MEDICAL REHABILITATION IN ACL, MENISCAL AND MCL INJURY PATIENT WITH CONSERVATIVE MANAGEMENT

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ABSTRACT

ACL injuries most commonly occur following a hyperextension injury or from a significant valgus force of blow to the knee. MCL injury occurs from a valgus force to the knee joint that stretches or tears the ligament. Nonoperative management in ACL injury with activity modification produces good to excellent results in 57% of patients older than 40 years. Acute phase focuses on the treatment of tissue injury, clinical signs, and symptoms. The goal in this stage is to allow tissue healing while reducing pain and inflammation. Recovery phase focuses on obtaining normal passive and active knee motion, improving knee muscle function, achieving normal muscle balance of the hamstrings and quadriceps, and working on proprioception. Functional phase focuses on increasing the power and endurance of the lower extremities while improving neuromuscular control.

Keywords : conservative, injury, knee, meniscal, pain,

INTRODUCTION

An injury affecting the anterior cruciate ligament (ACL), medial collateral ligament (MCL), and medial meniscus (MM) identified as term unhappy triad O'Donoghue. The O'Donoghue unhappy triad comprises three types of soft-tissue injury that frequently tend to occur simultaneously in knee injuries. The anterior cruciate ligament attaches to the anterior surface of the tibia in the intercondylar area just medial to the medial meniscus.. The medial collateral ligament, or tibial collateral ligament is a flat, broad ligament attaching to the medial condyles of the femur and tibia. Medial meniscus is half-moon, wedge-shaped fibrocartilage disks, located on the superior surface of the tibia,.[1,2,3]

ACL injuries most commonly occur following a hyperextension injury or from a significant valgus force of blow to the knee. MCL injury occurs from a valgus force to the knee joint that stretches or tears the ligament. It can also be injured in association with other structures of the knee, including the ACL, the medial meniscus, and the joint capsule. Meniscus can be injured in isolation or in conjunction with other structures, such as the collateral ligaments, ACL, etc.[4]

Diagnostic studies in ACL injury include plain radiographs to rule out intra-articular fractures, loose bodies, and arthritic changes. MRI may be indicated in the acute setting to evaluate associated pathologic changes as well as to aid in treatment planning of combined injuries.[5-7]

Medical rehabilitation services are carried out by medical and health workers who have qualifications in the field of medical rehabilitation, including physical medicine and rehabilitation physician, physiotherapists, occupational therapist , orthotic-prosthetics, medical social workers, and psychologists. The physician will make a comprehensive examination to make a clear diagnosis of a patient.[8]

Nonoperative management in ACL injury with activity modification produces good to excellent results in 57% of patients older than 40 years. Older patients often have more social and professional obligations that may prevent them from proceeding with ACL reconstruction and successfully completing a rehabilitation program. In MCL injury, appropriate treatment will allow a return to professional sports within three months for non-operative management. The risk of re-rupture is low. If a consensus decision is made by the physician, the patient, and the trainer to treat a meniscus tear nonoperatively, the patient may return to full activity as soon as the initial signs and symptoms resolve. Generally the patient may require 3 to 5 days of limited activity to allow for resolution of symptoms.[7,9,10]

CASE REPORT

A man 44 years old who work as private employee came to PMR department at Octtober 2nd 2019 with chief complaint pain on right knee. Sharp pain localized at right knee like being cut but its not radiating. Pain increases with walking, squatting and walk up and down stairs. Pain decreases with rest. He also complain redness, swelling and limited range of motion on his right knee. Redness has decrease than when it first appeared. Since he felt this pain, he never seen a doctor. He was massaged on his lower extremity three times. He only can walk about 150m.

The general condition using the Karnofsky Performance scale is 70 where reffered to cares for self; unable to carry on normal activity or to do active work. Vital sign are in normal limits. The localic status for inspection was find edema and redness. In palpation was find tenderness at medial knee with NPRS 6, warmth, and the Q angle was 18°, the right knee circumference has different 1 cm bigger than the left knee and the ROM are limited. The provocation test had not given due to pain.

