

A Thorough Physical Therapy Program for a Patient with a Conservatively Handled Thoracic Vertebral Fracture: A Case Report

Sanjivani Nikhil Kamble¹, Shivani Satish Lalwani², Ramkumar Dubey³,
Tushar J. Palekar⁴

¹Associate Professor, Department of Neuro Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

²Resident, Department of Neuro Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

³Resident, Department of Neuro Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

⁴Principal, Department of Musculoskeletal Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

Corresponding Author: Shivani Satish Lalwani

DOI: <https://doi.org/10.52403/ijhsr.20240225>

ABSTRACT

Vertebral compression fractures (VCFs) are common in the thoracolumbar spine. Thoracolumbar spinal compression fractures are caused by a trauma process referred to as flexion compression. As the initial component, this mechanism usually affects the longitudinal ligament at the front and the front half of the vertebral body. The most obvious indication is pain. An individual who was 48 years old was presented to the multispecialty facility on February 9th, 2023, with concerns about pain in the midback region along with difficulty in sitting since the morning. The patient reported a road traffic accident that he experienced in the morning, while he was riding his bicycle, a two-wheeler from the back side dashed his bicycle which led to the fall of the patient from a certain height straight to the ground. MRI and an X-ray of the vertebral column on an identical day indicated a D12 vertebral stable compression fracture mainly of the anterior column with a slight extension of fracture going toward the right pedicle along with no neuro deficit bilaterally. Earlier mobility, adequate lower-extremity and spinal muscle power, relief from pain, and a satisfactory quality of life expectancy are vital considerations. The vertebral fracture rehabilitation course is effective, as indicated by statistically noteworthy gains in physical ability and a healthy lifestyle. The present case study depicts a thorough rehabilitation approach for individuals who went through conservative spinal vertebral fracture therapy.

Keywords: Vertebral compression fracture, physical therapy, conservative management, early rehabilitation, Quality of life, Treatment regimen

INTRODUCTION

In both industrialized and developing nations, traumatic thoracolumbar fractures are one of the major contributors to neurological impairment, defects, and disability in adults of working age. Men are more likely than women to sustain these fractures, which spike around the ages of 20

and 40. Nearly fifty percent of cases may have serious social, medical, or financial repercussions(1). The weakest region for stress is between the 11th thoracic and second lumbar vertebrae, which is where thoracolumbar injuries typically occur contributing to morbidity. Treatment progress has minimized invasiveness and,

under certain stable circumstances, completely done away with the process. Physiotherapy, including manual treatments and exercise programs, is accumulating evidence to aid patients(2).

Spinal compression fractures require careful management and rehabilitation with physical therapy (PT). Breathing exercises, mild spinal stretches, mobility, patient education, and core strengthening exercises are typical methods. Patients who receive physical therapy can resume their regular activities, such as walking regimens and light strength training, once their discomfort has subsided. In acute nonsurgical therapy, bracing is frequently employed, and for certain people, early mobilization and ambulation may be recommended(3).

We present an instance of an individual aged 48 who experienced a conservatively managed D12 fracture and needed effective physiotherapy treatment that helped recovery by seeking to avoid or solve post-fracture complications while also providing treatment and rehabilitation to allow the individual to return to his pre-injury stage. Significant signs comprise earlier movement onset, adequate lower limb and core strength, pain reduction, and improved quality of living.

MATERIALS & METHODS

Patient Details:

An individual who was aged 48 having a dominant right hand, presented to the multispecialty hospital on February 9th, 2023, with concerns about pain in the midback region along with difficulty in sitting early that morning. The individual described a road traffic accident that he experienced in the morning, while he was riding his bicycle, a two-wheeler from the back side dashed his bicycle which led to the fall of the patient from a certain height straight to the ground. The individual remembers an earlier episode of concomitant pain that started suddenly, grew gradually, and was excruciatingly uncomfortable, getting worse with activity and then better after leisure. On an identical

day, the individual had an MRI and X-ray of the vertebral column as well, which showed a D12 stable compression fracture mainly of the anterior column with a slight extension of the fracture going toward the right pedicle along with no bilateral neurodeficiency (Figure 1 and 2).

After confirmatory diagnosis, the patient was treated conservatively with immobilization of the vertebral column with Taylor's brace for 6 weeks along with complete bed rest in the prone position. In addition, the patient was recommended to begin physiotherapy treatment six weeks after the fracture and to visit the orthopedic clinic for follow-up care on March 22, 2023.

