

Effectiveness of Therapeutic Ultrasound and Massage Therapy in the Recovery of Lateral Epicondylalgia

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Abstract— The condition firstly called ‘tennis elbow’ has been identified for a long time in different era. Complicated expressions consists of painful stimulus and pain on touch upon the lateral sided elbow of elbow, provoked by moving distal hand joint extension against resistance and passive distal hand joint flexion, and disabled hand power. Although too much tennis personnel may have such situation but mostly they are related to work-force activities or have no visible inducing factors.

The objective of this paper was to enquire about the efficacy of therapeutic ultrasound and massage treatment in the recovery of lateral epicondylalgia. A total of 60 participants were sample of this research including both genders. Painful stimulus pattern and intensity was assessed by Visual Analogous Scale and Lateral sided elbow painful stimulus Scale before the treatment session.

The research was classified into 2 sections or groups. One class was treated by therapeutic ultrasound only while other group was treated by massage therapy for the recovery of lateral elbow pain. Specifically those participants were in in the research who were willing were inclusive in this research project and who were having the symptoms of lateral sided elbow painful stimulus either acute or chronic.

I. INTRODUCTION

Lateral epicondylitis, more mostly known as ‘tennis elbow’. Its prevalence is about 1-3% among communities. Bisset L et. al. Candidates ranges from 35 and 54 years, were mostly targeted by this syndrome. Paoloni JA et.al. While often received as an disturbing situation, painful lateral elbow joint can hinder a person’s community role because of painful disability. On the other hand, 40-50% of sports persons including tennis having such condition either diagnosed or undiagnosed. 15% labors are working with great exertion in different high weighted tasks the includes major involvement of arm, forearm and distal hand joint. Baskurt F et.al. Research performed in The Netherlands concluded that ten percent of affected person either go on sick leave or and loose their perfection in growing better outcomes their domain. (Struijs PAA) zx

A. CAUSES AND SYMPTOMS

Lateral Epicondylitis is characterized as a painful stimulus over the lateral sided elbow of the

humerous, usually caeresponsible from overuse of distal hand joint and forearm movements. Taylor LP et.al. The extensor carpi radialis longus and brevis along with the extensor carpi ulnaris and extensor digitorum originate along the lateral epicondylar ridge of the humerus. Of these specified musculature, the extensor carpiradialis brevis and extensor digitorum dominant in the sense of painful stimulus and pathology. (Hall CM) Overuse of elbow and distal hand joint extension causes the tendons of these muscles, especially the extensor carpi radialis brevis, to become irritated and inflamed, causing swelling and soreness around the lateral aspect of the elbow. Certain acute movements, such as distal hand joint extension, can intensify symptoms, such as the movements involved when playing tennis, hence the term “tennis elbow.” Symptomatic individuals report painful stimulus and pain on touch around the lateral aspect of the affected elbow when the distal hand joint is extended. Distal hand joint movements such as grasping and pinching are often hindered, consequently limiting the function of the hand. (Ankara Fizik)

The treatment approach for lateral epicondylitis is usually conservative, consisting of relative rest, occasional bracing, inflammation control, and therapeutic exercise. Acute lateral epicondylitis can be immediately treated with rest and immobilization. The most common treatments of chronic lateral epicondylitis consist of soft tissue manipulation, phonophoresis of nonsteroidal anti-inflammatory drugs, and prolonged electrical stimulation. (Gliklich RE)

B. Etiology

Lateral sided forearm painful stimulus caeresponsible by overuse of upper limb because of constant day to day high exertional activities which comprised of heavy lifting and delifting of certain objects in an abnormal manner specially distal hand joint in backward position. It mostly found among tennis personnel but can be profound from any recreational activities that required distal hand extension, lateral deviation, and turning of distal arm. Squash and badminton individuals are also more prone to such debilitation painful stimulus of lateral sided forearm which

involves similar movements as compared to palyer invloved in tennis elbow. Such painful scenario provoked by the excessive and improper use of mechanical handling with putting in and off of various objects. (Benjamin K. Buchanan et.al)

C. Epidemiology

Lateral elbow pathology is the more prevelant factor nowadays found among different individuals in the normal society. The scenarrio impact both genders simultaneously. The commulative incidence is 1-3% percent in America. Instead of it, the scenarrio being generally called as lateral sided elbow pain, tennis individuals have only 10% of prevelance from overall population. Quarter of tennis sports personsuspect discomfort around elbow, 75% of the sports man having specific Lateral sided elbow painful stimulusdiscomfort. It is mostly prevelant in people more than fourty years old. Smoking, obesity, a continuous mobility for approximately 2 hours daily, and exertional activities (weight more than 20 kg) are pecipitating factors in the common population for having such situation. The pathophysiology of the case is suitable eight to ninty percent of recovery in a year or two. (Degen RM et.al)

D. Histopathology

Numerous findings expressing the cellular reflection of abnormal Extensor Carpi Radialis Brevis samples demonstrate any collection of the such particularities:

- Increase muscle mass or a lot of fibroblastic tissues
- Collagenization
- Increase in blood cells/tissues accumulation
- Reduced inflammation. (Nirschl RP et.al)

E. History and Physical Exam

Person must have a background history of repetitive strain activites which induces the symptoms of lateral sided elbow pain. The whiplash injuries of elbow or lateral elbow is also thought to be and integral part of occurance. The total time span in exagerating such situation is usually three to four days after suspecting to any work related stress or strain. Backward movement or repetitive movement of distal hand joint joint in such highly demading workloads is considered to be a causal factor.

