# Compare The Effects of Low-Level Laser and Ultrasonic Therapy in Subjects with Jumper's Knee

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***Abstract***

**Background: There are many treatments given for Patellar tendinitis or Jumper's knee which includes Anti-inflammatory Drugs, Massage, Eccentric training However, studies involving Low Level Laser Therapy for management of Patellar tendinitis or Jumper's knee are limited to this date .**

**Objective: To find out compare the effects of low level laser and ultrasonic therapy in subjects with jumper's knee.**

**Study design: Quasi experimental study design.**

**Subjects: 8 subjects with LASER with eccentric exercise, Ultrasound with eccentric exercise age group 19-30 years of both male and female.**

**Intervention: 4 subjects in the Group A received LASER and Eccentric exercise with pre and post-test and 4 subjects in Group B received Ultrasound with pre and post-test.**

**Outcome measure: Visual Analogue Scale(VAS) and Victorian Institute of Sports Association for Patellar tendinopathy.**

**Results: Statistical analysis was done by using Paired't' which showed significant improvement in both group.**

**Conclusion: Low level laser therapy has significant result in the reduction of pain and functional activity in patellar tendinitis.**

***Keywords*: Low Level Laser, Eccentric exercise.**

## I. INTRODUCTION

Patellar tendinopathy or Jumper's Knee is an overuse injury of the patellar tendon and most prevalent in sports involving some form of Jumping, such as Volleyball, Basketball, Soccer, and Athletics. Patellar tendinopathy is distinguished by activity-related anterior knee pain, focal patellar tendon tenderness and intratendinous imaging changes. It has historically been referred to as 'jumper's knee' or 'patellar tendinitis' as its prevalence is high in individuals participating in jumping sports and the underlying pathology was thought to involve inflammation.

However, the condition is found in many who do not partake in jumping sports and histopathological studies have consistently shown the underlying pathology to be degenerative (tendinosis) rather than inflammatory (tendinitis).

Patellar tendinopathy or Jumper's Knee is a common condition with an overall prevalence of 14% in elite athletes. There are many treatment methods for patellar tendinopathy, including Anti-inflammatory Drugs, Massage, Eccentric training, Low-Level Laser, Ultrasound, Surgery, and other modalities. However, no ideal treatment has emerged for the management of patellar tendinopathy. However, its true clinical significance lies in the morbidity that it causes. Disability associated with Patellar tendinopathy or Jumper's Knee is often prolonged and it causes many to cease their athletic careers. Contributing to this morbidity is a lack of scientific evidence directing the management of the condition. Jumper's knee is one of the more common tendinopathies affecting athletes with mature skeleton. With regard to bilateral tendinopathy (both sides), males and females are equally affected. With regard to unilateral tendinopathy (one side), twice as many males as females are affected.

Low-Level Laser Therapy (LLLT) has been widely applied in the field of sports medicine. Low-level laser therapy can exert effects of reducing inflammation and pain and promoting tissues regeneration in the treatment of soft tissue injuries. Bjordal et al. and Tumilty et al. have reviewed Low-level laser therapy for tendinopathy and have founded that Low-level laser therapy can potentially be effective in treating tendinopathy when recommended dosages are used. Stergioulas et al. have shown that Low-level laser therapy can accelerate clinical recovery from Achilles tendinopathy when added to an eccentric training regimen. However, it remains unclear whether Low-level laser therapy can bring about additional benefits to eccentric training in the treatment of patellar tendinopathy.

Ultrasonic Therapy is a method of stimulating the tissue beneath the skin's surface using very high frequency sound waves, between 800,000 Hz and 2,000,000 Hz. Ultrasound is a therapeutic modality that has been used by physical therapists since the 1940s. Ultrasound is applied using a round-headed wand or probe that is put in direct contact with the patient's skin. Ultrasound gel is used on all surfaces of the head in order to reduce friction and assist in the transmission of the ultrasonic waves. Therapeutic ultrasound is in the frequency range of about 0.8-3.0 MHz.

The waves are generated by a piezoelectric effect caused by the vibration of crystals within the head of the wand/probe. The sound waves that pass through the skin cause a vibration of the local tissues. This vibration or cavitation can cause a deep heating locally though usually no

sensation of heat will be felt by the patient. It has been shown to cause increases in tissue relaxation, local blood flow, and scar tissue breakdown. The effect of the increase in local blood flow can be used to help reduce local swelling and chronic inflammation.

An eccentric contraction is the motion of an active muscle while it is lengthening under load. Eccentric training is repetitively doing eccentric muscle contractions. Eccentric movement provides a braking mechanism for muscle and tendon groups that are experiencing concentric movement to protect joints from damage as the contraction is released.Eccentric training has proven to be a useful treatment for patellar tendinopathy or jumper's knee in a number of randomized controlled trials. Researchers have recommended eccentric training as an important conservative treatment for patellar tendinopathy .

