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Case Report

Physiotherapy Section

Physiotherapy Rehabilitation Post Lower Segment Caesarean Section to Strengthen the Core and Quadriceps Muscle: A Case Report

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ABSTRACT

Women often experience reduced physical strength following a Lower Segment Caesarean Section (LSCS), which may limit their ability to perform daily activities. A 32-year-old female presented with lower limb weakness, particularly involving the quadriceps muscles, five months after undergoing LSCS. The patient reported to the Physiotherapy Outpatient Department (OPD) with complaints of mild low back pain, difficulty climbing stairs, balance disturbances, and generalised lower limb weakness. The patient was assessed through physical examination, special tests, and a review of medical records. A four-week, individualised exercise protocol was implemented with the aim of improving core stability and quadriceps strength. Each session included warm-up and cool-down exercises to prevent fatigue and injury. Outcome measures included the Timed Up and Go (TUG) test for functional mobility and the hip-bridge test for core strength. Exercises were performed three times per week with 30-second rest intervals. These assessments helped ensure improved functional performance and injury prevention. Quadriceps strengthening exercises enhanced muscle strength and balance, while core training improved postural stability. The intervention resulted in significant improvements.

Keywords: Core muscles, Low back pain, Postpartum period, Pregnancy

CASE REPORT

A 32-year-old female, who had undergone an LSCS with a horizontal incision five months earlier, presented with complaints of lower limb weakness. The patient had a full-term pregnancy, complicated only by bilateral ankle swelling. Prior to delivery, there was no history of diabetes mellitus or hypertension. Five months post-delivery, the patient reported persistent low back pain and lower limb weakness, with no noticeable improvement since the surgery. This weakness adversely affected her daily activities, reducing both her pace and functional efficiency. Concerned about her condition, she visited the Physiotherapy OPD during the consultation, she reported ongoing low back pain, marked weakness in the lower limbs, and associated balance and coordination difficulties. She was a primigravida and this was her first caesarean section.

Pre-assessment details are presented in [Table/Fig-1-3], which show the pre and post-intervention assessment findings. Follow-up and outcome values are summarised in [Table/Fig-4]. [Table/Fig-5,6] illustrates the exercises performed by the patient as part of the four-week exercise regimen. [Table/Fig-7-10] outline the detailed four-week exercise protocol designed for the patient.

Core Muscle MMT (Pre assessment)		Quadriceps MMT (Pre assessment)	
Transverse Abdominis and obliques	2/5	Knee extension	3/5
Rectus abdominis	3/5		

[Table/Fig-1]: Pre assessment details.
MMT: Manual muscle testing

Physical Examination

Upon arrival, tenderness was evaluated using a grading system, with grade 3 indicating the highest level. Manual Muscle Testing (MMT) was performed to assess strength in the lower back and lower limbs. Pain intensity was measured using the Numerical Pain Rating Scale (NPRS), with the patient reporting a score of 5 on a 0-10 scale, indicative of mild low back pain persisting for five months following the caesarean section.

[Table/Fig-2]: Pre- assessment - Hip bridge test.

[Table/Fig-3]: Post treatment assessment- Hip bridge test.

Outcome	Pretreatment value	Post-treatment value
Tug test	26.49 seconds	14.51 seconds
Hip bridge test	75°	105°

[Table/Fig-4]: Follow-up and outcome.

[Table/Fig-5]: Russian twist exercise.

[Table/Fig-6]: Superman exercise.

Postural assessment revealed forward head posture and increased lumbar lordosis. Gait analysis showed a waddling gait pattern. Mild oedema was observed in both ankles. Sensory examination was conducted using a reflex hammer around the abdominal region, which revealed mild sensory loss around the LSCS scar. Quadriceps muscle strength was assessed using MMT, and findings were documented accordingly. The patient's Body Mass Index (BMI) was 22 kg/m^2, which falls within the normal range.

Diagnosis and Assessment

The patient underwent specific clinical tests for low back pain, including the Straight Leg Raise (SLR) test, Flexion-Abduction-External Rotation (FABER) test, and piriformis test, all of which yielded positive results. MMT was conducted to assess the strength of the quadriceps and core muscles [Table/Fig-1]. Additionally, assessment of Anterior Superior Iliac Spine (ASIS) alignment and limb length was performed to evaluate potential sacroiliac joint dysfunction. Based on the clinical findings, the authors concluded that the patient was experiencing significant lower limb weakness, particularly in the quadriceps muscles, along with compromised core muscle strength.