The knee rontgen on September 30th 2019 has no findings of abnormalities. However, on MRI examination on November 6th was find right medioposterior meniscus rupture and partial tears of ACL.

The patient has been given an natrium diclofenac 50mg twice a day as the analgetic to manage the pain, LLLT in medial right knee with wavelength 810 nm, power 180 mW, frequency continuous output, energy 5.4 J at each spot, treatment time 10 minutes, isometric exercise on right quadriceps and hamstring muscle with Frequency : 3x/day, Intensity : 8x repetition, Type of exercise : isometric exercise, Time : 6 second, Active Assisted Range of Motion (AAROM) exercise on right knee if pain reduce, bilateral axillary crutches to help him in ambulation.

First follow up at October 16th, the NPRS was decreased to 4 as well as the edema. The ROM was increased and he can walk with less pain. The locale status still found mild edema but there is no redness, the tenderness was still remain but it has decreased and the ROM is limited but has improved than the previous visit. The provocation were given and found the valgus stress test, anterior drawer test, lachman test, pivot test, McMurray Test, Apley's grinding and distraction test were positive. The management that has been given were LLLT with power 180 mW, frequency continuous output, energy 5.4 J at each spot, treatment time 10 minutes, isometric exercise on right quadriceps and hamstring muscle with Frequency : 3x/day, Intensity : 8x repetition, Type of exercise : isometric exercise, Time : 6 second and AAROM exercise at right knee.

Second follow up at November 27th 2019 was significantly improved where the NPRS decrease to one point, the edema was diminished, no limitation of ROM and he can walk with no pain. The locale status was find mild tenderness at medial knee. The management still be given LLLT with power 180 mW, frequency continuous output, energy 5.4 J at each spot, treatment time 10 minutes, an additional treatment of USD with frequency 3 MHz, 20% pulsed duty cycle, intensity 0.5 W/cm2, duration of treatment 5 minutes + stretching exercise right hamstring, Flexibility exercise with Frequency : 3x/week, Intensity : Stretch to the point of feeling tightness or slight discomfort, Type of exercise : static flexibility, Time : 20 second, a closed kinetic exercise and a brace.

The last follow up was at January 8th 2019. The pain is diminished and no limitation at mobility. No found of abnormalities at local status. The knee proprioception for right and left single leg stance was >30 seconds. The management were given strengthening exercise right quadriceps muscle with Frequency : 3x/week, Intensity : 8x repetitions, Type of exercise : isotonic exercise, Time : 15 minutes, a proprioceptive training and an education to reduce his body weight.

DISCUSSION

Medical treatment in this patient was given a natrium diclofenac. NSAIDs that inhibit the cyclooxygenase pathway and affect the lipoxygenase activity of the arachidonic acid cascade have been shown to be effective analgesics and the reasonable alternatives to oral narcotics in the management of moderate posttraumatic. Generally the oral route of drug administration is the preferred route for the management of pain. It is well tolerated, convenient, and the least expensive mode of treatment and has the fewest side effects.[11]

The rehabilitation of an ACL tear begins as soon as the injury occurs. Rehabilitation management focuses on reducing pain, restoring full motion, correcting deficits in muscle strength, achieving muscle balance, and returning the patient to full activity free of symptoms. The goals of rehabilitation for the knee with a collateral ligament injury are to restore range of motion, to increase stability and to return to pain-free activity. Rehabilitation in meniscal injury efforts should be directed primarily at minimizing pain and controlling swelling in addition to getting the patient back to functional activities as soon as possible.[5,7]

Nonoperative treatment with a stepwise approach can be tried for ACL injuries. For those who attempt a nonoperative treatment course, the results can be favorable, particularly if there is a strong focus on the later stages of strengthening and proprioceptive training, along with some type of functional bracing. Isolated, complete tears of the MCL can be successfully managed nonoperatively at all levels of sport participation and should be considered the state-of-the-art treatment for this injury. Not all meniscal injuries necessitate surgical intervention or resection. In fact, some meniscal lesions have gradual resolution of symptoms during a 6-week period and may have normal function by 3 months. Many meniscal tears can be treated conservatively with a combination of relative rest, vigorous icing, and NSAIDs initially, followed by a course of physical therapy with

restoration of motion and an aggressive strengthening program stressing closed kinetic-type exercises.[4,5]

