TREATMENT OF LATERAL EPICONDYLITIS WITH PLATELET RICH PLASMA OR CORTICOSTEROID INJECTION – A SHORT TERM COMPARATIVE STUDY

Dissertation submitted in partial fulfillment of the regulation for the award of M.S. Degree in Orthopaedic Surgery

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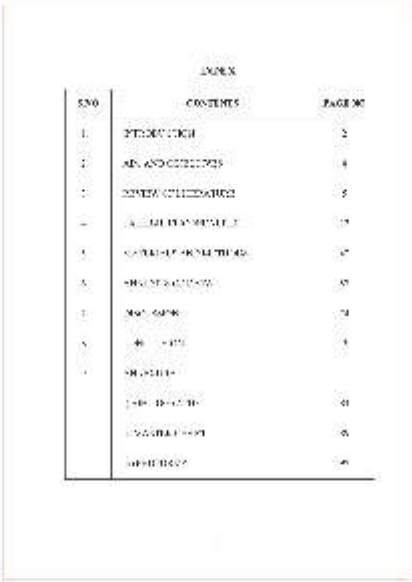
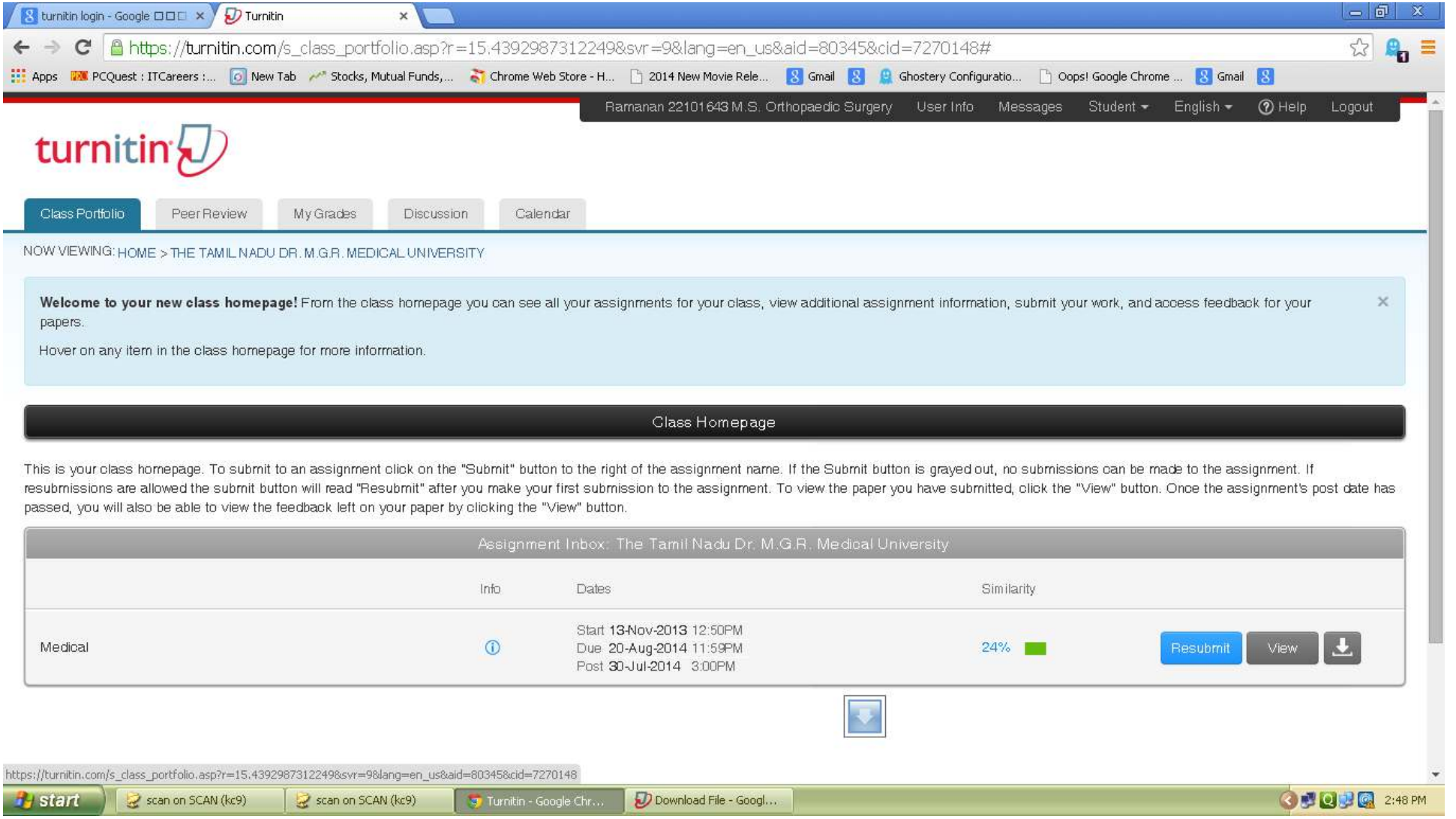


INDEX

S.NO	CONTENTS	PAGE NO
1.	INTRODUCTION	2
2.	AIM AND OBJECTIVES	4
3.	REVIEW OF LITERATURE	5
4.	ANATOMY OF ELBOW JOINT	17
5.	CLINICAL FEATURES AND DIAGNOSIS	47
6.	RADIOLOGICAL EXAMINATION	52
7.	MATERIALS AND METHODS	54
8.	OBSERVATION AND RESULTS	71
9.	DISCUSSION	75
	CONCLUSION	81
	SUMMARY	83
	BIBLIOGRAPHY	85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DECLARATION

I **Dr.N.S.RAMANAN** declare that the dissertation entitled **"TREATMENT OF LATERAL EPICONDYLITIS WITH PLATELET RICH PLASMA OR CORTICOSTEROID INJECTION – A SHORT TERM COMPARATIVE STUDY"** has been prepared by me, at Coimbatore Medical College Hospital under the guidance and supervision of **Prof. Dr.S.Elangovan, M.S.Ortho.,D.Ortho**., Coimbatore Medical College Hospital, Coimbatore, in partial fulfillment of Dr. M.G.R. Tamilnadu Medical University, regulations for the award of M.S.Degree in Orthopaedics.

This work has not formed the basis for the award of any other degree or diploma to me previously from any other university.

Place : Coimbatore

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Dr.N.S.Ramanan
Post graduate in Orthopaedics

ABSTRACT

BACKGROUND:

Lateral epicondylitis is the commonest chronic disabling painful condition of the elbow. Elbow pain and tenderness with resisted wrist extension are common manifestations in lateral epicondylitis. Recent studies have suggested platelet rich plasma (PRP) to be a safe and effective therapy for tennis elbow.

PURPOSE:

To compare the effectiveness of single dose injection of autologus platelet rich plasma with corticosteroid injection in treatment of lateral epicondylitis and to measure the outcome in a short term follow up study.

STUDY DESIGN:

Randomized controlled trial

METHODS:

A total of 40 patients with lateral epicondylitis were treated at Coimbatore Medical Hospital, April 2014 to June 2014 over 3 months. All patients had minimum three months of symptoms. Randomization and allocation to the trial group were carried out by a lot method. The platelet rich plasma (PRP) was prepared from venous whole blood. After receiving a local anesthetic, all patients had single dose injection of autologus platelet rich

plasma with corticosteroid injection in their extensor tendons at elbow. Patients received either an autologous platelet rich plasma injection or a corticosteroid injection through a peppering needling technique. The primary analysis included visual analog scale (VAS) pain scores and Disabilities of the Arm, Shoulder and Hand (DASH) outcome scores

RESULTS:

The PRP group was more often successfully treated than the corticosteroid group. When baseline VAS and DASH scores were compared with the scores at 12 weeks follow up, both groups showed improvement across time (intention-to-treat principle). However, the VAS and DASH scores of the corticosteroid group have not shown improvement, while those of the PRP group showed improvement at the end of 12 weeks (as treated principle). There were no complications related to the use of PRP.

CONCLUSION:

Treatment of patients with lateral epicondylitis with PRP reduces pain and increases function significantly, exceeding the effect of corticosteroid injection at the end of 12 weeks follow up. Future decisions for application of PRP for lateral epicondylitis should be confirmed by more number of patients and further follow up and should take into account possible costs and harms as well as benefits.

KEYWORDS:

lateral epicondylitis; platelet; platelet rich plasma (PRP);corticosteroid; tennis elbow.

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INDEX

INTRODUCTION

1. INTRODUCTION

Lateral epicondylitis is an inflammatory condition that occurs at the origin of the common extensor tendon of forearm over the lateral epicondyle. It is the commonest chronic disabling painful condition of the elbow. It causes symptoms in 1% to 3% of the general population. It is common in people whose occupation requires frequent rotary motion of the forearm like carpenter, gardener, computer workers and knitting workers. The age of onset of lateral epicondylitis is between 35 and 50 years with an equal male to female sex ratio. The dominant upper limb is most commonly affected [1,2,3].

The actual cause of lateral epicondylitis is not clearly understood. Now it is considered that degenerative process occurs at the common extensor tendon origin of the wrist and fingers due to overuse and abnormal microvascular responses [4,5,6]. Nirschl observed that the basic pathology was in the origin of the extensor carpi radialis brevis (ECRB) tendon. But sometimes the anteromedial edge of extensor digitorum communis (EDC) and the deep surface of extensor carpi radialis longus (ECRL) may also be involved.

Various modalities of treatment have been recommended for lateral epicondylitis like rest, activity modification, non steroidal anti inflammatory drugs, counterforce braces, massage, physiotherapy, laser treatment, extracorporeal shockwave treatment, acupuncture, ultrasound treatment and botulinum toxin type A injection. Previously Injection of corticosteroids was thought to be the gold standard treatment in lateral epicondyliis. The autologus blood injection and different types of open and arthroscopic operative treatment are also advised for lateral epicondylitis [7,8,9,10,11]. At present, platelet rich plasma (PRP) is considered as an ideal biological autologous blood derived component. It can be injected to different tissues where, platelet is activated and it releases high levels of transforming growth factors-beta (TGF-β), platelet derived growth factors (PDGF), fibroblast growth factors (FGF), vascular endothelial growth factors (VEGF) and cytokines at the injected site. These growth factors released from platelet rich plasma promote healing of wound, tendons and bone at cellular level [12]. In addition, platelet rich plasma has high antimicrobial potency and this property may prevent infections [13]. These details make us to conduct this study.

AIM AND OBJECTIVES

2. AIM AND OBJECTIVES

To compare the effectiveness of single dose injection of autologus platelet rich plasma with corticosteroid injection in treatment of lateral epicondylitis and to measure the outcomes in a short term follow up study.

REVIEW OF LITERATURE

3. REVIEW OF LITRATURE

- Smidt N, et al. Corticosteroid injection in tennis elbow: a systematic review. Pain. 2002. The author reported 13 randomized, controlled studies that documented the positive outcome of corticosteroid injection versus placebo injection, local anesthetic drug injection and dexamethasone or triamcinolone injection. The results showed that there was superior short term outcome in corticosteroid injection therapy for tennis elbow in view of pain reduction and grip strength, but there was no intermediate or long term beneficial effect in this study.