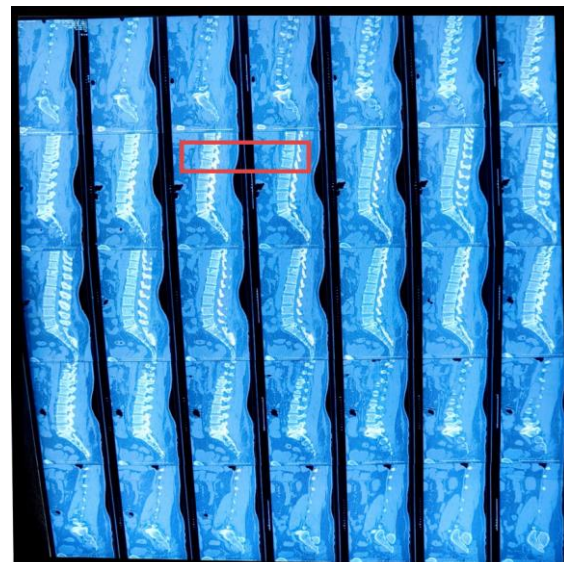


Figure 1: Present an MRI result illustrating the 12th thoracic vertebral fracture.



Figure 2: Present an x-ray illustrating the 12th thoracic vertebral fracture.

Clinical Findings:

After completion of 6 weeks of immobilization, i.e., on March 24, 2023, well with the individual's approval, for the physical evaluation, he was placed in a prone-lying posture with adequate head assistance. The level of the two posterior superior iliac spines (PSIS) was equal. During the examination, it was observed that the mobility of the chest wall was reduced. The grade 2 tenderness was present over D12, L3-L4-L5, and at sacrum level on palpation. Hip joint mobility was intact. Palpatory findings also revealed tenderness over the gluteal region. Sensory findings revealed intact sensations over the back region and bilateral lower limb. Upon palpation, the thoracolumbar area showed an increase in localized

temperature, whereas the paraspinal muscles showed spasms. Thoracic and lumbar range of motion had not been evoked because of the sensation of pain. Lacking apparent neurodeficiency, the distal circulation was unimpaired. The individual was experiencing pain at the site of the fracture, extended recuperation after the injury, weakening of the paraspinal muscles and abdomen, early weariness on light exertion, postural dependence, and emotional distress.

Therapeutic Management:

The aim of a person's recovery should have been to enable him to resume his everyday routine with the least amount of inconvenience. For twelve weeks, the patient underwent physical therapy sessions (Table 1).

Table 1: Outlines how the patient received physical therapy care from week one to week twelve.

Serial no.	Objectives of physical therapy	Interventions for therapy	Intervention Program	Precautions
An overview of the interventions offered from the first to the fourth week				
1)	To raise the individual's as well as the family's comprehension of the situation and get their engagement and approval.	Information and guidance regarding exercise regimens and the significance of following them for patients and caregivers.	Education was provided to caregivers as well as patients regarding the significance of proper positioning, then early mobility, and routine tasks.	
2)	To minimize soreness where the fracture is	Ice Packs	4-5 times a day, for ten minutes each.	
3)	To avoid breathing problems	Pursed lip breathing and diaphragmatic breathing	Breathing with 10 sec holds 3-4 times per day, 10 repetitions x 1 set	
4)	To maintain the range of motion (ROM) of the Upper (UL) and Lower extremities (LL).	1) Active ROM exercises of bilateral (B/L) UL in all joints in all planes. 2) In standing, active hip movements include flexion and extension (once the pain subsides), abduction, and adduction. 3) Active motions- knee flexion as well as extension. 4) No ROM to the thoracolumbar spine initially to avoid unnecessary stress to the fracture site.	Week 1- 1 set – 10 repetitions x TD Week 2- 1 set – 15 repetitions x TD Week 3 and 4 – 1 set – 20 repetitions x TD	
5)	To enhance the strength of muscles around the Abdominals and Lower limb	1) Isometric exercises for abdominals, glutei, and quadriceps. 2) Isotonic exercises for the ankle(gastrosoleus) 3) Straight leg raises (SLR) 4)Dynamic quadriceps using TheraBand and weight cuff. 5) Heel raises to strengthen calf muscles. 6) No strengthening exercises to spinal muscles.	Week 1 – 1 set – 10 repetitions x TD. Week 2 – 1 set – 15 repetitions x TD. Week 3 and 4 – 1 set – 20 repetitions x TD.	1) Incentive Spirometry to maintain Chest expansion and breathing pattern. 2) Compressive Stocking Pneumatic Compressive boots to prevent Deep Vein thrombosis (DVT).
6)	To strengthen the upper extremity	1)Utilizing TheraBand, flex and extend arms overhead.	Week 1 – 1 set – 10 repetitions x TD.	3) Air/Bed mattress to

