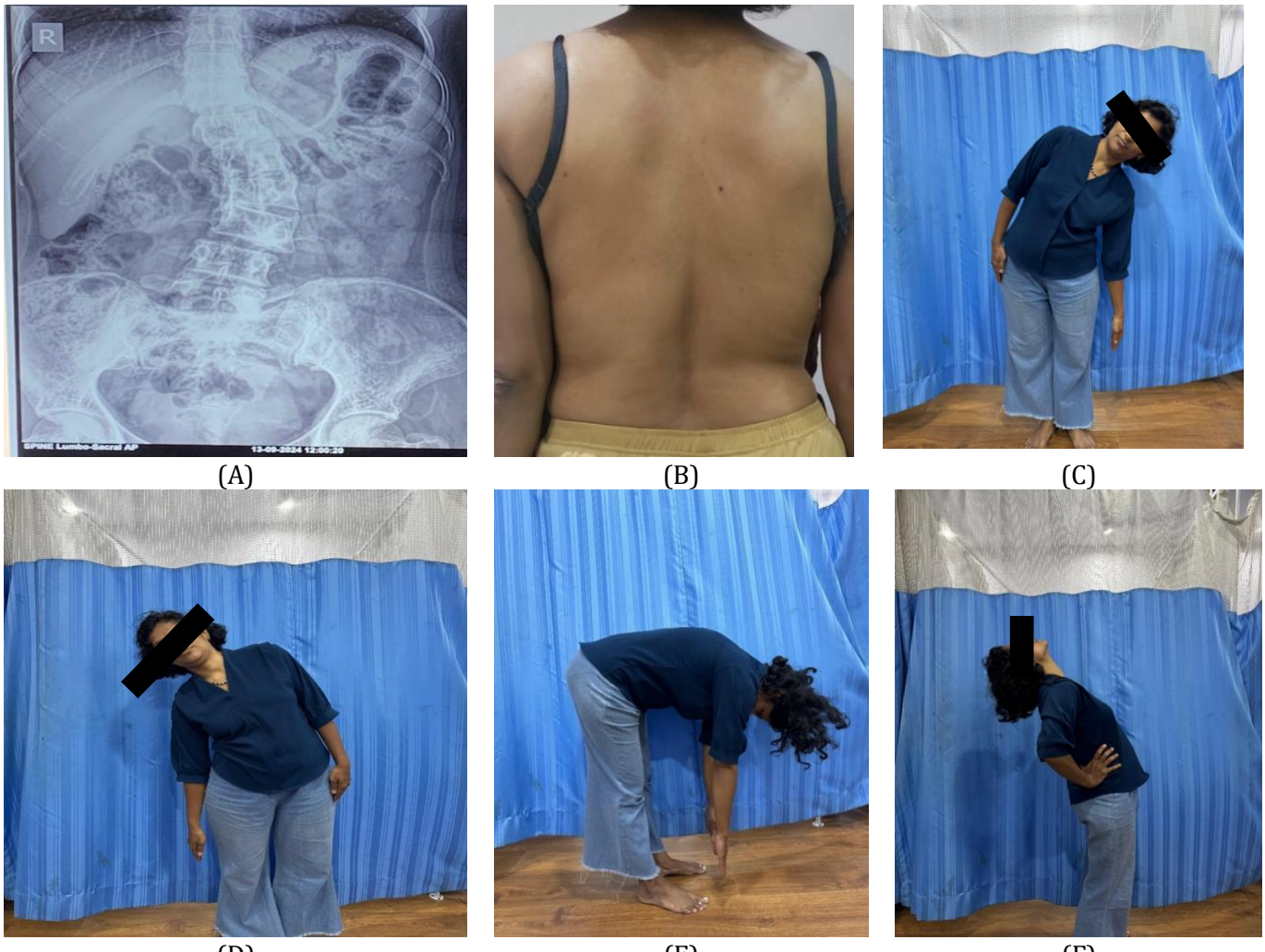
Research Article/ DOI: 10.5281/zenodo.15047191

or wedge resections. Changes in pelvic obliquity, the trunk's alignment and balance, the degree of correction achieved and sustained, and related problems were all assessed [10]. The importance of patient perspectives in evaluating scoliosis treatment outcomes is increasingly acknowledged. The primary objective of therapy is frequently to improve the patient's "quality of life." Hence, while clinical research has traditionally concentrated on physiologic outcomes like muscle strength, range of motion, or neurologic deficits, there is a growing focus on the accurate assessment of symptoms, functional status, role function, treatment satisfaction, and health care costs [11]. Hemivertebral excision was necessary for curve rectification, and this was done in a single surgical event utilizing successive anterior and posterior procedures [12].

2. MATERIALS AND METHODS

2.1. Case Presentation

We have presented a case of a 35-year-old female who came to our tertiary care hospital with complaints of pain over lower limb since 1 month. She is a known case of congenital lumbar scoliosis. Patient was apparently alright one month back when after which she started having pain over lower back. Pain was insidious in onset and non-progressive. It was moderate in intensity and constant through out the day. It aggravated with movement, walking, climbing stairs, prolonged sitting, weight lifting and relieved with rest and medication. Patient also complained of tightness over back which was sudden in onset. For the above complaints patient visited our tertiary care hospital where necessary investigation are done and was referred to physiotherapy for further management. Figures *1* show X-rays of the patient with congenital lumbar scoliosis.



