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Effect of Cryotherapy versus Ultrasound Therapy in Lateral Epicondylitis: A Comparative Study

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ABSTRACT

Background: Lateral epicondylitis is the most common overuse syndrome occurring in lateral side of the elbow region. Pain occurs at the lateral epicondyle from where common extensor tendon originates. It is also known as tennis elbow.
Individuals from mechanical profession and sports (such as tennis) or recreational activities who are prone to repetitive stress and vigorous use of forearm muscles are tend to have lateral epicondylitis.
Usually dominant arm is affected with the equal incidence among males and females. Patients may complain of gradual onset of pain and often appearing after vigorous activity. Diagnosis can be made by history and the tests which reproduces the pain. Treatment of lateral epicondylitis includes both the conservative and surgical approaches. Electrotherapeutic modalities are most commonly used for treating pain at the affected side.
However, agreement on a clearly superior modality has not been substantiated in the literature. So, this study was conducted to compare the effect of Cryotherapy and the ultrasound therapy in patients with lateral epicondylitis.
Methodology: 22 patients with lateral epicondylitis were included by convenience sampling after taking ethical approval for the present study. The patients were then equally divided in to two groups. Along with the conventional physiotherapy, patients in GROUP A were given Cryotherapy, while GROUP B ultrasound was given for 2 weeks. Pre and post interventional outcome measures in terms of NPRS, PPT (in kg) and PRTEE score were evaluated. Data of 22 patients were analyzed after the completion of the treatment.
Result: At the end of 2 weeks, patients in both the groups showed reduction in pain and improvement in hand functions, movements of elbow and wrist joint. Here, both the groups showed statistically significant improvement. ($p<0.05$)
Conclusion: Ultrasound therapy and cryoflow along with conventional physiotherapy helps in reducing pain and improving function and movements in patients with lateral epicondylitis.

Key words: Lateral epicondylitis, ultrasound therapy and cryoflow

INTRODUCTION

Lateral epicondylitis also known as lateral elbow tendinopathy & or tennis elbow, is one of the most common overuse syndrome of the extensor tendon of the forearm. [1] The term lateral epicondylitis was first described by Runge in 1873 and then used by Morris in 1882.Lateral epicondylitis is a frequent cause of elbow pain and it affects 1 to 3 % of adult population every year. [2]

Lateral epicondylitis is a degenerative or failed healing tendon response characterized by the increase presence of fibroblasts, vascular hyperplasia and disorganized collagen in origin of the extensor carpi radialis brevis (ECRB) the most common affected structure. [3]
Tendinous micro trauma in cases of lateral epicondylitis divided into following four stages. [4]

1) Inflammatory, reversible without pathological alterations.
2) Angiofibroblastic degeneration.

3) Tendinosis associated with structural alteration (tendon tear).
4) Fibrosis and calcification.

Lateral epicondylitis is a painful condition affecting the tendinous tissues of the origin of the wrist extensor muscle at the lateral epicondyle of the humerus leading to loss of function of the affected limb. It is activated by gripping activities. [5-7]

Lateral epicondylitis is most commonly seen in tennis players and hence it is known as "tennis elbow".

It also occurs in non-tennis players because of work related overuse injuries. Musicians, carpenters, assembly line workers and many other subjects whose activities involve supination, pronation, and overuse of wrist and finger extensors or lifting the objects with palm down, on almost daily basis are more prone to have lateral epicondylitis. [7] Although lateral epicondylitis can occurs at any age the peak prevalence age is between 30 t0 60 years. Both genders are equally affected, but the disorder appears to be of longer duration and severe in females.

The chief complaints in lateral epicondylitis are increased pain, decreased grip strength and functional activities leading to significant affection in activities of daily living. [8]

Cryotherapy is an application of cold to the local body part. It is working on the mechanism of relief of pain by producing cooling effects on deeper tissues, on nerve conduction velocity, pain threshold and pain tolerance. [11]

Physiological effects of Cryotherapy.

1) Vasoconstriction to decrease swelling and inflammation ,
2) Decreased tissue hypoxia,
3) Decreased pain, and
4) Decreased muscle spasm.

Ultrasound therapy is an application of mechanical vibration, produced electrically. It is high frequency ultrasonic waves that are effective in treating local painful area of the body part. Ultrasound produces micro massaging effects there by reducing pain. [13] Physiological effects of ultrasound:-

- Thermal effects
- Non thermal effects

Cavitations, acoustic streaming and micro massage. These above effects of ultrasound therapy help in reducing pain and improve healing. [14]

MATERIALS AND METHODS

Ethical clearance for this study was obtained by institution ethical committee prior to the study. 28 patients referred from the orthopedic OPD were screened for the eligibility. Patients having history of surgery to the elbow, Traumatic cases, Neurological abnormalities, Local arthritis or poly arthritis, Radial nerve entrapment and other musculoskeletal diseases excluded from the study. From those 28 patients between the age between 30 to 45yrs were included in the study. The whole procedure and purpose of the study were explained to all the patients. Written informed consent was taken from all the patients prior to the study. Total 22 patients were divided into 2 groups by convenience sequential sampling. **Group A**: Cryotherapy group (n=11) patients in this group were given ultrasound plus conventional treatment of hand and wrist. **Group B**: Ultrasound therapy group (n=11) patients in this group were given cryoflow plus conventional treatment of hand and wrist.