However, Eccentric training intervention needs a fairly long period and often induces some transient discomfort and pain. To increase efficacy and reduce exercise induced pain, some adjunctive interventions have been added to eccentric training for treating patellar tendinopathy. Dimitrios et al. have shown that eccentric training and static stretching exercises produced a larger effect than eccentric training alone in the treatment of patellar tendinopathy.

In recent periods LASER has been used a lot in the management of Patellar Tendinopathy or Jumper's Knee. Therefore this study is done to compare the effects of LASER therapy and Ultrasonic therapy in subjects with Jumper's Knee **AIM:** The Aim of the present study was to compare the effectiveness of low level laser therapy and Ultrasonic therapy over pain and functional capacity in subjects with jumper's knee. **NEED FOR THE STUDY**: Mostly for a long period of time, Patellar Tendinopathy or Jumper's Knee are managed by Ultrasound. LASER treatments are becoming popular nowadays for managing various sports injuries. Many studies and therapist have proven the benefits of LASER in various musculoskeletal and sports injuries. Also the Jumper's knee is always misdiagnosed and given less importance in the management of Physiotherapy. Furthermore there are only few studies done in condition of Jumper's Knee that too in Indian population. So to address the Sports condition that should be given importance and also to find the better Physiotherapy management for the same, this study is done. This study also is done to find the effects of the Physiotherapy management over their performance other than pain.

## II. REVIEW OF LITERATURE

**Xiao-Guang Liu, Lin Cheng, and Ji-Mei (2014),** concluded that Low-level laser therapy combined with eccentric exercises is superior to low-level laser therapy alone and eccentric exercises alone to reduce pain and improve function in patients with patellar tendinopathy.

**Rudavsky A, Cook J (2014)** concluded that Research has increased the understanding of patellar tendinopathy and pathology but there is still more to discover.

**Hernandez-Sanchez S[1], Hidalgo MD, Gomez A (2014),** Definition of the minimum clinically important difference will enhance the interpretability of changes in the VISA-P score in the athletes with Patellar Tendinopathy, but caution is required when these values are used.

**Tumilty S, McDonough S, Hurley DA, Baxter GD(2012)** concluded that the clinical effectiveness has not been proved of adding Low Level Laser Therapy to eccentric exercises for the treatment of Achilles' tendinopathy

**Zwerver J, Bredeweg SW, van den Akker-Scheek (2011)**, concluded that Prevalence of jumper's knee is high among non elite athletes and varies between 14.4% and 2.5% for different sports. Jumper's knee is almost twice as common among male nonelite athletes compared with female athletes. Different sport-specific loading characteristics of the knee extensor apparatus, a younger age, a taller body stature, and higher body weight seem to be risk factors associated with patellar tendinopathy.

**Sergio hernandez-sanchez (2011)**,concluded that Considering the data obtained from the cross-cultural adaptation and validation process, the VISAP-Sp questionnaire has good reliability, validity, and sensitivity to change for use with Spanish-speaking athletes with patellar tendinopathy

**Marsha Rutland, PT, ScD, OCS, COMT, CSCS (2010),** concluded that eccentric exercises has been found to be safe and effective and should be included as part of the comprehensive rehabilitation of this pathology.

**Tumilty S, Munn J, McDonough S, Hurley DA, Basford JR, Baxter GD (2010)**,concluded Low Level Laser Therapy can potentially be effective in treating tendinopathy when recommended dosages are used.

**Dimitrios Stasinopoulos (2010)**, concluded that the results suggested that the exercise programme was more effective treatment than ultrasound and transverse friction.

**Rees JD, Wolman RL, Wilson A (2009)**, concluded that the Eccentric exercises (EE) have proved successful in the management of chronic tendinopathy, particularly of the Achilles and patellar tendons.

**S. J. Warden, B. R. Metcalf (2008),** concluded that LIPUS does not provide any additional benefit over and above placebo in the management of symptoms associated with Patellar Tendinopathy.

**Apostolos Stergioulas, Rodrigo.Lopes-Martins, and Jan M. Bjordal (2008),** concluded that intention-to-treat analysis for the primary outcome, pain intensity during physical activity on the 100-mm visual analog scale, were significantly

lower in the Low Level Laser Therapy group than in the placebo Low Level Laser Therapy group.

**S. J. Warden,B. R. Metcalf , Z. S. Kiss,J. L. Cook, C. R. Purdam, K. L. Bennell and K. M. Crossley (2008),** concluded that Low Iintensity Pulsed UltraSound does not provide any additional benefit over and above placebo in the management of symptoms associated with Patellar Tendinopathy.

**Ha˚vard Visnes, Roald Bahr (2007),** concluded that eccentric training may have a positive effect on Jumper's Knee but ability to recommend a specific protocol for the same is limited.

**Oken O,Kahraman Y, et al., (2007),** suggested that in patients with lateral epicondylitis, Ultrasound has a lesser effect than LASER therapy in reducing pain, and that LASER therapy is more effective than Ultrasound treatment in improving grip strength.