Intervention

Before implementing the intervention, the Hip Bridge Test and the TUG test were conducted for baseline assessment [1]. Following the examination, a four-week exercise protocol was designed to strengthen the core muscles, enhance quadriceps strength, and improve performance in daily activities. Pelvic floor exercises were not included in the protocol, as the patient was asymptomatic for urinary incontinence and constipation. Informed consent was obtained prior to initiating the exercise regimen. The exercise intervention lasted four weeks, and sessions were conducted three times per week. The patient attended the Physiotherapy Outpatient Department (OPD) three times weekly to receive treatment.

Quadriceps strengthening exercises included straight leg raises, Vastus Medialis Oblique (VMO) activation exercises, lunges, and

Week wise protocol	Warm-up	Reps/hold	Exercises	Reps/hold	Cool-down	Reps/hold
1st week	• Iliotibial stretch • Quadriceps stretch • Stationary bicycle • Butterfly stretch	5 times/10sec hold	♣ For quadriceps- • Straight leg raises • VMO muscle strengthening • Short arc quads • Clamshell exercise ♣ For core- • Pelvic bridge • Single knee to chest • Double knee to chest	6 times/10 sec hold	• Iliotibial stretch • Quadriceps stretch • Butterfly stretch	5 times/10 sec hold

[Table/Fig-7]: First week protocol: Exercises chosen for rebuilding core and pelvic floor strength.

Week wise protocol	Warm-up	Reps/hold	Exercises	Reps/hold	Cool-down	Reps/hold
2nd Week	• Iliotibial stretch • Quadriceps stretch • Stationary bicycle • Butterfly stretch	5 times/10 sec hold	♣ For quadriceps- • Straight leg raises • VMO Muscle strengthening • Lunges • Sumo squat ♣ For core- • Pelvic bridge • Superman • Supine dead bug • Crunches with physio ball	7 times/10 sec hold	• Iliotibial stretch • Quadriceps stretch • Butterfly stretch	5 times/10 sec hold

[Table/Fig-8]: Second week protocol: Chosen for functional strengthening.

Week wise protocol	Warm-up	Reps/hold	Exercises	Reps/hold	Cool-down	Reps/hold
3rd Week	• Iliotibial stretch • Quadriceps stretch • Stationary bicycle • Butterfly stretch	5 times/10 sec hold	♣ For quadriceps- • Wall slide • Walking lunges • Sumo squat with 3kg dumbbell ♣ For core- • Russian twist • Plank • Dead bug	8 times/10 sec hold	• Iliotibial stretch • Quadriceps stretch • Butterfly stretch	5 times/10 sec hold

[Table/Fig-9]: Third week protocol: Chosen for stability and progressive strengthening.

Week wise protocol	Warm-up	Reps/hold	Exercises	Reps/hold	Cool-down	Reps/hold
4th Week	• Iliotibial stretch • Quadriceps stretch • Stationary bicycle • Butterfly stretch	15 times/10 sec hold	♣ For quadriceps- • Wall slide • Walking lunges • Sumo squat with 3kg dumbbell ♣ For core- • Russian twist • Plank • Dead bug	15 times/10 sec hold	• Iliotibial stretch • Quadriceps stretch • Butterfly stretch	15 times/10 sec hold

[Table/Fig-10]: Fourth week protocol: Chosen for maintenance of long term fitness and for better tone of pelvic floor and core muscle).

sumo squats using a 3-kg dumbbell. Core strengthening exercises comprised pelvic bridges, single knee-to-chest stretches, double knee-to-chest stretches, Superman exercise, supine dead bug, crunches using a physioball, plank, and Russian twists. All exercises were planned and executed according to the FITT (Frequency, Intensity, Time, and Type) principle. These exercises were selected to address the patient's symptoms, which were contributing to functional decline [1].

A rest interval of 30 seconds was provided between exercises to allow adequate recovery. Each session began with a warm-up and concluded with a cool-down period to prevent muscle fatigue, promote recovery, and enhance pelvic floor and core muscle tone.