(A) (B) (C)

(D) (E) (F)

Figure 1. X-ray of congenital scoliosis[A] ; Scoliotic changes[B] ;Left lateral lumbar flexion[C] ; Right lumbar lateral flexion[D] ; Lumbar flexion[E] ; Lumbar extension[F].

2.2. Clinical Findings

Prior to commencing the examination, the patient's informed consent was taken. The patient was conscious, cooperative, and able to follow instructions and had a mesomorphic build. The patient underwent assessment while standing in anterior view and posterior view. We observed right scoliosis in spine. Upon palpation, the local temperature was within normal limits. Tenderness was detected over the lower back. There was reduced muscle strength and painful restriction in the ROM in the lumbar joint. Patient rated pain as 4/10 on rest and 8/10 on activity according to the numerical pain rating scale.

2.3. Therapeutic Intervention

As needed for her recovery, the therapeutic intervention had been discussed with her family. The goals of the treatment were decided. The physiotherapy determined the progression of the intervention, which was carried out three times a day (Table 1)

Table 1. Physiotherapy interventions

Therapeutic intervention		Dosage
HMP		10 minutes
Interferential technique		10 minute
Active range of motion exercise for lower limb within pain free range	Flexion	10 reps of 3 sets
	Extension	10 reps of 3 sets
	Abduction	10 reps of 3 sets
	Adduction	10 reps of 3 sets
Active range of motion exercise for lumbar region	Flexion	10 reps of 3 sets
	Extension	10 reps of 3 sets
	Side bending	10 reps of 3 sets
Active range of motion exercise of Shoulder	Flexion	10 reps of 3 sets
	Extension	10 reps of 3 sets
	Abduction	10 reps of 3 sets
	Adduction	10 reps of 3 sets
Isometric exercise for Shoulder	Hamstring	10 reps of 1 sets with 10 seconds hold
	Quadricep	10 reps of 1 sets with 10 seconds hold
	Adductor	10 reps of 1 sets with 10 seconds hold
Tummy tucks		5 reps of 1 sets with 10 seconds hold
Core strengthening exercise		10 reps of 3 sets
Drawing in manuever		5 reps of 1 set with 10 seconds hold
Abdominal hollowing		5 reps of 1 set with 5 hold
Abdominal bracing exercise		5 reps of 1 set
Bed aerobics exercise		10 reps of 1 set
Lumbar extension maneuverer		10 reps of 1 set

Table 2. Comprehensive physiotherapy rehabilitation program (week wise)

PHASE	DURATION / WEEK	MODALITIES / EXERCISE	DOSAGES / REPITATION / SETS
Phase 1	Week 1	HMP	10 min
		IFT	Continues : 4 pole vector : 10 min
		Free exercise of LL:(supine) 1) Extension 2) Flexion 3) Adduction 4) abduction	10 reps of 3 sets
		Free exercise of lumbar region (standing) 1) flexion 2) extension 3) lateral side flexion	10 reps of 3 sets
		HMP	10 min
		Free exercise of LL	10 reps of 3 sets
		Free exercise of lumbar region	10 reps of 3 sets

Phase 2	Week 2	Isometric exercise : 1) Hamstring 2) Quadricep 3) Adductor	5 reps of 1 set with 10 sec hold
		Tummy tucks	5 reps of 1 set with 10 sec hold
Phase 3	Week 3	Isometrics exercise	10 reps of 1 set with 10 sec hold
		Core strengthening exercise : 1) Pelvic bridging 2) Arm and leg raises 3) Pelvic rotations	10 reps of 1 sets
		Drawing in manuever : with SLR	3 reps of 1 set with 10 sec hold
		Bed aerobics exercise 1) Single leg heel raises 2) Double leg heel raises 3) Back and heel raises	10 reps of 1 set
		Lumbar extension maneuver 1) Standimg lumbar extension 2) Lumbar extension while lying down	10 reps of 1 set
		Abdominal bracing exercise	10 reps of 1 set
Phase 4	Week 4	Core strengthening exercise as in phase 3	10 reps of 1 sets
		Drawing in manuever : 1) With SLR 2) With pillow	5 reps of 1 sets with 10 sec hold
		Isometrics exercises as in phase 2	10 reps of 1 set with 10 sec
		Abdominal hollowing Manuever	10 reps of 1 set with 10 sec hold
		Abdominal bracing exercise as in phase 3	10 reps of 1 set
		Lumbar extension maneuver as in phase 3	10 reps of 1 set
		Bed aerobics exercise as in phase 3 and chair aerobics	10 reps of 1 set

Abdominal bracing exercise : Preparation phase , relaxation phase , contraction phase

2.4. *Follow up and Outcome Measures*

The outcome measures were assessed after four weeks of physiotherapy . Table 3 show the pre and post treatment scores of outcome measures.

