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THERAPEUTIC EFFECTS OF HIGH POWER THERAPEUTIC LASER IN NON OPERATIVE ANTERIOR CRUCIATE LIGAMENT (ACL) TEAR -A RANDOMIZED CLINICAL CONTROL TRAIL

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Abstract

Background: Anterior Cruciate Ligament (ACL)Tear is an important cause of functional impairment in adults and athletes. An early and efficient intervention of ACL tear is important because it prevents from developing early Osteoarthritis. This study is aimed at exploring the therapeutic benefits of High power therapeutic laser in non operative ACL tear.

Methodology: The subjects with ACL tear were selected based on the selection criteria and randomly divided in to two groups. Group-A subjects received high power therapeutic laser treatment. Group-B subjects received Low intensity pulsed therapeutic Ultrasound. Both groups were treated for 3 days a week for a total of 8 weeks.

Data Analysis: All the values were tabulated and statistically analyzed by using paired and unpaired t-test. Data analysis revealed significant difference between the two groups in the parameter functional disability.

Conclusion: High power therapeutic laser treatment is effective in reducing pain, early healing and improving functional capabilities in Subjects with non operative ACL tear

Key Words: Anterior Cruciate Ligament Tear, High power laser therapy, low intensity pulsed ultra sound, KOOS, IKDC.

INTRODUCTION

Anterior cruciate ligament (ACL) rupture is a common knee injury with a recent estimated incidence of 81 per 100,000[4]. The majority of ACL injuries (~70%) occurs while playing agility

sports and the most often reported sports are basketball, soccer, skiing, and football. An estimated 70% of ACL injuries are sustained through noncontact mechanisms, while the remaining 30% result from direct contact[8].

The knee is one of the more frequently injured joints in the human body and is commonly injured during sporting activities. ACL tears are the common among the knee injuries. The ACL is a multifascicular, multiple collagen bundle that extends posteriorly and laterally from a point anterior to the intercondylar area of the tibia to the posterior part of the medial surface of the lateral condyle of the femur.[23] The ACL provides the majority of the resistance to anterior tibial translation during hyper extension of knee. It also plays a vital role in stabilization against rotatory loads[24]. In many clinical scenarios, the ligament often requires a reconstructive surgery which is quite expensive and tedious to rehabilitate the injured knee. Laser radiations are now trending and most promising intervention in ACL tears.

Laser radiation is absorbed in metabolically active chromophores located in tissues, cells and intracellular organelles, such as mitochondria. The absorption depends on quality and quantity of chromophore molecules present in tissues[1].Biochemical processes probably play an important role in anti inflammatory, anti edema, analgesic, and bio stimulating effects associated with laser radiation. An important role is played by the key elements of the cell redox system, such as cytochromes, nicotine coenzymes and flavoproteins, together with additional molecules. Radiation-induced alteration of stereo chemical conformation can result in increased cellular energy metabolism with an up to 200% increase of the ATP concentration [2-4]. Photons can be able to optimize the function of the sodium-potassium pump at the level of cellular membranes, increasing protein synthesis and significantly increasing the number of mitosis[1]. Photothermic interaction at the tissue level is controlled by absorption in the target molecules. Temperature changes over time depend on the method used to transfer laser energy to the tissues, especially on the duration and energy of the pulses.

AIM OF THE STUDY:

To study the therapeutic effectiveness of the High power therapeutic LASER on Healing ,pain and Functional abilities in Non-Operative Anterior Cruciate Ligament (ACL) tear.

OBJECTIVES OF THE STUDY:

1. To study the effectiveness of the High Power therapeutic LASER on Healing of the Non-Operative Anterior Cruciate ligament Tears.
2. To study the effectiveness of the High Power LASER on Pain in Patients with of the Non-Operative Anterior Cruciate ligament Tears.
3. To study the effectiveness of the High power LASER on Functional abilities of the Patients with Non-Operative Anterior Cruciate Ligament tears.
4. To compare the effectiveness of the High power LASER on Healing, Pain and Functional abilities of the Non-Operative Anterior Cruciate ligament Tears over the Therapeutic Ultrasound therapy.