**Lan G Macintyre et c(2007),** concluded that in the absence of an inflammatory mechanism of pain production; certain byproducts of increased cellular activity or tendon degeneration such as lactic acid ,glutamate and chondroitin sulphate acts as biochemical irritants that activate peritendinous nociceptors.the distruption of collagen in a tendinosis can also be the cause of pain.

**Håkan Alfredson and J Cook (2007),** stated that Achilles tendinopathy is a condition that can be effectively treated by the primary care practitioner. There are many simple and easily applied conservative treatment options that can relieve most tendon pain. Most of those who fail to respond to conservative care will find relief from surgical treatment.

**M Young, J Cook, C Purdam, Z Kiss (2005),** concluded that the decline squat protocol offers greater clinical gains during a rehabilitation programme for patellar tendinopathy in athletes who continue to train and play with pain.

**Lian OB, Engebretsen L, Bahr R (2005),** concluded that the prevalence of jumper's knee is high in sports characterized by high demands on speed and power for the leg extensors. The symptoms are often serious, resulting in long-standing impairment of athletic performance.

**Visnes and Bahr (2005)**, that athletes with patella tendinopathy should be withdrawn from sport whilst engaging in eccentric exercise (EE) rehabilitation programs.

**M A Young, J L Cook, C R Purdam, Z S Kiss, H Alfredson (2004),** stated that in active jumping athletes with patellar tendinopathy, exercise protocols improved pain and sporting function. This study shows that the decline squat protocol presents a much greater chance of clinical improvement in function over a 12 month season than the step protocol

**Jack Taunton, MD, K.M (2003)**, documented that Extra corporeal shock wave therapy appears to be a useful adjunct to the eccentric drop-squat strength protocol in the treatment of chronic patellar tendinopathy.

**C R Purdam, P Jonsson, H Alfredson, R Lorentzon, J L Cook, K M Khan (2003),** concluded that in a small group of patients with patellar tendinopathy, eccentric squats on a decline board produced encouraging results in terms of pain reduction and return to function in the short term.

**Yusuke Morimoto , Akiyoshi Saito, Yasuaki Tokuhashi (1990)**, concluded that Forty-one patients with sports injuries were treated by using Low Level Laser Therapy . The rate of effectiveness was 65.9%. The rate of effectiveness in cases of jumper's knee, tennis elbow and Achilles tendinitis was high. Low Level Laser Therapy is an effective treatment for sports injuries, particularly jumper's knee, tennis elbow and Achilles tendinitis.

**Colosimo AJ, Bassett FH (1990)**, concluded that an increasing incidence of peripatellar tendinitis, affecting either the quadriceps tendon or the patellar tendon insertion onto the patella, most commonly occur in jumping athletes.

## III. METHODOLOGY

**STUDY DESIGN** **:** Quasi Experimental ,

**STUDY TYPE** **:** Comparative

**SAMPLING METHOD** **:** Convenient sampling

**SAMPLE SIZE** **: 8**

**STUDY DURATION** **: 3** Weeks

**STUDY SETTING** **:** SRM Medical College Hospital and Research Centre, Kattankulathur.

**Inclusion criteria of the study are** Athlete suffering from jumper's knee**,** Both male and female athletes**,** Age group 19-30**,** Unilateral painful activity related symptoms**,** Tenderness and palpation over the inferior pole of the patella and No history of trauma to the knee

**Exclusion Criteria of the study are** Skin infections**,** Any recent fractures in knee**,** Any recent Meniscal injury**,** Hyperpyroxia and Acute sepsis**.**

**Materials used for the study are** LASER**,** Ultrasound, Ultrasonic gel**,** Goggles **&** Cotton**. Outcome measure of the study are** Visual Analogue Scale(VAS), Victoria Institute of Sports Assessment for Patellar Tendinopathy (VISA-P)

*PROCEDURE*

Based on the inclusion and exclusion criteria an informed consent was obtained after explaining clearly about the treatment protocol. A total of 8 subjects were taken conveniently and divided into two groups GROUP A and GROUP B with 4 subjects in each group.

GROUP A (4 subjects) was given LASER for 1 week and eccentric exercises for 2 weeks. GROUP B (4 subjects) was given Ultrasonic therapy for 1 week and

Eccentric exercises for 2 weeks. Before and after the study duration Visual Analogue Scale(VAS) and Victoria Institute of Sports Assessment for Patellar Tendinopathy (VISA-P) were taken.

*GROUP-A (LASER therapy)*

Each individual in this group received LASER therapy for 2 minutes with 6 joules and the process was repeated for 7 days. Before starting the treatment the subjects was assessed carefully and an informed consent was taken. Following LASER management Eccentric training has been given for two weeks.

*LASER THERAPY*

*Position of the subject: Supine lying*

The Subject in supine position was given LASER at the inferior pole of the patella for 2 minutes of 6 joules.

