



Efficacy of functional training and muscle energy technique in post-operative (ACL reconstruction) knee extension lag

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Abstract

Overall, in India each year around 8000-10,000 ACL reconstruction surgeries are performed. Injury to ACL most commonly occurs in athletes. It happens frequently in those who plays sports involving pivoting. The extension lag describes the lack of full extension of knee with full contraction of quadriceps. Also called quadricep lag of knee. To reduce the extension lag physiotherapy is effective treatment. Among them. In current study hypothesized that functional training program and Muscle Energy Technique is more efficacious as compared to conventional training in minimizing quadriceps lag after several knee surgeries. Total 54 subjects fulfilled the inclusion criteria of having knee extension lag. Samples divided into 2 group. Group 1 was experimental and Group 2 was conventional. The Extension lag of knee was found to be significantly reduced in the experimental group which was given functional training and muscle energy technique as compared to the conventional group which was given conventional physiotherapy. Functional training exercises resulted in remarkable reduction in post-operative knee pain. Muscle energy technique helped in improving the strength of the muscles.

Keywords: physiotherapy, extension lag, knee surgeries, functional training, muscle energy technique

Introduction

Overall, in India each year around 8000-10,000 ACL reconstruction surgeries are performed. Anterior cruciate ligament is fundamental structure in the knee joint kinematics, as it resists the anterior tibial translation and rotational loads. The ACL provides approximately 85% of the total restraining force of anterior translation. It also disreets excessive tibial medial and lateral rotation as well as varus and valgus stresses^[1]. ACL is important for stability of knee joint, particularly in activities of weaving, pivoting or kicking^[2]. The knee becomes unstable with ruptured ACL. ACL reconstruction is surgical procedure to restore stability of joint. ACL reconstruction is surgery to replace torn anterior cruciate ligament (ACL)-a major ligament of knee. It is most of times associated with meniscal injury.

Injury to ACL most commonly occurs in athletes. It happens frequently in those who plays sports involving pivoting. They can range from mild to severe. Both contact and non-contact tears or ruptures can occur. Females' athletes are suffering more with ACL tear than male athletes^[3].

The extension lag describes the lack of full extension of knee with full contraction of quadriceps. It is also called quadriceps lag of knee. Limited knee extension range of motion may also cause the lack of full extension but eliminating limited range of motion as the problem, quad weakness is the major issue. The weakness in the quadricep extensor mechanism causes the extensor lag.

The surgery is performed in order to make the knee stable and ameliorate patient gratification. However, many patients' post-surgery has reported sedulous impairments and functional inhibitions. The impuissance and delayed activation of quadriceps have been identified as the major cause of activity circumscriptions post knee surgeries. The postoperative Quadriceps vigor has been found to be truncated to as much as 60% as compared the pre operated vigor^[4]. Consequently, Quadriceps activation is a consequential consideration for rehabilitation following a post-operative knee surgery. Antecedent studies have shown the impact of different postoperative rehabilitation strategies as resistance exercises, weight bearing functional exercises, low and high impact sports activities, proprioceptive and balance training^[4]. However, there is a desideratum to develop evidence predicated practice guidelines. Balance training along with traditional functional training has shown positive effects on the functional instauration after total knee arthroplasty^[5]. There is an incrementing trend of pre-operative and post-operative outpatient Rehabilitation for ACL reconstruction surgery.

Physiotherapy rehabilitation after ACL reconstruction is general as a standard and vital remedy. Its aim is to maximise capability and independence and to reduce complications along with wound infection, deep vein thrombosis, pulmonary embolism^[6]. The physiotherapy rehabilitation routine has 4 components: therapeutic exercise, transfer training, gait training, and instruction in activities of daily living (ADL)^[6]. The reconstruction is done for severe rupture or tear of ligament and meniscus and when the conservative management fails to deal

with it. Present day guidance recommends that patients have get admission to inpatient physiotherapy after ACL-r to enhance mobility and functional independence before discharge. Inpatient physiotherapy is executed in a rehabilitation clinic or specialized medical institution unit ^[6]. After discharge, there may be a few steerages to be had about physiotherapy provision following ACL-r.