The rehabilitation program consists of acute, recovery, and functional phases. **Acute phase** focuses on the treatment of tissue injury, clinical signs, and symptoms. The goal in this stage is to allow tissue healing while reducing pain and inflammation. Reestablishment of nonpainful ROM, prevention of muscle atrophy, and maintenance of general fitness should be addressed. Although phase progression is mainly criteria-based, this phase may last 1 to 4 weeks.[5]

The therapeutic intervention in acute phase for this patient were given :

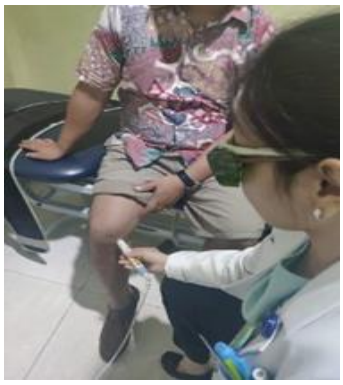
1. LLLT

Laser therapy stimulates collagen synthesis and fibroblast development and increases new blood vessel formation, allowing for repair of injure tissues.

Additional studies have shown that laser therapy can lead to increased tensile strength. These cascade can enhance cellular growth and metabolism and lasers therefore have the potential to accelerate tissue healing and cell growth in ligaments. The parameters for the use of laser in this patient is wavelength 810 nm, power 180 mW, frequency continuous output, energy 5.4 J at each spot, treatment time 10 minutes.[12,13,14]

2. Isometric exercise

For isometric exercise on right quadriceps muscle we give quadriceps sets. Quadriceps set exercise is an isometric contraction or the quadriceps



Picture 1. LLLT application

Picture 2. Isometric exercise

muscle. The leg should be straightened as much as possible, and the patella should track proximally.

Quad sets are done isometrically with the knee in full extension to help the patient relearn how to contract the quadriceps following injury. For isometric exercise on right hamstring muscle, the patient is in a sitting position with one leg off the exercise table. The back is straight, and the leg to be stretched is straight. All this exercise using Frequency : 3x/day, Intensity : 8x repetition, Type of exercise : isometric exercise, Time : 6 second.[18,19]

3. Active assisted ROM exercise on right knee

For active assisted ROM exercise on right knee we give active assistive knee slides use the good leg supporting the injured knee to regain flexion and extension if pain reduce.

At orthotic-prostetic, we give program ambulation with crutches. It will be necessary to have the patient on crutches initially, progressing to full weight bearing as soon as tolerated. The patient should use crutches until full extension without an extension lag can be demonstrated; and the patient can walk normally without gait deviation.[7]

For **recovery phase** focuses on obtaining normal passive and active knee motion, improving knee muscle function, achieving normal muscle balance of the hamstrings and quadriceps, and working on proprioception. Biomechanical and functional deficits, including stiffness and inability to run or jump, should begin to be addressed. This phase may last for 4 to 12 weeks after injury.[5]

The therapeutic intervention in recovery phase for this patient were given LLLT and USD modalities Because the cellular level and vascular processes demonstrated to occur in response to low-intensity ultrasound are essential components of tissue healing, they are thought to underlie the enhanced recovery found to occur in response to the application of ultrasound to patients with a variety of pathological conditions. Vasodilation from increased nitric oxide and resulting increased blood flow may further enhance healing by promoting the delivery of essential nutrients to the area. US applied to right knee for 5 minutes, Frequency 3 MHz, 20% pulsed duty cycle, intensity 0.5 W/cm2. The parameters for the use of laser in this patient is wavelength 810 nm, power 180 mW, frequency continuous output, energy 5.4 J at each spot, treatment time 10 minutes, applied to medial right knee.[17]