*ECCENTRIC EXERCISE*

Subjects in single leg squat position, and they are instructed to do this for 3 sets with 15 repetitions.

*GROUP-B (Ultrasound)*

Each individual in this group received ultrasound for 10 minutes with 1:1 ratio and the process was repeated for 7 days. Before starting the treatment the subjects was assessed carefully and an informed consent was taken. Following ultrasound management Eccentric training has been given for two weeks.

*ULTRASOUND*

*Position of the subject: Supine lying*

The subject in supine position was given Ultrasound at the inferior pole of the patella for 10 minutes at 0.75 W/cm$^2$.

*ECCENTRIC EXERCISE*

Subjects in single leg squat position, and they are instructed to do this for 3 sets with 15 repetitions.

## IV. DATA ANALYSIS

TABLE -1

COMPARISON OF PRE AND POST VALUES OF VISUAL ANALOGUE SCALE (VAS) AND VICTORIAN INSTITUTE OF SPORTS ASSESSMENT FOR PATELLAR TENDINOPATHY (VISA-P) QUESTIONNAIRE IN GROUP-A SUBJECTS TREATED WITH LASER THERAPY

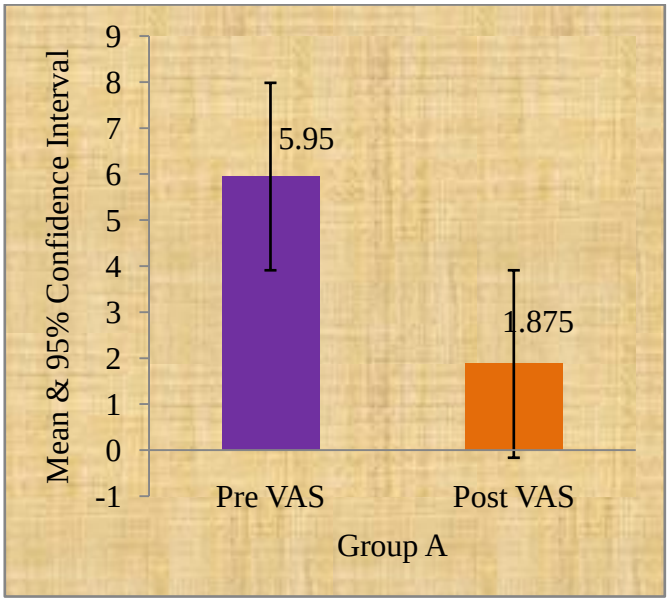
| Group A | Mean | Std.Deviation | t | Sig |
|---|---|---|---|---|
| Pre VAS | 5.950 | 0.332 | 14.351 | 0.001 |
| Post VAS | 1.875 | 0.854 | | |
| Pre Questionnaire | 42.250 | 4.031 | 10.888 | 0.002 |
| Post Questionnaire | 76.500 | 5.066 | | |

$p<0.01$

This table shows that there is statistically significant difference between pre and post test measure of Visual Analogue Scale and Victorian Institute of Sports Assessment patellar Tendinopathy Questionnaire in Group-A patients treated with LASER.

GRAPH 1

PRE AND POST VALUES OF VISUAL ANALOGUE SCALE (VAS) IN GROUP-A SUBJECTS TREATED WITH LASER THERAPY




GRAPH 2

PRE AND POST VALUES OF VICTORIAN INSTITUTE OF SPORTS ASSESSMENT FOR PATELLAR TENDINOPATHY QUESTIONNAIRE(VISA-P) IN GROUP-A SUBJECTS TREATED WITH LASER THERAPY

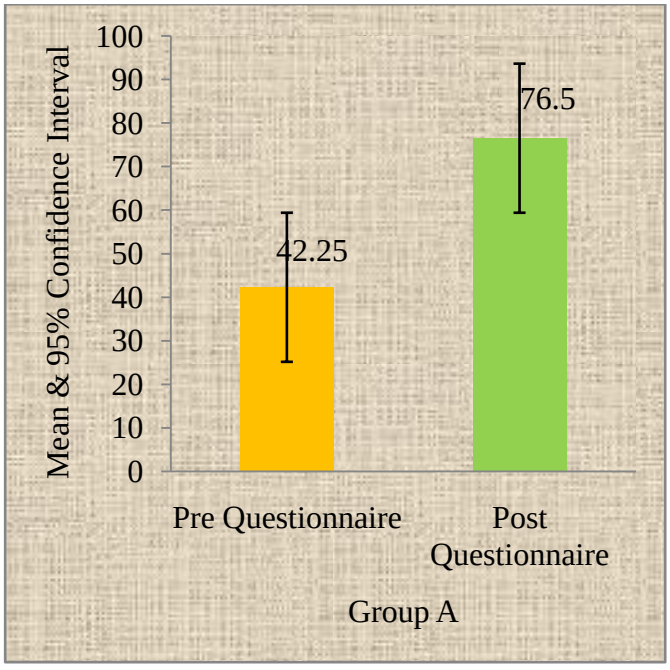


TABLE -2

COMPARISON OF PRE AND POST VALUES OF VISUAL ANALOGUE SCALE (VAS) AND VICTORIAN INSTITUTE OF SPORTS ASSESSMENT FOR PATELLAR TENDINOPATHY QUESTIONNAIRE(VISA-P) IN GROUP-B SUBJECTS TREATED WITH ULTRASOUND.

