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"A Study On Effectiveness Of Laser Therapy And Splinting Compared With Conventional Therapy For Lateral Epicondylitis"

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ABSTRACT

AIM: The aim of the study is to compare the effectiveness of laser therapy and splinting with conventional therapy for lateral epicondylitis.

OBJECTIVE: To determine the effectiveness of laser therapy and splinting compared with conventional therapy for lateral epicondylitis.

PROCEDURE: Total of 20 subjects was selected using convenient sampling technique based on the inclusion and exclusion criteria. The study was explained to the participants and written consent is obtained from the subjects. Subjects are allocated in two groups using randomized method of sampling.

GROUP A (n=10):.Control group A has been treated with pulsed ultrasound and wrist stretching exercise, the subject were undergone pre and post test values consist of 10 minutes per session per day for ultrasound therapy and 10 reps, 3 sets and 2 session per day of stretching exercise for 3 weeks.

GROUP B (n=10): Experimental group B has been treated with laser therapy and splinting. These subjects were undergone pre and post test values consist of low level laser therapy for 12 minutes with a wavelength of 904 nm per session per day and splinting for three weeks.

RESULT: From statistical analysis made with the quantitative data revealed statistically significant difference between Group A and Group B and also within the pre- test and post-test values of both the group. Group B – low level laser therapy and splinting reduces the pain and improves grip strength effectively when compared to the patients who undergo ultrasound therapy and stretching exercises.

CONCULSION: From the result, it has been concluded that low level laser therapy and splinting (group B) is more effective than group A

1.1 INTRODUCTION

Lateral epicondylitis is a frequent cause of elbow pain and affects 1 to 3% of the adult population every year [1]. Lateral epicondylitis or tennis elbow is an overuse injury involving the extensor muscles that originate on the lateral epicondylar region of the distal humerus. It is more properly termed as tendinosis that specifically involves the origin of the extensor carpi radialis brevis muscle. It is generally work related or sports related pain disorder, usually caused by excessive, quick, repetitive movements of the wrist and forearm [2].

Tennis elbow is a condition caused by inflammation of the tendons on the outer bony prominence lateral epicondyle of the elbow. Tennis elbow is a classic repetitive strain injury with prevalence 1.3% among those between 30 and 64 years of age but is equally distributed between men and women. Excessive constant gripping or squeezing on dominant upper extremity can cause lateral epicondylitis. Lateral epicondylitis is believed to be a degenerative process, which stems from repetitive micro trauma [3].

Tendinopathy is most often mentioned, and is characterized by a lesion of the common extensor tendon with or without inflammation [4]. Lateral epicondylitis is a degenerative or failed healing tendon response characterized by the increased presence of fibroblasts, vascular hyperplasia, and disorganized collagen in the origin of the extensor carpi radialis brevis. The tendons are relatively hypo vascular proximal to the tendon insertion [5].

The use of wrist hand splints are popular orthoses which are prescribed for the treatment of tennis elbow. The mechanism of action for current orthotic intervention in the treatment of lateral epicondylalgia is related to their effects on the restriction of forearm movement or relief of loads on the origin of the extensor muscles [6].

In general, treatments like splinting, stretching and strengthening exercises, and soft tissue mobilization are recommended [7]. Grip strength is the force applied by the hand to pull on or suspend from objects and is a specific part of hand strength. The intrinsic and extrinsic muscles of wrist both work together to produce the strength of grip. The extrinsic muscles responsible for producing flexion of the fingers pass through the carpal tunnel in front of the

wrist, so the position of wrist optimizes the grip strength. Hand grip strength is a reliable measurement when standardized methods and calibrated equipment are used, even when there are different assessors or different brands of dynamometers. There are different methods of positioning patients during measurement, and for calculating their grip strength from repeated measurements [9].

Wrist splints or braces are often prescribed during rehabilitation to limit wrist motion and provide additional support. Wrist splints are often applied to the dorsal aspect of the hand and should reduce extensor muscle activity by supporting the wrist joint thus reducing the need for muscular co-contraction to maintain posture. Without splinting, co-contraction of the flexor and extensor muscles must occur at the wrist to allow for the performance of finger flexion movements while maintaining wrist posture. However, the effectiveness of splinting during active use is inconclusive. During active use, wrist splinting has been shown to decrease forearm extensor muscle activity [10].