- Altay T, Günal I, Oztürk H. Local injection therapy for tennis elbow. Clinical Orthopaedics & Related Research. 2002. The author conducted a study using the peppering technique while comparing a combined steroid and anesthetic drug injection to only anesthetic drug. There was no significant difference among the groups at two, six and 12 months after injection in regard to provocative testing and Verhaar's Scoring System for the treatment of lateral epicondylitis. They attribute to the improved excellent outcome in 93% of patients with steroid and 95% without steroid regarding healing of the

degenerative myxoid tissue that may be stimulated by multiple bleeding channels created with peppering technique.

- Newcomer KL, et al. Corticosteroid injections in initial treatment of tennis elbow. Clinical Journal of Sports Medicine 2001. In a randomized trial, 19 patients treated with rehabilitative method and a placebo injection, and 20 patients treated with rehabilitative method and an injection of corticosteroid. No significant difference was observed among the two groups on pain questionnaires, visual analog score and grip strength at four, eight and twelfth weeks. But both groups showed similar improvements in the follow up, with over 80% of patients showed better results from baseline to 6 months.

- Bisset et al. from Australia and Smidt et al. from Netherland randomized subjects with lateral epicondylitis to physical therapy, corticosteroid therapy, or a wait and see strategy. In these trials, corticosteroid therapy showed superior results at six weeks. But in all groups there were increased recurrence rates with significantly poorer results at one year. In a randomized study, steroid injection is compared to naproxen and placebo tablets and steroid injection showed better improvement at four weeks, but more than 80% of

subjects were improved by one year in all groups without significant differences.

- Price et al. conducted a double blinded trial that compared various types of steroid injections to lignocaine injection alone. The author documented that the initial effect to steroid injection was superior to lignocaine injection alone, but at 24 weeks, the results were similar. The author also noted that there was worsening of pain in post injection period in about 50% of all steroid treated patients.

- In a study by Dr. Smidt and colleagues, maximum of three injections of steroid were superior at six weeks than either physiotherapy or a wait and see strategy. The outcome for the corticosteroid injections group had declined rapidly at 52 weeks.

- The combination of ultrasound therapy, deep friction massage, and exercise showed significant effect than steroid injections over the long term period. Dr. Smidt's study showed that the early response for corticosteroid injections was reduced after six weeks. The long term effect of corticosteroid injection was 69% compared to the results of 91% and 83% for the physiotherapy and wait and see approach groups respectively, at 52 weeks.

- A long term outcome study by Dr. Smidt on wait and see approach, rest, ergonomic advice and NSAIDS showed the similar results as physiotherapy management or corticosteroid injection. "In view of our results," concluded Dr. Smidt's group, "we have no reason to reach the conclusion that awaiting spontaneous recovery will not be the adequate management for the patients with a short period of symptoms."

- After review of four studies on acupuncture treatment, Cochrane reviewers published that there was inadequate documents to either support or refuse the acupuncture treatment. The British Journal of Sports Medicine reviews documented that there was "some evidence" for better outcome at two to eight weeks, but the studies were lacking in key methodology.

- Cochrane's review at 14 trials of the short term, topical non steroidal anti inflammatory drugs were superior to placebo therapy for up to 28 days. The role of oral non steroidal anti inflammatory drugs was not clear. There was a few evidence that steroid injections were better than oral non steroidal anti inflammatory drugs. "More randomized trials are needed," the author concluded.

- Runeson L, Haker E. conducted a double blind comparative study of Iontophoresis with cortisone in the treatment of lateral epicondylitis. Scand J Medical Science Sports 2002. The study with adequate methodological quality showed that there was no benefit of electromagnetic field management over placebo management. The advantages of utilising electrical current to deliver drug to soft tissue (iontophoresis) is not clear. There is no evidence that steroid iontophoresis is better than saline placebo, and non steroidal anti inflammatory drug iontophoresis. Runeson and Haker compared corticosteroid iontophoresis with a placebo (saline) iontophoresis group and evaluated the results of 12 and 24 weeks. Their reports did not favour the use of corticosteroid solution in iontophoresis.

- A 2002 Cochrane review of a trial comparing braces and other orthotics came to a conclusion that although the application of elbow braces and other orthotics abounds, the evidence to support them is weak. British Journal of Sports Medicine reviewed that the results of two studies on orthotics were conflicting and made it difficult to reach a definite conclusion.

- According to the British Journal of Sports Medicine authors, two randomized controlled studies on extracorporeal shock wave treatment

concluded that there is "no added benefit of extracorporeal shock wave treatment over that of placebo,"

- In a Cochrane review on surgery for lateral elbow pain 2002, the authors could not review a single controlled study of surgery for lateral epicondylitis. They reported, "Without a control group, it is not possible to confirm the effect of surgery in lateral epicondylitis treatment."

- In a double blind randomized controlled study, the positive outcomes of platelet rich plasma versus corticosteroid injections in tennis elbow, American Journal of Sports Medicine 2011, management of subjects with chronic lateral epicondylitis with platelet rich plasma showed significant improvement in pain and functional activities, more than the outcome of corticosteroid injections over two years follow up. The author documented that the effect of platelet rich plasma injection for tennis elbow should be confirmed by further follow up from this study and benefits and side effects should be documented.

- In a randomized controlled study, The Egyptian Rheumatologist journal April 2012, comparison of the effectiveness of injection of

autologous platelet rich plasma (PRP) and local steroid in reducing pain and improving function in a cohort of patients with tennis elbow (TE) and plantar fasciitis (PF) studied. Significant differences were observed between VAS and DASH scores at base line and 6 weeks after treatment in both groups. Local injection of autologous platelet rich plasma (PRP) proved to be a promising form of therapy for tennis elbow. It is safe and effective in relieving pain and improving function.

- Peerbooms et al 2010, in a randomized trial in tennis elbow treated with platelet rich plasma versus steroid injection: The study concluded that, according to the visual analog scale scores, 24 out of the 49 subjects (49%) in the steroid group and 37 out of the 51 subjects (73%) in the platelet rich plasma group were treated successfully, which was significantly different. According to the Disabilities of the Arm, Shoulder and Hand scores, 25 out of the 49 subjects (51%) in the steroid group and 37 out of the 51 subjects (73%) in the platelet rich plasma group were treated successfully, which was also significantly different. The steroid injection group showed better results in early period and then declined after 12 weeks, whereas the platelet rich plasma group progressively improved.

- In a 2003 trial by Edwards with platelet rich plasma therapy, 79% of patients in whom nonsurgical treatment like physiotherapy, splinting, anti inflammatory drugs and prior steroid injections that had failed were completely relieved of pain.

LATERAL EPICONDYLITIS

4. LATERAL EPICONDYLITIS

Tennis elbow was first described in the German literature by Runge in 1873 and by Major in 1883 [14]. It was named as lawn tennis arm by Morries. After that, this name has become common for all painful condition at lateral elbow. This condition is usually related to work and this condition mostly occurs in non athletes (95%) [15].

Anatomy of lateral epicondyle:

The elbow joint consists of three long bones, namely the humerus, ulna and radius. Movements of elbow joint occur at three individual articulations. The ulnahumoral articulation is a modified hinge joint that permits flexion and extension movement. The radiohumoral articulation is a combined hinge and pivot joint that allows flexion and extension movement and also rotary movement of radial head on the capitulum. During supination and pronation the proximal and distal radioulnar joints rotate. The main support for the elbow joint is given by various muscles, ligaments and tendons that present around the elbow. The common extensor group originate from the lateral epicondyle of the humerus and the common flexor group originate from the medial epicondyle of the

humerus. The brachioradialis and biceps also have attachment around this joint.

The lateral epicondyle is a pyramid shaped bony prominence. The extensor digiti minimi (EDM), supinator, extensor carpi radialis brevis (ECRB), extensor digitorum communis (EDC), and extensor carpi ulnaris (ECU) form the common extensor tendon. The tendon usually involved in lateral epicondylitis is called the extensor carpi radialis brevis [16-23].

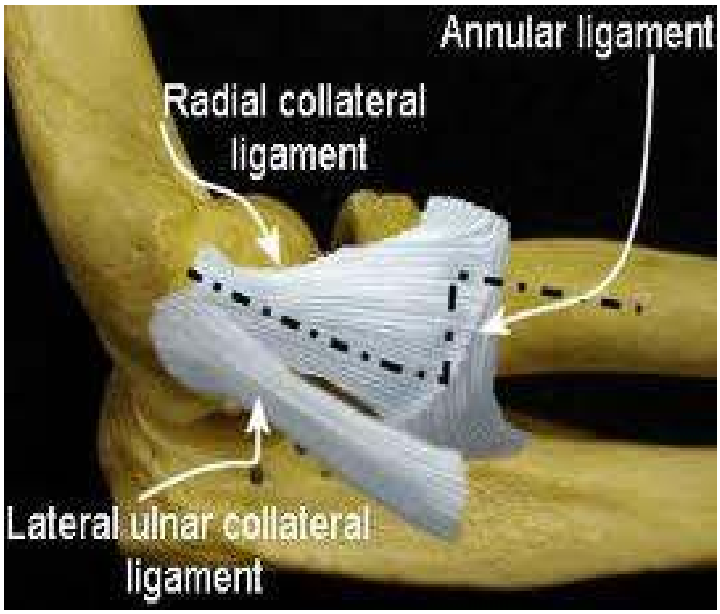
Lateral epicondyle muscles attachment

The anterior surface of lateral epicondyle and supracondylar ridge are nearby origin sites for the brachioradialis and the extensor carpi radialis longus (ECRL).

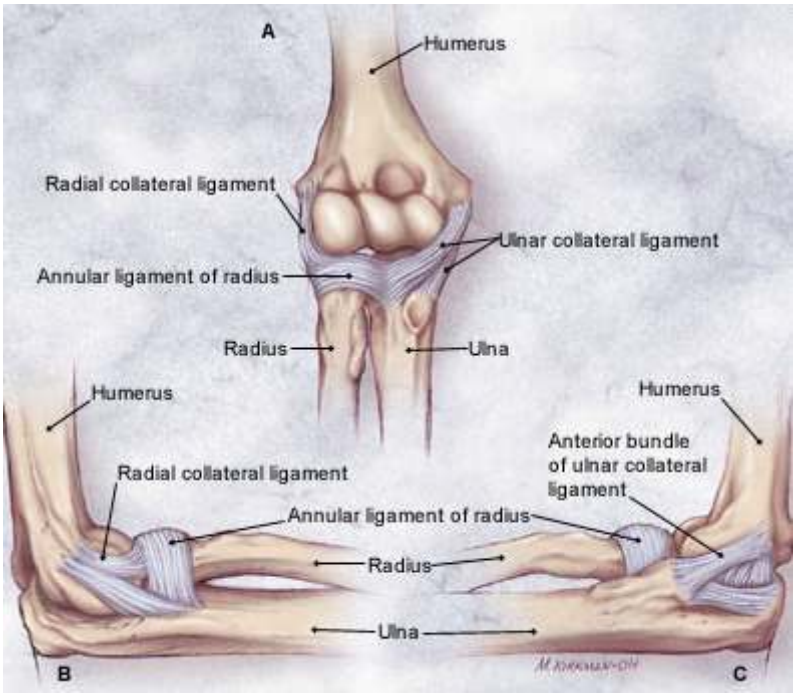
Another anatomical structure arising from the lateral epicondyle is the lateral collateral ligament complex, which is formed by the lateral unlar collateral ligament (LUCL), the radial collateral ligament (RCL) and the annular ligament. In severe lateral epicondylitis, there is thickening and tearing of the lateral ulnar collateral ligament and radial collateral ligament along with capsular injury. The extensor carpi radialis longus and extensor carpi radialis brevis have a unique relationship at the elbow level. The extensor carpi radialis longus overlies the proximal portion of extensor carpi radialis brevis such that the extensor carpi radialis longus should be raised anteriorly in order to view the superficial surface of the extensor carpi radialis brevis. A thin film of areolar connective tissue separates these two structures. The origin of extensor carpi radialis longus is entirely muscular along the lateral supracondylar ridge of the distal humerus. The muscle origin has triangular configuration with the apex pointing proximally. In contrast, the origin of extensor carpi radialis brevis is entirely tendinous. Although it blends with the origin of the extensor digitorum communis, when divided from distal to proximal

direction and using the tendon undersurface, it can be separated from the extensor digitorum communis back to humerus. The attachment of the extensor carpi radialis brevis tendon is located just beneath the distal most tip of the lateral supracondylar ridge. The footprint is diamond shaped measuring approximately 13 by seven millimeter. At the level of the radio capitellar joint, the extensor carpi radialis brevis is intimate with outer surface of the anterior capsule of the elbow joint, but it is quiet easily separable at this level.