		2) 1 kg weight cuff for elbow curls.	Week 2 – 1 set – 15 repetitions x TD. Week 3 and 4 – 1 set – 20 repetitions x TD.	prevent pressure sores if prolonged bed rest is needed. 4) A body cast/brace to provide spinal stability. 5) Avoid flexion, sit-ups, and spinal rotation. 6) The patient should be monitored for changes in neurologic status.
7)	To initiate weight-bearing and ambulation.	1) knee walking and four-point kneeling: Pre-weight-bearing activities	Entire Week 1.	
		2) Partial weight-bearing as tolerated with assistive device or no weight-bearing. 3) Ambulation or transfer to a chair using assistive devices (Walker/Cane).	- At the end of 1 st week. - Weeks 2, 3, and 4	
		4) Ambulation without assistive devices except on uneven ground. 5) Starts to negotiate stairs with a step-over-step pattern.	By the end of 4 th Week	
8)	To improve and modify the activities of daily living.	1) Using both a chair and a raised toilet seat.	Follow such modifications in ADLs from Week 1 to Week 4.	
		2) Bed mobility: - Log rolling, avoid prone lying.		
An overview of the interventions offered from the fifth to the eighth week				
1)	To preserve and enhance physiological ROM of Upper and Lower extremities and spine.	1)Active ROM exercises of B/L UL in all planes. 2) Shoulder shrugs 3) Scapular sets 4) Over 90 degrees, self-assisted heel slips. 5)SLR with weight cuff in supine and side-lying (Figure 3. A and B).	Week 5 – 1 set – 10 repetitions 3 times a day. Week 6 – 1 set – 1 repetition 3 or 4 times daily. Week 7 and 8 – 1 set – 20 repetitions x 3 to 4 times per day.	1)No passive ROM to the thoracolumbar spine. 2) Avoid rotatory and flexion movements to the thoracolumbar spine.
		6)Active Back extension of thoracolumbar spine	Initially for a few seconds to minutes without a break and gradually extending the duration based on the patient's capacity.	
2)	To increase the spine's and the upper and lower extremities muscle endurance.	1) Self-resisted exercises for muscles of the hip and knee. 2) Exercises using isometrics to target the medius and maximus muscles. 3) Utilizing weight cuff and TheraBand, resistance workouts for hip flexion, extension, and abduction.	Week 5 – 1 set – 10 repetitions x thrice daily. Week 6 – 1 set – 15 repetitions x 3 to 4 times per day.	
		4) Resisted isotonic exercises for upper limb muscles with Thera band and weight cuff.	Week 7 and 8 – 1 set – 20 repetitions x 3 to 4 times per day.	
		5) No strengthening exercises to paraspinal muscles. 6) Active back extension – prone on the elbow, prone on the hand.		
3)	To enhance the patient's ability to bear weight and walk	1) Ambulation without assistive equipment except on uneven ground. 2) Continues to negotiate stairs with a step-over-step gait.	After the fifth week, the patient begins to walk independently, either with or without support.	
4)	To modify and enhance the ADLs.	1) Self-sustaining bed movement – continue log rolling	The individual continues to become self-sustaining following the fifth week.	
		2)Self-reliant regarding dressing		
		3) Avoid prone lying, continue lying supine or on one side.		
		4) The patient can raise the body from a seat with the use of his arms to push up.		
		5) Continue to utilize a raised toilet seat and also a chair.		
An overview of the interventions offered from the ninth to the twelfth week				
1)	To preserve optimal ROM of bilateral Upper and Lower extremities.	Same as in week 5 to week 8	20 Repetitions x 1 set x 3 to 4 times per day.	1) The individual's body awareness of spinal instability
2)	To enhance and sustain	Active motion of the	1 set – 10 repetitions x	