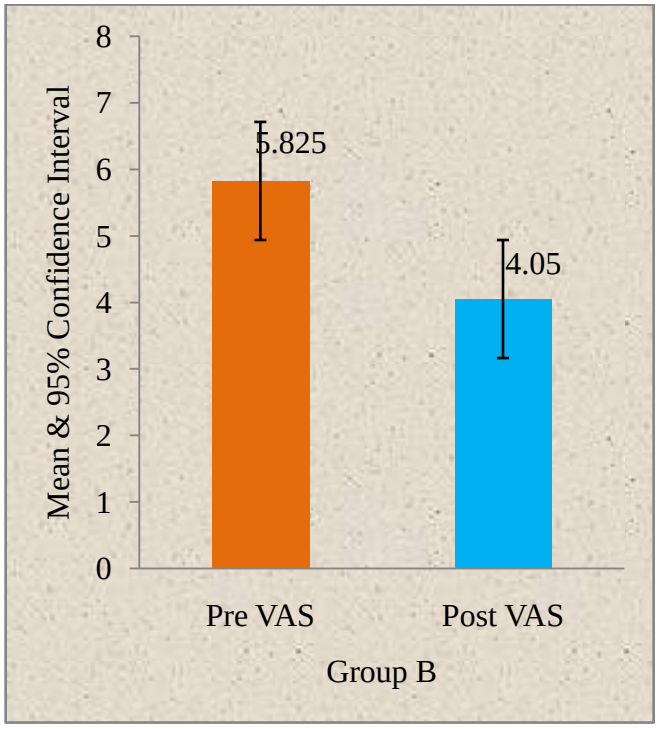
| GROUP B | Mean | Std.Deviation | t | Sig |
|---|---|---|---|---|
| Pre VAS | 5.825 | 0.842 | 11.468 | 0.001 |
| Post VAS | 4.050 | 0.777 | | |
| Pre Questionnaire | 47.250 | 8.694 | 4.430 | 0.021 |
| Post Questionnaire | 58.250 | 5.563 | | |

p<0.01

This table shows that there is statistically significant difference between pre and post test measure of Visual Analogue Scale and Victorian Institute of Sports Assessment patellar Tendinopathy Questionnaire in Group-B patients treated with Ultrasound.

GRAPH-3

PRE AND POST VALUES OF VISUAL ANALOGUE SCALE (VAS) IN GROUP-B SUBJECTS TREATED WITH ULTRASOUND.




GRAPH 4

PRE AND POST VALUES OF VICTORIAN INSTITUTE OF SPORTS ASSESSMENT FOR PATELLAR TENDINOPATHY QUESTIONNAIRE(VISA-P) IN GROUP-B SUBJECTS TREATED WITH ULTRASOUND.

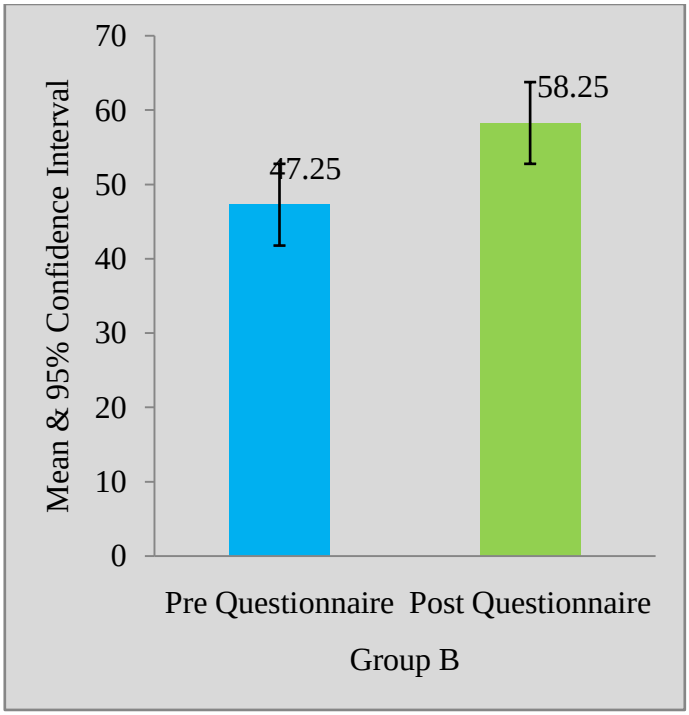



TABLE -3

COMPARISON OF POST TEST VALUES OF VISUAL ANALOGUE SCALE (VAS) BETWEEN GROUP-A SUBJECTS TREATED WITH LASER THERAPY AND GROUP B SUBJECTS TREATED WITH ULTRASOUND.

