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Effect of Physiotherapeutic Rehabilitation on Post Surgical Case of Quadricepsplasty

Anjila Ghimire[1], Amit [2]

[1]BPT Student, Physiotherapy Department, Sharda University, Greater Noida, Uttar Pradesh
[2]Tutor, Physiotherapy Department, Sharda University, Greater Noida, Uttar Pradesh

Corresponding Author: Amit

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ABSTRACT

Objective: To present the effectiveness of physiotherapeutic rehabilitation on patients after quadricepsplasty surgery.
Design: Case Report
Case description: A five-year-old boy presented with chief complaints of stiffness and restricted ROM and inability to walk for 1.5 months. He had a history of quadricepsplasty surgery. Patient was advised to take a physiotherapy session for at least 6 weeks. The knee ROM, muscle strength, NPRS score and Functional Disability Inventory score were evaluated at 4th week and 6th week after physiotherapy sessions. The functional activities were enhanced by implementing a rehabilitation program tailored to quadricepsplasty patients.
Conclusion: Outcome scores revealed that knee ROM, muscle strength, NPRS score and Functional Disability Inventory score improved with the rehabilitation. In conclusion, the findings of the study support that surgery specific physiotherapeutic rehabilitation is effective in improving functional outcome after quadricepsplasty.

Key words: Quadricepsplasty, physiotherapy, stiffness, flexion deformity

INTRODUCTION

In clinical practice, knee stiffness, also known as ankylosis, is a prevalent condition which is mostly caused by scarring adhesion in quadriceps-femoral apparatus and intra and extra-articular fibrosis. [1,2] A normal gait and knee function depends on the full range of motion (ROM) of knee, therefore, knee stiffness due to any cause might result in discomfort and functional impairment. The main causes of knee stiffness include injury to knee, subsequent immobilization and surgery.

Fixed Flexion Deformity (FFD) of the knee, which combines ligamentous, capsular and bony deformity, causes higher stress at patellofemoral and tibiofemoral joint and affects knee biomechanics.[3] It arises when the hamstring (knee flexor) muscle fails to extend in tandem with the bone , particularly in absence of appropriate physical therapy to facilitate both active and passive mobilization of affected joint.[4] A fixed flexion in one knee increases abnormal force on the opposite knee, causing an altered walking pattern.[3]

Quadricepsplasty is a surgical technique performed to release quadriceps muscle for increasing ROM. The primary indication for this surgery is knee stiffness in extension. [5] Like any other surgical methods, this procedure also has many complications such as patellar septic arthritis, knee stiffness, extension lag etc. [5,6] Therefore effective rehabilitation is important post-operative

care to preserve ROM in knee that is achieved after surgery. [6]

To minimize loss of the ultimate range of motion, postoperative care is an essential component of quadricepsplasty. Postoperative mobility should be maintained with both active and passive exercises. It is advised to begin manipulation under anesthesia (MUA) as soon as any discernible loss of flexion appears after surgery. [7] Early in the recovery process, it has been demonstrated that using CPM in addition to physiotherapy is beneficial. [8] 4-6 weeks of post-operative physical therapy are believed to be helpful in maintaining the increased range of motion.[8]

Electrical modalities such as Neuromuscular electrical stimulation (NMES) can be used to increase quadriceps muscle strength both before and after surgery. Similarly, Whole body vibration is utilized to help individuals with low extremity weakness achieve postural control, strengthen their muscles, and enhance their countermovement. Isotonic as well as isometric exercises, walk lunges with body weight, stair walking, squats and faster stairs can greatly increase functional strength and power. [2]

CASE HISTORY

- **History:**

On 14th September 2023, a four years old boy presented with chief complaints of stiffness and restricted ROM in his right knee and difficulty in walking for 1.5 months. Three years ago, a patient had stiffness in his right knee which kept on worsening. At first, his ROM got restricted and after that he was unable to walk and had a painful ROM of knee. He went to a local doctor in his village who prescribed him some ointment and painkillers but that didn't improve his condition. On 24th July, 2023, he visited Sharda hospital for treatment of quadriceps contracture and flexion deformity of knee where he was prescribed quadricepsplasty surgery. On 26th July, the patient was operated on and then he was prescribed physiotherapy. But the patient did not follow advice, and his symptoms got worse and again started having stiffness in knee.