	optimal ROM of the spine	thoracolumbar spine - extension, flexion, lateral bending, and rotation.	thrice daily.	and pain helped in monitoring the appropriate ROM.
3)	To preserve muscle endurance in both the upper and lower limbs.	Same as in week 5 to week 8	1 set – 20 repetitions x 3 to 4 times per day.	2) Sometimes pain was present because of stiffness. So, Deep heat and massage were used to reduce stiffness and pain.
4)	To improve the strength of muscles of the spine and abdominals.	1) Trunk strengthening and paraspinal strengthening exercises. 2) Plank in prone 3) Pelvic bridging (Figure 4. A and B)	Week 9– 10 Reps x 1 set x thrice daily. Week 10– 15 Repetitions x 1 set x 3 to 4 times per day. Week 11 and 12 – 20 Repetitions x 1 set x 3 to 4 times per day.	
5)	To regain normal weight-bearing and gait pattern	1) Full weight bearing. 2) Progressing to Spot march 3) Single-leg stand 4) Complete putting weight on the afflicted leg. 5) Staircase Climb	By the end of 12 weeks	
6)	Enhance and adjust the ADLs.	1) Independent bed mobility – Avoid log rolling	The patient gains independence commencing in the ninth week.	
		2) Patient able to lie prone at 12 weeks.		
		3) The patient can transfer independently and without difficulty from the bed to a chair and a standing position.		

Figure 3. (A and B)

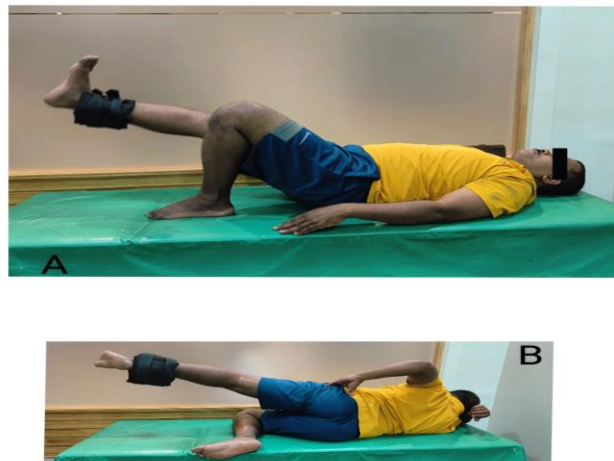


Figure 3. (A and B): Resisted SLR with weight cuff in supine and side-lying exercises provided in weeks 7 and 8.



Figure 4: Strengthening exercises provided in weeks 9 -12: A) The patient is performing Plank exercise in a prone position B) The patient is performing Pelvic bridging.

RESULT

Intervention outcomes and follow-up:

Following twelve weeks of physical therapy rehab, before and after rehabilitation outcome assessments were obtained.

Table 4: Pre and Post-rehabilitation outcome measures.

Serial.no.	Outcome Indicators	Pre-physical therapy rehab grade	Post-physical therapy rehab grade
1)	NPRS	9	3
2)	Thoracic spine ROM		
	Flexion	0-05 degree	35 degrees
	Extension	0-05 degree	30 degrees
	Lateral flexion (right)	5-7 degree	30 degrees
	Lateral flexion (left)	5-7 degree	30 degrees
	Rotation (right)	5-10 degree	25 degrees
	Rotation (left)	5-10 degree	25 degrees
3)	Lumbar spine ROM		
	Flexion	0-20 degree	70 degrees
	Extension	0-10 degree	35 degrees
	Lateral flexion (right)	0-10 degree	30 degrees
	Lateral flexion (left)	0-10 degree	30 degrees
	Rotation (right)	0-10 degree	40 degrees
	Rotation (left)	0-10 degree	40 degrees
4)	MMT for Back extensors Grade (Out of 5)	1/5	5/5
5)	Chest Excursion (at nipple level) (Normal 5-cm)	1-2 cm	4-6 cm
6)	Oswestry low back disability questionnaire	34/50	14/50

NPRS (Numerical pain rating scale), MMT (Manual muscle testing), ROM (Range of motion)

DISCUSSION

The patient, in this study, had experienced persistent back pain after a vertebral fracture. Post-fracture, conservative treatment was initiated, focusing on gentle exercises and weight-bearing ambulation. The patient reported discomfort and restricted movement. Ice packs were applied to alleviate discomfort. Although some studies have explored the impact of conservatively managed vertebral fracture recovery, data are scarce on acute and regular therapies. Proper precautions and muscle strength maintenance are crucial to prevent recurrence. These treatment regimens have yielded effective outcomes and well-being for the patient.