The radial nerve descends between the brachialis and brachioradialis muscle in the distal arm. The radial nerve gives two branches, the terminal or deep branch and superficial branch at the level of the elbow joint. The terminal branch of the radial nerve is continued as the posterior interosseous nerve. The posterior interosseous nerve can be compressed at radial tunnel and this condition may cause refractory lateral epicondylitis.



Ligaments attachment on lateral aspect of elbow



Ligaments attachment in elbow

Incidence:

The incidence of tennis elbow is 1 to 3 % in the general population per annum. Tennis elbow typically affects the individuals ranging from ages of 35 to 50 years with a median of 41 years and it affects equally both males and females. The dominant arm is affected in more than half of the patients Populations at high risk are workers whose occupations require frequent rotary motion of the forearm like carpenter, gardener, computer workers, knitting workers, weight lifting workers and construction workers. 95% of lateral epicondylitis occurs in non tennis players and 10 to 50 % of regular tennis players are affected by lateral epicondylitis symptoms.

Etiology:

The literatures have suggested many theories [16,17,23] about the causes of lateral epicondylitis. The significant causes are

- Extra articular radiohumeral bursitis.
- Osteochondral radiocapitellar lesion.
- Posterior interosseous nerve entrapment syndrome or Radial tunnel syndrome.

- Cervical spondylosis and cervical disc disorders at C5-6 or C6-7 level with referred pain to elbow.
- Posttraumatic periosteitis.

Recently the studies shows the site of lesion starts at the superficial and deep fibers of the extensor carpi radialis brevis (ECRB) involving repetitive micro tears or partial tear of the tendon fibers, which develops fibrous scar tissue and magnifies the risk of further injury. Few trials showed that extensor digitorum cummunis or extensor carpi radialis longus or extensor carpi ulnaris were the site of initial injury. Repetitive overload, frequent extensor compartment muscles contraction and improper gripping techniques of rackets or equipments continue to tear the damaged tendon and aggravate the symptoms in lateral epicondylitis. Complete tendon ruptures are rare. Since there is no evidence of inflammatory activity in the pathological lesion and the word tendinosis is preferred over tendinitis or epicondylitis. Tennis elbow with radial tunnel syndrome occurs in 5% of patients.

Pathophysiology:

Lateral epicondylitis has three histological changes of tendinosis. They are fibroblastic change, vascular granulation and abnormal collagen

fibers formation. Mechanical overload or a trauma causes fibroblastic granulation, which is the early response in elbow tendinosis. Tensile, varus and valgus stress within the tendon activate the mechanoreceptors (integrins) on the surface of the resting tenocyte and affect these cells, when a cleavage plane is created between the tendon fascicles. The activated fibroblast starts to increase in numbers and form collagen locally [24,25].

A few fibroblasts return to their dedifferentiated mesenchymal state, whereas other fibroblasts develop chemotaxis and intracellular contractile elements. The dedifferentiated fibroblasts develop into chondroblasts, osteoblasts, and vascular endothelium [26,27]. This event indicates the intrinsic capacity of tendons to attempt to heal the tendinosis. It does not prevent the significant contribution of an extrinsic source of fibroblasts in tendinosis, but the lack of an effective vascular system that causes the failure of healing cycle in tendon repair [28].

Though the humoral process being guided by the immune-based inflammatory response, the mesenchymal cell-based process in tendinosis lacks the chemical mediators guidance that normally would maintain the matrix and the remodeling phase of tendon healing.

The abnormal vessels in tendinosis are formed by dedifferentiated fibroblasts that became mesenchymal cells and then endothelial cells. The presence of surrounding fibroblasts could be either an influx of extrinsic cells or a local micro environmental population of reprogrammed cells in an active fibroblast stage. The thick abnormal basement membrane and the constricted appearance of vessels are seen in tendinosis, and such abnormal vessels could be a significant source of extrinsic fibroblasts. The pluripotent tendon fibroblast utilise local chemical mediators, which it is capable of forming rudimentary blood vessels. Chemical mediators of cellular activity are known to be mitomorphogenic substances. Cytokines such as platelet derived growth factor-beta (PDGF-β) stimulates mitogenesis of fibroblasts, and chemotactic polypeptides like transforming growth factor-beta (TGF-β) promotes migration and maturation of fibroblasts and angiogenesis [29]. The presence of red blood cells inside the abnormal vessels seen in regions of tendinosis indicates that vascular granulation is occurred with an extrinsic healing process, provided that the immune system receives signals of a need for the healing activity.

Rehabilitative treatment exercises increase regional hyperemia. Controlled exercises create cyclical tensile forces that cause the

remodeling of collagen. Rehabilitation exercise that is programmed for patients who have tendinosis of the elbow must concentrate on the creation of low impact repetitive tensile forces across the collagen fiber matrix and fibroblast system that is the important factor for tendons as a structure. Fibroblasts in tendinosis have extreme metabolic activity. The capacity for the formation of collagen fiber is high and the collagen in tendinosis is primarily type I or type III. These collagens have the similar ultra structural configuration, with a sixty four nanometer periodicity and a quarter stagger arrangements of filaments. The extracellular alignment and cross linking of collagens are not formed in tendinosis [29]. The fibroblast driven process normally would be expected to cross link old and new collagen in order to contribute to the final stability of the matrix [29,30]. Tendinosis tissue contains hyperplasia of nonfunctional vascular elements, active distorted fibroblasts and lack of lymphocytes or neutophils that is clearly distinct from inflammatory tendinitis and normal tendon. The cause of pain in tendinosis correlates with the chemical natures of the matrix including the pH level, lactic acid level, and the level of prostaglandins.

Clinical Presentation:

Patient gives history as repetitive grasping or twisting movements produces symptoms, and the onset of lateral epicondylitis commonly associated without injuries. Usually the symptom starts gradually in lateral epicondylitis. Patients are presented with typical complaints of localised pain at the lateral epicondyle, sharp nature of pain that is aggravated with grasping and rotation movements, morning pain and wrist palmer flexion. Some patients may complain weakness or difficulty to grip objects.

The clinical examination of tennis elbow shows the signs of point tenderness at the region of common extensor tendon origin and maximum tenderness at five millimeter anterior and just distal to the origin of the extensor carpi radialis brevis and extensor digitorum communis muscles. Other findings are decreased grip strength, restricted supination, and dorsiflexion of the wrist. Sometimes weakness of forearm may occur.

Special Orthopedic Tests:

Lateral epicondylitis is diagnosed clinically in many cases. Lateral epicondylitis is diagnosed by evaluating

- History of gradual onset of pain over lateral epicondyle during work and sport activities.
- Pain is aggravated while supinating against resistance and wrist dorsiflexion with extended elbow.
- Point tenderness at the origin of common extensor tendon.
- Decreased grip strength.

Cozen's Test or Thomson's test:

In the sitting position, after stabilising the affected elbow, the examiner palpate along the lateral epicondyle. With closed fist, the patient is instructed to pronate the forearm and radially deviate and dorsiflex the wrist against the resistance given by examiner.

This test is positive when there is pain over the lateral epicondyle or muscle weakness or discomfort at elbow.

Mill's Test:

In the sitting position, the examiner palpates over the lateral epicondyle of the patient with one arm, while pronating the patient's forearm, palmar flexing the wrist, with the extended elbow with the other arm.

This test is considered to be positive when there is reproduction of pain over the region of the extensor tendon origin at the lateral epicondyle.

Maudsley's test: (Resisted third digit extension)

The examiner gives resistance while the patient extends the middle finger of the hand, stretching the extensor digitorum muscle and tendon with one arm, and palpating over the lateral epicondyle of the patient with the examiner's other arm.

This test is considered to be positive when there is pain over the lateral epicondyle of the humerus

Chair test:

This test is described by Gardner. The patient is asked to get up from a chair with both hands firmly gripping and pressing the arms of the chair. Severe pain felt at the lateral epicondyle of the affected side is considered as a positive test.

Coffee cup test:

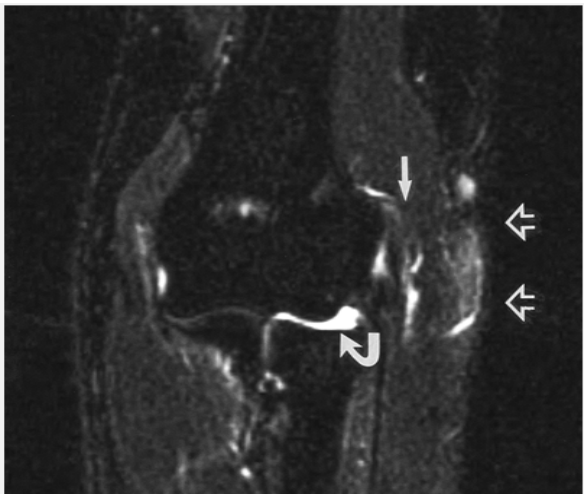
Coonard has described this test. The patient is instructed to pickup a coffee cup by his hand. The test is considered to be positive when there is pain over the lateral humeral epicondyle.

Diagnostic Tests:

Diagnosis of lateral epicondylitis is commonly based on physical examination and the diagnostic tests are not required usually. The diagnostic tests are recommended to diagnose the complicated cases to identify abnormalities and progression of lesion over the common extensor tendon [19,20,31]. Plain radiograph shows soft tissue calcification adjacent to the lateral epicondyle in approximately 25% of patients, especially if the patient previously had steroid injections.

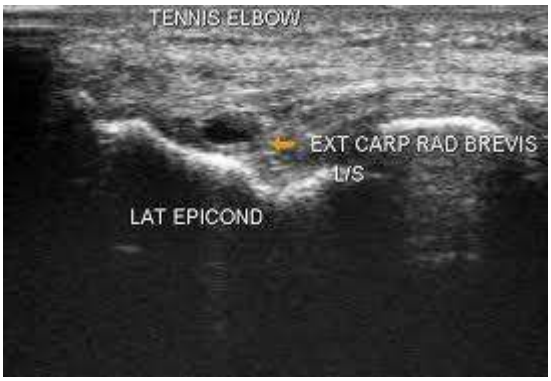
Magnetic Resonance Image is recommended to diagnose the intra articular pathology, radial collateral ligament integrity and tear at the origin of the extensor tendons. Some trials have been conducted to identify the sensitivity and specificity of the use of Magnetic Resonance Image (MRI) as a diagnostic tool. The sensitivity of Magnetic Resonance Image for diagnosis of lateral epicondylitis ranges from 90 to 100 % and specificity ranges from 83 to 100 %. Magnetic Resonance Image can

diagnose edema and thickening in 90 percent of pre treatment symptomatic tennis elbow patients. MRI shows tendon thickening with increased T1 and T2 signals.



