

## Role of ankle position in static stretching for hamstrings to improve flexibility in post-operative knee stiffness-a case report

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### ABSTRACT

A 30 years old male patient presented with complaint of difficulty in bending right knee since 2months and pain around right knee joint following an operation for supracondylar fracture of right femur. On objective examination, swelling over right knee; on postural analysis, there was right pelvic drop; gait was antalgic with limping on left side. On palpation, muscle spasm and tenderness were present over quadriceps, hamstrings. Tightness of hamstring, piriformis were prominent. The ROM and strength was reduced for knee. According to the subjective, objective examination and radiological investigations of right knee, the case was diagnosed as post-operative right knee stiffness. A treatment session of 14 days was given along with hamstring stretching with ankle plantar flexed for 7 days. The therapeutic interventions taken were manual therapy-MET with Mulligan technique for knee joint, patellar mobilization, continuous passive movement (CPM), exercise therapy and stretching of hamstring. In cases of post-op knee stiffness, primary concern is always for improving joint range of motion and reducing pain but the tightness of hamstring plays a major role in knee joint mobility during locomotion and also the altered biomechanics. So the stretching of hamstrings with ankle plantar-flexed and working on the biomechanics should be taken into consideration in any type of post-operative cases of lower extremity.

**Keywords:** Post-operative, tightness, ankle-position, plantar flexion.

### Introduction

Knee joint mobility is one of the necessary factors for locomotion (Phansopkar et al., 2020). The flexibility of muscle groups involved in knee mobility must be considered for the same. Being a two joint muscle; hamstring flexibility plays a key role in knee mobility (Naqvi, 2020). Due to presence of muscle imbalances and bone pathology, there is an alteration in the biomechanical analysis in the kinetic chain concerned during the gait analysis (Bais et al., 2020). No doubt there will be an effect of bone fracture in the biomechanics but somewhere and other due to the presence or involvement of one pathology, there shall be depiction of another symptoms leading to complete alteration in the biomechanics (Dhankar and Bele, 2019).

In this case, treatment was mainly focused on effect of ankle position during static stretching of hamstring to decrease tightness and improve biomechanics by correcting the muscle imbalances. Tight hamstring affects range of motion at knee joint so the focus was on improving flexibility of hamstring using static stretching of hamstring with ankle plantar flexed which solely provides stretch to the hamstring muscles and thereby improving ROM.

## **Patient Information**

Patient was 30years old male who met with an accident 5 months back; a loading auto dashed his right knee. He was diagnosed for supra-condylar fracture of femur and was operated for the same twice. Second surgery was performed after 3 months. He had difficulty in riding bike. His socioeconomic status comes under upper middle class. Due to pain and reduced mobility at knee, for his selfcare and prevention, he uses western toilet. Patient's primary complaint was difficulty in bending right knee since 2months and secondary complaint was pain around the right knee since 2months.

## **Clinical Findings**

### On objective examination

Posture analysis with the plumb line: On anterior view right shoulder was depressed than left shoulder. Right ASIS was depressed lower than left. Right leg 7 degrees laterally rotated. On lateral view thoracic kyphosis was observed. On posterior view right shoulder was depressed than left. Right PSIS was depressed than left.

Tightness of piriformis, hamstring muscle was found.

Muscle spasm was present for quadriceps, hamstrings muscles.

Resisted isometrics were weak and painful for knee musculature.

Knee joint range of motion-knee flexion was 0-55degrees initially and was improved upto 0-80degrees, restricted with empty end-feel.

According to MMRC scale knee musculature strength was grade 3 and the hip abductors were found to be weak i.e Grade 3.

Joint play was found to be grade 2 for tibio-femoral and patellar joints.

In gait analysis the patient was walking in an antalgic gait pattern with limping on left side. There was 2 cm difference in the limb length. Knee joint circumference was having difference of 4 cm.

## **Diagnostic Assessment**

X-ray was done.

Compression plates with nailing on right side were observed.

## **Diagnosis**

Diagnosis was done on the basis of subjective, objective examination and radiological investigations for post-operative right knee stiffness.

## **Prognosis**

The physiotherapy treatment was more of biomechanical correction and patient's prognosis was considered to be good.

## **Therapeutic Intervention**

Earlier he had taken medications for pain and swelling for knee joint prescribed by the orthopedic.

For his-self care he is using western toilet.

CPM-20min.

Mulligan mobilization was given in 3 sets. In one set 5 glides were given

Muscle energy technique 3 sets 5sec hold.

Therapeutic exercises- 5reps 2 sets.

Static Stretching for hams with ankle plantar flexed position for 1min given.

After the treatment sessions are over the patient was given a home programme along with the education regarding lifestyle modifications. In home programme static and dynamic quadriceps and hamstring exercises were given to be performed twice a day. The patient will be also advised about the breathing exercises and modified aerobic exercises to improve the cardiopulmonary endurance. Breathing exercises will be performed for 2-3 times a day and modified aerobic exercises 2-3 times a week.

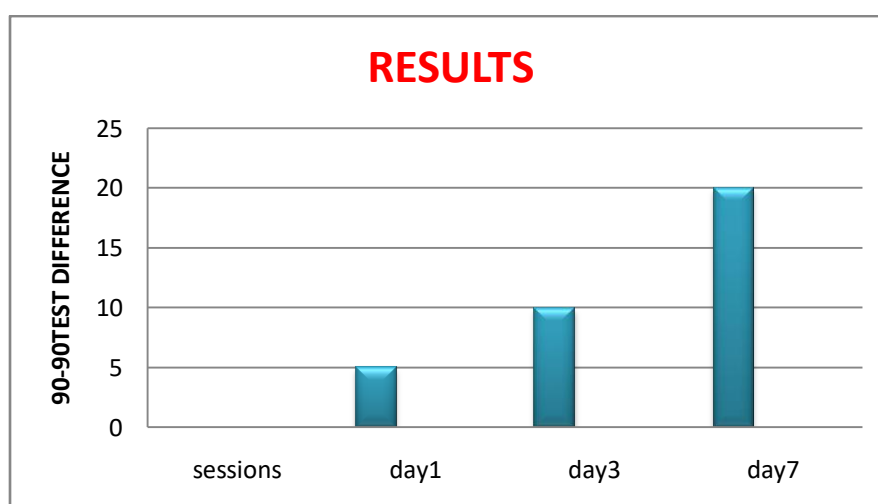
### Follow-up and Outcomes

Outcomes used were hamstring 90-90 test, NPRS scale.

On daily follow up basis there was an effect of manual therapy and stretching component on joint range of motion. Joint range of motion was measured pre and post treatment. Difference in hamstring 90-90 test was 20degrees after 7 days of static stretching with ankle in plantar –flexed position and ROM was improved by 30degrees after 14 days of treatment.

SESSIONS	HAMSTRING 90-90 TEST DIFFERENCE
DAY 1	5 DEGREES
DAY 3	10 DEGREES
DAY 7	20 DEGREES

**Table for difference in hamstring 90-90 test.**



**Graph showing hamstring 90-90 test result**

### Intervention adherence and tolerability

Patient was well adhered with number of physiotherapy days. Patient had well co-operated through manual therapy and exercises.

### Adverse and unanticipated events

There were no adverse and unanticipated events

### Strength associated with the case report-

The treatment approach was not only focused on reducing the local symptoms - pain and improving ROM but rather correction of the altered biomechanics due to fracture.

By improving the hamstring stiffness and co-contraction of hamstring there will be significant gain in knee joint ROM and can help the patient to improve his posture and gait.

### **Weakness associated with the case report-**

Insufficient number of treatment sessions.

### **Discussion**

According to the researchers, to improve the flexibility of the hamstrings static stretching is frequently used (Bhandakkar et al., 2020). During static stretching of hamstrings, position of ankle plays a key role (Risaldar et al., 2020). Sayaka Nakao investigated that static stretching must be performed with ankle plantar-flexed to reduce passive stiffness of hamstrings in healthy men (Nakao et al., 2019).

Many of the researches have reported that hamstring flexibility (long muscle length) decreases the knee angle flexion torque, thus improving knee joint mobility (Alonso et al., 2009).

Hamstring stiffness can be improved by static stretching of the muscles with passive knee extension rather than passive hip flexion to improve joint mobility, reported N Miyamoto et al (Miyamoto et al., 2017).

Dynamic stretching is often performed to improve joint flexibility, reduce risk of hamstring injury and has sustained effects on range of motion and passive stiffness of hamstring muscles, reported Masahiro Iwata et al on healthy individuals (Iwata et al., 2019). But in patient with post-operative knee stiffness, dynamic stretching could not be performed as there is insufficient availability of knee range of motion. Therefore static stretching of hamstring with ankle in plantar flexed position was chosen not only to reduce the hamstring stiffness, but also to improve knee range of motion.

### **Conclusion**

In cases of post-op knee stiffness, primary concern is always for improving joint range of motion and reducing pain but the tightness of hamstring plays a major role in knee joint mobility during locomotion and also the altered biomechanics. So the stretching of hamstrings with ankle plantar-flexed and working on the biomechanics should be taken into consideration in any type of post-operative cases of lower extremity.

### **Scientific rationale**

The hamstring tightness was assessed by hamstring 90-90 test. As hamstring is a two joint muscle, thus hamstring tightness is one of the component restricting knee joint mobility.

Tightness is the measure of elasticity of a material and is defined as the slope of stress/strain curve in the elastic region of the curve. The visco-elastic response of hamstring muscles produced after slow stretch will decrease passive tension of muscles, thus improving the range of motion at knee joint.

Tight hamstrings will not allow complete mobility at hip and knee joints, the quadriceps will take over from inefficient hamstrings, putting tremendous load and strain on the knee. Thus improving the flexibility of hamstrings is of utmost importance along with other manual and therapeutic intervention to improve mobility at knee joint. Stretching the tight hamstrings with ankle in plantar-flexed position provides complete stretch to the target muscle (hamstrings) excluding the plantar flexors, to improve range of motion at knee joint.

### Patient Perspective

The patient shared his perspective that compared to the day one he found that his knee range improved by 30degrees after 14days of manual and exercise therapy. After 4 days of manual therapy treatment his knee pain got reduced by 4 on NPRS.

On 14<sup>th</sup> day he was able to ride a bike with good mobility at knee joint.

**Author's Contribution:** All authors contributed equally to the case report.

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

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**Informed Consent:** Written & Oral informed consent was obtained from patient included in the study.

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