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PHYSIOTHERAPY INTERVENTION FOR BLADDER, BOWEL, AND FUNCTIONAL MOBILITY RECOVERY IN NEGLECTED CAUDA EQUINA SYNDROME POST L4–L5 DISCECTOMY AND FUSION: A CASE REPORT

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ABSTRACT

Cauda Equina Syndrome (CES) is a rare and potentially debilitating condition that results from severe compression of the cauda equina nerve roots in the lumbar spine. This syndrome can lead to a variety of symptoms, lower back pain, leg weakness, bladder and bowel dysfunction, sexual dysfunction, saddle anaesthesia and reduced functional mobility. Timely intervention is essential to optimize outcomes, but neglected cases pose a unique challenge in rehabilitation. This subject a 65-year-old female, presented with numbness and weakness of bilateral lower limbs with low back pain on and off for the past 15 years which worsened for the past two years leading to complete loss of bladder and bowel control and weakness of the lower limb muscles with loss of sensation of bilateral foot and saddle anaesthesia pattern. The subject had undergone decompression discectomy L4-L5 with posterior lumbar inter body fusionL4-L5, but due to a delayed intervention, neurological deficits persisted. A comprehensive physiotherapy management program was implemented, including Electrical Stimulation, core stabilization exercises, lower limb strengthening exercises, gait training, and bladder and bowel retraining. Over an eight weeks' period, the patient demonstrated significant improvements in motor power in lower limbs, bladder bowel function and functional mobility and quality of life. This single case study brings lights on physiotherapy management on a neglected case of CES after decompression and stabilization prognosis is good and the patient can have a better quality of life. Physiotherapy intervention appeared to play a crucial role in enhancing the patient's overall well-being.

Keywords: Cauda Equina Syndrome (CES), bladder and bowel dysfunction, NBD Score, ICIQ-UI Short Form, physiotherapy, MRC scale, Lower extremity functional scale.

INTRODUCTION

The term "cauda equina syndrome" describes a distinctive pattern of urogenital and neuromuscular symptoms brought on by the simultaneous compression of several lumbosacral nerve roots below the conus medullaris. Low back pain, unilateral or typically bilateral sciatica, saddle sensory abnormalities, bladder and bowel dysfunction, and varying motor and sensory loss in the lower extremities are some of these symptoms (1). The compression of nerve roots by lumbar disc herniation is the usual cause of CES (2). The most common causes of cauda equina syndrome include herniated discs, spinal tumours, spinal infections, trauma, or spinal stenosis (narrowing of the spinal canal). It's a medical emergency requiring surgery for decompression to prevent permanent damage (3). While prompt surgical intervention is recommended to alleviate the compression and mitigate neurological deficits, some cases of CES may go untreated or undiagnosed, leading to long-term complications (4).

The most common surgical approaches for Cauda Equina Syndrome include Decompressive Surgery, Discectomy, Laminectomy, Spinal Fusion. If is not treated promptly it can result in a number of serious impairments, such as irreversible loss of bowel, bladder and sexual function as well as permanent paralysis of one or both limbs severely affecting the quality of life for a patient. Neglected CES is characterized by persistent and progressive neurological deficits, including sensory loss, motor weakness, and bladder and bowel dysfunction (5). The sequelae of this condition significantly impact an individual's quality of life, making an effective rehabilitation approach essential. Cauda Equina Syndrome classified in to Suspected CES, Symptom-only CES, Incomplete CES, CES with retention, and Complete CES (6).

Early treatment is essential for a better prognosis. Delayed treatment can significantly impact a person's quality of life. Physiotherapy plays an important role in the management of individuals with Cauda Equina Syndrome (CES). While surgical intervention is often the primary treatment to address the underlying compression of nerves, Physiotherapy focuses on restoring strength, improving mobility, improve bladder, bowl function and enhancing overall function, contributing to the patient's independence and quality of life post-surgery (7).

Understanding the potential benefits of physiotherapy in such neglected cases is crucial, as it can provide insights into improving the overall quality of life for CES patients, even when surgical treatment is delayed (8).

This single case study focuses on a patient who did not receive timely surgical intervention and as a result experienced long-term complications that continued to affect their daily life even after surgery with a comprehensive physiotherapy approach designed to address the unique challenges of CES patients.

Bladder dysfunction in Cauda Equina Syndrome

Bladder dysfunction is the main issue facing those with Cauda Equina Syndrome. The nerves that govern the bladder and its associated muscles are located at the lower end of the spinal cord. When these nerves sustain damage, the signals from the bladder cannot effectively reach the brain, leading to a condition known as a flaccid bladder. In such cases, the bladder tends to retain urine for an extended period, potentially causing the stretching of the bladder wall. This prolonged retention may harm the detrusor wall and elevate the risk of infections (9).