MRI of lateral epicondylitis

Studies have shown that ultrasongraphy can diagnose symptomatic lateral epicondylitis with sensitivity of 72 to 88 percent and specificity of 36 to 48.5 percent respectively. Ultrasound is utilised to detect calcification, tendon thickening and bone irregularities.



Ultrasongraphy of lateral epicondylitis

Recently, infrared thermography appears to be a highly sensitive tool, with specificity of between 94 to 100 % for the assessment of tennis elbow.

MANAGEMENT:

Conservative Treatment:

Literatures have documented the success of treatment of tennis elbow with conservative or non operative methods. Recent studies show that the success rate might be higher as 89 to 95 percent. The goal of non operative management of tennis elbow is to decrease pain and inflammation. There are various management modalities for lateral epicondylitis, but only a very few studies have been documented on which modality has the best outcomes and the long term benefits. The non operative treatments for lateral epicondylitis are listed below:

Wait and watch:

Cessation of any painful or aggravating activity, the alteration of technique or equipment or modification of workplace reduces pain and relieves symptoms of lateral epicondylitis. Cessation of activities is advised in the initial period of management for 14 to 21 days. But immobilization should not be recommended since it causes disuse

atrophy of upper limb. For the first two to three weeks RICE (rest, ice, compression and elevation) therapy is recommended. The next stage of management is continued from six months to one year, according to the severity of tennis elbow. At this stage of management, the strength and range of movements of elbow are improved and lifestyle modification is advised.

NSAIDS:

Non steroidal anti inflammatory medications are useful for acute pain relief in lateral epicondylitis. They act by reducing the inflammation associated with the acute painful condition. But in chronic condition, where the main pathology is degeneration of extensor tendons rather than inflammation, its effectiveness seems more of placebo effect rather than by its real pharmacological action. Long term intake of analgesics is not advisable as it causes gastrointestinal bleeding, renal and liver damage.

Injection Treatment:

Various injection therapies have been studied in the management of tennis elbow. Corticosteroid, botulinum toxin type A, autologus whole blood and platelet rich plasma injections are four therapies being used in the treatment of lateral epicondylitis. Studies on corticosteroid injections

have showed that pain relief starts from five days after initial injection. From three months to 12 months, results of corticosteroid injections document worsening or the similar outcomes as other lines of management. Botulinum toxin type A injection has been studied with conflicting results of true clinical benefit.

Corticosteroid injection:

Mechanism of action: corticosteroids belong to steroid group. It acts by reducing inflammatory reaction thereby decreasing pain.

Role in lateral epicondylitis: According to recent microscopic studies, there are no inflammatory cells in tissues obtained from cases of lateral epicondylitis. Therefore the anti inflammatory role of corticosteroids may not play a part here except in acute conditions. But the beneficial effects of corticosteroids in this condition seem to exist for long time. Probably, there must be some other action of steroids in this condition that still it remains uncertain.

Commonly used preparations:

1. Betamethosone

2. Dexamethosone

3. Methyl prednisolone

4. Triamcinolone acetonide

Mode of injection: Injection of steroids is made after palpating the area of maximum tenderness. It is usually injected in combination with a local anesthetic agent to tolerate the immediate post injection pain.

Targeted injection may be much beneficial in which the affected tissue is localized with ultrasound and then injection given.

Advantages:

1. Very effective in acute cases
2. Even single injection may bring about resolution of the condition
3. Cost effective
4. Do not need expensive equipments.

Disadvantages:

1. Invasive procedure
2. Cannot be done in patients with uncontrolled diabetes and hypertension.

3. Side effects are common which includes tendon rupture, fat pad necrosis, etc.

Botulinum toxin injection:

Botulinum toxin type A injection has been used for lateral epicondylitis. It can be injected at the site of maximum tenderness. It has increased incidence of side effects.

Mechanism of action:

It relieves pain by destroying the pain sensitive nerve fibres. It causes muscle relaxation and decreases muscle volume. It also decreases central sensitization, sympathetic activity and reduces the accumulation of pain mediators like substance-p and glutamate.

Side effects:

1. digit paresis
2. weakness of finger extension

Autologous blood injection:

This is injection over the affected tissues with the patient's own blood in small quantities. Autologous blood injection was initially done

by Edwards and Calandruccio in 2004 for tennis elbow with good outcome. It was gradually extended for other tendinopathies and chronic inflammatory conditions.

Mechanism of action:

Autologous blood when injected into an area of inflammation or degeneration tends to provide cellular or humoral mediators and thereby initiate inflammatory reaction and brings about healing of the conditions.

Advantages:

1. No chance of reactions as the patient's own blood is injected
2. Cost effective
3. No need for expensive equipment.

Disadvantages:

1. Effect may be short lived
2. May need multiple injections
3. Patient may not accept it.

Platelet rich plasma injection:

Platelet rich plasma (PRP) is blood derived plasma that has high concentration of platelets. As an enriched source of autologous platelets, platelet rich plasma possesses several different growth factors and cytokines and releases them through degranulation and stimulate healing of bone and soft tissue.

Mechanism of action:

Various growth factors and cytokines in the platelet have healing potentials and these factors helps to heal the inflammation and degeneration at the tendons.

Growth Factors in Platelet rich Plasma

Growth Factors	Function
Platelet-derived growth factor	Increases cell replication, angiogenesis, mitogenesis for fibroblasts
Vascular endothelial growth factor	Angiogenesis
Transforming growth factor-β	Main factor in balancing between tissue fibrosis and myocyte regeneration
Fibroblast growth factor	Increases proliferation of myoblasts, angiogenesis
Epidermal growth factor	Increases proliferation of mesenchymal and epithelial cells, potentiation of other growth factors
Hepatocyte growth factor	Angiogenesis, mitogenesis for endothelial cells, antifibrosis
Insulin-like growth factor-1	Increases proliferation of myoblasts and fibroblasts, mediates growth and repair of skeletal muscle

Uses:

1. Lateral epicondylitis
2. Plantar fascitis
3. Rotator cuff tear
4. Degenerative osteoarthrosis
5. Achilles tendon repair
6. Anterior cruciate ligament reconstruction
7. Non union management
8. Maxillofacial and plastic surgical procedures

Advantages:

1. No reaction to injected substances.
2. More biological form of injection.

Disadvantages:

1. Needs centrifugation apparatus.
2. Requires more amount of blood to be drawn.

Physiotherapy:

Physiotherapy is a commonly prescribed treatment for tennis elbow. A standard treatment protocol for physical rehabilitative treatment of tennis elbow has not been formed. The aim of physiotherapy concentrates on decreasing elbow pain, improving range of motion, grip strength, and stretching of the forearm muscles. Studies have documented various protocols. Mills and Wadsworth recommended manipulation under anesthesia, particularly in patients with concomitant flexion contractures. The manipulation involves sudden, forcible, full extension of the elbow with the wrist and fingers flexed and the forearm pronated to bring the extensor carpi radialis brevis and other extensors under tension. The results are excellent if there is audible, palpable snap during manipulation. Cyraix's protocol uses Mill's manipulation technique combined with deep transverse friction (DTF). Researchers have concluded that eccentric strengthening is effective than concentric strengthening in tennis elbow. Other methods of physiotherapy for management of tennis elbow are ultrasonic therapy and electrotherapies (inotophoresis and electromagnetic therapy).

Electrical stimulation and Iontophoresis:

This works on the principle of ultrasound waves. High voltage electrical stimulation diminishes chemical inflammation and reduces pain and improves tendon healing. A combination of applying a NSAID or steroid cream over the affected area and delivering electrical stimulation is known as iontophoresis. Only limited reports are only available to support its use.

Orthoses:

The recommended types of orthoses are proximal forearm bands and cock up wrist splints. The orthoses are used to counteract muscle forces of both contraction and tension. Aims of these orthoses are to decrease the intrinsic muscular force and tension at the forearm extensor tendons in elbow and to give time to heal. The orthoses must be non elastic.

Laser therapy and Acupuncture:

Laser waves are delivered to the tendons through any of the three modes given below:

1. LLLT-Low level laser therapy

2. LED-Light emitting diodes

3. SLD-Super luminous diodes

Short term follow up trials on laser therapy have shown inconsistent results and long term follow up trails have shown that laser therapy has no benefit for lateral epicondylitis management. Researches on acupuncture therapy have found positive short term effects and these benefits last only for few weeks.

Surgical Treatment:

Surgical treatment for tennis elbow is done rarely. It is the last line of management when conservative treatment fails [17,19,22,23,32]. If symptoms persist after eight to 12 months, surgical management is recommended. The surgical techniques used by orthopedic surgeons are open, percutaneous and arthroscopic techniques.

Surgical treatment falls into three basic categories:

1. Release of common extensor origin
2. Resection of degenerate or ruptured tendon with repair of defect
3. Thermal disruption of degenerated tissue within the tendon

Elbow Open Surgery:

Open debridement is performed to remove degenerative part of the extensor carpi radialis brevis tendon by making a surgical incision at the lateral epicondyle, and after excising the damaged tissues, the remaining tendon is reattached. This procedure gives success rate of 80 to 85 %. In some cases, an operative procedure is performed to release the common extensor tendon. Approximately 80% of patients report good results following an open procedure and over 90% success is reported for a percuteneous release. Thermal disruption of the degenerative tendon has been reported to be beneficial. The procedure should not be performed under local anaesthesia, as patients can experience considerable pain during the application of probe's impulse within the tendon.

Post operative management differs little among surgical techniques. Sling, splint or soft bandages are applied for the initial two weeks after

surgery. Aims of rehabilitation after the surgical procedure are to improve range of movement and to increase the strength of the soft tissues around the elbow in four to six weeks.

Arthroscopic lateral release:

With the advances that have been made with arthroscopy, indications have come to include arthroscopic lateral release and debridement. Advantages of this technique include the ability to visualize the articular surfaces for other occult pathology.

Complications of surgical treatment:

- Infection
- Neurovascular injury
- Possible prolonged rehabilitation
- Loss of strength
- Loss of range of motion
- The need for further surgery
- Synovial fistula (2%)
-

MATERIALS AND METHODS

5. MATERIALS AND METHODS

This is a prospective study of about 40 patients includes 26 females and 14 males who were diagnosed as lateral epicondylitis for the period from March 2014 to June 2014 at Coimbatore Medical College Hospital, Coimbatore.

The present study attempts to compare the effectiveness of platelet rich plasma injection verses corticosteriod injection as a treatment for lateral epicondylitis.

DRUGS USED:

- 3-4ml autologus platelet rich plasma.
- Triamcinolone acetonide (40mg/ml). 1ml (40mg) of Triamcinolone acetonide is taken with 2ml of Lignocaine (1 %) 10mg/ml.

PLATELET RICH PLASMA PREPARATION:

The platelet rich plasma preparation has been done using desktop-size centrifuge apparatus. 27 ml of whole blood is withdrawn from the patient with 18 gauge needle. Blood is equally divided into three parts (nine ml each) which is then added to three pre filled test tubes, each

containing one ml of 3.8% of sodium citrate solution. The blood is centrifuged at 1500 rpm for 15 minutes. By the end of the procedure the whole blood is separated into three layers such as platelet poor plasma (PPP), platelet rich plasma (PRP) and red blood cells (RBC). Platelet rich plasma is withdrawn from the middle layer.