Most of the sports men having the history of repetitive work load for a longer duration may result to the abrupt onset of lateral epicondylgia. This scenarrio also be exagerated by an recent mechaincal injury;e.g lifting a massive item or performance of a rough beforehand shots in tennis. These recent injuries leads to the many of long term procedure (i.e. early-on-delayed) excessive injuries. The discomfort of painful stimulus normally around the outer side of elbow which badly damaged while activities and improvement associated with relaxation. The painful stimulus variably being minimum, for instance, with symptoms provoking tasks like

tennis or the repeated use of a hand tool, or it can be such severe painful stimulus that simple activities like picking up and holding a coffee cup or a coffee cup sign will act as a trigger for the pain.

On examinational perspective, the spot of maximally discomfort on touch is mostly over the lateral sided elbow , mostly in specific area, distally located about 1- 2 cm from the lateral sided elbow itself. The palpation of the whole tendon may have some sort of discomfort, and the associated muscle may express uneven stiffness. The patient's painful stimulus will higher or be reoccur with resisted distal hand joint extension, speifically when the elbow is moved back and the forearm is rotated. Resisted extension of the central big finger, while the elbow joint is in extension, is specifically painful associated to more stress placed on the tendonous unit, furthurmore supports the diagnosed case. Moreover, there must be an reduction of neuropathic pain symptoms or parasthesia. These physical abnormal features express another procedure such as a radial nerve compression instead of these problems exist. (Ramage JL)

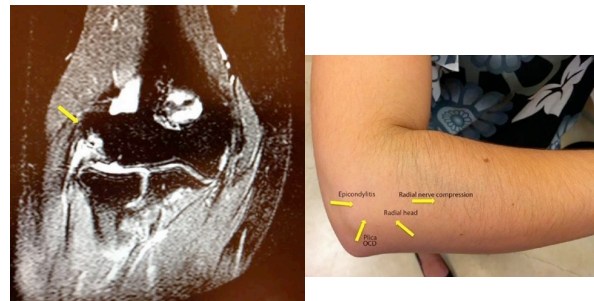


Fig. 1 Coronal T-2 weighted MRI image of a right elbow showing an injury of the insertion of the extensor muscles at the lateral sided elbow .

F. Evaluation

Lateral sided elbow pain is a clinically diagnosed case scenarrio and radiogrpahs are mostly not important. A doctor may suspect taking an elbow radiogrpahs series (anteroposterior and lateral) if other injured conditions are prone to history physically exam. Other conditions warranting potential imaging workup include evaluating for concoinations. Intermittant degeneration jointl alterations, hairline fractures, malignancy, or inflammatory bursa. Magnetic resonance imaging and theraputic ultrasound is preferable when the conservative treatment does not respont towards pain and disability recovery. All these modes of diagnosis are vulnarable to find out different sort and level of wear and tear within the joint or muscle. (NowotnyJ, et.al)

G. Treatment and Mangement Options

1. Conservative Treatment

Intial recovery for lateral epicondylgai includes rest from exertional activites. Icing afterward any activity, orally responsible Non-Steroidal Anti-inflammatory Drugs can be administred to assist with painful stimulus control. Forearm opposite forces strapping ("cho-pat" straps) are indicated to reduce stress at the lateral sided elbow.

These must be responsible while performing activities. The status of cho-pat strapping is a debating issue as fewer affected person may express painful stimulus around the area of maximal pain on touch secondary to direct manual pressure on the area. Bracing and strapping use in the form of a cock-up distal hand joint splinting can be indicated to relieve of the distal hand joint extensor muscles. (Varacallo M, et.al)

Occupationally or physiotherapy with enforcement over lower arm stretching and resistance exercises and leading to eccentric muscular strength of the specific extensor tendon has also shown to be substitution. If the painful stimulus does not respond to conservative measures, then noted more advanced or invasive techniques for instance; superficial nitrates, botulinum toxin, autologous platelet-rich plasma, and dextrose prolotherapy. (StatPearls. et.al)

2. Surgical recovery and types

Surgical recovery should be valuable at the extreme stage of lateral sided elbow pain. Long-term conservative techniques for 6 months to 1 year should be choice of priority, prior to the invasive procedures. Lateral epicondylitis has various suspected causes and multiple surgically recovery options for treatment. Open Extensor Carpi Radialis Brevis release, percutaneous extensor tenotomy and arthroscopic ECRB release are currently the most preferred procedures with a success rate of 80-97%. The best surgical treatment is not known.

Various health professionals prefer alternative scale of ECRB release due to surgery from the tendon originating at the lateral sided elbow. In the choice of selections, surgeons selecting to forego an actual Extensor Carpi Radialis Brevis removal, a valuable release and cutting-off must be performed at the Extensor Carpi Radialis Brevis attachment point with specification of surgical removal of the pathological tissues and stimulations of a normal, vascular outflow, bony-bed of soft tissues at the lateral sided elbow to assist in stimulating healing potential. (Hegmann KT, et. al)

H. Prognosis

The rate of recovery for lateral epicondylgia is normally perfect results. Many people will have painful stimulus relief approximately within 1 year after receiving physiotherapy treatment options like icing, rest, and Non-steroidal anti-inflammatory medicines. For victims who haven't any chance of recovery from conservative treatments with primary treatment options, many types of physical and occupational therapies could be substitutions. Patient, who doesn't follow the proper treatment guidelines, he or she must have a repetitions of symptoms. (Nishizuka T, et.al)

I. Complications

Medical related problems related to lateral epicondylgia can consists of repetition of the mechanical load when activities of daily living are commenced again. damage to the soft tissues like; tendons with repeatedly invasive injectables of steroids, and failure of improvement from physical means of treatment.