Bowel dysfunction in Cauda Equina Syndrome

In cauda equina syndrome flaccid bowel dysfunction occurs where there is loss of reflex response. Due to loss of sphincter tone and peristalsis movements it is difficult to clear the bowel, the fluid and mucus will be leaking out of the anus (10).

Physiotherapy Intervention for Bladder, Bowel, and Functional Mobility Recovery in Neglected Cauda Equina Syndrome Post L4–L5 Discectomy and Fusion: A Case Report. This study was conducted at Department of Physiotherapy, Chettinad Hospital and Research Institute. The subject was explained in detail about the study and signed informed consent was obtained. This study was approved by the Institutional Human Ethics Committee for Faculty research (CARE IHEC-11)

CLINICAL PRESENTATION

Patient Information

A 65-year-old female subject admitted in Chettinad hospital and research institute with complaints of low back pain on and off for past 2 years. Which was insidious in onset, gradually progressive in nature, dull aching, aggravated on activities and relived on rest and medication. And subject have radiating pain to B/L lower limb L >R for the past 6 months, Numbness present over B/L leg for past 15 years. And subject have urinary incontinence and abnormal bowel and bladder habits for the past 1 year, lower limb function was severely affected with the patient completely dependent for functional mobility, Neurological claudication present. And subject had no history of trauma. CBC report are normal. Pathology report shows negative HIV and HbsAg.

Radiological investigation was done. MRI showed postero central disc protrusion with superior migration at L4-L5 level causing severe spinal canal stenosis with impingement of cauda equine nerve root, bilateral L4 and L5 nerve roots. Patient was diagnosed as L4-L5 Complete canal stenosis with neglected cauda equine syndrome, Subject underwent discectomy at L4-L5 and stabilisation at L4-L5 and was referred to department of physiotherapy for rehabilitation.

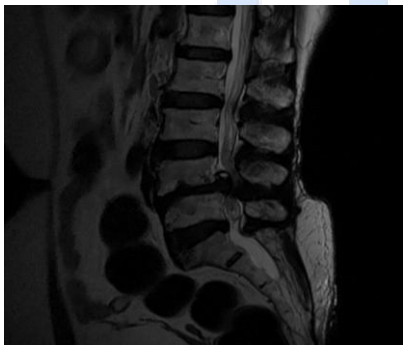

Fig 1: MRI of Lumbosacral spine

Fig 2: X-ray post PLIF L4-L5

CLINICAL FINDINGS

Patient was assessed on post-operative day two. Subject general condition fair, vitals stable. Pain present over surgery site. On observation dressing present over surgery site. Dressing intact. Superficial sensation was diminished over L4 and L5 dermatome level and absent over S1 -S5 dermatome and anal tone absent. Plantar reflex, knee jerk and Ankle jerk was blunt bilaterally. Bowel and bladder sensation were absent.

Physiotherapeutic intervention

Initial assessment of the subject revealed severe muscle weakness bilateral lower limb with bilateral foot drop and a score of 21 on ICIQ-UI scale, 14 on lower extremity functional scale (LEFS) and 35 on NBD score. The subject was put on an extensive rehabilitation programme with Phase I, II and III which is given in table 1.

TABLE 1: EXERCISES REGIMEN

WEEK	EXERCISE PROGRAMME	REPITITIONS AND HOLD
Phase 1 (Week 1–2)	Deep breathing exercises Ankle pump exercises Active ROM exercises given to bilateral upper limb and lower limb Pelvic bridging exercises Gait training with TLSO brace Electrical stimulation for Hip abductors, extensors, hamstrings and	15 sec hold, 10 times repetition 3 times per day

	Ankle dorsiflexor and plantar flexors.	
Phase 2 (Week 2–4)	Abdominal bracing and supine marching Isometric abdominal and back exercises Glut sets, isometric for quadriceps, adductor squeezes Hamstring and calf stretching exercises Straight leg raise exercises knee to chest single and bilateral increase waling time (30 min) Stair climbing	20 sec hold 10 times repetition 3 times/ day
Phase 3 (Week 4–8)	Superman Core exercises Step ups mini wall squats Balance exercises (single leg standing, single leg standing with eye closed, Single leg standing with arm movement.) Cardiovascular exercises	20 sec hold 10 times repetition 3 times/ day

Management for bladder Dysfunction:

Bladder training was given by clamping the catheter every one hour three days a week with pelvic floor muscle strengthening exercises (11), counselling and behavioural techniques. The subject was able to appreciate the filling of bladder after 2 weeks of surgery and was put on bladder stimulation with electrical stimulation and Valsalva and creed manoeuvre (12,13), after 4 weeks' catheter was removed and the subject trained on using intermittent catheter and same exercise protocol was followed. At the end of 8th week the subject was able to void on her own and had a better control over her bladder and urine was leaking only on coughing or straining. Her bladder function score improved from very severe to slight impairment on ICIQ –UI score.