Laser is a form of light amplification by the emission of radiation, low level laser therapy produce significant heating and produce improvement in soft tissue injuries, wound healing. It increases cytochrome C oxidase production and reversing the effect of cellular inhibitors of respiration at the cellular level. Tissue healing is accelerated by increasing collagen fibril size and decreasing prostaglandin E2 levels in a dose dependent manner. A matrix degeneration associated with tendinopathies have an influence in improved healing of damaged tendon [11].

The usage of different treatment protocols regarding the variables such as dose, duration and frequency in various laser studies shows contradictory results. The guideline concerning the dose regimen for laser application has been recommended by World Association for Laser Therapy(WALT) [12] . Ultrasound therapy with intensity 1:1 ratio for10 minutes associated with stretching exercise regimen are more encouraging in lateral epicondylitis. Low level laser therapy (LLLT) of 904 nm wavelength associated with splinting, reduce recovery time by 3 weeks in two groups.

1.2 NEED FOR THE STUDY

The purpose of the study has lateral epicondylitis or tennis elbow is a condition caused by overuse of the wrist and forearm, which can result in elbow pain. Rest is an important factor in treating a patient which every patient ignore due to ignorance. To stress the importance of rest, this study is mainly focused. Recent evidence has shown wrist joint splinting and laser therapy as an effective intervention for people with lateral epicondylitis.

2. AIM AND OBJECTIVES

2.1 AIM OF THE STUDY

The aim of the study is to compare the effectiveness of laser therapy and splinting with conventional therapy for lateral epicondylitis.

2.2 OBJECTIVE OF THE STUDY

To determine the effectiveness of laser therapy and splinting compared with conventional therapy for lateral epicondylitis.

2.3 HYPOTHESIS

The Experimental groups have beneficial effectiveness of laser therapy and splinting compared with conventional therapy for lateral epicondylitis.

- NULL HYPOTHESIS:

$H_0$1: Laser therapy and splinting is not effective when compared to conventional therapy for lateral epicondylitis.

- ALTERNATIVE HYPOTHESIS:

H11: Laser therapy and splinting is more effective when compared to conventional therapy for lateral epicondylitis.

3. REVIEW OF LITERATURE

1. **In 2019, GirayE',Karali-Bingul D',Akyuz G,:** concluded that the kinesio taping in addition to exercises is more effective than sham taping and exercise only in improving pain daily activities and arm disability due to lateral epicondylitis .
2. **In 2019,Kocak FA',Kurt EE, SaSS,Tuncay F, Erdem HR:** concluded that in the treatment of lateral epicondylitis, kinesiotaping alone was found to be as effective as steroid injection alone. However, co-administration of steroid injection and kinesiotaping is more effective compared with each treatment alone.1
3. **In 2019 Celik D',Ana foroglu Kulunkoglu B',:** Concluded that both PBMT and ESWT are useful and can be used in treatment of lateral epicondylitis.
4. **In 2019 Kachanathu SJ et al.Eur:** Concluded that using wrist joint splinting in addition to physical therapy for a short duration is effective for reducing pain intensity. The evidence from this study indicates that wrist joint splinting and physical therapy may also be effective for improving wrist ROM and grip strength in the treatment of patients with lateral epicondylitis.
5. **In 2018 Guler NS', Saegin S',**: concluded that pain and functional improvement were more prominent in our lateral epicondylitis patients treated with **ESWT** than placebo effect where no statistically significant results were found.