Eligibility for injection therapy:

Age eligibility for study: 18 years and above

Genders: Both male and female

Healthy volunteers: Not accepted

Criteria for injection therapy:

Inclusion criteria are

- Duration of pain over lateral epicondyle more than three months
- Lateral elbow pain that is maximum at the lateral epicondyle and the pain is aggravated with pressure on the lateral epicondyle and resisted wrist dorsiflexion.

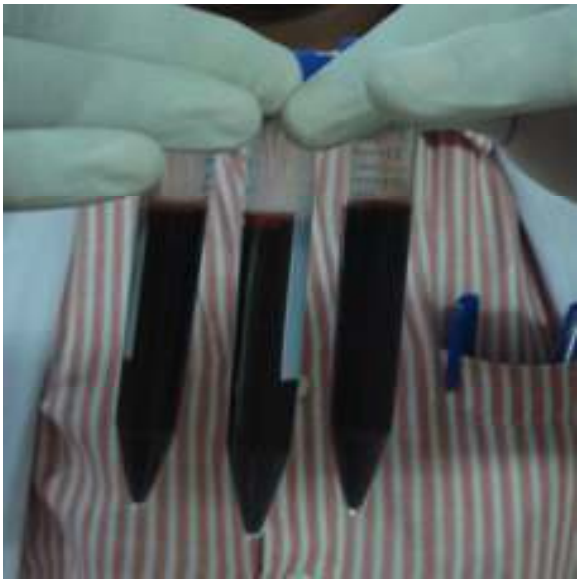
Exclusion criteria are

- Chronic inflammatory disease like Rheumatoid arthritis.
- Fibromyalgia.
- Pain in hand or shoulder or neck in the same upper limb.
- Uncontrolled diabetes and systemic hypertension.
- On anticoagulation therapy.
- Ulcers over the elbow.
- Steroid injection within the last three months.
- Tumors in upper limb.

PLATELET RICH PLASMA INJECTION

TRIAMCINOLONE ACETONIDE INJECTION

BLOOD IN CENTRIFUGE TUBES



CENTRIFUGE APPARATUS

PLATELET RICH PLASMA INJECTION

TRIAMCINOLOME ACETONIDE INJECTION

OUTCOME MEASURES:

The Patient's clinical outcome is measured by using two self report quitionarries at each review period. 1. The Disabilities of the Arm, Shoulder and Hand (DASH) outcome score. 2. Visual analog scale (VAS) score to assess pain and functional outcome in lateral epicondylitis.

Disabilities of the Arm, Shoulder and Hand Score (DASH):

The Disabilities of the Arm, Shoulder and Hand score has 30 items with self report questionnaires structured to assess physical activity and symptoms in persons who have musculoskeletal problems of the upper limbs. These items indicates the magnitude of difficulty in doing different functional activities since this score contains the questionnaires related to arm, shoulder, or hand problems of the affected upper limb (21 items), the severity of each of the symptoms of pain, activity related pain, weakness, tingling, and stiffness (five items), and the problem's effect on social activities, daily work, and sleep and its psychological effect (four items).

The Disabilities of the Arm, Shoulder and Hand also assess two optional four items scales assessing the capability to do sports activity and to play a musical instrument (sport/music scale), and the capability to

work (work scale). In this study, the two optional scales are not included in the analysis. The scores for 30 items are taken to calculate a total score ranging from 0 (no disability) to 100 (severest disability).

Disability or symptom score:

Minimum 27 of the 30 items should be completed for a score to be calculated. The calculated values for all completed items are added and averaged, to make a score out of five.

This value is then converted to a score out of 100 by subtracting one and multiplying by 25. This conversion is carried out to make the score easier to compare with VAS on a 0 to100 scale. A high score indicates severe disability.

DASH disability or symptom score = [(sum of n responses) - 1] /n x 25 where n is equal to the number of completed responses.

Visual Analogue Scale (VAS):

A Visual Analogue Scale (VAS) is a measuring scale that tries to measure a characteristic or attitude of pain that is believed to range across a continuous spectrum of values and cannot be measured directly. Simply, it is a measuring scale to quantify the amount of various pain

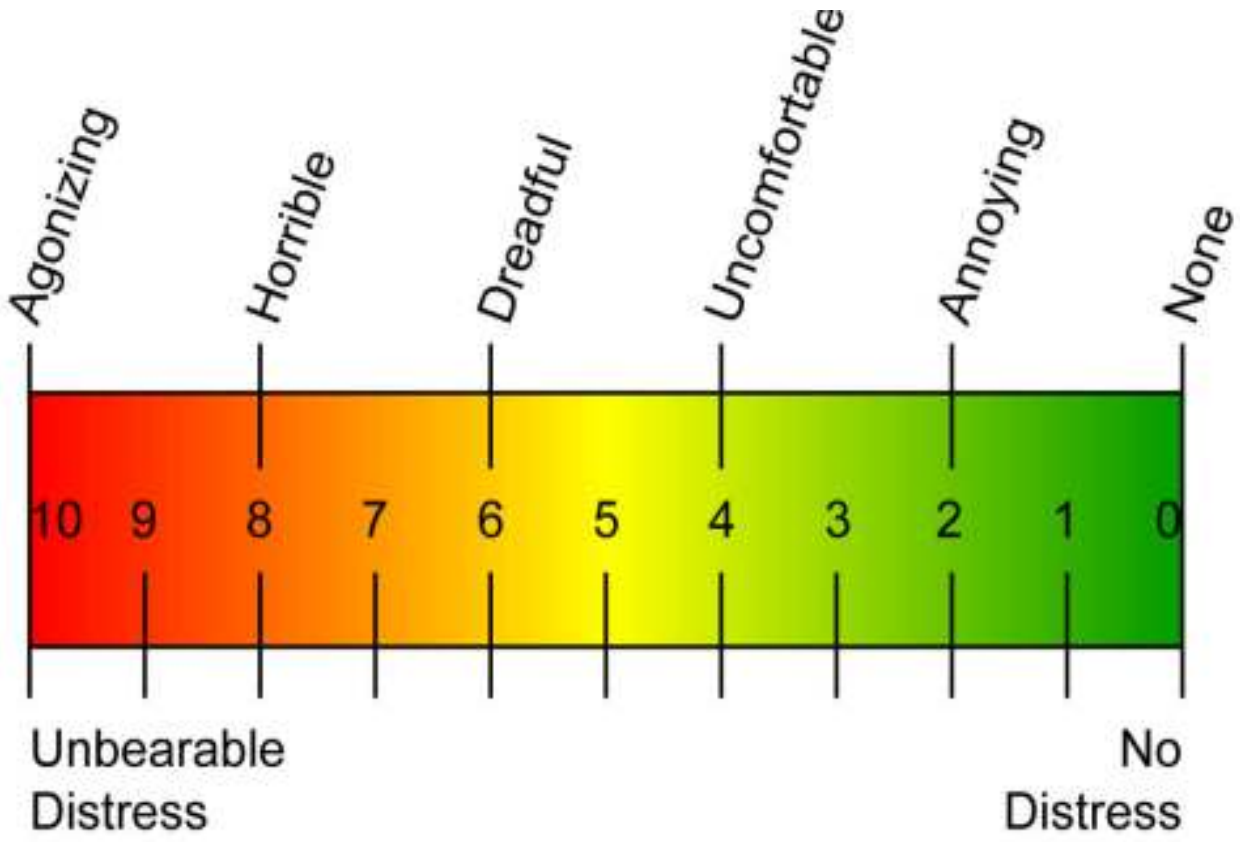
notified by the patients. Scores range from 0 (no pain) to 100 (severest pain). The amount of pain that a patient indicates can range across a continuous spectrum from none to severest amount of pain. From the patient's perspective, this spectrum appears as continuous and their pain does not take discrete value as a classification of none, mild, moderate and severe. Visual Analogue Scale is used to make out this idea of an underlying continuous spectrum of pain in patients.

Operationally a Visual Analogue Scale is often a horizontal line, 100 mm in length, written with word description at each end. Patients make a mark on the line, the point that they feel indicates their perception of their current pain value. The Visual Analogue Scale score is recorded by measuring in millimeters from the right side end of the line to the point that the patient marks.

Outcome is measured by the changes in pain measured by Visual Analogue Scale and Disabilities of the Arm, Shoulder and Hand Score with the time period of pre injection, four weeks, eight weeks and 12 weeks.

The adverse events are recorded throughout the entire 12 weeks.

VISUAL ANALOGUE SCALE



THE DISABILITIES OF THE ARM, SHOULDER AND HAND

SCORE

1	Open a tight jar or new jar	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
2	Write	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
3	Turn a key	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
4	Prepare a meal	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
5	Push open a heavy door	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
6	Place an object on a shelf above the level of head	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
7	Do heavy household jobs	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
8	Garden or yard work	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
9	Make a bed	no difficulty	mildly difficult	moderately difficult	severely difficult	unable

10	Carry a shopping bag or briefcase	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
11	Carry a heavy object	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
12	Change a lightbulb overhead	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
13	Wash or blow dry your hair	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
14	Wash your back	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
15	Put on a pullover sweater	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
16	Use a knife to cut food	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
17	Recreational activities which require little effort (eg. knitting, card playing)	no difficulty	mildly difficult	moderately difficult	severely difficult	unable

18	Recreational activities in which you take some forces or impacts through your arm, shoulder or hand (eg. hammering, tennis etc)	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
19	Recreational activities in which you move your arm freely (eg. playing badminton)	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
20	Manage transposition needs (getting one place to another place)	no difficulty	mildly difficult	moderately difficult	severely difficult	unable
21	Sexual activities	no difficulty	mildly difficult	moderately difficult	severely difficult	unable

22	During the past week, to what extent your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	not at all	slightly	moderately	quit a bit	extremely
23	During past week were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?	not limited	slightly limited	moderately limited	very limited	unable
24	Arm, shoulder or hand pain	none	mild	moderate	severe	extreme

25	Arm, shoulder or hand pain when you performed any specific activity?	none	mild	moderate	severe	extreme
26	Tingling(pins and needles) in your arm, shoulder or hand	none	mild	moderate	severe	extreme
27	Weakness in your arm, shoulder or hand	none	mild	moderate	severe	extreme
28	Stiffness in arm, shoulder or hand	none	mild	moderate	severe	extreme
29	During the past week how much difficulty have you had sleeping because of pain	no difficulty	mildly difficult	moderately difficult	severely difficult	

	in your arm, shoulder or hand?					so much I can’t sleep
30	I feel less capable , less confident or less useful because of my arm, shoulder or hand	strongly disagree	disagree	neither agree or disagree	agree	strongly agree

ANALYSIS OF DATA

6. ANALYSIS OF DATA

PATIENTS:

Between the above mentioned period, 40 cases of lateral epicondylitis who met the above criteria were included for the study.

There were 26 females with 18 right side lateral epicondylitis and 8 left side lateral epicondylitis and 14 males with 11 right side lateral epicondylitis and 3 left side lateral epicondylitis. The mean age was 44.3 years and the range was 30 to 67 years. The mean duration of symptom was 4.8 months.

INJECTION PROTOCOL:

- Patients who met the inclusion criteria were randomly allocated into two groups by a lot method.
- Consent was obtained from the patients after explaining the study, benefits and complications of the procedure and regarding the need for regular follow up.
- Fresh blood was drawn from the platelet rich plasma (PRP) group patients (about 27 ml) and anticoagulant (three ml) is added. Then blood was centrifuged at 1500 rpm for

approximately 15 minutes and 3 – 4 ml of platelet rich plasma was prepared.