Bowel Management

The subject reported to have sensation of defecation immediately after surgery and was having severe constipation and inflammation on the perianal area. He was put on a high fibre diet and was taught digital rectal stimulation for a duration of 10-30 seconds with lubricated gloved finger and rotate the finger in circular motion until the bowel is clear (14) and proper positioning was taught with raised toilet seat and forward leaning while defecation.

Abdominal massage over the abdomen in clock wise circular motion from right to left with her hands for 15 minutes (15), hot water fomentation over the pubic region for 20minutes (16) was given on the 4th week the subject was able to clear the bowel without digital stimulation and the constipation episodes reduced for 2- 3 times a week. At the end of 8th week the subject gained complete control over the bowel and was having a normal faecal defecation.

Outcome measures

Medical Research Council (MRC) Scale for Muscle Strength

The Medical Research Council (MRC) Scale for Muscle Strength is a standardized system, ranging from 0 to 5, used to assess the strength of individual muscles or muscle groups. The scale grades muscle strength from complete absence (Grade 0) to normal strength (Grade 5). It is commonly applied in neurology and rehabilitation medicine to evaluate

muscle function in a consistent and quantifiable manner. (17)

The Neurogenic Bowel Dysfunction score

The score is based on 10 questions concerning bowel evacuation with a score ranging from 0 to 47with a severity score of 0–6 Very minor, 7–9 Minor, 10–13 Moderate, 14 or more Severe. (18)

Lower Extremity Functional Scale (LEFS)

This scale has 20 items each rated from 0-4 with a total score ranging from 0 to 80 with a score of severe 0-20, 21- 40 moderate, 41-60 mild and 61 to 80 minimal deformity19.

International Consultation on Incontinence Questionnaire - Urinary Incontinence Short Form (ICIQ-UI Short Form)

This is a widely used questionnaire designed to assess the impact of urinary incontinence on an individual's quality of life. The ICIQ-UI Short Form typically consists of a series of questions that cover various aspects of urinary incontinence, including frequency, severity, and the impact on daily activities. The questionnaire aims to provide a standardized and reliable way to assess and quantify urinary incontinence symptoms. The score ranges from 0-21 with a severity score of 0-5 slight, 6-15 moderate, 13-18 severe, 19-21very severe. (20)

TABLE 2: MEDICAL RESEARCH COUNCIL (MRC) SCALE PRE&POST-OPERATIVE FOR BILATERAL LOWER LIMBS

LOWER LIMB	Pre-operative Score Right side	Post-operative 1st week Right side	4th week	8th week	Pre-operative Score Left side	Post-operative 1st week Left side	4th week	8th week
Hip								
Flexors	3+/5	4/5	4+/5	5/5	3/5	3+/5	4-/5	4+/5
Extensors	2+/5	3/5	3+/5	4/5	2/5	2+/5	3/5	4/5
Abductors	2+/5	3/5	3+/5	4/5	2/5	2+/5	3+/5	4/5
Adductors	3/5	3/5	4/5	4+/5	3/5	3+/5	4/5	4+/5
Internal Rotators	3/5	3/5	4-/5	4+/5	3/5	4-/5	4/5	4+/5
External Rotators	3/5	3/5	4-/5	4+/5	3/5	4/5	4+/5	4+/5
Knee								
Flexors	3/5	3+/5	4/5	4+/5	3/5	3+/5	4/5	4+/5
Extensors	3+/5	3+/5	4/5	4+/5	3-/5	3/5	4/5	4+/5
ANKLE								
Plantar flexors	2/5	2+/5	3/5	4/5	2/5	2+/5	3/5	4/5

Dorsiflexors	2/5	2+/5	3/5	4/5	2/5	2+/5	3/5	4/5
Invertors	2/5	2/5	2+/5	3+/5	2/5	2+/5	3/5	4/5
Everters	2/5	2/5	2+/5	3+/5	2/5	2/5	3/5	4/5
TOE								
EHL	2-/5	2/5	2+/5	3/5	1/5	2-/5	2/5	3/5
FHL	2-/5	2/5	2/5	3/5	1/5	2-/5	2/5	3/5

TABLE 3: NEUROGENIC BOWEL DYSFUNCTION SCORE

Date	Pre-operative	Post-operative Day-2	4th week	8th week
NBD score	35	21	12	6
Interpretation	Severe	Severe	Moderate	Very minor

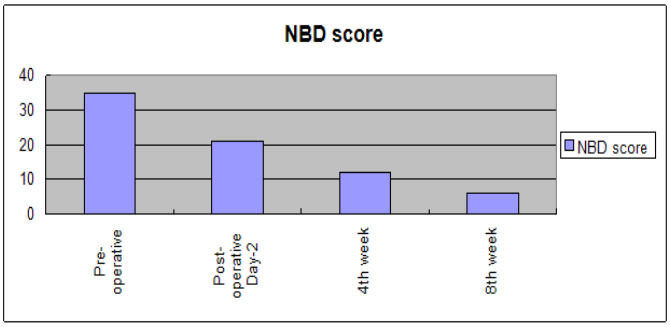

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TABLE 4: ICIQ –UI SHORT FORM SCORE

Date	Pre-operative	Post-operative Day-2	4th week	8th week
ICIQ –UI score	21	16	10	5
Interpretation	Very severe	Severe	Moderate	Slight

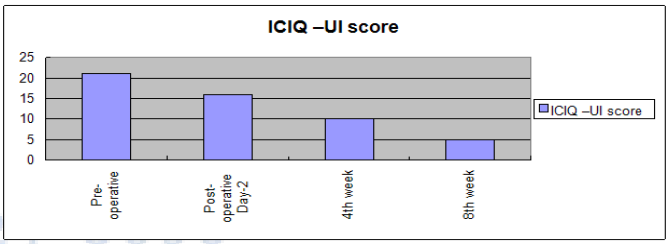

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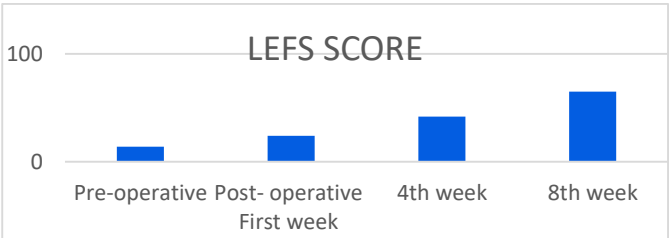
TABLE :5 LOWER EXTREMITY FUNCTIONAL SCALE (LEFS)

Date	Pre-operative	Post-operative First week	4th week	8th week
LEFS SCORE	14	24	42	65
Interpretation	severe	Moderate	Mild	Minimal



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DISCUSSION

Cauda equina syndrome is a serious condition where nerve compression at the base of the spinal cord leads to symptoms like severe lower back pain, leg weakness, loss of bowel and bladder control, and saddle anaesthesia. Core exercises are crucial after spine fusion surgery as they provide stability, reduce strain on the spine, prevent future injuries, and improve posture.

From table 1 it is observed that the muscle power of bilateral lower limb muscles strength increased and the subject attained full function independence, according to the medical research council scale(MRC) with an extensive strengthening programme as mentioned in table 2.

Strengthening the core facilitates recovery, enhances functional movement, and contributes to overall fitness, promoting long-term spine health (21). Regaining strength and functionality in the lower limbs can have positive effects on mental well-being. It boosts confidence, reduces dependency, and enhances overall quality of life (22).From table 3 it can be seen that the bowel function improved form very severe to very minor according to neurogenic bowel score.

Digital rectal stimulation stimulates preserved anorectal colonic reflexes, which in turn increases left colon motility (23). Abdominal massage improves frequency of stools, shortens colonic transit time, and stimulates peristalsis (24). Applications of heat can help facilitate stool transit and ease discomfort and spasms (25). From table 4 it can be seen that the bladder function increased from very severe to slight according to ICIQ-UI short form score.

The Valsalva manoeuvre increases intra-abdominal pressure, facilitating urine expulsion, while the Crede's manoeuvre involves manual pressure to assist bladder emptying (26).From table 5, the lower extremity function increased form severe to minimal in the eight week of post-operative period with progressive resisted exercises and electrical stimulation to lower limb.

Kegel exercises help strengthen the pelvic floor muscles, which play a crucial role in urinary control. Improved muscle tone can aid in preventing or managing urinary incontinence. Strengthening the pelvic floor muscles provides better support to the bladder and surrounding structures. This can contribute to improved bladder function and control. Restoring bladder control through pelvic floor muscle training enhances an individual's quality of life (27)

Our findings demonstrated that after comprehensive physiotherapy management program over the course of 8 weeks the subject reported a reduction in episodes of incontinence, increased awareness of bladder and bowel sensations, and greater independence in managing these functions. our subject regained independent functional mobility and control over the bowel and bladder and a better quality of life Physiotherapy rehabilitation plays a crucial role in rehabilitating the subject to the nearest normal even in a case of neglected CES with a chartered physiotherapy programme and bladder and bowel care.

CONCLUSION:

This single case study provides valuable insights into the prognosis of physiotherapy management in a neglected CES patient who underwent discectomy and fusion surgery. The improvements in bladder and bowel control and functional mobility observed in this case highlight the potential benefits of comprehensive physiotherapy intervention. This study serves as a foundation for understanding the role of physiotherapy in the rehabilitation of CES patients and underscores the importance of early intervention in such complex spinal conditions.

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