After surgery various pathological conditions can occur associatedly like:

1. Failure of Physical means of treatment options
Participants express lowest results and absence of recovery if the initial cause of signs are not considered; affected person should be guided perspective to the dangers and useful impacts of post-surgery -- the prior involve but are not bounded to inflammation or infectious response, loss of red blood cells, head and brain injuries, constant painful stimulus, rigidity of soft tissues, or collectively malfunctioning. Cervical radiculopathy often omitted out of diagnosis from approximately five percent of the affected person who are being able to managed by lateral sided elbow pain.

2. Iatrogenic LUCL injury
Happen iatrogenically with higher danger if the post-surgical cuts being measured more than radial topical equator. After surgery, iatrogenic postero-lateral rotatory instability (PLRI) could be happen if the backward movement or LUCL compromise is important.

3. Iatrogenical neuro-vascular injury
Cervical nerve injuries are most common speciall laterally occurring radial nerve.

4. Heterotopical excessive bone fragments
Reduced the danger with through copious saline irrigation following decortication and removal of extra dead or waste tissues.

5. Infectious risk. (Welsh P, et.al)

J. Physiotherapy In affected Person with Tennis Elbow

The pathology of constant disability of painful stimulus in the elbow, specially in the radio-humeral joints, is refer to as tennis elbow, lateral epicondy inflammation, or lateral sided painful elbow. The perfect cause of Lateral sided elbow painful stimulus is unknown. It is a painful situation and dangerous musculo-skeletal problem that impacts medical care industries. It is often famous in people whose jobs requirements are constant rotation motion upon forearm (e.g., tennis sports personnels and the person working with wood art). It is mostly because of mosre abruptly, monotonous, cycling eccentric contraction and distal hand joint gripping activities. (D. M. Bosworth, et. al)

The mostly affected limb is the dependent upper limb, with a occurrence of one to three in the common communities, but the happening abruptly higher to ninteen percent between thirty to sixty years of age and assumes be more critical and prolonged in females. The commulative period of an relapse of lateral epicondylgia ranges between six months to two years. In tennis elbow, small and major injuries can be present in the Extensor Carpi Radialis Brevis (ECRB) (J. H. Cyriax)

The major clinical expression and the major complaints in Lateral sided elbow painful stimulus are decreased grip strength, reduced functional status, and provoked pain, which may have major impression on activities of daily livings. The diagnosis of Lateral sided elbow painful stimulus can be more simpler, and it may be confirmation by labs which would produce the painful stimuli, discomfort on touch over on the joints of the lateral sided elbow on touch, resisted distal

hand joint extension, resisted middle finger extension, and passive distal hand joint flexion. (E. B. Kaplan)

K. Cyriax Physical Therapy and its Effectiveness

In order to highlight the treatment options as Cyriax physiotherapy, the two treatment options highlighted in the previous paragraphs must be applied together in the specific pattern. In this goal, patient must adhere to this protocol thrice in seven days for about 28 days. However, the ratio of researches concluding the efficacy of this treatment option is least, the cause behind is that mostly of them do not have guided random studies, blinded results measures, and perfect functional outcomes questionnaires. For the above-mentioned causes, more studies are guaranteed to check out the efficacy of Cyriax physiotherapy protocols. The previous treatment techniques of Lateral sided elbow painful stimulus is mostly combined by specific exercise plan which may include resistance exercises, flexibility, or endurance training exercises. For instance, Stasinopoulos et al. recommended the use of static stretching of the Extensor Carpi Radialis Brevis (ECRB) and eccentric resistance exercises for the distal hand joint extensors in treating lateral epicondylitis. Even though many treatment options are present in the recovery of painful tennis elbow, perfect treatment procedures are not satisfied upon till date. Hence, more researches are important to sort out the best treatment strategy in the recovery of affected person with Lateral sided elbow painful stimulus. (J. H. Cyriax)

L. Ultrasound Therapy for Lateral Epicondylitis

A first research from Greg W. et al says that therapeutic ultrasound is maybe substitution for lateral epicondylitis. Therapeutic ultrasound is thought to have heating and mechanical impacts on the affected cells leads to higher metabolism of the body, vascular outflow, lengthening of soft tissues, and tissues regrowth. The finest available database illicit that therapeutic ultrasound provides lowest painful stimulus minimization over one to three months. Exercise seems to be most effective rather than therapeutic ultrasound for painful stimulus relief. Associated therapeutic ultrasound with deep transverse friction massage or corticosterone injections are no important than therapeutic ultrasound alone. Therapeutic ultrasound should be implemented two or three times in 7 days for approximately 6-8 weeks. (Greg W)

(Lin CL et al) evaluated 34 affected person (35 elbows), with a collective age of 52.1 years (range, 35-65 years), suffering from affected lateral epicondylgia for more than six month and had failed non-operative treatment strategies. They were dealt with US directed radio-frequency thermal lesioning (RTL). Affected person's were followed-up for at least six months by physical examinations and twelve month by face to face observation. The severity of painful stimulus was calculated with a visual analog scale (VAS) scale. The functionally oriented outcomes were investigated using grip strength, the upper limb Disability of Arms, Shoulders and