- pre injection and post injection score were calculated.

INJECTION TECHNIQUE:

- The procedure was done on an outpatient basis. Once the exact location was determined by assessing the maximum tenderness point clinically, the patient was injected with a local anesthetic drug (Lignocaine) under sterile technique. Platelet rich plasma group was injected with 3-4 ml platelet rich plasma, using a "peppering" technique in a clock wise manner to better cover the affected area of lateral epicondyle.

- Triamcinolone acetonide (40mg/ml). One ml (40mg) of Triamcinolone acetonide is taken with two ml of Lignocaine (1%, 10mg/ml). It was injected in the maximum tenderness point deep into the tendon.

The patient was then observed for 15 to 20 minutes and then discharged. After the injection, patient was allowed to follow our post injection protocol.

POST INJECTION PROTOCOL:

Since the patients may experience discomfort at the site of the injection for up to three days, they are advised to have ice fermentation over the injection site, limb elevation, activity modification and oral acetaminophen for pain relief.

FOLLOW UP:

- All the patients were followed up at fourth, eighth and twelfth week of post injection.
- One patient did not return for final follow up in platelet rich plasma (PRP) group.
- At follow up, pain was assessed according to Visual Analogue Scale (VAS) and Disabilities of the Arm, Shoulder and Hand (DASH) score and compared with pre injection score levels.
- Final outcome was measured based on the pain reduction from the pre injection level.
- Patients were observed for post injection complications.

COMPLICATIONS:

1. In steroid group one patient had paraesthesia at the injection site of elbow at fourth week post injection but it disappeared at twelfth week with observation.

2. No case of infection, cellulitis was observed.

3. No neurovascular injury noted

SEX DISTRIBUTION:

Male: 14

Female: 26

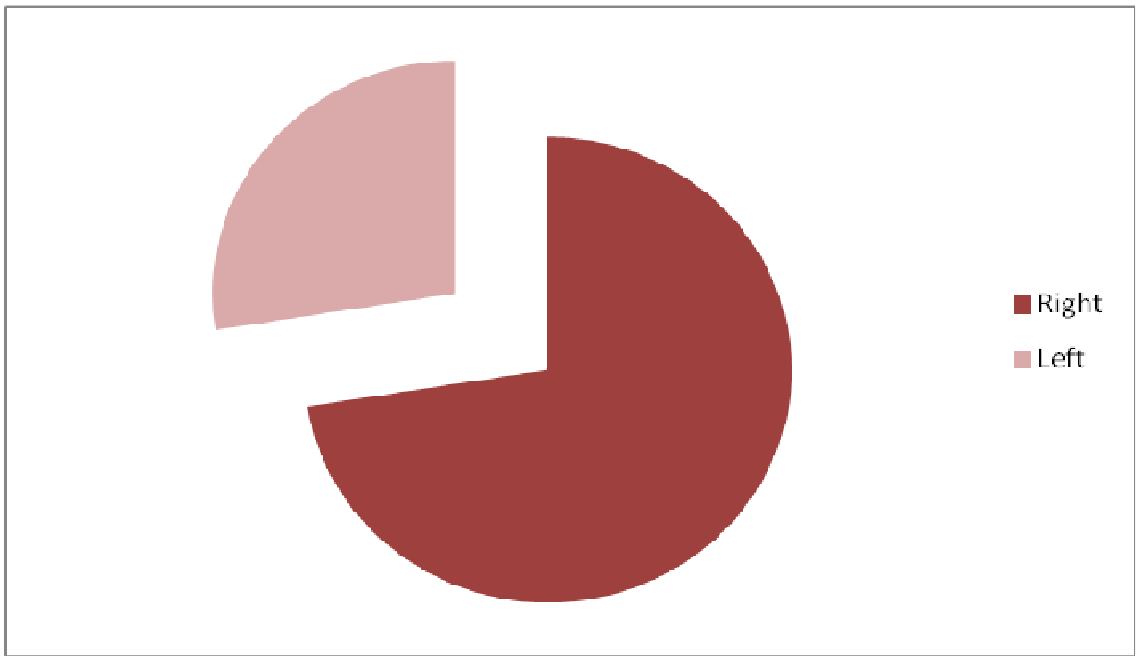
SEX DISTRIBUTION

SIDE DISTRIBUTION:

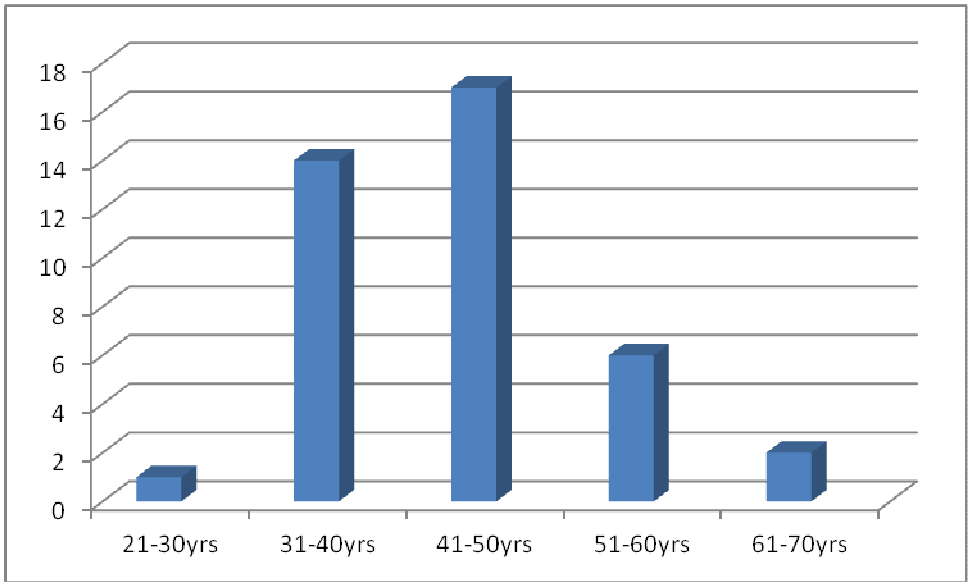
Right: 29

Left: 11

SIDE DISTRIBUTION



AGE DISTRIBUTION IN YEARS



AGE IN YEARS	NUMBER OF PATIENTS
21-30	1
31-40	14
41-50	17
51-60	6
61-70	2

PRE INJECTION SCORE:

The average pre injection scores were:

1. Platelet rich plasma injection group:

VAS: 66.6

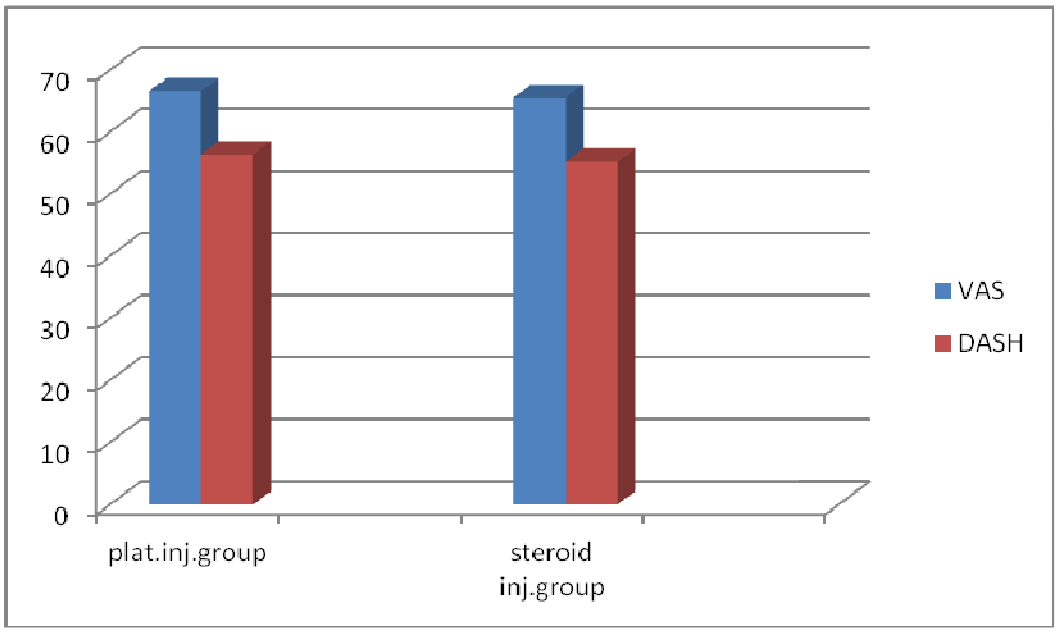
DASH: 56.4

2. Steroid injection group:

VAS: 65.5

DASH: 55.2

The average pre injection scores



POST INJECTION SCORE:

The average post injection scores at 4 weeks were:

1. Platelet rich plasma injection group:

VAS: 54.5

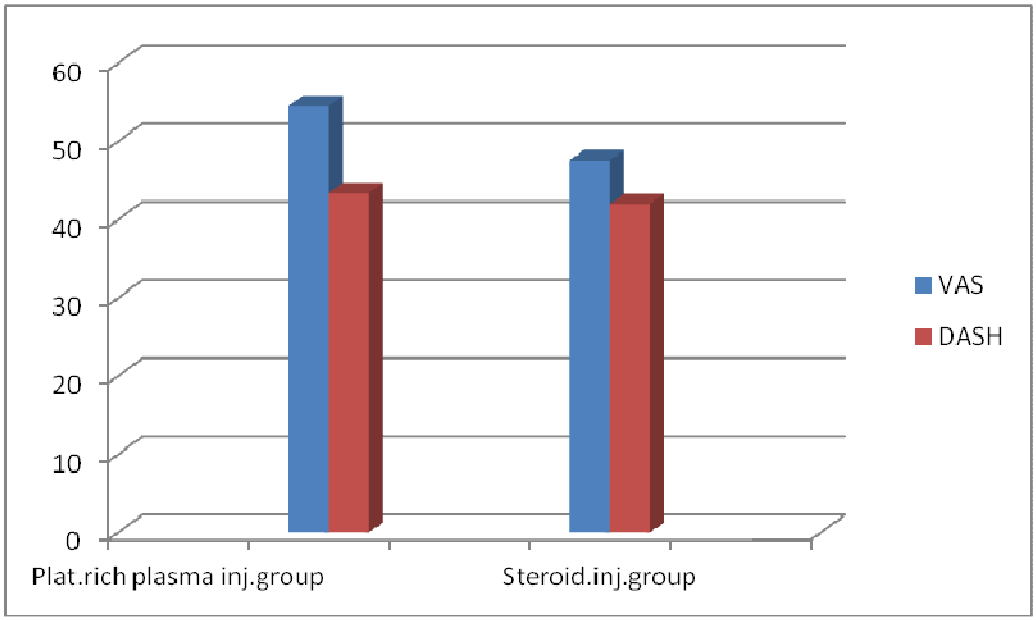
DASH: 43.4

2. Steroid injection group:

VAS: 47.6

DASH: 42.0

The average post injection scores at 4 weeks



The average post injection scores at 8 weeks were:

1. Platelet rich plasma injection group:

VAS: 44.1

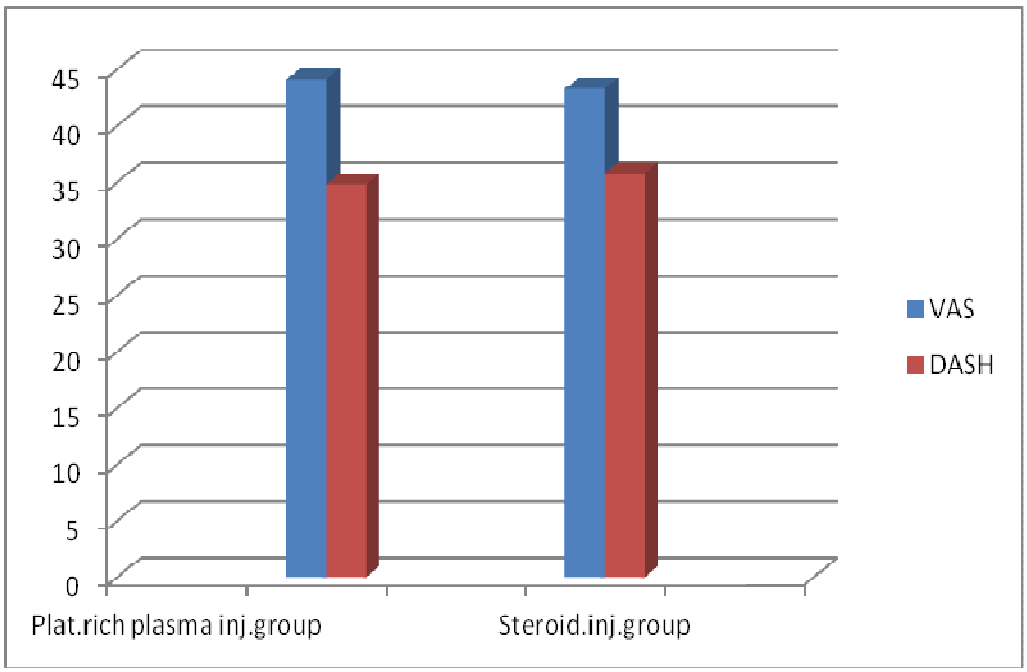
DASH: 34.8

2. Steroid injection group:

VAS: 43.3

DASH: 35.8

The average post injection scores at 8 weeks



The average post injection scores at 12 weeks were:

1. Platelet rich plasma injection group:

VAS: 36.5

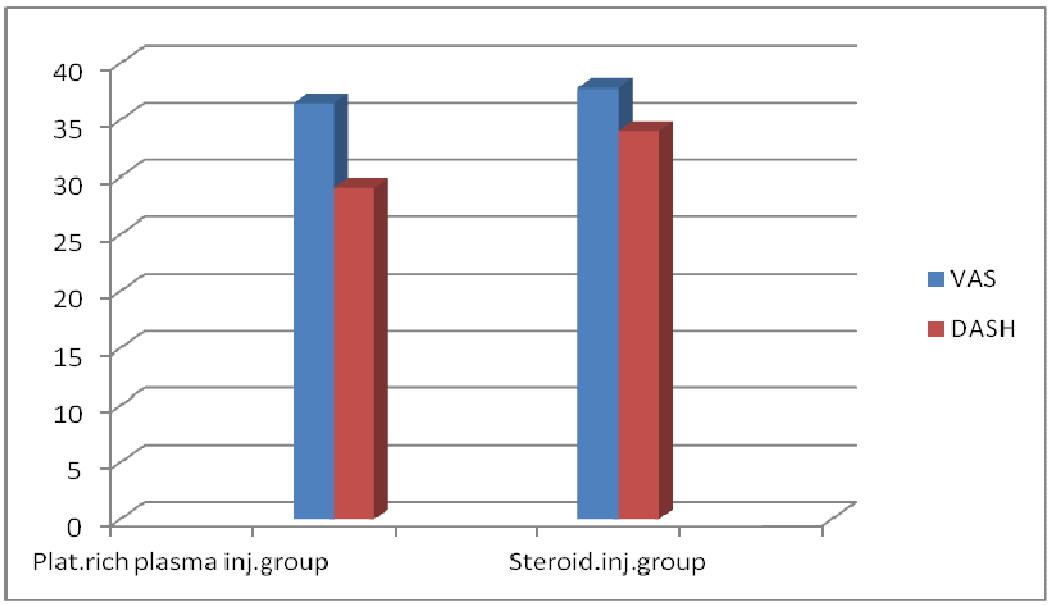
DASH: 29.1

2. Steroid injection group:

VAS: 37.8

DASH: 34.0

The average post injection scores at 12 weeks



RESULTS:

All the relevant data's were analyzed.

The average Visual Analogue Scale (VAS) and Disabilities of the Arm, Shoulder and Hand (DASH) scores in both the groups of pre injection, four, eight and 12 weeks post injection are shown in the below tables:

PLATELET RICH PLASMA GROUP

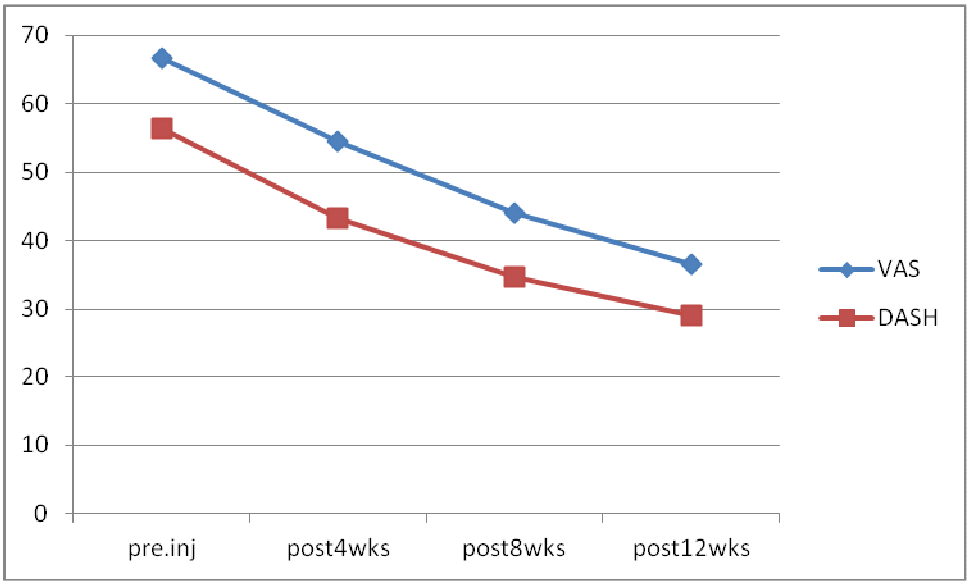
Pre injection score		Post injection score (4 weeks)		Post injection score (8 weeks)		Post injection score (12 weeks)	
VAS	DASH	VAS	DASH	VAS	DASH	VAS	DASH
66.6	56.4	54.5	43.4	44.1	34.8	36.5	29.1

STERIOD GROUP

Pre injection score		Post injection score (4 weeks)		Post injection score (8 weeks)		Post injection score (12 weeks)	
VAS	DASH	VAS	DASH	VAS	DASH	VAS	DASH
65.5	55.2	47.6	42.0	43.3	35.8	37.8	34.0

The effects of our injection observed with the Visual Analogue Scale (VAS) and Disabilities of the Arm, Shoulder and Hand (DASH) scores in the both the groups is depicted in a graph given below.

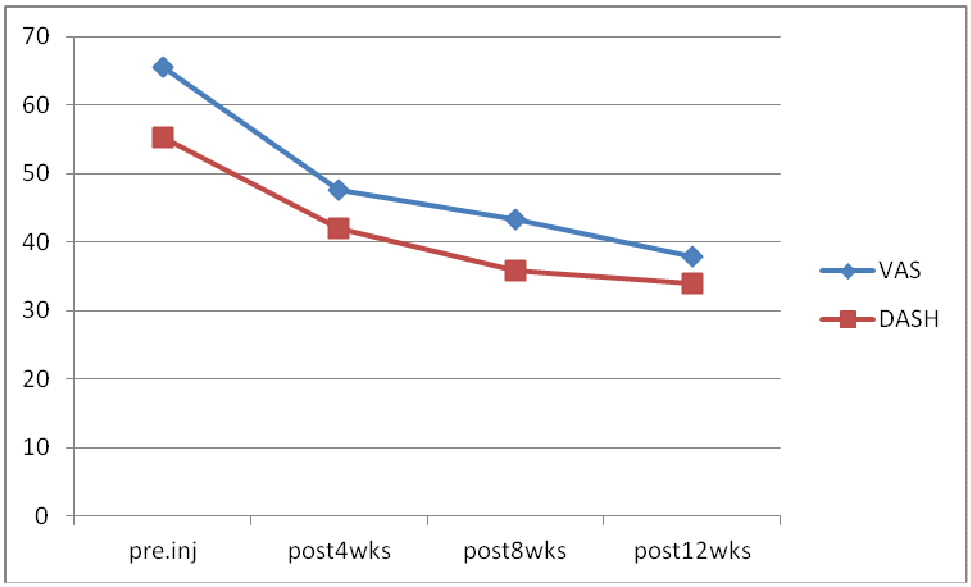
PLATELET RICH PLASMA GROUP



PLATELET RICH PLASMA GROUP

Pre injection score		Post injection score (4 weeks)		Post injection score (8 weeks)		Post injection score (12 weeks)	
VAS	DASH	VAS	DASH	VAS	DASH	VAS	DASH
66.6	56.4	54.5	43.4	44.1	34.8	36.5	29.1

STERIODS GROUP



STERIOD GROUP

Pre injection score		Post injection score (4 weeks)		Post injection score (8 weeks)		Post injection score (12 weeks)	
VAS	DASH	VAS	DASH	VAS	DASH	VAS	DASH
65.5	55.2	47.6	42.0	43.3	35.8	37.8	34.0

From the above curves, it is clear that the steroid group had a steep curve than PRP group indicating the faster relief of pain initially. But at the end of 12 weeks follow up the steroid group shows flat curve pattern whereas the platelet rich plasma group shows falling curve pattern.

VAS COMPARISON IN BOTH PLATELET RICH PLASMA GROUP AND STERIOD GROUP

Visual Analogue Scale (VAS) in carticosteriod group decreases at four and eight weeks and increases at the end of 12 weeks comparative to platelet rich plasma group.

DASH COMPARISON IN BOTH PLATELET RICH PLASMA GROUP AND STERIOD GROUP

Disabilities of the Arm, Shoulder and Hand (DASH) score in carticosteriod group decreases at fourth week and increases at the end of twelfth week comparative to platelet rich plasma group.

IN THIS STUDY, THE VISUAL ANALOGUE SCALE (VAS) SCORE IN PLATELET RICH PLASMA GROUP IS DECREASED BY 30.1 AND THE DISABILITIES OF THE ARM, SHOULDER AND HAND (DASH) SCORE IS DECREASED BY 27.3 AT 12 WEEKS COMPARED TO THE PRE INJECTION SCORE.

WHEREAS THE VISUAL ANALOGUE SCALE (VAS) SCORE IN STERIOD GROUP IS DECREASED BY 27.7 AND THE DISABILITIES OF THE ARM, SHOULDER AND HAND (DASH) SCORE IS DECREASED BY 21.2 AT 12 WEEKS COMPARED TO THE PRE INJECTION SCORE.

