



ISOMETRIC HOLD EXERCISE WITH TERMINAL PASSIVE KNEE EXTENSION IN QUADRICEPS LAG – A CASE REPORT

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ABSTRACT

Quadriceps lag is one of the complications of surgery and or prolonged immobilization. Various factors like pain and stiffness can contribute to decreased muscle power leading to lag. Early intervention and appropriate exercise protocols will reduce the chances of the complication and may help in the early recovery for an optimal function. This study aims to introduce a combination of exercise methods in two different cases involving the knee joint, both the case presented with a classic quadriceps lag. The patients were put on a new combination exercise techniques which consist of isometric hold exercise and terminal passive knee extension. A pre and post results on the active joint range of motion was recorded and analyzed for significance.

Conclusion: Exercise technique which combined terminal passive knee extension and isometric hold exercise was effective in improving active knee extension.

KEYWORDS : Isometric exercises, Quadriceps lag, terminal extension, knee, Iso-inertial

Background:

Inhibition of the quadriceps muscle activity and reduced knee-extension strength in terminal extension is observed in most of the cases following total knee arthroplasty (TKA) and anterior cruciate ligament (ACL) reconstruction. Quadriceps lag (QL) if persists can lead to limitation of functional and performance skills. TKA and ACL reconstruction rehabilitation protocols and recent evidence does not mention about specific tailored exercise programs to address the quadriceps lag in the respective protocols. Isometric exercise, isolytic, iso-inertial and stretching exercises are performed as a part of knee rehabilitation program; although these are widely followed the efficacy to improve must also form as an integral part. The loss of quadriceps power may be due to reduced voluntary activation of the quadriceps muscle due to arthrogenic muscle inhibition (AMI) 2. Knee extension is limited by the passive tension in the posterior structures of knee after surgery, which may be thought to be inflammation, swelling and receptor damage following surgery 2. Stretching and maintaining the joint in a position by activation of the muscle by isometric contraction can influence reflex inhibition of antagonist. The effects of coalesce techniques of maintaining optimal length passively through range of motion to be achieved and activating muscles to maintain actively through muscle contraction may have positive effects in achieving terminal extension. The possibility of the activity can be used to reduce the AMI after surgery leading to preserving muscle property with faster and better recovery in normal range and strength.

Aim:

To incorporate specific exercise to achieve active knee joint extension in patients with persistent quadriceps lag following knee surgery.

Methods:

In this non-randomized descriptive case study the patients attending tertiary care hospital for physiotherapy were selected during one month duration. Patients with persistent quadriceps lag after an exercise program of minimum six weeks of post-knee surgery were included for the study. Two male patients were identified with quadriceps lag. A baseline data was recorded for the active joint range of motion (JROM) using a standard goniometer and Kinovea software. An exercise technique which combined terminal passive knee extension and isometric hold exercise at the new active range was incorporated to achieve the full knee extension; the isometric hold was encouraged for ten seconds. The active JROM at knee was then measured after ten repetitions. The results were analyzed by time series taking the pre-test and post -test results.

Key points from Case 1:

A male patient, aged forty-four years presented with fracture of lateral condyle of femur operated with closed reduction and internal fixation with three cannulated cancellous screws in the month of November, 2016. Decreased functional skills, with quadriceps lag of 29 degrees (Active JROM 88-29 degrees) and with fixed flexion deformity of six degrees was recorded at the baseline. The patient was cooperative,

active adult attended physiotherapy sessions with an intention to get back his normal function at knee joint.

Key points from Case 2:

A young adult male, aged 27 years enrolled for ACL rehabilitation after reconstruction surgery in the month of December 2016 presented with decreased JROM and knee function. A home exercise program with a follow up of once in a week was advised to the patient after the surgery at a different hospital. Quadriceps lag of 22 degrees was noted at the baseline (Active JROM 22-85 degrees) during the first visit to the hospital.

These two diverse cases presented with similar findings of quadriceps muscle wasting, decreased active JROM, altered motor control and function. They had no improvement in achieving full knee extension after an average 10 weeks of exercise program. There was a marked quadriceps lag with diffidence in joint control, making it difficult for the patients to perform functional skills independently. A specific exercise technique which combined the terminal passive knee extension and isometric hold exercise was administered as a part of the tailored rehabilitation program. Active JROM was used as an outcome measure which was determined prior and immediately after the procedure.

Results:

The quadriceps lag was measured using Active Joint Range of Motion (AJROM), a standard goniometer was used and standardized using the Kinovea software, the JROM yielded a close normal recording. The pre-post results are summarized in the table 1-1

Table 1-1: The standardized AJROM values in degrees of the initial (pre-test) and immediate after intervention (post-test) at right knee joint

Session	Case 1	Case 2
	Mean*	Mean*
I	9	2
II	3	1
III	5	1
IV	4	2
V		1
Pre-post mean	5.25	1.4

Mean of differences between the pre-test and post-test in degrees

Case 1: The mean of differences between the pre-test and post-test AJROM was analyzed to have an increase in the knee active range by 5.25 degrees. The values measured after the sessions was carried out in the baseline and after fourth session at the physiotherapy OPD, the JROM recorded at baseline and at the end of the session were 29 and 23 respectively with a mean difference of 6 degrees' improvement in the active knee extension.

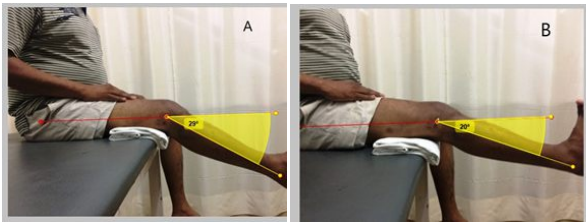


Figure 1 : Pre (A) and Post (B) Active joint range of motion– Case 1

Case 2: The mean of differences between the pre and post-test AJROM increased in the knee active range by 1.4 degrees. The values measured after the sessions was carried out in the baseline and after fifth session at the physiotherapy OPD, the JROM recorded at baseline and at the end of the session was 22 and 19 respectively with a mean difference of 3 degrees' improvement in the active knee extension (table 1-2)

Table 1-2: The AJROM values in degrees of the initial (pre-test) and after end of sessions (post-test) at right knee joint

Case 1			Case 2		
Pre	Post	Mean*	Pre	Post	Mean*
29	23	6	22	19	3

Mean of differences between the pre-test and post-test in degrees

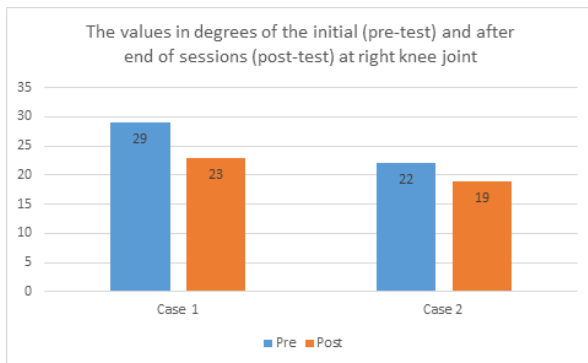


Figure 2: Pre and post joint range of motion at the end of session.

Both the subjects presented with an increase in immediate outcome measure, achieving an improvement in the knee joint extension range.

Conclusion: Exercise technique which combined terminal passive knee extension and isometric hold exercise was effective in improving active knee extension and thus reducing the quadriceps lag.

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