| Post test-VAS | Mean | Std.Deviation | T | Sig |
|---|---|---|---|---|
| GROUP A | 1.875 | 0.8539 | 3.768 | 0.009 |
| GROUP B | 4.050 | .7767 | | |

P<.01

As P<0.01, this table shows there is statistically significant difference between post test measures of Visual Analogue Scale of Group-A subjects treated with LASER therapy and Group B subjects treated with Ultrasound.

TABLE-4

COMPARISON OF POST TEST VALUES OF VICTORIAN INSTITUTE OF SPORTS ASSESSMENT FOR PATELLAR TENDINOPATHY QUESTIONNAIRE(VISA-P) BETWEEN GROUP-A SUBJECTS TREATED WITH LASER THERAPY AND GROUP B SUBJECTS TREATED WITH ULTRASOUND

| Post test-VAS | Mean | Std.Deviation | t | Sig |
|---|---|---|---|---|
| GROUP A | 76.500 | 5.0662 | 4.852 | 0.003 |
| GROUP B | 58.250 | 5.5603 | | |

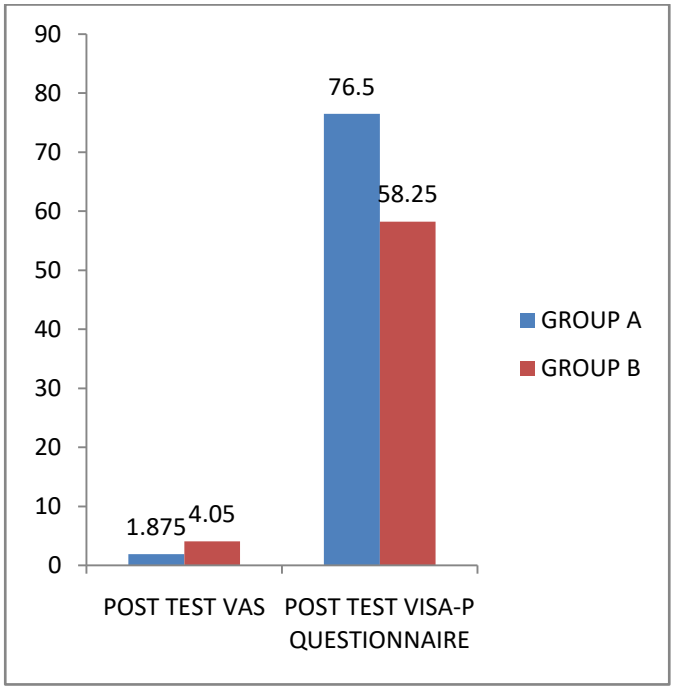
P<.01

As P<0.01, this table shows there is statistically significant difference between post test measures of Victorian Institute Of Sports Assessment For Patellar Tendinopathy Questionnaire(VISA-P) of Group-A subjects treated with

LASER therapy and Group B subjects treated with Ultrasound.

GRAPH 5

POST TEST VALUES OF VAS AND VICTORIAN INSTITUTE OF SPORTS ASSESSMENT –PATELLAR TENDINOPATHY QUESTIONNAIRE BETWEEN GROUP-A SUBJECTS TREATED WITH LASER THERAPY AND GROUP-B SUBJECTS TREATED WITH ULTRASOUND.




## V. RESULTS

**According to table 1,** the Pre test mean value of Visual Analogue Scale of group A was 5.950 and the Post test value was 1.875. The Pre test mean value of Victorian institute of sports association patellar tendinopathy was 42.250 and Post test value was 76.500. ($p<0.01$).This table shows that there is a statistically significant difference between pre and post test measure of Visual Analogue Scale and Victorian Institute of Sports Assessment patellar Tendinopathy Questionnaire among Group-A subjects treated with LASER.

**Graph 1** shows there was a significant reduction in Visual Analogue Scale Score among Group-A subjects treated with LASER for a period of one week.

**Graph 2** shows that there was a significant improvement in function as assessed by Victorian institute of sports association patellar tendinopathy questionnaire among Group-A subjects treated with LASER for a period of one week.

**According to table 2** the pre test mean value of Visual Analogue Scale of Group B was 5.825 and post test value was 4.050. The pre test mean value of Victorian Institute of Sports Association for Jumper's knee was 47.250 and post test test value was 58.250. ( $p<0.01$), this table shows that there is a significant difference between Group Pre- Test and Post- Test of Visual Analogue Scale and Victorian Institute of Sports Association among subjects with Jumper's knee.

**Graph 3** shows the pre & post test visual analogue scale scores of Ultrasound. There was a significant reduction in Visual Analogue Scale Score among Group-B subjects treated with Ultrasound for a period of one week.