Hand (QuickDASH) outcomes measure, and the Modified Mayo Clinic Performance Index (MMCPPI) for the lateral elbow. The ultrasonography findings regarding the extensor tendon origin were recorded, as were the clinical pathologies. Ultrasonographical directed RTL for lateral epicondylgia was found to be a minimally close treatment with best optional result in this pilot study. This new procedure can be elected as an secondary treatment of lateral epicondylgia before any surgical strategies. (Lin CL)

(D'Vaz AP et al) evaluated the effectiveness of low-intensity ultrasound therapy (LIUS) vs placebo therapy daily for twelve week in participants with long term lateral epicondylgia inflammation (LE) in a randomized, double-blind, placebo controlled trial. In this research LIUS was no more good option for a large treatment effects than placebo for recalcitrant LE. (D'Vaz AP)

(Öznur Öken, et al) evaluated the impacts of low-level laser therapy (LLLT) and to compared these with the impression of brace or ultrasound (US) treatment in tennis elbow. The research articles responsible was a prospective and randomized, controlled, single-blind trial. Fifty-eight outaffected person with lateral epicondylitis (9 men, 49 women) were consisted of may clinical trials. The affected personnel were classified into

3 classes: 1) brace group—brace plus exercise, 2) therapeutic ultrasound group—US plus exercises, and 3) laser therapy group—LLLT plus physical exercise. There were not any clear dissimilarities among the groups on VAS and grip strength at first line and at follow-up evaluations. The findings shows that, in affected person having lateral epicondylitis, a physical support has a least benefit effects rather than Ultrasound and low level laser therapy in minimizing pain, and that laser therapy is most significant than the bandaging or physical support and Ultrasound treatments in improving grip strength. (Öznur Öken)

M. Effectiveness of Massage Therapy & Types

Lateral sided elbow painful stimulus is a long, irritation and upsetting injury which can happen easily again and again. Putting the elbow joint in resting and mend itself can move anywhere between six months and two years, reducing the re-injury is key component. There are numerous types of massage techniques such as;

1. Effleurage. The sort of massage therapy having long glides and strokes.
2. Petrissage. The sort of massage strokes is normally designated as one in which the professional is kneading, rolling, wringing, and lifting the soft tissue which are affected and targeted.
3. Friction Massage
4. Tapotement
5. Vibration

1. Effleurage

Effleurage is implemented with light pressure, mostly responsible to begin a massage treatment. Effleurage is performed onto several body parts using fingers and flat

hands. Effleurage betterment vascular flow towards the cardiac system, using elongated strokes to help enhance heat of the soft tissues. Effleurage is perfect to increase the lymphatic system. The lymphatic system is system of the circulation that transfers lymph fluids throughout the body. Effleurage is implemented in an up direction towards lymph nodes. Lymph nodes are present through the whole body and associated to the lymphatic trunks and bundles. Effleurage assists to enhance the lymphatic system and bring improvements in its physiological status. Effleurage is also a well-known skill which is applied in therapeutic massages. Effleurage is also responsible at a low speed which is responsible to minimize tension and relieve tension. Effleurage applied at low pace can increase relaxation. Effleurage increases the parasympathetic nervous system that releases positive hormones and betterment temperature. The parasympathetic system is prone to providing relaxation and calmness after emotions such as depression. Effleurage relaxes the body and reduced the heart rate. Effleurage helps reduce stress. Stress can be related behavioural events in life such as work life, health or sporting performances. Massage can deal all sorts of stress. Effleurage promotes the body to relieve so that stress is disappeared. Effleurage can improve behaviour by stimulating good hormones and the parasympathetic nervous system. Effleurage is effective as a massage technique after any physical assault. Effleurage is performed in an up directions to promotes the lymphatic flow. Stimulating the lymphatic flow assists with the immune system and the drainage of useless items. Lymphatic drainage is responsible after an injury has happened to take away any extra fluid and helps the immune system to combat against any infection. Effleurage can also be responsible after surgery to help maintain the function of the lymphatic system. During surgery lymph nodes can be damaged or removed. Damaged or removed nodes can affect the function of the lymphatic system. If the lymphatic system does not function then excess fluid can build up causing lymphedema. Higher lymphedema can cause health scenarios. It is important to maintain the flow of lymph throughout the body so that fluid can be drained. When nodes are affected the body will rely on effleurage massage treatments to keep the lymph fluid moving. (Rex W Thomson et.al)

2. *Petrissage:*

Petrissage is responsible to free up movement of tissues and muscle by treating muscle knots or spasms. The petrissage massage technique uses a squeezing technique in which can alleviate muscle spasm. Petrissage can improve blood circulation, break up adhesions and relax the muscles. Massage therapists at Manchester Physio can use petrissage as an effective treatment for a range of conditions. Petrissage massage technique can include stretching, kneading and squeezing soft tissues and underlying muscles. Petrissage lift tissues away from structures to relieve tension and stretch and loosens muscles fibres. Petrissage is also increases the skin including vascular and lymphatic responses. The lymphatic response allows the drainage of toxins and eliminates waste products in the body. The petrissage technique in which is

implemented with pressure helps break down adhesions. Adhesions are areas of thick connective tissue which develop after a muscular injury or surgery. Adhesions can pull on other areas, compress nerves and restrict movement causing pain. Petrissage is an effective massage technique responsible to:

- Increase blood circulation
- Stretch and loosen muscle fibres
- Increase range of movement