METHODOLOGY

A total of 60 subjects with Anterior cruciate ligament (ACL) tear, between the ages of 25 and 40 years, participated in this study . The subjects were recruited from the Orthopedics and Physiotherapy OPD of Lalitha Superspeciality Hospital, India. The Inclusion criteria were subjects with joint laxity, 25-45 years of age and both genders were selected from the same clinical settings as control groups. All the subjects signed an informed consent form approved by the scientific review board and Institutional human ethical committee before participating in the study. The subjects were randomly divided into two groups Group A (n=30) (Experimental) and Group B (n=30) (Control) by computerized randomization.

Method

Setting and Participants

Consecutive outpatients attending the Orthopedics and Physiotherapy OPD of Lalitha Superspeciality Hospital, India ,from December 2016 to September 2017 were invited to participate in the study. Patients had experienced knee pain and joint laxity for at least 4 weeks before the study. Diagnostic criteria included are anterior drawer test ensuring the presence of joint laxity, pain on while climbing steps, a positive impingement sign. All patients also were evaluated by magnetic resonance imaging of the knee joint to confirm the diagnosis of stage I or II.[7] Patients were excluded from the study if they met any of the following criteria: anesthetic or corticosteroid injections within 4 weeks of study enrollment, surgery or previous fractures of the knee joint of the affected side, a history of acute trauma, known osteoarthritis in the patello- femoral or tibio-femoral joint, calcifications exceeding 2 cm in the joint, signs of a rupture of the posterior cruciate ligament, inflammatory rheumatic disease, diabetes mellitus type I or II, thyroid dysfunctions, pacemaker, neurological pathologies, or anxiety-depression syndromes. Patients received no other physical therapy intervention for knee pain during the study or in the 4 to 5 weeks before the study. The participants were instructed to avoid analgesic or anti inflammatory drugs for the duration of the treatment and to abstain from the execution of painful activities of daily living involving the affected knee. The participants kept a daily log of analgesic or anti-inflammatory drug intake during the study period. A total of 60 consecutive patients (10women and 50 men) were screened for study eligibility. At the end of the evaluation, 60 patients who were affected by ACL tear (grade I or II, 40 right knees and 20 left knees), had sub acute or chronic pain, fulfilled the selection criteria, agreed to participate, and signed informed consent statements were enrolled in the study (10 women and 50 men; mean age_34.1 years, SD_9.0,range_35–69; mean time since onset of pain_1.2months, SD_9.8).

Outcome Measures

All of the participants in the present study were evaluated with a Knee injury and Osteoarthritis Out come Score (KOOS) and International Knee Documentation Committee (IKDC). The KOOS meets basic criteria of outcome measures and can be used to evaluate the course of knee injury and treatment outcomes[21]. The KOOS's five patient-relevant dimensions are scored separately: Pain (nine items); Symptoms (seven items); ADL Function (17 items); Sport and Recreation Function (five items); Quality of Life (four items). A Likert scale is used and all items have five possible answer options scored from 0 (No problems) to 4 (Extreme problems) and each of the five scores is calculated as the sum of the items included. Scores are transformed to a 0–100 scale, with zero representing extreme knee problems and 100 representing no knee problems as common in orthopedic scales and generic measures. Scores between 0 and 100 represent the percentage of total possible score achieved. the results of several studies on this issue were considered**.**

The International Knee Documentation Committee (IKDC) is a knee-specific patient-reported outcome measure. It's considered to be one of the most reliable outcome reporting tools in its category and was one of the instruments used in the popular MOON study. IKDC has been subjected to rigorous statistical evaluation and has proven to be a valid and responsive patient-reported outcome tool (PRO)[5] The IKDC is one of the instruments most commonly used to determine results following various knee procedures including ACL reconstructions[6]. The reliability and responsiveness of IKDC is also comparable with other widely-used patient-reported outcome measures, particularly for those suffering from articular cartilage lesions[6].

Results

The mean age was 34.1 years in the group A and 34.7 years in group B ($p = 0.85$). In this study there were 25 males in group A and 25 males in group B. Most common mode of ACL injury in our study was road traffic accident in 20 patients in group A and 22 in group B followed by sporting

activities. The dominant side of the knee was involved in 18 patients in group A and 20 patients in group B. Meniscal tear were present in 9 patients in group A and 16 patients in group B.

Range of motion.

The range of motion was less in group B for all measurements made in the first 8 weeks after treatment. The difference was significant ($p < 0.01$) at 8weeks.There is no difference in the range of motion in both groups was not significant. Significant residual flexion deficit (> 5 degree) was present in one patient in the group B but none in the group A.