**Graph 4** shows that there was a significant improvement in function as assessed by Victorian institute of sports association patellar tendinopathy questionnaire among Group-A subjects treated with LASER for a period of one week.

**According to table 3,** the post test mean value of Visual Analogue Scale for Group A was 1.875 and the Post test value of Visual Analogue Scale for Group B was 4.050. This table shows that there is a significant difference between Group A post test of Visual Analogue Scale and Group B Post- Test of Visual Analogue Scale.

**According to table 4,** the post test mean value of Victorian Institute of Sports Association for Jumper's knee of Group A was 76.500 and Post test mean value of Group B was 58.250. This table shows that there is a significant difference between two groups

**Graph 5** shows post test values of Visual Analogue Scale and Victorian Institute of Sports Assessment –Patellar tendinopathy Questionnaire between group-A subjects treated with LASER therapy and group-B subjects treated with Ultrasound.This graph shows there was a significant improvement in pain and function among the subjects treated with LASER than the other group of subjects treated with Ultrasound.Thus LASER therapy is proved to be more effective than Ultrasound in subjects with Jumper's Knee.

## VI. DISCUSSION

Patellar tendinitis which is also known as jumper's knee is the inflammation of the patellar tendon that connects the kneecap (patella) to the shinbone (tibia). There are many treatment methods for patellar tendinopathy, including Anti-inflammatory Drugs, Massage, Eccentric training, Ultrasound, Surgery, and other modalities. However, no ideal treatment has emerged for the management of patellar tendinopathy. Recent advancement in management of Jumper's knee is LASER.so this study aims to compare the effect of Ultrasound and LASER over pain and function among Jumper's Knee subjects.

Improvement in pain and Range of Motion (ROM) is one of the important aim in treating patients with jumper's knee. Research into Jumper's knee has largely investigated physical therapy modalities including exercise; Much less emphasis has been placed on LASER.

In this study visual analogue scale and Victorian institute of sports assessment for jumper's knee were used to assess the pain and function of the patients. In this study LASER and ultrasound was administered for 7 days in

patients with Jumper's knee followed by eccentric exercise for 2 weeks, there were significant and benefits in pain and range of motion post test.

The results shows that both Group A subjects who were given with LASER, eccentric exercises show statistically significant improvment over pain and function ($p<.01$).

This goes in hand with **Yusuke Morimoto , Akiyoshi Saito , Yasuaki Tokuhashi** ,1990, who concluded that Forty-one patients with sports injuries were treated by using LLLT. The rate of effectiveness was 65.9%. The rate of effectiveness in cases of jumper's knee, tennis elbow and Achilles tendinitis was high. LLLT is an effective treatment for sports injuries, particularly jumper's knee, tennis elbow and Achilles tendinitis.

**Xiao-Guang Liu, Lin Cheng, and Ji-Mei Song,july 2014**, concluded that Low-Level Laser Therapy combined with eccentric exercises is superior to low-level laser therapy alone and eccentric exercises alone to reduce pain and improve function in patients with patellar tendinopathy.

The physiology behind the improvement in pain levels is that LASER irradiation affects the cellular metabolism, protein synthesis, wound healing, and the immune response in order to improve the speed of healing of soft tissues injuries and decreases pain levels.Hence there was a significant reduction n in pain in these subjects post management of LASER for period of 1 week.

It is proved that the low level laser therapy is able to reduce pain and improve function in patients with patellar tendinopathy. This wavelength (808 nm) and power have been reported clinically effective for multiple musculoskeletal conditions at depths. In addition (808nm) is within the Infra red spectrum and Infra Red radiation penetrates tissue particularly well.Thus LASER increases the blood circulation and enhances the erection of lactate or inflammatory substances and facilitate secretion of endogenous opiates (Yoon et. Al., 2012) that reduces the pain significantly.

Eccentric exercise training was given for two weeks post LASER includes unilateral squatting exercise 3 sets of 15 repetitions.This study results reveals an improvement in function as per Victorian Institue of Sports Association for Patellar Tendinopathy which can be explained by reduction of pain will lead to improvement in function and further more Herzog et al. add that there is an increase in the stiffness of the titin protein (see Figure 1) during the eccentric contraction.Thus Group A subjects had a significant improvement for pain and function post the treatment for a period of three weeks.

Results shows that there is statistically significant difference between pre and post test measure of Visual Analogue Scale and Victorian Institute of Sports Assessment patellar Tendinopathy Questionnaire in Group-B subjects treated with Ultrasound.($p<.05$).

This is in contradictory to **S. J. Warden1,2, B. R. Metcalf**,**(2008)** who concluded that These findings suggest that Low Intensity Pulsed Ultrasound does not provide any additional benefit over and above placebo in the management of symptoms associated with Patellar Tendinopathy.