Table 3. Manual muscle testing of lower limb and lumbar

Muscle group	Pre – treatment MMT grade	Post – treatment MMT grade
Knee flexors	3/5	4/5
Knee extensors	3/5	4/5
Hip flexors	3/5	4/5
Hip extensor	3/5	4/5
Hip internal rotators	3/5	4/5
Hip external rotators	3/5	4/5
Hip adductors	3/5	5/5
Hip abductors	3/5	4/5
Back Rotators	3/5	4/5
Lumbar flexors	3/5	4/5
Lumbar extensors	3/5	4/5
Lumbar side flexors	3/5	4/5

MMT : manual muscle testing . 0:No contraction; 1:Flickering of contraction; 2:Full range of motion in gravity eliminated position; 3:Full range of motion against gravity position; 4:Full range of motion against gravity with minimal resistance; 5:Full range of motion against gravity with maximal resistance .

Table 4. Range of motion of Hip, Knee, Ankle joints

Joint	Movement	Pre treatment ROM	Post treatment ROM
Knee	Flexion	84°	90°
	Extension	12°	15°
Hip	Flexion	40°	90°
	Extension	15°	20°
	Abduction	30°	40°
	Adduction	10°	15°
Lumbar	Flexion	45°	55°
	Extension	10°	15°
	Lateral flexion	25°	28°

Table 5. Pain assessment

VAS	Pre-Treatment	Post-Treatment
At rest	7/10	4/10
On activity	9/10	5/10

VAS : Visual analogue scale

4. DISCUSSION

A sideways curvature of the spine is known as scoliosis. It may be either non-structural or structural. In structural terms, the vertebrae rotate along their long axis in addition to tilting sideways. They're not in the non-structural category. Visible malformation was the only sign usually. Adults who have stood for a long time sometimes experience pain. Cobb's angle, which is the angle formed by the lines traversing the vertebral borders at the curves' ends, is used to quantify the curve's severity. Since the conservative care guidelines for scoliosis were developed, practitioners have identified several exercise techniques that they claim are useful in slowing the evolution and reducing the size of the scoliosis curve [13].

With notable effects on cervical range of motion, manual therapy and passive stretching techniques can be suggested as treatments for CMT. According to this systematic review, physical therapy is crucial to children with CMT's recovery; therefore, it is advised that caregivers participate in an exercise regimen at home. In early physiotherapy programme we focus on preventing affected postural alignment. To improve children's motor development and avoid additional consequences, it is appropriate to identify the CMT and treat the disease correctly [14].

Patients with idiopathic scoliosis who receive conservative treatment for their condition have a significantly lower surgical rate than those who do not receive treatment. Therefore, it is clear that conservative scoliosis treatment may lower the need for surgery, which not only results in high medical costs but also involves the danger of repeat procedures and additional difficulties [15]. Abdominal bracing improves spinal extensor strength, pain, and function in chronis low back pain patients. Adding abdominal bracing to spinal stability exercises can help maintain the lordosis angle and alleviate chronic low back pain symptoms [16]. Core stabilization and strengthening exercises are more effective at reducing pain as given in the previous study. It effectively improves proprioception, balance, and helps in correcting the posture of spine [17].

In present study, we have provided active range of motion exercise for within pain free range along with core strengthening and abdominal hollowing exercises which will enhance core strength and had a positive impact on increasing lumbar strength as well. Abdominal Bracing exercises were given for strengthening of core and spine. In this case, noticeable improvement over the course of four weeks of rehabilitation was seen. Therefore, it is clear that conservative scoliosis treatment may lower the need for surgery in future, which not only results in high medical costs but also involves the danger of repeat procedures and additional difficulties. Therefore early physiotherapy rehabilitation will help to gain positive outcomes in congenital scoliosis patients.

Strength

Demonstrates the potential benefits of physiotherapy in improving pain, muscle strength, and range of motion. It Provides a detailed, individualized treatment approach, which can guide clinical practice. It Highlights the feasibility of non-invasive interventions for congenital scoliosis.

Limitations

These Findings are based on a single case, limiting generalizability. Short-term follow-up makes it unclear whether the benefits are sustained over time. In future, the study can be performed for prolonged period of time and yearly follow-up can be taken

5. *Conclusion*

According to this study, the 35-year-old female patient receiving treatment for congenital scoliosis has shown a considerable improvement in her functional outcomes. Significant functional improvements, such as pain alleviation, range of motion, and muscle strength enhancement, are made possible by the physiotherapy regimen over the four weeks of rehabilitation, which eventually permits a safe return to daily activities by improving quality of life.

Conflict of Interest

The authors declare that there are no conflicts of interest related to the publication of this case study.

Ethics Committee

Patient informed conset form was obtained before initiation of the study.

Author Contributions

Conception and design of the study: SP, SA, SS; Data collection: SP, SA; Data analysis and interpretation: SP, SA; Drafting the article and/or its critical revision; SP, SA, SS; Final approval of the version to be published: SS. All authors have read and agreed to the final version of the manuscript.

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