Demographic data of the patients were taken and pre-assessment was done outcome measures numerical pain rating scale, pain pressure threshold and patient rated tennis elbow evaluation score were measured before and after the treatment intervention. Treatment was given 6 days a week for 2 weeks excluding Sunday.

CONVENTIONAL PHYSIOTHERAPY:-

Patients in both the groups were given conventional physiotherapy in the form of stretching and strengthening exercise. Stretching of wrist extensors was applied with the patient in supine lying,

elbow in extension, forearm pronation, wrist flexion and ulnar deviation, according to the patient tolerance. This position was held for 30 seconds, 3 times before and 3 times after strengthening exercise, 30 sec. rest between each procedure. [7]

Strengthening exercise of wrist were started with elbow in 90°flexion.patient in high sitting position with elbow supported on the pillow in the patient lap. 3 sets of 10 repetitions, 1 min. rest b/w each set, for each treatment session. [8] with manual resistance.

Photograph: 1 stretching of wrist extensors.

Photograph: 2 strengthening of wrist flexors and extensors.

Photograph: 3 strengthening of supinators and pronators.

Patients were given comfortable sitting position with pillow in the lap and elbow was kept in 90°of flexion and forearm pronation. Patient were explained about the treatment which they

were about to receive. 10min.before applying treatment machine was switched on for warm up. Cryotherapy was given using Cryoflow 1000(IR guided) machine in the form of cold air flow over the lateral epicondyle, 10 min, Temperature >13°, Distance between skin and nozzle of Cryoflow is 2 to 10 cm. after completing the treatment machine was turned off and placed nozzle to its original place. The skin was then inspected for any abnormality.

Photograph: 4 TREATMENT IN GROUP – A WITH CRYOTHERAPY.

GROUP B: ULTRASOUND THERAPY GROUP

Patients were given comfortable sitting position with pillow in the lap and elbow was kept in 90°of flexion. Patients were explained about the treatment, which they were about to receive. Ultrasound was given using therapeutic ultrasound machine. Ultrasonic gel was used as a coupling medium. Ultrasound was given with 1 MHz frequency at 1.5 w/cm^2 intensity with pulsed mode 1:4 for 5 minutes in circular manner. After completion of treatment the part was cleaned with cotton and skin was inspected for any obvious changes.

Photograph: 5 ultrasound therapy

RESULTS

The present study was conducted to compare the effect of Cryotherapy versus ultrasound therapy in lateral epicondylitis Pre and post intervention outcome measures were evaluated before and after completion of the treatment program. Outcome measures evaluated and analyzed by NPRS

score, Pain threshold by pressure threshold meter (PPT) and PRTEE score.

Out of 22 patients, [Group A = 11, Group B = 11] completed the study for 2 weeks. Data of 22 patients were analyzed by statistical package of social science version 16 [SPSS 16] and Microsoft excel 2013. Level of significance was at 5% with the confidence interval 95%.

Data was not normally distributed for all the outcome measures. So, non-parametric tests were applied for within group and between group analyses. Data analysis was done after 2 weeks of intervention. Wilcoxon Signed Rank test applied to analyses pre and post outcome measure within group, while between group analyses was done using Mann Whitney U test for all outcome measures. Mann Whitney U test was applied to compare the baseline characteristics of the patients in both the groups. No Statistically significant difference was found between both the groups.

Wilcoxon Signed Rank test was applied to compare pre and post NPRS, PPT AND PRTEE Score in both the groups. Within group analysis showed statistically significant difference ($p<0.05$) in NPRS, PPT and PRTEE score for the both the groups. (Table 1)

NPRS	PRE	POST	Z VALUE	P VALUE
	MEAN±SD	MEAN± SD		
GROUP A	6.54±1.43	1.54±0.93	-2.980	0.003
GROUP B	6.27±1.10	1.63±0.50	-2.965	0.003

PPT	PRE	POST	Z VALUE	P VALUE
	MEAN±SD (KGF)	MEAN±SD (KGF)		
GROUP A	2.58±1.19	3.32±1.06	-2.934	0.003
GROUP B	2.96±1.12	4.01±1.28	-2.934	0.003

PRTEE	PRE	POST	Z VALUE	P VALUE
	MEAN ± SD	MEAN±SD		
GROUP A	66.60±1.12	16.18±4.53	-2.940	0.003
GROUP B	57.90±1.39	9.27±3.46	-2.934	0.003

Mann whiney U test applied to compare the difference of NPRS score between two groups. There was no statistically significant difference found, while comparing both the groups. ($p>0.05$).