Petrissage is responsible to improve blood circulation, increase recovery, stretch and loosen muscle fibres and increase range of movement. Petrissage is responsible to increase blood circulation. Increase blood circulation betterment temperature of the muscles allowing them to relax. The petrissage massage techniques pick up and squeeze

muscles stimulating capillarisation and vasodilation in the blood flow. Capillarisation and vasodilation is the increase of number and size of blood cells. Petrissage is also responsible to stretch and loosen muscle fibers. Petrissage uses kneading and squeezing tissue and muscles to relieve tension. Squeezing a muscle can decrease muscle spasms and relieve pain. Petrissage is responsible to increase range of movement. When muscle fibres are stretched, the fibres are able to move apart slightly releasing tightness and improving flexibility. Heat or cold compresses may help with inflammation as will non-steroidal anti-inflammatory drugs (such as Ibuprofen) and paracetamol will help to ease the pain. Deep tissue massage to the forearm is a very effective method of easing Lateral sided elbow painful stimulus and healing it much faster than rest alone. Deep tissue massage will enhance circulation and combining this with friction therapy to the tendons on the elbow joint, positive results are seen. Friction therapy breaks down the tension in the tendons, while deep tissue massage techniques will break up scar tissue, alleviate pain, release muscle spasms and improve flexibility. It is important to note that patience is essential when treating Lateral sided elbow painful stimulus to avoid reinjury, it is tempting to resume the normal activity as soon as symptoms are relieved. Damaged structures are still vulnerable and can easily tear once more before the healing process is fully complete. A few sessions of massage and exercising caution while the tissues are strengthened gradually will ensure that injuries will heal in the long term. A research was conducted by (Rosemary Yi , Walter W. Bratchenko, and Virak Tan) on effectiveness of massage therapy on tennis elbow. The research concluded that Deep friction massage is an effective treatment for lateral epicondylitis and can be responsible in affected person who have failed other nonoperative treatments, including cortisone injection. (Greg W et al)

3. *Friction Massage*

Deep friction massage is a specific connective tissue massage that was developed by Cyriax. The purpose of deep friction massage is to maintain the mobility within the soft tissue structures of ligament, tendon, and muscle and prevent adherent scars from forming. The massage is deep and must

be implemented transversely to the specific tissue involved unlike the superficial massage given in the longitudinal direction parallel to the specific tissue involved unlike the superficial massage given in the longitudinal direction parallel to the vessels which increases circulation and return of fluids. Before friction massage can be performed successfully, the correct structure must be found through proper evaluation procedures. The distinction must be made between contractile structures such as the muscle belly, musculotendinous junction, tendon, and tendon-periosteal junction and noncontractile structures such as the joint capsule, bursae, fascia, dura mater, and ligament. In addition to finding the right spot, the massage must also be given the most effective way by following these basic principles: The proper location must be found through proper evaluation procedures and palpation of the specific tendon, ligament, or muscle. Friction massage must be given across the affected fibers. The thicker and stronger a normal structure, the more important friction is given strictly across the grain. The therapist's fingers and patient's skin must move as one, otherwise moving subcutaneous fascia against muscle or ligament could lead to blister formation or subcutaneous bruising. The friction massage must have sufficient sweep and be deep enough. The patient must be in a comfortable position. The frequency and duration of treatment varies with the severity and type of the injury. In a recent injury, i.e. ligament sprain, start daily with gentle massage to keep mobility. It is important for the therapist to distinguish between pain on touch and pain. Pain on touch can be due to deep friction and can persist long after the painful stimulus disappears. Painful stimulus elicited by clinical assessment and reassessment. Deep friction massage may be given every other day or when the excess pain on touch has worn off. The duration of the treatment varies; for example, with an acute ligamentous injury, the gentle massage performed may last only 1-2 minutes. However, it may well take several minutes to be able to get your fingers on the structure depending on the severity of pain. With deep friction massage, the treatment will last 10-15 minutes.

Uses of Friction Massage

Painful stimulus relief

The analgesic effect of the massage can last up to 24 hours.

Stimulation of fiber orientation in regenerating connective tissue

Transverse friction when implemented in early repair cycle increases remodeling and hence reorientation of the collagen fibers in a longitudinal manner.

Prevention of adhesion formation

As friction massage causes a transverse movement of the collagen fibers it helps in preventing adhesion formation. In situations where adhesion are already formed a more intense friction can help to break them as well. In such cases friction is responsible to mobilize the scar tissue and break

the cross linkages between the connective tissues and the surrounding structures.

Traumatic hyperaemia

As it is a forceful and deep movement it effectively causes higher vascular circulation to the local area of application through vasodilatation. This assists in removal of chemical irritants and allows the transportation of endogenous opiates, thus causing painful stimulus relief. (Michael J. Callaghan)

4. Tapotement

Tapotement is a massage technique with a wide range of applications. At the end of a relaxing Swedish massage, it can be responsible to re-invigorate and ground the client before they leave. It is also the most frequently responsible technique to energise the muscles and the nervous system in pre-event Sports massage. In Chinese medicine and

other medical settings, it is often responsible to loosen up mucus in the lungs. The name comes from the French word tapoter, which means 'to tap' or 'to drum'. Fingers, cupped hands or loosely held fists or the edge of the hand are responsible to apply rhythmical percussion strokes. Tapotement is usually performed

alternating hands and maintaining a fast pace of between four to ten strikes per second. Sixty seconds tends to be the minimum threshold where tapotement's impacts

kick in. Therefore, the aspiring therapist must moderate their pace so that she can maintain the strokes for at least a minute. Over time, this can be higher to four to ten minutes spread over two, three sessions or delivered at once.

Key benefits

Tapotement is an effective and an established massage technique that can be easily overlooked if its benefits are not clearly understood.