Pharmacologic fracture preventive medications strengthen bones and reduce the chance of fractures, but they have no immediate impact on the risk of falls or bodily activity. Exercise may enhance bone strength, minimize the likelihood of falls, and alleviate pain(4). Rehabilitation protocols should include weight-bearing mat exercise orthosis, home-based workout routines, and a vigorous strengthening program for the upper limb. Techniques for

breathing are also offered to increase pulmonary compliance(3). A 10-week fitness regimen focusing on lumbar stability, strength, and overall balancing enhanced everyday function, reduced discomfort, and enhance individuals' general well-being life, according to research by Malmros et al. The exercises decreased flexor moments and promoted stable spine alignment by focusing on the posterior trunk posture and spinal extensor muscles. The low-intensity exercises targeted slow-twitch muscle fibers, minimizing compression loads through weakened vertebrae(5). The individual, as reported in the present study, received physical therapy rehab from a qualified physiotherapist, which involved multiple tasks and resistance devices. The patient experienced significant pain reduction, allowing more time for rehabilitation and enhancement in joint motion and muscle conditioning. The therapy sessions aimed to preserve back muscle integrity and enhance lower and upper limbs, encouraging independent ambulation with minimal assistance. The patient was instructed to perform most workouts at home, followed by follow-up

meetings. The case report emphasizes the importance of conservative physiotherapy and rehab services to achieve performance objectives and improve prognosis.

CONCLUSION

The post-fracture rehab approach works, leading to significant improvements in both well-being and physiological functionality. The case study mentioned earlier offers an in-depth treatment strategy for individuals who endured conservative post-fracture treatment. Although the individual's complete recuperation was not achieved through the course of therapy, most therapeutic goals were achieved, including enhanced strength of the muscles, gradually increased spine flexibility and range of motion, boosted capacity for function, pain alleviation, a better walking sequence, and improved everyday tasks following a 12-week concentrated exercise regimen.

Declaration by Authors

Acknowledgement: We express our gratitude to the patient who cooperated with us throughout his therapy and gave permission for his case study to be published for future use as a resource and as inspiration for our authors.

Source of Funding: This report has not received any external funding.

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Muratore M, Allasia S, Viglierchio P, Abbate M, Aleotti S, Masse A, et al. Surgical treatment of traumatic thoracolumbar fractures: a retrospective

- review of 101 cases. *Musculoskelet Surg.* 2021 Apr;105(1):49–59.
2. Somaiya KJ, Patil S, Thorat R. Rehabilitation Strategies for a Patient With Traumatic Multiple Fractures: A Case Report. *Cureus* [Internet]. 2022 Sep 29 [cited 2024 Jan 15]; Available from: <https://www.cureus.com/articles/110650-rehabilitation-strategies-for-a-patient-with-traumatic-multiple-fractures-a-case-report>
3. Gandhi RS, Bhoge SS, Fating T, Sawalkar RG. Positive Outcomes of Physiotherapy Intervention in a Wedge Compression Fracture of the L1 Vertebra: A Case Report. *Cureus* [Internet]. 2024 Jan 6 [cited 2024 Jan 15]; Available from: <https://www.cureus.com/articles/207675-positive-outcomes-of-physiotherapy-intervention-in-a-wedge-compression-fracture-of-the-l1-vertebra-a-case-report>
4. Giangregorio LM, Ponzano M. Exercise and physical activity in individuals at risk of fracture. *Best Pract Res Clin Endocrinol Metab.* 2022 Mar 1;36(2):101613.
5. Bennell KL, Matthews B, Greig A, Briggs A, Kelly A, Sherburn M, et al. Effects of an exercise and manual therapy program on physical impairments, function, and quality-of-life in people with osteoporotic vertebral fracture: a randomized, single-blind controlled pilot trial. *BMC Musculoskelet Disord.* 2010 Dec;11(1):36.

How to cite this article: Sanjivani Nikhil Kamble, Shivani Satish Lalwani, Ramkumar Dubey, Tushar J. Palekar. A thorough physical therapy program for a patient with a conservatively handled thoracic vertebral fracture: a case report. *Int J Health Sci Res.* 2024; 14(2):187-193.
DOI: <https://doi.org/10.52403/ijhsr.20240225>