OUTCOME MEASURE	GROUP A (MEAN ±SD)	GROUP B (MEAN±SD)	U – VALUE	p VALUE
DIFFERENCE NPRS SCORE	5.00±1.09	4.63±0.92	45	0.285

OUTCOME MEASURE	GROUP A (MEAN ±SD) KGF	GROUP B (MEAN±SD) KGF	U – VALUE	p VALUE
DIFFERENCE PPT SCORE	0.73±0.28	1.05±0.59	42	0.224

OUTCOME MEASURE	GROUP A (MEAN ±SD)	GROUP B (MEAN±SD)	U – VALUE	p VALUE
DIFFERENCE PRTEE SCORE	49.81±9.16	48.63±1.14	52.50	0.599

Thus from the results of the present study, there is no significant difference between Cryotherapy with conventional therapy and ultrasound therapy with conventional therapy in patients with lateral epicondylitis, null hypothesis is accepted.

DISCUSSION

The result of the present study showed improvement in NPRS score, pain pressure threshold, and PRTEE score ($p<0.05$) in both the groups. There was no statistically significant difference found in the all above mentioned outcome measures ($p>0.05$) between the groups. Stretching minimizes the internal strain to the tendon by optimizing tissue extensibility during stress activity. Strengthening and stretching both are the main component of exercise programs, because tendons must have

flexibility along with the strength. Lengthening of tendon unit by stretching and strengthening exercises. [3]

Statistically significant improvement was found in NPRS score in the group treated with Cryotherapy. The mechanisms behind reduction of pain was Lewis hunting reaction, decreased metabolic activity at cellular level and decreased necrotic enzymatic activity thereby improving healing and recover function in patient. [9, 11] it is because of infrared guided cooling effect of Cryoflow therapy.

Similar findings found in the study done by Rahul et al who compared the effect of Cryoflow using infrared guided Cryoflow machine, In 30 patients of shoulder impingement syndrome. Statistically significant improvement was found in pain pressure threshold (PPT) in the group treated with Cryotherapy.

The mechanism behind increase in pain pressure threshold was decrease in nerve conduction velocity thereby increase threshold of pain at treated area. There is in consistency with the study done by Aminan alga fly et al**.** effect of Cryotherapy on nerve conduction velocity, pain threshold and pain tolerance". They did study on 23 adult male sports players. [13]

There was statistically significant improvement found in PRTEE score in the group treated with Cryotherapy. There was reduction of pain, improvement in pain pressure threshold and improved function in patients treated with Cryotherapy. Cherry et al (2012) through a randomized controlled trial concluded that exercise and Cryotherapy used in isolation or in combination reduced the symptoms of lateral epicondylitis. [15]

There was statistically significant improvement found in NPRS score in the group treated with ultrasound therapy. Mechanism behind reduction of pain was non thermal effects of ultrasound therapy like micro massage, cavitations and acoustic streaming. These effects increases vascularity at treatment site and enhanced proliferation of fibroblasts. The reparative process is enhanced by acoustic streaming and cavitations by increase diffusion of ions and metabolic across the cell membrane. Change in calcium permeability enhances the tissue healing and increase permeability of sodium may reduce the pain and spasm by altering neural activity. [10]

Similar result was found in the study done by Shaji, Jhon Kachanathu et al (2013) who conducted a study to compare the effects of pulsed ultrasound and continuous ultrasound over a period of 2 weeks and demonstrated the effectiveness of pulsed ultrasound. [12]

There was statistically significant improvement found in PPT score in the group treated with ultrasound therapy. Reason behind improvement of pain threshold can be indirectly correlated to reduction of pain increase the tolerance of pressure pain.

There was statistically significant improvement found in PRTEE score in the group treated with ultrasound therapy. Similar results was found in study done by A.P.D VAZ, et al.2006Conducted a study "pulsed low intensity ultrasound therapy for chronic lateral epicondylitis randomized controlled trial including59 subjects.VAS (visual analogue scale), PRFE (patient rated forearm evaluation questionnaire) were taken for pain and function measurement. [14]

There was no significant difference found in any of the outcome measures between Cryotherapy and ultrasound therapy groups. Both the Cryotherapy and ultrasound therapy have the benefits of providing pain relief, improve pain pressure threshold and function in lateral epicondylitis.

CONCLUSIONS

Results showed significant improvement in both Cryotherapy and ultrasound therapy groups. But there was no statistically significant difference between the effect of Cryotherapy and ultrasound therapy on pain, pain pressure threshold and

function in patients with lateral epicondylitis.

So, it can be concluded that Cryotherapy and ultrasound therapy are equally effective and either of them can be used in the treatment of lateral epicondylitis.

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