There are three primary benefits to ultrasound. The first is the speeding up of the healing process due to the increase in blood flow in the treated area. The second is the decrease in pain from the reduction of swelling and oedema. The third is the gentle massage of muscles tendons and/ or ligaments in the treated area because no strain is added and any scar tissue is softened.

The important physiological effects of ultrasonic energy on living tissue are thermal, mechanical, chemical and biological and that includes Increased collagen extensibility, Increased nerve conduction velocities, Increased metabolism of oedema and exudates, Decreased joint stiffness, Increased pain threshold ,Decreased muscle spasm, Releases histamine

During the inflammatory phase, Ultrasound has a stimulating effect on the mast cells, platelets, white cells with phagocytic roles and the macrophages (Nussbaum 1997, ter Haar 1999, Fyfe & Cahal 1982, Maxwell 1992, Watson 2008; Li et al 2003). For example, the application of ultrasound induces the degranulation of mast cells, causing the release of arachidonic acid which itself is a precursor for the synthesis of prostaglandins and leukotreine – which act as inflammatory mediators (Mortimer & Dyson 1988, Nussbaum 1997, Leung et al 2004)

It is suggested that the application of Ultrasound to injured tissues will, amongst other things, speed the rate of healing & enhance the quality of the repair (Watson 2006).These physiological aspects clearly explains the reason over the reduction of pain following ultrasound management for a period of one week.

Following the one week ultrasound treatment ,two weeks of single leg squat eccentric training (3 sets of 15 repetition) was given which together has produced a significant improvement over function in subjects with patellar tendinopathy.

This was supported by **Rees JD[1], Wolman RL, Wilson A(2009)** who ,concluded Eccentric exercises (EE) have proved successful in the management of chronic tendinopathy, particularly of the Achilles and patellar tendons, where they have been shown to be effective in controlled trials

The results goes in hand with **Ha˚vard Visnes, Roald Bahr (2007)** who concluded that eccentric training may have a positive effect on Jumper's Knee but ability to recommend a specific protocol for the same is limited.

An eccentric muscle contraction, stretching of a muscle in response to an opposing force on that muscle, in which the opposing force (weight being lifted) is greater than its current force production,so Eccentric training along with the reduction of pain have been proven to successfully improve the function in subjects with patellar tendinopathy.

But on Comparing both the groups, there is statistically significant difference between post test measures of Visual Analogue Scale and Victorian Institute of Sports Association for Patellar Tendinopathy between Group-A subjects treated with LASER therapy and Group B subjects treated with Ultrasound.

Thus on comparing both the groups LASER with eccentric exercises prove to reduce pain(1.875) than Ultrasound with eccentric exercises(4.050).

Oken O,Kahraman Y, et al., (2007) ,suggested that in patients with lateral epicondylitis, Ultrasound has a shorter effect than laser therapy in reducing pain, and that LASER therapy is more effective than Ultrasound treatment in improving grip strength.Similarly LASER proves beneficial in Patellar Tendinopathy than Ultrasound.

It has been suggested that weak muscles generally have increased circulation, but are unable to use the substrates in the circulation. As increase in temperature would aid metabolism and help to use its substrates more effectively.

Ultrasound alters the permeability of cell membrane and aids in accelerating phagocytosis and absorption of exudates.it is also thought to cause capillary hyperaemia by the thermal effect of ultrasound.this will help remove the pain metabolites.Where as LASER have been shown to effect peripheral nerve activity. It is indicated that prostaglandin production is affected by laser stimulation, and these changes possibly reflect an accelerated resolution of inflammatory process and reduction of pain .

The effects of LASER on peripheral sensory nerve latency has been investigated in Humans by Snyder-Mackler and Bork.this double-blint study showed that exposure of the superficial radial nerve to low dosages of LASER resulted in a significantly decreased sensory nerve conduction velocity, which may provide information about the pain-relieving mechanism of LASERS. Other explanations for pain relief may be hastened healing, anti-inflammatory action, autonomic nerve influence, and neurohumoral response (serotonin, norepinephrine) from descending tract inhibition.

With all this physiology explained,this study demonstrates that Low Level Level Therapy combined with eccentric training can produce greater improvements in knee pain and function and quadriceps muscle strength and endurance for patients with patellar tendinopathy than Ultrasound with eccentric training.

## VII. CONCLUSION

The findings in this study suggests that both LASER along with Eccentric Exercise and Ultrasound with Eccentric exercise produced a significant improvement in Pain and Function. But on comparing LASER and Eccentric Exercise management has shown major improvement in Pain and Functional activity than Ultrasound and Eccentric Exercises among the subjects with patellar tendinitis.

*Limitations and Recommendations*

**The limitations of the study are** Long-term effect of LASER was not analysed, The sample size was small and only the VAS was used to assess Pain. The recommendations are Different types of Eccentric exercises can be studied, Long term effect and chances of reinjury can be studied and Microcurrent effects may be taken for future research.

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