Improve respiration – Tapotement in general and cupping in particular implemented to the middle back can help get rid of mucus in the lungs and help affected person with bronchitis or cystic fibrosis. It is important to obtain a clearance from a physician for any client with respiratory scenarios to ensure massage would be appropriate.

Hyperaemic effect – Tapotement warms up and softens tissues by increasing local blood circulation. The skin appears flushed and is warm to touch. This is often a desirable effect before an athletic endeavour and one obtained with pre-event sports massage.

Stimulation – This technique generates tiny muscle contractions by stimulating the nerve endings. This in turn, betterment muscle tone. One theory suggests that this happens because the pressure is registered by the mechanoreceptors and the Golgi tendon organ of the muscle. This is followed by a reflex-driven contraction of voluntary and involuntary muscles alike. This is another sought after effect in pre-event situations. (Walker H)

II. LITERATURE REVIEW

A research was conducted on Short-Term Effectiveness of Ultrasound Treatment in Affected person with Lateral Epicondylitis by Ceyda et al. The research concluded that US treatment for lateral epicondylitis improved painful stimulus and activities of daily living and resulted in high patient satisfaction. (Ceyda Akin, et. al)

In 2016 a research was conducted on Intense Therapeutic Ultrasound for Chronic Lateral Epicondylitis Painful stimulus Reduction by Michael H Slayton, John A Kearney, Richard C Amodei and Keegan B Compton. The research concluded that Successful reduction of overall painful stimulus scores at 12 and 26 weeks following the first treatment are 88% and 82% of affected person meeting the painful stimulus reduction criteria respectively. Also, at the same follow-up time points, affected person reported an average VAS Painful stimulus Score reduction of 59% (Week 12) and 57% (Week 26) from a pre-treatment average of 5.08 down to an average of 2.2 at week 26. Additionally, affected person reported an average painful stimulus reduction while performing everyday tasks of 58% and 61% respectively. Patient satisfaction remained over 80% for all follow-up dates. (Slayton MH, et. al)

A research was conducted Effectiveness of Therapeutic Ultrasound with and without Mulligan Mobilization in Lateral Epicondylitis by Muhammad Waqar Afzal, Ashfaq Ahmad, Muhammad Sharif Waqas, Umair Ahmad. The research concluded that therapeutic Ultrasound with Mulligan mobilization was more effective than Therapeutic Ultrasound to reduce painful stimulus and restoration of function. (Muhammad Waqar Afzal, et. al)

A Research was conducted in 2012 on Comparison of Effectiveness of Supervised Exercise Program and Cyriax Physiotherapy in Affected person with Tennis Elbow. The research concluded that Both the supervised exercise program and Cyriax physiotherapy were found to be significantly effective in reduction of painful stimulus and in the improvement of functional status. The

supervised exercise programme resulted in greater improvement in comparison to those who received Cyriax physiotherapy. The results of this clinical trial demonstrate that the supervised exercise program may be the first treatment choice for therapist in managing tennis elbow. (Viswas R, et. al)

Another research was conducted in 2003 on Manipulation of the Distal hand joint for Recovery of Lateral Epicondylitis. The research concluded that Manipulation of the distal hand joint appeared to be more effective than ultrasound, friction massage, and muscle stretching and resistance exercises for the recovery of lateral epicondylitis when there was a short-term follow-up. However, replication of our results is needed in a large-scale randomized clinical trial with a control group and a longer-term follow-up. (Struijs PA, et. al)

A research was conducted in 2019 on Effectiveness of therapeutic ultrasound and kinesiotope in treatment of Lateral sided elbow painful stimulus by Hamza Shaheen, Azzam Alarab, and Muntaser S Ahmad. The research

concluded that treatment was improvement between both groups. However, the kinesiotope is better than therapeutic ultrasound. (Hamza Shaheen, et. al)

A research was conducted in 2018 on Comparison of ultrasound and extracorporeal shock wave therapy in lateral epicondylitis by Bestami Yalvaç a, Nilgün Mesci b, Duygu Geler Külcü b, Ozan Volkan Yurdakul. The research concluded that : ESWT and therapeutic US are equally effective in treating LE. ESWT is an alternative therapeutic strategies and as effective as US. (Bestami Yalvaç, et. al)

A research was conducted in 2017 on Deep Friction Massage Versus Steroid Injection in the Treatment of Lateral Epicondylitis by Rosemary Y, Walter

W. Bratchenko, and Virak Tan. The research concluded that Deep friction massage is an effective treatment for lateral epicondylitis and can be responsible in affected person who have failed other nonoperative treatments, including cortisone injection. (Rosemary, et.

In 2012, a research was conducted on Comparison of Effectiveness of Supervised Exercise Program and Cyriax Physiotherapy in Affected person with Lateral sided elbow painful stimulus (Lateral Epicondylitis): A Randomized Clinical Trial by Rajadurai Viswas, Rejeeshkumar Ramachandran, and Payal Korde Anantkumar. The research concluded that the supervised exercise program may be the first treatment choice for therapist in managing tennis elbow. (Rajadurai Viswas, et. al)

In 2017, a research was conducted on Impacts of Progressive Resistance exercises in Chronic Lateral Epicondylitis by Dr. Sweta Upadhyay

, Dr. Yagna Shukla, Dr. Kaushik Kumar Patel. The research concluded that Progressive resistance exercises along with conventional physiotherapy is more effective in relieving pain, improving functional disability and improving painful stimulus free maximal isometric grip strength than conventional physical therapy alone in affected person having chronic lateral epicondylitis. (Dr. Sweta Upadhyay, et. al)

In 2016, a research was conducted on Impacts of Therapeutic Eccentric Exercise on Painful stimulus and Grip Strength in Persons with Lateral Epicondylitis by Nizar Abdul Majeedkutty, Nishad Abdul Latheef Majida. The research concluded that therapeutic eccentric exercise should be considered in the recovery of persons with lateral epicondylitis. (Nizar Abdul Majeedkutty, et al)

III. RESULTS

A total of 60 participants were added in the research among which 18 are male and 42 are female. As listed in table IV.1. The response rate was 100 percent. The age of the participants ranged from 23 years old to 42 years old as listed in table IV.2. Both male and female candidates were included according to non-probability sampling technique. A randomized controlled clinical trial was performed at different physiotherapy departments of Karachi. A

questionnaire for Lateral sided elbow painful stimulus assessment was responsible in the research to check out the initial response of their painful stimulus when they enrolled in the rehabilitation department on their first day.

A 3 weeks physiotherapy was given to the affected person which included 2 groups designated as group A and group B. Group A were treated only with the ultrasound therapy with the frequency of 1Mhz for 3 to 5 minutes daily but the group B candidates were treated by the combination of ultrasound therapy for 2 to 5 minutes with the combination of deep transverse friction massage for 5 to 7 minutes.

The data was collected in two sessions before treatment and after 3 weeks of treatment. The data was arranged into 4 sections. The first section included the demographic data, the second section included the painful stimulus rating scale in which the intensity of painful stimulus was measured through painful stimulus measuring scale, the third section included the functional activity limitation or disability while doing day to day work due to lateral sided elbow painful stimulus and the fourth section included the recreational activities and their limitation due to lateral sided elbow pain. All these readings were taken from the patient through face to face interview, through direct conversation and by filling paper based questionnaire

Before the treatment, 30 candidates were having mild painful stimulus in both groups, 27% of participants were having moderate painful stimulus and 3% candidates were having severe pain. After the treatment visual analog scale (VAS) was responsible to reassess the patient's painful stimulus and asked for the response rate of their painful stimulus which they were having 3 weeks back. The results were totally changed in Group A and Group B. Group A were having few complaints of painful stimulus after 3 weeks so they required more sessions but in group B only 3% of candidates were having painful stimulus while all other were having no painful stimulus and they were normal painful stimulus free activities of daily livings.

TABLE I

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	18	30.0	30.0	30.0
Female	42	70.0	70.0	100.0
Total	60	100.0	100.0	

It shows the Gender of participants included in the research. Among which 18 are male and 42 are females. Both genders were added in the research ranging from 23 to 42 years old.

TABLE II

Age	Frequency	Percent	Valid Percent	Cumulative Percent
23.00	1	1.7	1.7	1.7
24.00	2	3.3	3.3	5.0
26.00	1	1.7	1.7	6.7
27.00	1	1.7	1.7	8.3
29.00	1	1.7	1.7	10.0
30.00	1	1.7	1.7	11.7
31.00	1	1.7	1.7	13.3
33.00	8	13.3	13.3	26.7
34.00	16	26.7	26.7	53.3
35.00	1	1.7	1.7	55.0
37.00	7	11.7	11.7	66.7
38.00	4	6.7	6.7	73.3
39.00	5	8.3	8.3	81.7
40.00	2	3.3	3.3	85.0
41.00	5	8.3	8.3	93.3
42.00	4	6.7	6.7	100.0
Total	60	100.0	100.0	

It shows the Age of participants ranging from 23 years to 42 years old including both male and female participants. The overall response rate was 100 percent. The mean age was 33.0625. The frequency of young adults were more higher as compared to other age group (16%).

TABLE III

VAS SCALE READING AFTER 2 WEEKS OF TREATMENT WITH ONLY THERAPEUTIC ULTRASOUND (GROUP A).

Painful stimulus Scale	Frequency	Percent	Valid Percent	Cumulative Percent
1 to 4 mild pain	3	5.0	5.0	100.0
5 to 7 moderate pain	0	0	0	0
8 to 10 severe pain	0	0	0	0
Total	60	100.0	100.0	

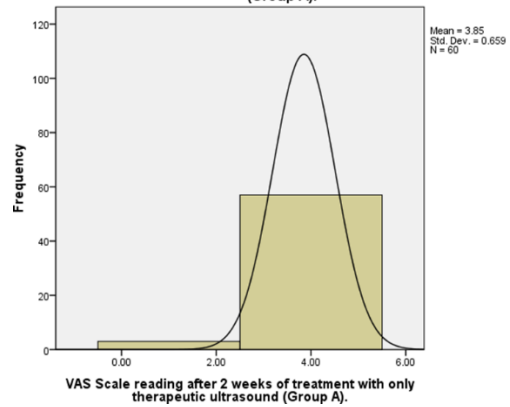
The final conclusion of this research shows that 5% of the candidates who were treated with only ultrasound therapy were having mild painful stimulus and they required more sessions.

TABLE IV
VAS SCALE READINGS AFTER 2 WEEKS OF TREATMENT WITH ULTRASOUND AND MASSAGE THERAPY (GROUP B).

Painful stimulusScale	Frequency	Percent	Valid Percent	Cumulative Percent
1 to 4 mild pain	0	0	0	0
5 to 7 moderate pain	0	0	0	0
8 to 10 severe pain	0	0	0	0
Total	60	100.0	100.0	

This table reveals that the participants who were treated with the ultrasound therapy in combination with massage therapy will not having any complaint of painful stimulus after full treatment session.

VAS Scale reading after 2 weeks of treatment with only therapeutic ultrasound (Group A).



T- Score Values

One-Sample Statistics

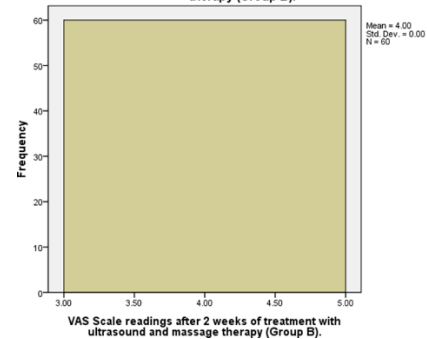
	N	Mean	Std. Deviation	S.E. Mean
VAS Scale readings after 2 WEEKS of treatment with ultrasound and massage therapy (Group B).	60	4.00	.00	.00
VAS Scale reading after 2 WEEKS of treatment with only therapeutic ultrasound (Group A).	60	3.85	.66	.09

One-Sample Test

Test Value = 1.000000

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
VAS Scale readings after 2 WEEKS of treatment with ultrasound and massage therapy (Group B).	+Infinity	59	.000	3.00	3.00	3.00
VAS Scale reading after 2 WEEKS of treatment with only therapeutic ultrasound (Group A).	33.48	59	.000	2.85	2.68	3.02

VAS Scale readings after 2 weeks of treatment with ultrasound and massage therapy (Group B).



CONCLUSION

The research concluded that most of the participants who were included in the research were having complaint of chronic elbow lateral sided painful stimulus which was treated with the therapeutic ultrasound and massage therapy. The effectiveness of only ultrasound therapy is least rather than its combination with massage therapy. So it was concluded that ultrasound therapy in combination with massage therapy is more effective in the recovery of lateral sided elbow pain.

A research was conducted Effectiveness of Therapeutic Ultrasound with and without Mulligan Mobilization in Lateral Epicondylitis by Muhammad Waqar Afzal, Ashfaq Ahmad, Muhammad Sharif Waqas, Umair Ahmad. The research concluded that therapeutic Ultrasound with Mulligan mobilization was more effective than Therapeutic Ultrasound to reduce painful stimulus and restoration of function.

Mostly responsible modality in Physiotherapy practice is "Therapeutic Ultrasound" to treat musculoskeletal and conditions related to sports injuries and overuse syndromes, for instance tendinopathy like rotator cuff, medial epicondylitis and other tendon injuries. Tendon healing is promoted by ultrasound because it increases collagen synthesis the tendon cells by stimulating cell migration and proliferation that may benefit tendon healing.

As the combination therapy is more effective with

therapeutic ultrasound and massage therapy. More studies are required to check out the combination of ultrasound therapy with anti-inflammatory agents and analgesics.

IV. DISCUSSION

Musculoskeletal painful stimulus is usually recognized as commonest complaints in the workplace and about billions of dollars are spending yearly on work-related musculoskeletal concerns around the globe. Musculoskeletal painful stimulus is an increasing scenario in our community with a great influence in the workplace. After common cold, musculoskeletal painful stimulus is the second most reason for short duration work-related ill health. Work-related musculoskeletal painful stimulus is very common; it is the main cause of illness in working community and usually betterment with age,

Allied health providers, includes physical therapists, technologists and nurses. engage in more physical work and are prone of developing work related musculoskeletal painful stimulus. (39)

Any ache or discomfort in the elbow joint structures such as tendons, bursa, bones or nerves causes elbow painful stimulus. Risk factors include working in the same

posture, working in the uncomfortable posture, twisting or bending, lifting, transfer the affected person, performing repetitive tasks, high number of affected person and lack of rest breaks, being a fresher, and having lesser years of experience. Elbow is a composite 'hinge' joint made of three discrete articulations; the ulno-humeral, radiohumeral, and radioulnar articulations because it can flex, extend, supinate and pronate the forearm. (40) Structures include biceps brachii muscle and tendon, brachialis muscle and tendon, brachial artery, radial nerve, and median nerve, trochlea-ulna and radio-capitellar joints, triceps brachii, anconeus muscles, ulnar nerve, tendon of common extensors, radial collateral ligament, radial nerve, tendon of common flexors, and medial collateral ligament. Site and

behavior of symptoms determine the location of the injury in one out of four anatomical compartments: posterior, anterior, lateral and medial compartments. Investigations of the elbow can be obtained by using plain radiography, magnetic resonance imaging or musculoskeletal therapeutic ultrasound. (41)

There is a vast literature available on musculoskeletal pain. In 2010, Alreza Rahimi et al. investigated work-related musculoskeletal disorders among medical lab scientists of Isfahan. The prevalence of work-related elbow complaint was 7.8%. In 2015, Islam et al. conducted a research to find musculoskeletal symptoms of painful stimulus among physiotherapist and occupational therapist in Bangladesh. Elbow painful stimulus was least reported by physiotherapists with 23%. In 2009, Hill et al. studied prevalence of musculoskeletal complaints with anthropometric measurements and work stress among female sonographers. The elbow complaints reported was 27%. In 2016, Vieira et al. studied systemic review to find frequency,

natures, and risks of work related musculoskeletal disorders in physiotherapists. They concluded the 15% prevalence of elbow pain. In 2017, (Anap DB, et al) studied work-related musculoskeletal injuries among nurses in India and revealed elbow painful stimulus was 1.88% [20]. In 2012, Emmanuel et al. conducted a research among health and allied providers of Nigeria. They found elbow painful stimulus prevalence of 11%. (42)

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