DISCUSSION

7. DISCUSSION

Lateral epicondylitis is an inflammatory condition at the origin of the extensor tendon of forearm muscles over the lateral epicondyle. It is the commonest chronic disabling painful condition of the elbow. It causes symptoms in 1% to 3% of the general population. It is common in people whose occupation requires frequent rotary motion of the forearm like in carpenter, gardener, computer workers and knitting workers. The age of onset of lateral epicondylitis is between 35 and 50 years with an equal male to female sex ratio. The dominant upper limb is most commonly affected.

The actual cause of lateral epicondylitis is not clearly understood. Now it is considered that degenerative process occurs at the common extensor tendon origin of the wrist and fingers due to overuse and abnormal micro vascular responses [4,5,6]. Nirschl observed that the basic pathology was in the origin of the extensor carpi radialis brevis (ECRB) tendon. But sometimes the anteromedial edge of extensor digitorum communis (EDC) and the deep surface of extensor carpi radialis longus (ECRL) may also be involved.

Various modalities of treatment have been recommended for lateral epicondylitis. They are rest, activity modification, non steroidal anti inflammatory drugs, counterforce braces, massage, physiotherapy, laser treatment, extracorporeal shockwave treatment, acupuncture, ultrasound treatment and botulinum toxin type A injection. Injection of corticosteroids was thought to be the gold standard treatment in lateral epicondyliis previously. The autologus blood injection and different types of open and arthroscopic operative treatment are also advised for lateral epicondylitis [7,8,9,10,11]. At present, platelet rich plasma (PRP) is considered as an ideal biological autologous blood derived component. Platelet rich plasma has been utilised and studied since 1970. It can be injected in different tissues where, platelet is activated and it releases high concentrations of transforming growth factor-beta (TGF-β), platelet derived growth factors (PDGF), fibroblast growth factors (FGF), vascular endothelial growth factors (VEGF) and cytokines at the injected site. These growth factors play significant roles in cell proliferation, chemotaxis, cell differentiation and angiogenesis. Bioactive factors like serotonin, histamine, dopamine, calcium and adenosine are also stored in the dense granules in platelets. These non growth factors plays important role on the biological aspects of wound healing. The platelets in platelet rich plasma are delivered in a clot, which contains several cell adhesion

molecules including fibronectin, fibrin and vitronectin. These cell adhesion molecules promote cell migration, and potentiate biological activity of platelet rich plasma. The clot itself promotes wound healing by acting as conductive matrix or scaffold upon which cells can adhere and initiate the wound healing process [12]. In addition, platelet rich plasma has high antimicrobial potency and this property may prevent infections.

There are less number of studies regarding the benefits of platelet rich plasma injection over corticosteroid injection therapy for lateral epicondylitis. The main outcome parameters considered were pain and functional activities of elbow. Currently long term follow up data's regarding the effectiveness of platelet rich plasma are lacking. This study shows three months follow up results using the same outcome parameters.

In the study by **Gosen et al** march 2011, compared the effectiveness of autologous platelet rich plasma injection to steroid injection therapy in lateral epicondylitis, it is proved that platelet rich plasma injection is safe and easy. Concerning functional impairment, the corticosteroid group showed better results during the initial period and then declined to baseline level. Whereas in platelet rich plasma group symptoms improved progressively. There was a significant difference in decrease of pain and

functional impairment after platelet rich plasma application even after one year.

In this study the **DASH** score among platelet rich plasma group has declined from pre injection score of 56.4 to 43.4 at 4 weeks, 34.8 at 8 weeks and 29.1 at 12 weeks which is almost similar to the study by **Gosen et al** march 2011, where the pre injection DASH score is 54.3 which declines to 43.1 at 4 weeks, 31.2 at 12 weeks.

In this study the **VAS** score among platelet rich plasma group has declined from the pre injection score of 66.6 to 54.5 at 4 weeks, 44.1 at 8 weeks and 36.5 at 12 weeks which is almost similar to the study by **Gosen et al** march 2011, where the pre-injection **VAS** score of 69.0 declines to 55.7 at 4 weeks, 45.1 at 8 weeks and 40.2 at 12 weeks.

In this study the **DASH** score among steroid group started to decline from the pre injection score of 55.2 to 42.0 at 4 weeks ,35.8 at 8 weeks and 34.0 at 12 weeks, whereas in the study by **Gosen et al** march 2011, DASH score among steroid group decline similarly up to 12 weeks .

In this study the **VAS** score among steroid group declines from 65.5 of pre injection score to 47.6 at 4 weeks, 43.3 at 8 weeks and 38.4 at 12 weeks, whereas in the study by **Gosen et al** march 2011, the decline of

VAS score from pre injection score of 66.2 to 44.3 at 4 weeks and 38.5 at 12 weeks.

Comparing the results prescribed in this study with the results of three months follow up, the outcome in the corticosteroid group is declined, whereas the outcome in the platelet rich plasma group is maintained. A significant finding is that the platelet rich plasma group had worse pre injection VAS scores and better after 12 weeks. This strengthens our conclusion that the platelet rich plasma injection is better than corticosteroid injection.

In the **Mishra and Pavelko** research, the success rate was 93% in the platelet rich plasma group and 65% success rate for steroid group in the **Hay et al** study.

In this study out of 40 patients, one patient didn't return for follow up in platelet rich plasma group and the post procedure complication is negligible except for one patient who presented with paraesthesia at steroid injection site which resolved at twelfth week.

CONCLUSION

8. CONCLUSION

In conclusion, the comparative study of treatment of lateral epicondylitis with platelet rich plasma verses corticosteroid injection shows that a single injection of autologous platelet rich plasma improves elbow pain and functional activities more effectively than corticosteroid injection in lateral epicondylitis. These improvements were maintained over in our follow up period without any significant complications.

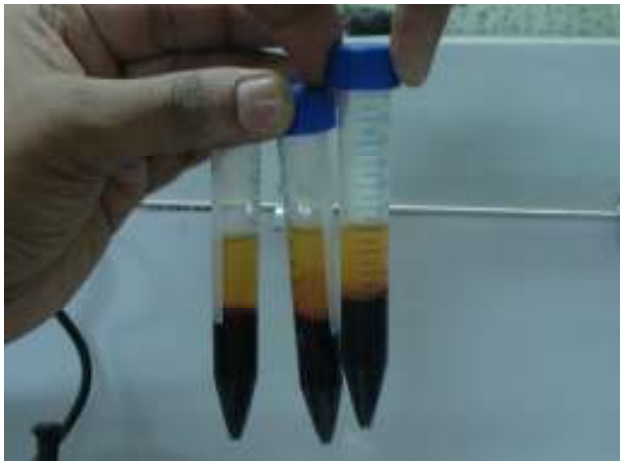
Corticosteroid gives better results up to eighth week and after that pain decreased slightly. Long term follow up with more number of patients is needed to evaluate lasting benefits of pain relief and functional improvement in lateral epicondylitis.

ANNEXURE

BIBLOGRAPHY

CASE ILLUSTRATIONS

CASE: 15



PLATELET RICH PLASMA INJECTION

CASE: 28

PLATELET RICH PLASMA INJECTION

CASE: 17

STERIOD INJECTION

CASE: 39

STERIOD INJECTION

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MASTER CHART

MASTER CHART

S.NO	O.PNO	AGE	SEX M/F	SIDE L/R	DURATION MONTHS	DRUG P/S	PRE INJECTION SCORE		POST INJECTION 4WEEKS		POST INJECTION 8 WEEKS		POST INJECTION 12 WEEKS	
							VAS	DASH	VAS	DASH	VAS	DASH	VAS	DASH
1.	11837	53	F	R	4.5	P	66	57	54	50	46	47	42	33
2.	57120	42	M	R	6	P	63	52	47	46	44	37	31	32
3..	12755	40	F	L	6.5	S	70	61	48	43	44	38	40	31
4.	7318	48	F	R	3	P	64	63	50	42	46	30	36	28
5.	29828	40	F	L	3.5	S	67	52	46	32	42	34	48	30
6.	9644	50	F	L	4.5	S	70	64	54	50	48	42	38	36
7.	36093	37	F	R	4	P	79	69	48	37	47	30	30	28
8.	49532	42	M	L	5	S	63	56	41	44	38	34	40	37
9.	5572	46	F	R	5	P	65	60	48	47	42	36	38	26
10.	32254	48	M	R	6	S	64	52	48	40	50	34	38	36
11.	35752	38	M	R	4	S	62	68	57	58	48	44	38	35
12.	25962	44	M	R	8	P	76	63	62	45	49	35	46	32
13.	6405	47	F	R	3.5	P	70	59	53	42	40	36	35	25
14.	7708	46	M	R	4	S	64	50	41	36	44	37	31	34
15.	58388	43	M	R	5	P	74	60	57	49	48	37	36	27
16.	67207	50	M	R	4.5	S	76	54	53	49	48	42	38	36
17.	31890	52	F	R	4	S	60	53	43	41	43	32	38	31

18.	16096	36	M	R	3	P	64	70	56	40	47	38	39	32
19.	20481	49	M	L	3.5	P	75	69	46	41	46	40	41	32
20.	98801	55	F	L	4	S	66	62	53	54	47	44	38	28
21.	21671	38	F	L	5.5	P	67	56	53	40	43	32	38	33
22.	20242	44	F	R	6	P	72	62	58	44	41	30	34	36
23.	35489	35	F	L	7	S	70	64	56	50	44	42	38	36
24.	10911	65	M	R	5.5	P	75	51	49	34	40	29	23	22
25.	23951	52	F	R	8	S	57	54	45	38	39	32	39	33
26.	24567	51	F	R	3.5	S	61	50	42	34	43	30	37	39
27.	42772	44	F	L	5.5	S	65	47	44	31	40	30	36	32
28.	21240	45	M	R	6	P	70	52	53	41	47	33	35	27
29.	24901	39	M	R	4.5	S	69	50	49	39	45	30	35	32
30.	22116	33	F	R	3.5	P	72	52	50	47	43	32	44	26
31.	35363	39	F	R	3	P	66	51	53	47	40	41	39	33
32.	43590	30	F	R	4	S	61	54	40	38	38	36	36	35
33.	5677	67	M	L	3.5	S	69	53	53	49	37	32	33	28
34.	24124	46	F	R	6	P	70	52	54	45	44	37	41	35
35.	25972	38	F	R	7	P	74	69	55	39	43	32	LF	LF
36.	5233	35	F	R	5.5	P	67	60	49	50	45	37	34	22
37.	26064	41	F	L	4	P	70	52	51	41	40	27	35	22
38.	25976	33	F	R	4.5	S	69	59	43	31	48	30	39	37
39.	23760	40	F	R	3.5	S	60	50	48	37	40	39	36	37
40.	21141	53	F	R	4	S	67	51	48	46	39	34	39	36

KEY:

- L- Left
- R-Right
- M-Male
- F-Female
- P-Platelet rich plasma
- S-Steroid
- VAS-Visual Analog Scale
- DASH- Disabilities of the Arm Shoulder Hand score
- LF- Lost follow up

PROFORMA

PROFORMA

NAME: S.NO:

AGE: OP.NO:

SEX:

OCCUPATION:

PAIN DURATION: PHONE NO:

SIDE:

DRUG: ADDRESS:

Pre injection		**Post injection (4 weeks)**		**Post injection (8 weeks)**		**Post injection (12 weeks)**	
VAS	DASH	VAS	DASH	VAS	DASH	VAS	DASH

COMPLICATIONS: