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Case report

Efficacy of early community integration rehabilitation for cervical laminectomy: A case report

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ABSTRACT

Cervical laminectomy is one of the crippling conditions that has a detrimental impact on patients' quality of life. Patients thus find it difficult to achieve functional independence. With advancements in surgery and therapy, these areas can be improved. This case report describes the rehabilitation of a 55-year-old male patient. He had a cervical injury in an accident that required a laminectomy. Issues were identified, goals were set, and an intervention plan was created after the analysis. The patient had inpatient therapy six days a week for a total of two sessions per day. The patient was able to perform essential and basic everyday tasks on their own after treatment. The study comes to the conclusion that patients who have had a cervical laminectomy benefit from early, systematic, evidence-based physical therapy treatment in terms of improved functional independence and decreased impairment.

Keywords: Disability, Rehabilitation, Community Physiotherapy, Cervical Laminectomy.

INTRODUCTION

Laminectomy is one of the most popular treatments for decompressing the constricted spinal cord brought on by a number of disorders, including degenerative stenosis, fractures, primary and secondary spinal tumors, abscesses, and deformities. The intersection of compression and decompression is one potential site for spinal cord deformation. Compression of the cord may result from modifications in the mechanics of cerebrospinal fluid flow. Paraparesis is one of the adverse outcomes of laminectomy. According to Krishna Anand et al.'s study, it may be caused by direct trauma following surgery or postoperative hematomas ^[1].

The narrowing of the spinal canal in the neck area is the hallmark of cervical canal stenosis, also referred to as cervical spinal stenosis. Numerous symptoms may arise from the spinal cord and nerve roots being compressed or impinged upon as a result of this constriction. Cervical canal stenosis is

more common in older people and can be caused by a variety of reasons. To control the symptoms and stop additional problems, early diagnosis and suitable treatment are essential. Cervical canal stenosis causes include: Cervical canal stenosis can develop as a result of several factors, such as: 1) Degenerative Changes, 2) Herniated Discs, 3) Spinal Tumors, 4) Trauma or Injury, 5) Congenital Factors as described by Minhaj Tahir in his study ^[2].

Disorders affecting the cervical spine's C3 to C7 levels often result in significant neurological and functional abnormalities because these levels are so near to the spinal cord and nerve roots. Laminectomy with lateral mass fixation is a popular surgical treatment used to decompress the spinal cord and stabilize the cervical spine in cases of cervical canal stenosis, trauma, tumors, or degenerative conditions. Even though these therapies aim to address the underlying illness and prevent further neurological deterioration, the

postoperative phase poses a substantial challenge, particularly in restoring mobility, strength, and functional independence. The healing phase following a C3–C7 laminectomy with lateral mass fixation depends on physical therapy [3].

Physiotherapy's primary objectives in this case are to control pain, strengthen the cervical spine, avoid issues like joint stiffness or deep vein thrombosis, and regain functional abilities. An evidence-based physiotherapy program is required to optimize neuromuscular control, promote tissue repair, and facilitate a safe and effective return to daily activities and work. This case study investigates the role of physical therapy in the care of a patient who underwent a C3–C7 laminectomy with lateral mass fixation. It places special emphasis on the assessment process, treatment goals, and rehabilitation methods that are tailored to the patient's clinical presentation. It also discusses the challenges and outcomes of using physiotherapy to treat such cases, emphasizing the value of a multidisciplinary approach to get the greatest potential recovery [4].

Case Report

An elderly person of 55 years of age was driving his two-wheeler on the way back home when he met with an accident. Due to the accident, the patient got hit on his neck. He felt unconscious after the accident. The people nearby gathered and took him to the nearby Primary Care Hospital, where initial investigations were done, primary treatment was provided, and then after that, the patient was referred to a Tertiary Care Hospital as the required facilities were not present there. After transferring the patient here, again MRI of the cervical spine & other Laboratory investigations were performed. The patient was suggested for surgery for his cervical spine. Before the surgery, the patient was bedridden and could only perform bed mobility activities. The surgery took place on 29th November 2024 & the duration of the operation was four hours. After the surgery, the patient was kept in the SICU for 48 hours, and after that, he was shifted to the male surgery ward. After the surgery, when the patient became conscious, he was able to move his hands and legs and was also able to perform bed mobility, but the movements were painful.

Clinical Findings

On observation, visible muscle atrophy was present in the arm, thigh, and calf muscles, and the right shoulder

appeared slightly depressed compared to the left. On examination, all superficial and deep sensations were intact; all muscles had normal tone; deep tendon reflexes were all normal. All passive ranges of motion (ROM) were complete and pain-free; active ROM was restricted in the Shoulder, Hip, and Ankle joints secondary to muscle weakness. Muscle strength was grade 3 for all the scapular muscles, all shoulder muscles 3-/5, elbow flexors 3+/5, elbow extensors 3+/5, wrist and finger flexors 4-/5, wrist and finger extensors 4-/5, lumbricals and interosseous muscles were fair. Muscle strength was grade 3-/5 for Hip flexors, extensors, abductors, adductors & internal as well as external rotators. Knee flexors and extensors strength was grade 3/5, and Ankle dorsiflexors and Plantarflexors were grade 3-/5. Core and back muscle strength was also poor. Sitting static balance was fair, and dynamic balance was poor. Also, standing static as well as dynamic balance both were poor. Functional assessment of hand functions showed difficulty holding objects with both hands. ADLs were also affected when measured by Katz ADL Scale. QOL was also hampered as assessed by the WHO-QOL questionnaire [5].

Diagnostic Assessment

MRI scan of cervical spine was done on 21st November 2024; it showed evidence of degenerative changes in Cervical Spine; posterior disc protrusions were noted at C5 - C6 & C6 - C7 level causing compression of thecal sac; posterior disc bulge was noted at C4 - C5 level causing indentation of thecal sac; intramedullary hyperintensities noted in the cervical cord at C6 -C7 level represented cord contusion with oedema. Also, a postoperative X-ray scan was done on 30th November 2024, in which C3-C7 laminectomy with lateral mass fixation was observed [6].

Therapeutic Intervention

Goals

The primary goal was to achieve bed mobility activities. The next goal was to increase the contraction strength of the core and back muscles. Also, one of the initial goals was to improve bilateral Upper limb & Lower limb muscle strength with betterment in static sitting balance. The functional goal was to achieve sitting independently in a high sitting position [7].

Physiotherapy Interventions

Week 1-2

The patient was given basic exercises starting with Ankle - toe Movements and Heel slide to prevent DVT. Then

muscle setting exercises for Hams and Quads were given to improve strength of B/L Lower limbs. Also Upper limb Strengthening was started using weight cuff of 0.5kg. Bed mobility exercise consisting of Rolling, Supine to side lying & Side lying to sitting was taught to the patient.

Scapular strengthening exercises were given to improve the strength of the scapular muscles. Proprioceptive neuromuscular facilitation technique (PNF) was performed for B/L upper limbs and lower limbs (D1 flexion and extension pattern) against the manual resistance provided in the opposing direction. The patient was asked to use efforts bilaterally. Dosage: 7 reps with 10 sec holds for each muscle was given for the first 5 days; for consecutive 10 days, 10 reps with 20 sec holds were given. The VMO strengthening with EMS was done, which provided significant results. Stretching was performed for B/L LL, particularly for Hams and TA muscles. The patient was taught core activation exercises along with static back and glutes exercises.

Week 2-3

Goal

The primary goal was to increase the muscle strength of the scapular muscles, upper limb, & lower limb muscles. The next goal was to increase the strength of the core muscles. Also, improvement was required in dynamic sitting and static standing balance. Crutch muscle training was also provided. Cervical range of motion exercises were added. The functional goal was to perform the ADL with moderate support.

Physiotherapy Interventions

As the patient could sit unsupported, further exercises were introduced, like sit-to-stand and multiple-angle squats. The patient was able to perform bed mobility independently, and hence, further difficult exercises were started. They consisted of Pelvic bridging and Abdominal Curls for Core, strengthening exercises with a 1kg weight cuff for B/L Upper limbs and with 0.5 kg for B/L lower limbs. Patient was given exercises with skates and a weight cuff for B/L lower limbs for better activation of Lower limb muscles as they were weaker than upper limb muscles. The difficulty of skate exercise was increased using a wedge after the patient could do that exercise easily. Furthermore, static cycling for B/L lower limbs and Upper limbs was used for around 5 minutes each. Also, recreational training was done using a Swiss ball and weight cuffs applied on the lower limbs & upper limbs for better activation of muscles. VMO with EMS

was also going on. The patient could now perform sit-to-stand in parallel bar with ample support and was also able to perform multiple angle squats with a 10-second hold. Ankle strategy for balance training was used to improve standing static balance. Cervical flexion, extension, and rotation, along with isometrics, for the same were started with due care and supervision.

Week 3-4

Goal

The primary goal was to increase the muscle strength of the upper limb, lower limb, and core muscles; the next goal was to improve gait pattern. Cervical muscles were more targeted during this phase. The functional goal was to perform the movement with minimal to moderate difficulty in ADLs.

Physiotherapy Intervention

The patient was able to sit independently and could now even perform sit-to-stand with a walker with minimal support. Now the main focus was on two things, i.e., one was balance and the other was gait training in the parallel bar. More balance exercises were introduced in the ongoing protocol. Perturbations with the Swiss ball, weight shifting, and single leg standing (with arm support) were added, each for 10 repetitions. Gait training was provided in parallel bar and even with a walker further on. All the other exercises mentioned above were kept going on and were held twice a day. Cervical muscles isometric exercises were taken in all four directions with 10-second holds and 10 repetitions in each of the four directions.

Table 1: Patient-reported outcome measures

Outcome Used	1 st day Score	15 th day Score	30 th day Score
Shoulder Pain and Disability Index (SPADI)			
Pain Scale	1	23	11
Disability Scale	4	44	29
Neck Disability Index	0	29	22
Barthel Index	5	45	80
Geriatric Depression Scale (GDS)	6	3	0

According to outcome measures assessed over a 30-day period, notable improvements have been noted in several functional, psychological, and physical domains. According to the Neck Disability Index, participants' pain intensity, personal cleanliness, lifting, reading, focus, work performance, driving, and leisure activities all steadily improved. Most domains showed reduced impairment scores by the 15th day, and by the 30th day, these values had

dropped or stayed the same, indicating better cervical function and less pain.

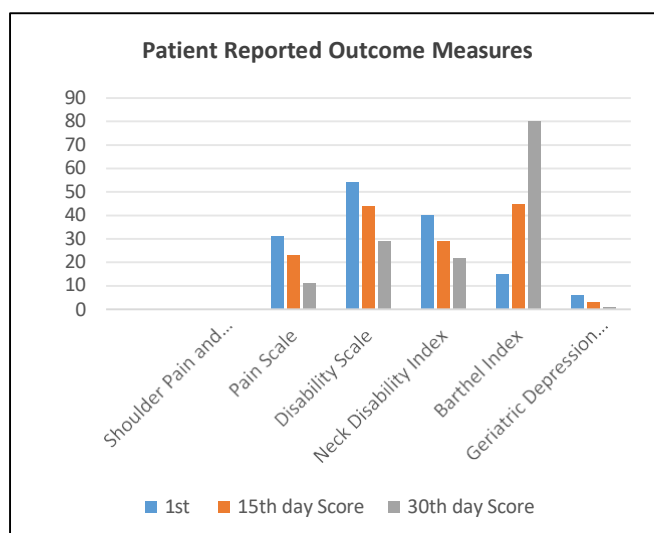


Table 2: Geriatric Quality of Life Questionnaire (QoLQ)

Outcome Used	1 st day Score	15 th day Score	30 th day Score
QOL as a whole	4	3	2
Life overall	14	10	09
Health	14	13	11
Social relationships	9	7	7
Independence, control over life, freedom	15	13	10
Home and neighborhood	9	9	9
Psychological and emotional well-being	11	9	7
Financial circumstances	9	9	9
Leisure and activities	14	13	11

There were notable decreases in both the pain and disability subscales of the Shoulder Pain and Disability Index (SPADI). Participants reported decreased pain when performing certain exercises, such as lying on the affected side, reaching overhead, and pressing with the affected arm. Similarly, an improved ability to perform daily tasks including lifting, dressing, and hair washing indicated improved upper limb functionality [8].

The Geriatric Depression Scale (GDS) showed an improvement in psychological condition over time. Positive responses to questions regarding energy levels, pleasure, and life satisfaction increased by the 30th day, whereas negative responses about helplessness and hopelessness declined. This suggests that attitudes and emotional well-being have improved.

As indicated by the Barthel Index, functional independence significantly improved with time. Notable

progress was made in the areas of feeding, clothing, toileting, bowel and bladder control, mobility, and stair use. By the thirty-first day, individuals achieved near-full or complete independence in most self-care categories.

Health, independence, and psychological well-being were among the areas where the Geriatric.

Quality of Life Questionnaire (QoLQ) shown consistent improvement. Participants' ability to manage everyday living was enhanced, and the effects of pain were minimized. While other components of perceived quality of life, such financial happiness and social companionship, remained largely unchanged, there was a notable improvement in emotional and health-related aspects of life.

Together, these findings demonstrate that the 30-day intervention or rehabilitation approach was effective in improving the overall quality of life, psychological well-being, and physical function of the older participants [9].

DISCUSSION

There needs to be more evidence on the effectiveness of physiotherapy management on C3-C7 laminectomy with Lateral mass fixation. The present case study was projected toward rehabilitating a patient with C3 - C7 injury.

Figure 1: Swiss ball exercises for strengthening lower limb



Figure 2: Cervical MRI



Figure 3: Static caviling exercise**Figure 4: Standing balance exercise****Figure 5: Balance training****Figure 6: Gait training**

A shorter length of stay (LOS) and decreased risks of pulmonary problems, thromboembolism, and urinary tract infect Pain Scale ions are among the well-established advantages of early mobility, which is typically described as the patient getting out of bed as soon as feasible following surgery. Early mobility among critical care patients has received more attention in recent years, and research has shown that early mobility in the neurology intensive care unit (ICU) reduces length of stay and improves the frequency of discharge to home. In the critical care unit, several effective interdisciplinary early mobility protocols have been developed and recorded as mentioned by Kristin Rupich et. al. [10].

The successful return to everyday activities is the aim of most cervical spine surgeries. Following surgery, patients frequently report feeling better right away. However, a sustained regimen of exercise and therapy is necessary to improve the weak muscles and soft tissue that support and surround the neck. Some patients experience a significant financial burden and return of symptoms as a result of their bad postoperative living or work habits. Thus, the goal of clinical treatment and follow-up is to maintain postoperative efficacy and prevent symptom recurrence [11].

Certain stretches or exercises may need to be modified to target particular muscles or reduce discomfort. Most patients may eventually continue neck stretches and exercises at home to maintain neck strength and flexibility over time. Stretching and strengthening the neck might help it become less sensitive to pain. Chin tucks and other posture-maintaining exercises may also help the head and neck. Weak neck muscles are more prone to cause forward head position and neck pain. According to SS Mohammed et al.'s study (4), holding the head in neutral alignment with the ears slightly above the shoulders reduces the strain on the cervical spine and its discs [12].

According to Jogi et.al, a vital component of movement and bodily function is balance. A person's mobility and physical function, including everyday living activities like transfers and self-care, are consequently restricted by a balance impairment, which is also linked to a higher risk of falls. Hence sitting balance component was taken into consideration and protocol was tailored according to the patient's condition and needs [13].

Numerous studies documenting the effect of surgical intervention on patients' quality of life are consistent with the improvement in QOL seen in this study. Fehling's et al. assessed the results of surgical decompression for cervical myelopathy and discovered a noteworthy improvement across all SF-36 domains. Zhou et al. discovered that at three months following surgery, none of the SF-36 categories displayed statistically significant improvements; however, at one year following surgery, PF, RP, and SF all demonstrated notable improvements as compared to preoperative ratings. About 70% of the patients showed significant improvements in all outcome indicators, according to Al-Tomimi et al. At the five-year follow-up, around two-thirds of the patients who had initially shown improvement had kept up these notable gains. The influence of surgical surgery on functional impairment, disability, and quality of life in patients with DCM is examined in this systematic study. The systematic review documented by M.G. Fehlings et al. shows notable improvements in the Visual Analogue Scale, Neck Disability Index, and Japanese Orthopaedic Association or modified scores after surgery, demonstrating the long-term advantages of surgical intervention and showing a favorable effect on functional status, pain, and disability. According to this research, individuals with degenerative cervical disorders benefit from surgical intervention in terms of discomfort, functional impairment, and quality of life, as mentioned by Huang CY et. Al. In his study ^[14].

CONCLUSION

Rehabilitation following C3-C7 laminectomy with lateral mass fixation is critical for achieving optimal recovery and functional independence. The physiotherapy approach should be individualized, taking into account the patient's specific surgical history, needs, and rehabilitation goals. Early rehabilitation helps in achieving early basic mobility. This study helps in building a tailored protocol for Cervical Laminectomy patients. The only problem faced in rehabilitation is that Gait training in such patients is difficult to achieve. Ongoing research and adherence to evidence-based practices will enhance the efficacy of rehabilitation programs and support patients in their journey toward community reintegration.

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