6. **In 2018 Eraslan L, et al, :** Concluded that kinesiotaping was found to be effective for decreasing pain intensity , recovery grip strength and improving functionality in patients with lateral epicondylitis undergoing rehabilitation.
7. **In 2017, Seda baktir PT, MSC, et al :** Concluded that, low level laser therapy provides a benefit for pain and improves grip strength for lateral epicondylitis
8. **In 2010 Saniye Konur Emanet, M.D, et al :** Concluded that, although low energy laser therapy had no advantage compared to placebo in patient with LE for the short term, a significant improvement, particularly in functional parameters, was achieved in the long term. Laser which has relatively no side effects, might be included in long term treatment options for Lateral epicondylitis.
9. **In 2008 Oken O, et al,:** Concluded that the patients with lateral epicondylitis, a brace has a shorter beneficial effect than US and laser therapy in reducing pain, and that laser therapy is more effective than the brace and US treatment in improving grip strength.
10. **In 2007 Liz Kit Yinlam, et al :** Concluded that, low level laser therapy in addition to exercise is effective in relieving pain and in improving the grip strength and subjective rating of physical function of patients with lateral epicondylitis.
11. **In 2007 Stergioulas A. Photomed laser surg,:** Concluded that combination of laser with plyometric exercises was more effective treatment than placebo laser with the same plyometric exercises at the end of the treatment as well as at the follow-up.
12. **In 2003 Vicenzino B',:** Concluded as the manipulative therapy and taping treatment presented in this master class warrant consideration in the clinical best practice management of lateral epicondylitis, and serve as a model for other similar musculoskeletal conditions .
13. **In 2000 Basford JR et al,:** Concluded that treatment with low intensity 1.06-micron laser irritation within the parameters of this study was a safe but ineffective treatment of lateral epicondylitis.
14. **In 1994 Krasheninnikoff M et al,:** Concluded that low power laser offers no advantage over placebo in the treatment of musculoskeletal pain as lateral epicondylitis.
15. **In 1992 Vasseljen O et al,:** Concluded that a significant improvement in the laser compared to the placebo group was found on VAS ($p = 0.02$) and grip strength ($p = 0.03$) tests four weeks after treatment . In this study low level laser therapy was shown to have an effect over placebo in the treatment of lateral epicondylitis.

4. METHODS

4.1 STUDY DESIGN: Experimental study

4.2 STUDY SETTING: Saveetha College of Physiotherapy

4.3 SAMPLE METHOD: Convenient Sampling Technique

4.4 SAMPLE SIZE: 20 subjects

4.5 INCLUSION CRITERIA:

- GENDER: Both Males and Females
- AGE: 35 – 60 years
- Tenderness and pain over the lateral epicondyle region

4.6 EXCLUSION CEITERIA:

- Recent fracture.
- Infectious diseases.
- Open wound.
- Recent surgeries
- Mal union
- Nonunion
- Diffuse pain syndrome(e.g generalized tension myalgia or fibromyalgia)
- Connective tissue disease.

4.7 MATERIALS:

1. Splint

2. Hand Dynamometer

3. Laser therapy

4. Ultra sound therapy

PROCEDURE

Total of 20 subjects selected using convenient sampling technique based on the inclusion and exclusion criteria. The study was explained to the participants and written consent was obtained from the subjects. Subjects were allocated in two groups using convenient method of sampling.

GROUP A (n=10): Control group A has been treated with pulsed ultrasound and wrist stretching exercise, the subject were undergone pre and post test values consist of 10 minutes per session per day for ultrasound and 10 reps, 3 sets and 2 session per day of stretching exercise for 3 weeks.

GROUP B (n=10): Experimental group B has been treated with laser therapy and splinting. These subjects were undergone pre and post test values consist of low level laser therapy for 12 minutes with a wavelength of 904 nm per session per day and splinting for three weeks.

Irradiation area	Two or six points over a $5cm^2$ area
Duration	3 weeks
Frequency	3 sessions per week for 3 weeks
Wavelength	904nm
Output power	Between 5 and 50 Mw
Energy density	0.25 and $1.3Jcm^2$ of the energy density to each point

4.9 OUTCOME MEASURES

- VAS FOR PAIN:

  The VAS consists of a 10cm line with the two end points labeled with verbal descriptors. The patient is required to place a mark on the 10cm line at a point that corresponds to the level of pain intensity him or her presently feels. VAS consists of a 10cm line with descriptors at each end. At the left end there was the number zero with the descriptor “no pain at all”, and at the right end there was the number ten with the descriptors “most severe pain”. Each subject placed an X dong a 10 cm line to describe the amount of pain he/she was presently experiencing.

- HAND DYNAMOMETER FOR GRIP STRENGTH:

  The Jamar hand dynamometer was used to measure grip strength with subjects in sitting with shoulder in neutral position, elbow flexed in 90 degrees, forearm in mid prone and wrist in 10 degrees extension with finger flexed.

4.10 STATISTICAL ANALYSIS

The collected data was tabulated and analyzed using descriptive & inferential statistics. To all parameters mean and standard deviation (SD) was used. Paired t-test was used to analyse significant changes between pre and post measurements. Unpaired t-test was used to analyze significant changes between two groups.