Follow-up and Outcome

Following the four-week intervention, the patient demonstrated significant improvement in functional mobility. The TUG test showed a reduced completion time of approximately 11.9 seconds post-treatment, indicating improved mobility and stability. Additionally, a notable improvement of 30 degrees was observed in the Hip Bridge Test. The patient reported enhanced strength and improved control of the gluteal and core muscles, reflecting an overall improvement in functional movement, balance, and physical endurance during daily activities.

DISCUSSION

The present study was undertaken to enhance core and quadriceps muscle strength following lower limb functional impairment after LSCS. The effects of the four-week exercise protocol were evaluated using pre and post-intervention TUG and Hip Bridge tests. Many previous studies have focused exclusively on specific muscle groups, such as the quadriceps or core muscles, or have examined only lumbar region rehabilitation following LSCS. In contrast, the present case report adopted a comprehensive rehabilitation approach by addressing both quadriceps weakness and core muscle insufficiency simultaneously. This structured protocol is novel, as earlier studies primarily focused on either core strengthening alone or core strengthening combined with other muscle groups. The present case report specifically targeted both core and quadriceps muscles.

Objective outcome measures, including the TUG and Hip Bridge tests, were utilised to assess this specific weakness profile, offering clinicians a practical framework for managing similar patients in whom core dysfunction may contribute to peripheral weakness and functional limitations. Previous research has demonstrated that abdominal exercises effectively activate abdominal musculature [2]. Strengthening these muscles is essential for restoring abdominal function, with core strengthening exercises providing optimal support and flexibility [3]. The primary objectives of exercise regimens are to enhance muscle strength and improve range of motion. Studies have also shown that patients may experience muscle weakness and numbness immediately following LSCS.

Earlier studies have incorporated exercises such as squats, walking lunges, and clamshells to improve quadriceps muscle contraction, strength, and flexibility [4], reporting significant improvements in quadriceps strength. Additionally, core strengthening exercises, including crunches and planks, have been shown to improve core stability and balance during movement [4]. Exercises such as squats and lunges have been associated with improved lower limb strength and balance. Previous research has also included core and physical training exercises such as the dead bug and Russian twist, which are known to enhance physical development and strengthen core musculature [4]. Warm-up routines involving quadriceps stretching and stationary cycling have been recommended to prevent overtraining [5].

The present study incorporated these exercises to improve core and quadriceps strength. Following the intervention, improvements were observed in gait pattern, endurance, posture, functional mobility, and Activities of Daily Living (ADLs), including bending and lifting. Warm-up and cool-down exercises, such as quadriceps stretching and stationary cycling, were included to promote muscle recovery. Exercises such as single knee-to-chest stretches and pelvic bridging were included to strengthen the core and alleviate low back pain, consistent with previous studies reporting improved core strength and reduced back pain [6]. Prior research comparing scar mobilisation combined with core stability exercises versus scar mobilisation alone demonstrated that the combined approach was more beneficial for managing lumbopelvic and scar-related pain following caesarean section [7]. However, the present study was a single-patient case report and did not include comparative groups; instead, it focused on improving both core and quadriceps strength through an integrated protocol.

Another randomised controlled trial involving patients with knee osteoarthritis demonstrated that quadriceps strengthening exercises significantly improved pain, knee function, and quality of life compared to education-based interventions [8]. The findings of that study support the relevance of quadriceps strengthening for improving gait quality and functional performance post-surgery, which aligns with the outcomes observed in the present case. Additionally, previous clinical trials comparing abdominal exercises combined with core stability training versus no intervention in patients with chronic nonspecific low back pain found significant improvements in postural balance and spinal stability [9]. In the present study, core stability exercises were combined with quadriceps strengthening to enhance muscle control, strength, and functional performance during daily activities. Overall, the current study utilised exercises aimed at strengthening core muscles, relieving lower back tension, and improving flexibility in the hip and lumbar regions.

CONCLUSION(S)

The present case report demonstrates the effectiveness of a four-week exercise protocol in improving core and quadriceps muscle strength following LSCS. The intervention resulted in significant functional improvements and may serve as a foundation for larger-scale experimental studies aimed at posture correction and functional efficiency. While previous studies have addressed low back pain following caesarean section, the present study specifically focused on quadriceps and core muscle weakness. The intervention also improved balance and enhanced the patient's ability to perform activities of daily living. The exercises prescribed were simple, cost-effective, and easy for patients to perform, making this protocol feasible for clinical practice.

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