- **Examination Findings:**

Patient was fully conscious and well-oriented to time, place and person. The patient had an ectomorph build. The observation of the patient's attitude of limb showed that the right knee was slightly flexed, the hip externally rotated and the foot was plantarflexed and inverted. There was muscle wasting of the right lower limb. Scar from previous surgery was present over the right knee extending upward till mid-thigh. There was flexion deformity of the right knee. The pain was measured using a Numeric Pain Rating Scale with end range descriptors of "0" for no pain and "10" for severe pain. The intensity of pain for the patient was 8/10. Swelling was present over the right knee. There was no local rise in temperature. Patient was unable to walk and used a wheelchair for ambulation.

Functional Disability Inventory scale was used to measure the limitations in physical and psychosocial functioning of the patient due to his physical health which consist of 15 items and each item is scored from 0 (no trouble) to 4 (impossible) to attain total scores ranging from 0 to 60, with higher scores indicating greater disability. The Functional Disability Inventory score of the patient was 36/60.

Active knee ROM was measured using a universal goniometer.

Knee movement	**Right**	**Left**
Flexion	15-100	0-135
Extension	100-15	135-0

Power was measured using the MMT scale.

		Right	**Left**
Hip	Flexors	2	4
	Extensors	2	4
	Adductors	3	4
	Abductors	3	4
	External rotators	2	4
	Internal rotators	2	4
knee	Flexors	3	4
	Entensors	3	4

Physiotherapeutic plan:
Patient was advised to follow physiotherapy sessions for 6 weeks.

Day 1:
- Active knee ROM exercise (1set, 1reps)
- Heel slide (1set, 10 reps)
- Ankle Toe Movement (1set, 10 reps)
- Cold Pack (15 min.)

Day 2:
- Continue day 1 exercise (1 set, 15 reps)

Day 3:
- Continue day 2 exercise (1 set, 20 reps)

Day 4:
- Continue day 3 exercise
- Calf and Hamstring stretching (1set, 10 reps) Knee Isometrics (1set, 10 reps, 10 sec hold) Active Assisted Straight Leg Raise (1set, 10 reps)
- Active Hip Abduction against gravity (1set, 10 reps) Weight bearing as tolerated
- Muscle stimulator on quadriceps (Faradic current for strengthening) Ball kick
- Scar mobilization Cold pack

Day 5:
- Continue day 4 exercise (1 set, 15 reps)

Day 6:
- Continue day 5 exercise (1 set, 20 reps)

2nd to 4th week:
- Continue day 6 exercise
- Hot fermentation (10 min.)
- Patellar mobilization (on medio-lateral and superior inferior directions)
- Heel sliding on the wall
- Single limb standing (on each leg for 5 min.) Squats
- Walking in Parallel bar
- Walking unsupported

4th to 6th week:
- Continue above exercises
- Knee ROM in- side lying position Step up and down
- Tandem walk
- Treadmill walking (5 min)

Fig 1. Sitting position

Fig 2. Standing position

RESULT

- **Initial evaluation after 4 weeks of physiotherapy:** The knee ROM, muscle strength, NPRS score and Functional Disability Inventory score were improved after physiotherapy. Patient was able to walk with support and perform affected activities of daily living approx. 60% easier than earlier.
- **Re- evaluation after 2 weeks of initial evaluation:** Score on NPRS and Functional Disability Inventory had mostly all improved. The pain was decreased by approx. 90%. Patient was able to walk without support and perform affected activities of daily living approx. 80% easier.

Table 1. Result of knee ROM, muscle strength, pain level and disability score 4th and 6th week after physiotherapy

	After 4 weeks	After 6 weeks
ROM (Right)		
Knee flexion	10- 120	9-125
Knee extension	120-10	9-125
Strength (Right)		
Hip flexors	3	4
Hip extensors	3	4
Hip abductors	4	4
Hip adductors	4	4
Hip external rotators	3	4
Hip internal rotators	3	4
Knee flexors	3	4
Knee extensors	3	4
Functional Disability Inventory score	17/60	7/60
NPRS	3	2

CONCLUSION

A comprehensive rehabilitation protocol was provided to the patient that helped him by relieving pain, reducing swelling, increasing ROM and strength. The patient was able to walk independently, play and conduct everyday living tasks with less difficulty. The rehabilitation plan focuses largely on quadriceps strengthening and co-contraction of the quadriceps-hamstrings muscle complex to preserve knee control after surgery. Similarly, it was aimed to retain knee ROM and to restore the gait of the patient. Therefore, it can be concluded that it is crucial to design a patient and surgery specific rehabilitation program after quadricepsplasty surgery.

Limitation

The limitation of the case report was that only one patient was taken for the study. It would have been better to study the larger sample.

Declaration by Authors

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