TABLE-1: COMPARISON OF PRE-TEST AND POST-TEST VALUE OF GROUP-A

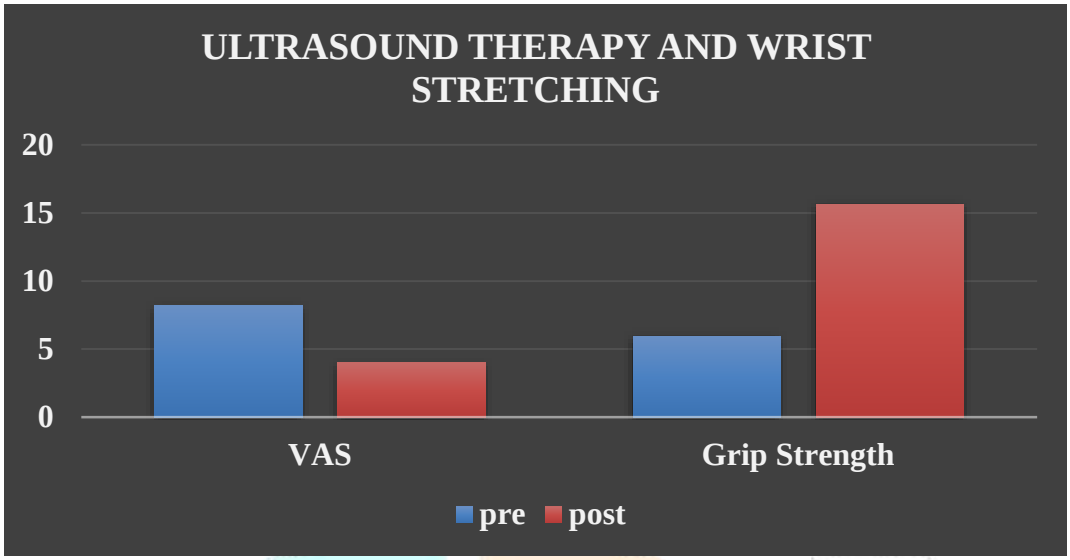
PARAMETERS	PRE		POST		T-value	P-value
	MEAN	SD	MEAN	SD		
VAS	8.20	0.79	4.00	0.82	11.698	<0.0001
GRIP STRENGTH	5.952	3.607	15.652	2.192	7.266	<0.0001

TABLE-2: COMPARISON OF PRE-TEST AND POST-TEST VALUE OF GROUP-B

PARAMETERS	PRE		POST		T-value	P-value
	MEAN	SD	MEAN	SD		
VAS	8.00	0.82	2.10	0.99	14.50	<0.0001
GRIP STRENGTH	7.93	3.477	26.234	2.192	14.075	<0.0001