For range-of-motion exercise we give active range of motion (AROM) for flexion, the patient is seated, with the feet flat on the floor. The injured leg is allowed to slide back actively along the floor, keeping the foot flat on the floor. The foot is planted,

and the hips are allowed to slide forward over the affected leg, providing some extra stretch. We also give flexion-to-extension exercise. In the starting position, the patient sits with the feet resting on the floor. The knee is then extended and held in as full extension as possible for a count of live and then gently lowered to the floor.[15,16]

For flexibility exercise, we give program hamstring and quadriceps muscle stretching exercise using theraband. We use Frequency : 3x/week, Intensity : Stretch to the point of feeling tightness or slight discomfort, Type of exercise : static flexibility, Time : 20 second.[16]

Closed chain exercises can be used safely during rehabilitation because they appear to generate low anterior shear force and tibial displacement through most of the flexion range. When using the different closed-kinetic-chain exercises, it is essential to emphasize co-contraction of the hamstrings, both to stabilize the knee and to provide a posterior translational force to counteract the anterior shear force created by the quadriceps during knee extension.

Picture 3. AROM exercise program

Picture 4. Flexibility exercise

Picture 5. Patient with knee brace

For closed kinetic chain exercise we give minisquat performed in 0-to-40 degree range.[7]

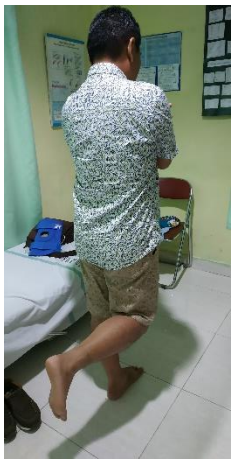
At orthotic-prostetic, we give program brace. Bracing is generally used further along into rehabilitation or to facilitate a return to sports.[15] These braces may reduce symptoms of instability in individuals, improve proprioception, and possibly reduce some strain in low-demand activities.[5] However, there may be some benefit in terms of increased joint position sense, through stimulation of cutaneous sensory receptors, that may enhance both conscious and subconscious awareness of the existing injury.[7] Once aggressive functional exercises are started, the patient may be placed in a functional brace.[15]

For **functional phase** focuses on increasing the power and endurance of the lower extremities while improving neuromuscular control. Rehabilitation at this stage works on the entire kinetic chain, addressing specific functional deficits. This program should be continuous with the ultimate goal of preventing recurrent injury and facilitating a safe return to competition but for this patient safe return to work. The functional phase may last for 12 to 24 weeks after injury.[5]

The therapeutic intervention in recovery phase for this patient were given Strengthening exercise, where primary goal in knee rehabilitation is the return of normal strength to the musculature surrounding the knee. Along with the return of muscular strength, it is also important to improve muscular endurance and power. Strengthening exercises should be emphasized for both the hamstrings and the gastrocnemius muscles which act to translate the tibia posteriorly, minimizing anterior translation. Closed-chain strengthening exercises are thought to be safer because they minimize anterior translation of the tibia. A goal of these strengthening exercises should be to achieve a quadriceps/ hamstring strength ratio of 1:1. For strengthening exercise we give program standing wall slides are done to strengthen the quadriceps with Frequency : 3x/week, Intensity : 8x repetitions, Type of exercise : isotonic exercise, Time : 15 minutes.[16]

Proprioceptive training is the ability of a joint to determine its position in space, detect precision movement and kinesthesia, and contribute to dynamic joint stability. We give program single leg stance for proprioceptive and neuromuscular training with Frequency : 3x/week, Time : 20 min, Type : balance, proprioceptive exercise training.[16]

At last follow up, we found increasing muscle strength in this patient after undergo rehabilitation until functional phase. There are improvement for this patient. In history and physical examination showed improvement and then at last control showed



Picture 6. Proprioceptive training

maximal improvement. For NPRS showed improvement at first control and continue decreased till the last treatment the pain was disappear. The muscle strength value using hand held dynamometer showed more better until last control.

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