Outpatient physiotherapy is completed both at an outpatient rehabilitation hospital (health centre-based) or within the affected person's home (domestic-based) ^[6]. The paucity of advice might also relate to uncertain evidence about the effectiveness of physiotherapy after discharge following surgery. Development in bodily feature is observed with physiotherapy after surgery. With constrained steering and unsure evidence about submit-discharge physiotherapy, there is a want to evaluate current exercise which will broaden capacity interventions. A recent study on the post-operative care after total knee replacement has revealed that 26% patients get the out-patient predicated physical rehabilitation after their discharge which can have profound effects on the long term salubrity and quality of life of the patient ^[7]. Vigor training with high resistance has been shown to amend quadriceps vigor and activation. Progressive vigor training has been proposed to be commenced as early as 1 to 2 days post op in order to minimize vigor deficits in quadriceps. Diminutive to mitigate amendments in range of kineticism and functional status have been visually examined with functional exercise after 3-4 months of total knee replacement ^[7]. Home predicated unsupervised exercises have additionally been notionally theorized to truncate pain and incapacitation. But the efficacy of home base exercises and functional exercises in providing long term amendments in range of kineticism and functional status is obscure.

Muscle Energy Technique was proposed by osteopathic physician Fred Mitchell, Sr. It was refined by Fred Mitchell, Jr and has continue to evolve contributions from many individuals ^[8]. MET is a technique which uses muscle's own energy in the form of gentle isometric contractions to relax the muscles via autogenic or reciprocal inhibition and lengthen the muscle ^[8]. As compared to static stretching which is a passive technique in which the therapist does the all work, MET is an active technique in which the patient is also an active participant. MET is based on the concepts of Autogenic Inhibition and Reciprocal Inhibition. If a sub-maximal contraction of the muscle is followed by stretching of the same muscle it is known as Autogenic Inhibition MET and if sub-maximal contraction is followed by opposite group of muscles it is known as Reciprocal Inhibition MET. In this study we are going to use Reciprocal Inhibition MET.

Therefore, there is a desideratum to evaluate the efficacy of various techniques in ameliorating quadriceps strength and minimizing functional inhibitions after different knee surgeries. Current study hypothesized that functional training program and Muscle Energy Technique is more efficacious as compared to conventional training in minimizing quadriceps lag after several knee surgeries.

Material and Methodology

This experimental investigation has been carried out at Krishna Hospital in Karad after receiving approval from the Institutional Ethics Committee. The research's main objective is to check the efficacy of functional training and muscle energy technique in post-operative (ACL reconstruction) knee extension lag.

Total 54 subjects fulfilled the inclusion criteria of having knee extension lag. Out of which 1 subject did not agree to participate while the other 3 terminated the treatment. The remaining subjects were found. The subjects showed a maximum positive response to the treatment both genders, of age 18 to 55 years, patient having extension lag after ACL reconstruction or individual with meniscal injury were included in the study. Patient having knee extension lag were randomly allocated by using random sampling in two groups. Group 1 was experimental and Group 2 was conventional. both group 1 and 2 had 25subject each.

An informed written consent was obtained from the subjects. An assessment was performed using MMT, VAS, ROM, and examination of extension lag. Pain examination was done by visual analogue scale whereas examination ROM is taken by Goniometer. Similarly, for examination of extension lag patient is asked to sit in high sitting position the extend both the knees by visually watching or by goniometer we can measure extension lag. For muscle performance MMT grading system was used. The assessment was done before intervention then the after one month again assessment was recorded.

Discussion

Anterior cruciate ligament is a ligament which connects tibia to the femur. Usually ACL-r occurs in sports players who plays basketball, volleyball, football, etc. The mechanism of injury involves sudden stopping and changing the direction while playing ^[9]. It is the surgery in which the torn ligament is replaced.