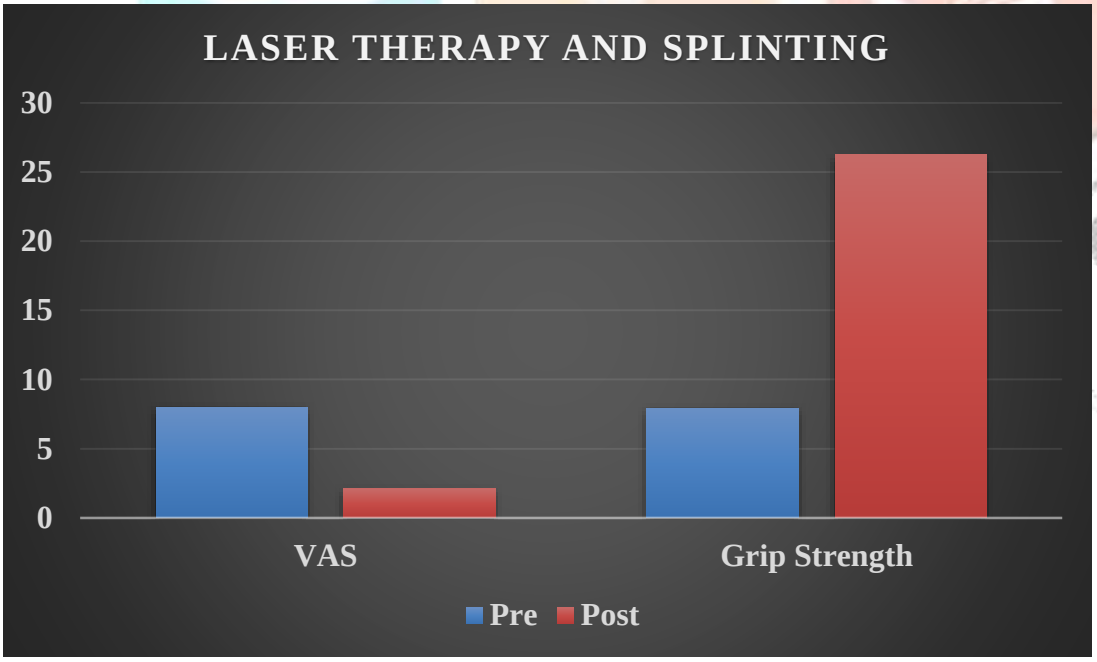
GRAPH-1

GRAPH SHOWING PRE-TEST AND POST-TEST VALUES OF GROUP-A



GRAPH -2

GRAPH SHOWING PRE-TEST AND POST-TEST VALUES OF GROUP-B



5. RESULT

From statistical analysis made with the quantitative data revealed statistically significant difference between Group A and Group B and also within the pre- test and post-test values of both the group. Group B – low level laser therapy and splinting reduces the pain and improves grip strength effectively when compared to the patients who undergo ultrasound therapy and stretching exercises.

6. DISCUSSION

This study was done to determine effect of low level laser therapy and splinting for lateral epicondylitis. Results showed a significant difference between control group and experimental group.

The result of the current study shows overall improvement in both the groups by decrease in pain intensity and increase in grip strength, but the group using wrist splint and laser therapy for 3weeks in addition to low level laser therapy and splinting intervention showed greater improvement than conventional therapy in decreasing pain intensity and improving grip strength for the patients with lateral epicondylitis.

In group A, pre test mean of VAS was 8.20 and grip strength was 5.952 after post test the mean value of VAS decreased to 4.00 and grip strength was increased to 15.652 which showed statistical difference within the group. In group B pre test mean of VAS was 8.00 and grip strength was 7.936 after the post test the mean value of VAS is decreased to 2.10 and grip strength is increased to 26.234 which showed statistical difference within the groups.

Hyman J et al., While tendinous tissue is positively correlated with collagen content and density of stable cross-links, enhancement of tensile capacity will probably be linked to the production of 'normal' collagen, in contrast with 'abnormal' collagen (type III) observed in tendinosis,[15 16] .

KraushaarBS et al., suggested tendon adaptation could improve the tendon's ability to withstand high levels of tensile force. Indeed, adaptive mechanisms do not simply result from loading exercises, but are probably dependant on the mode of contraction [17].

LamL.K et al., The positive results obtained by combining low level laser therapy of 904 nm wavelength with a splinting regimen, are encouraging. Results showed an added value in terms of a more rapid recovery when low level laser therapy was used in conjunction with a splinting regimen. This may indicate that splinting can be more effective when inflammation is kept under control [14] .Although no gold standard measure of outcome is available for lateral epicondylitis. We think that measures we choose were appropriate. Pain and grip strength measures were the primary outcome measures reported by studies.

However measurement methods varied widely and there was often insufficient data from which to estimate effect sizes arising from the treatment protocols.

Some previous studies have compared using a wrist splint to physical therapy, but few compared a combination of using a wrist splint and a physical therapy program to physical therapy alone. Those that have compared a combination of using a wrist splint and physical therapy alone have done so with inconsistent results.

Soderberg et al., compared an exercise intervention to using a brace, and they found no difference in pain and reduction after 6 weeks of intervention [15].

Okuni et al., used LLLT in the treatment of elbow pain on the tender point. At the end of 4 weeks (8 sessions), the VAS scores were meaningfully decreased similar to our LLLT application results [16].

Lam et al., used GaAs LLLT in the treatment of epicondylosis. The application lasted 3 weeks (9 sessions) on painful point by applying splint, it provides rest that improves the healing process of the condition.

Based on statistical analysis both group A and group B showed improvement in grip strength and decreased VAS. However, subjects who received low level laser therapy and splinting showed better improvement in grip strength and decreased VAS than subjects who received conventional therapy. Hence combination of laser therapy and splinting reduces pain and increases grip strength.

7. CONCLUSION

From the results, it has been concluded that low level laser therapy and splinting (group B) is more effective than group A. It concluded that low level laser therapy and splinting both are clinically and statistically have significant effect in improving the grip strength and reducing pain, therefore it is recommended to implement splinting with laser therapy in clinical practice to reduce pain and to improve the grip strength.

8. LIMITATIONS AND RECOMMENTATIONS

LIMITATIONS:

1. Small sample size

2. The study doesn't include adults below 35 years.

RECOMMENDATIONS:

1. Further study can be done with large sample size.

2. Subjects of varying age groups to be included in future study

9. REFERENCES:

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