Functional outcome

KOOS and IKDC score was apparently better in the group A, but the difference was significant till 8 consecutive weeks ($p<0.01$). There were no significant differences in the KOOS and IKDC score at group A ($p = 0.06$).

Discussion

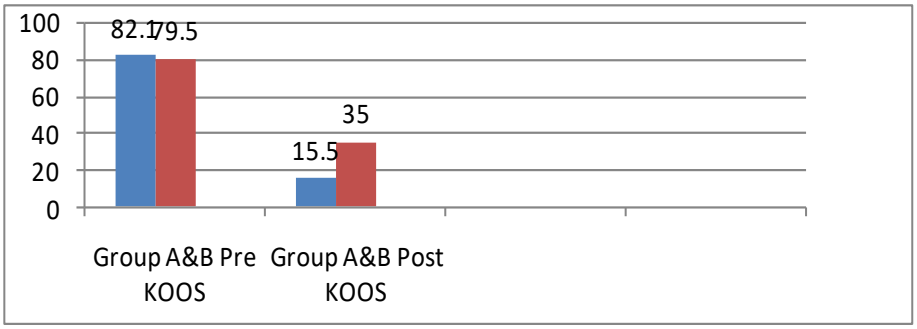
In the present study, we compared the results obtained after 24 treatment sessions over a period of 8 consecutive weeks with 2 different physical therapy modalities in subjects diagnosed with grade I or II ACL tear. The group A received only HILT 3days per week like 8 weeks and group B received only US therapy 3days per week like 8 weeks. The subjects treated with HILT showed a greater reduction in pain and more improvement in articular movement, functionality, and muscle strength of the affected knee than the subjects treated with US therapy. Significant differences in changes after 24 treatment sessions over a period of 8 consecutive weeks from the baseline by treatment group were observed. In particular, the difference in the change in the KOOS and IKDC scores between the groups (1.65 points) Contrasting findings have been reported for US therapy and laser therapy in the treatment of ACL tear and other knee disorders. There is little evidence that active therapeutic US is more effective than placebo US for treating people with soft-tissue disorders of the knee, including ACL. Several authors have reported no differences between true US and sham US for subjects with soft-tissue disorders of the knee. Conversely, studies by other researchers have supported the efficacy of US therapy in reducing pain, improving activities of daily living, and improving quality of life

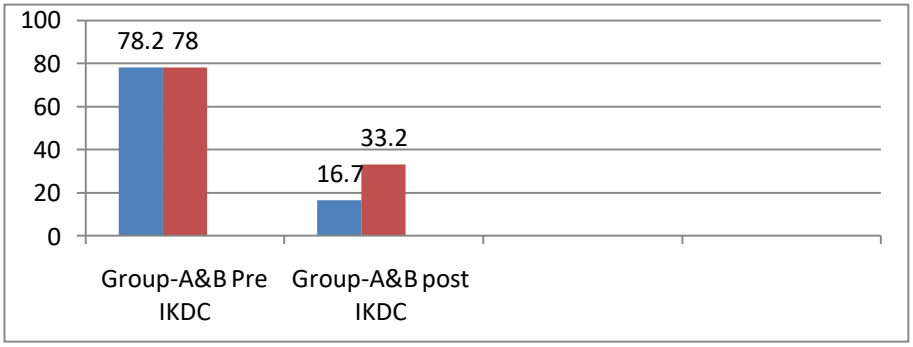
Conclusion

Although further studies are needed to confirm the effectiveness of physical therapy interventions for HILT was shown to have greater benefit for US therapy in reducing pain and improving the articular movement, functionality, and muscle strength of the affected knee. The results of the present study are encouraging, but other studies with larger samples, long term findings, and possible comparisons with other conservative interventions or placebo control groups are needed.

Tables :

	GROUP I				GROUP II		
		MEAN	SD	P VALUE	MEAN	SD	P VALUE
KOOS score	PRE TEST	82.1	1.81	0.0001	79.5	2.26	0.0001
	POST TEST	15.5	1.12		35	2.30	
IKDC score	PRE TEST	78.2	1.79	0.0001	78	2.90	0.0001
	POST TEST	16.7	1.09		33.2	2.06	





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