Previous study was done on comparison of functional training and strength training in improving knee extension lag after total knee replacement. They have concluded that the both strength training and functional training are equally effective in improving knee extension lag ^[4].

This study included two groups; one conventional group in which there was 27 participants, 13 males and 14 females. This included the age group from 15-55 years. This group was given conventional physiotherapy which includes electrotherapeutic modalities for pain reduction, range of motion exercises and at the end at around 6th week of treatment resistance training was started. By conventional physiotherapy the patient needed 8 to 10 weeks for full recovery but to compare both the groups we have taken the readings at the end of 4th week in this study.

The second group experimental group in which there was 27 participants, 12 males and 15 females. This comprises population from the age group 15 to 55 years. This group was given treatment protocol which

includes hot moist pack, short arc knee extension exercise, 3-way SLR, MET in supine, prone and high sitting, resistance training and functional training (stair climbing, sit to stand). This group needed 4 to 5 weeks for recovery and there was complete removal of extension lag of knee.

In previous study they have used low electric charge for quadriceps inhibition^[10]. In this study we have majored the strength with the help of manual muscle technique. For control group there was no much improvement in the strength in 4 weeks but in treatment group there was visible changes^[12]. The range of motion was taken by goniometer. The extension lag was majored by a new technique which is not in previous study is examination of extension lag in high sitting position. The subject is in high sitting position at end of bed and ask him/her to extend the knees and now compare the extension on both sides. All the assessment was taken before and after the recovery. To make this study fair we have noted the readings before and after 4 weeks of treatment in both the groups^[13, 14].

Quadriceps activation fails after ACL-r is not simply an isolated phenomenon related to atrophy. This has been associated with arthrogenic muscle inhibition which is caused by neural inhibition^[15]. Mechanism for this include alteration in muscle resting motor thresholds, changes in the discharge of articular sensory receptors, altered spinal reflex excitability and abnormal cortical activity^[11]. In this study we found that when there is operative procedure in and around the knee the muscles around it; quadriceps, hamstring, adductors, and the vastus medialis obliquus which is part of quadriceps muscles is getting weaken. The strength of these muscles will get affected. The range of motion of the joint will also be affected. We have focused on these factors in this study. To improve both range of motion and the muscle strength we have chosen the muscle energy technique. Muscle energy technique is a technique which will increase muscle strength with its length. Once we achieved a good range of motion of the affected joint then we worked on the strength of the muscles. To improve more strength later we included resistance training, the muscle training with the equipment in the therapeutic gymnasium and in the end started functional training.

In this study the subjects in the age group of 15-25 years were recovered fast as compared to elderly population. This seems to be because the healing process in younger population is higher than the elderly or middle aged. We have noticed that the males are getting recovered fast than the women. This can be because of the muscle strength which is already greater in males compare to females.

An overall quality of life based on muscle performance and functional independent was found out to be better in the treatment group. The more likely reason for it could be better the treatment of choice, the use of muscle energy technique and functional training and the early physiotherapeutic approach.

Some limitations must be taken into consideration while interpreting the results of the study. One of the limitations of the study was that there was no data interpreted before the physiotherapy treatment. Therefore, it was difficult to compare the post-physiotherapy treatment results, as a baseline was not established. If an immediate post-operative assessment was taken, the results after physiotherapy treatment would have been able to compare in a better way. The present study was conducted at a single institution; therefore, generalization of the result may be limited. Another limitation in our study was the lesser number of sample size.

Conclusion

The Extension lag of knee was found to be significantly reduced in the experimental group which was given functional training and muscle energy technique as compared to the conventional group which was given conventional physiotherapy. The study also concluded that the muscle energy technique can be started after suture removal. Functional training exercises resulted in remarkable reduction in post-operative knee pain. Muscle energy technique helped in improving the strength of the muscles.

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