Original Research Article

A Study of Clinical Profile and Functional Outcome of Lateral Epicondylitis Post PRP Injection

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Abstract

Introduction: Lateral epicondylitis also known as tennis elbow attributed the onset of symptoms due to overexertion of the extremity with repeated wrist extension and alternating forearm pronation and supination. In Lateral epicondylitis , the mainstay of management which involves a variety of options, including rest, physical therapy, non steriodalanti inflammatory drugs (NSAIDS), local cortisone injection, autologous Platelet-Rich Plasma injection , botulinum toxin injections, shockwave therapy , supportive forearm bracing and local modalities. For patients with recalcitrant disease, open debridement technique, arthroscopic or percutaneous procedures are tried. Despite its high prevalence the development of a single effective and consistent management remains an unrealized goal. **Aim:** To study the effictiveness of autologous Platelet - rich plasma injections and look for best available treatment in the management of Lateral epicondylitis of humerus. We focused on comparing different modalalties of treatment for lateral epicondylitis and drew a conclusion after evaluating merits and demerits of the same.**Methodology:** All patients were included in the study after full filling the inclusion criteria and informed consent. Total 25 patients were included in the study of who did not get relief from conservative management were selected. All patients were treated with three injections of autologous PRP and followed up for a minimum period of six months. The treatment options were discussed before the procedure with patients and close relatives and an informed consent was taken for the study. The primary analysis included local tenderness, Grip test, Cozen test, The Disabilities of the Arm, Shoulder and Hand(DASH) score , Nirschl Pain Score and Visual Analogue Scale(VAS) for pain which were used for clinically assessing the outcome and improvement at different follow up periods of 1,4 and 24 weeks.**Conclusion:** The results obtained in this study indicate that autologous Platelet Rich Plasma injection in patients with Lateral Epicondylitis produced significant improvement in reducing pain, restoring functions and returning to previous activities. It also did not provoke any local or systemic adverse effects. The safety of autologous PRP makes it an attractive option for the treatment of lateral epicondylitis.

Keywords: lateral epicondylitis, platelet-rich plasma, Tennis elbow, corticosteroid

Introduction

Lateral epicondylitis or tennis elbow is a common cause of elbow pain in the general population. Traditionally, lateral epicondylitis has been attributed to degeneration of the extensor carpi radialisbrevis and common extensor origin, although the underlying collateral ligamentous complex and joint capsule has also been implicated[1]. The diagnosis was first made by Runge[2]in1873. It was named "Lawn-Tennis Arm" by Major[3] in 1883 due to its association with this sport. Lateral epicondylitis affects 1%- 3% of adults each year[4,5]. It affects adults in fourth or fifth decade of life. It affects both the sex equally with symptoms more common in the dominant arm. Goldie[6] in his study of Lateralepicondylitis attributed the onset of symptoms due to overexertion of the extremity with repeated wrist extension and alternating forearm pronation and supination. History of manual labour with heavy tools and significant strain over elbow while performing repetitive tasks are the risk factors[7].The radial nerve located between brachioradialis and brachialis divides into the superficial radial nerve and the Posterior InterosseusNerve(PIN), at the level of radial head. The PIN then enters the radial tunnel or the superficial layer of supinator muscle, called the Arcade of Frohse (Supinator Arch), where if it is compressed leads to refractory lateral epicondylitis[8].The etiology of generation of pain in Lateral epicondylitis may be attributed to many factors. Both intra-articular and extra-articular structures produce symptoms which varies in different patients. Electromyographic and Cinematographic evaluation of Lateral epicondylitis patients demonstrates increased ECRB activity and altered swing mechanics when compared with asymptomatic controls[9], which provides an explanation for predilection for the pathology in ECRB muscle. The common extensor tendinous origin comprises of the ECRB and EDC. Lateral epicondylitis pathology occurs in the more superior and slightly deeper fibers of ECRB.

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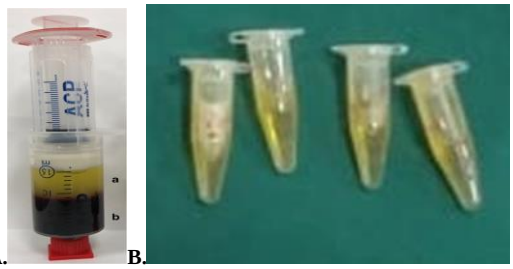
Platelet-rich plasma (PRP) is blood plasma enriched with platelets [10]. The platelets contain many growth factors and are irregularly shaped cell fragments derived from precursor megakaryocytes. Therefore, it is an autologous preparation of concentrated bioactive factors[11], which is easily derived from blood after centrifugation. PRP provides multiple number of growth factors which help in promoting healing. Activated platelets after contact with exposed endothelium of wounds or damaged tissues , release wound healing factors like Platelet Derived Growth Factor (PDGF), Vascular Endothelial Growth Factor (VEGF), Transforming Growth Factor (TGF), Epidermal Growth Factor (EGF) and Insulin-like Growth Factor (IGF). All of these factors set the stage for tissue healing, which involves intricate overlapping processes that are often categorized into haemostasis, inflammation, proliferation, and remodelling . Once tissue injury occurs, a haematoma forms at the site of tissue damage, platelets adhere to exposed collagen creating a clot, and the inflammatory phase begins with activation of platelets resulting in release of growth, bioactive, and haemostatic factors. Each factor plays a unique but important integrating role in the early stages of the intrinsic and extrinsic pathways of the clotting cascade. Access to the wound site by neutrophils and macrophages occurs within hours of injury thereby initiating the phagocytosis of tissue debris. Within a few days of injury, the proliferative phase begins characterized by angiogenesis, collagen deposition, granulation tissue formation, epithelialization, and wound healing. Finally, in the remodelling phase collagen maturation and apoptosis of excess cells takes place which can take from several weeks to months after an injury depending upon the degree of damage. On the basis of above described model, addition of autologous PRP stimulate different stages of the wound healing cascade. PRP has the advantage of offering multiple, synergistically working growth factors at the wound site in biologically and physiologically appropriate concentrations.Injection of autologous PRP in tennis elbow is an established procedure for the treatment of Lateral Epicondylitis which has yielded favourable results[12].Past studies of PRP have shown an increase in cell proliferation, migration, differentiation, inflammation mediation and matrix synthesis. We are conducting this study to analyze clinically the role of autologous PRP injection as an evolving treatment option in improvement of symptoms and functions of lateral epicondylitis.

How is PRP made?

Not all PRP is the same, and preparation methods lack a standardized protocol[13].After a blood sample is collected from the patient, that sample is run through a centrifuge, which separates the samples cellular products based on different specific gravity[14]. One primary difference in PRP systems involves this centrifugation, which can involve either one or two spins through the system. Systems utilizing one spin, such as autologous conditioned plasma (ACP) (Arthrex, Naples, Florida) and Cascade PRP (MTF Biologics, Edison, New Jersey), separate the sample into a plasma layer containing platelets and a separate layer containing red and white blood cells (Fig. 1 A).



A. B.

Fig 1:A: The resultant product of a single spin centrifugation, with an upper plasma layer (a) and a lower layer (b) containing both leukocytes and erythrocytes B: after separating the PRP from rest

These one-spin systems typically result in platelet concentrations that are 1 to 3 times greater than whole blood; furthermore, the one-spin systems are efficient because they typically have short preparation times (under 10 min), which can remove the need for an anti-coagulant to be added to the preparation to prevent clotting. PRP systems that utilize two spins, like the Biomet GPS (Zimmer Biomet, Warsaw, Indiana) and Magellan PRP (Isto Biologics, Hopkinton, Massachusetts), focus on separating the blood sample into three layers: a layer with red blood cells, a buffy coat layer containing platelets and white blood cells, and a platelet depleted plasma layer. The focus of the two-spin systems is to concentrate the buffy coat layer, which contains higher platelet concentrations (> 5× whole blood) than the one-spin systems. Due to the nature of the two-spin cycle, the preparation times for these products are longer, typically 30 min or greater, often requiring the use of an anti-coagulant to prevent the sample from clotting during the preparation process.

Growth factors in PRP: Growth factors have been extensively studied for OA and cartilage repair because of their ability to enhance matrix synthesis. The efficacy of growth factors in cartilage repair is related to the recruitment of chondrogenic cells, stimulation of proliferation, and enhancement of cartilage matrix synthesis[15]. Growth factor therapy could be an attractive method for stimulation of the repair of damaged cartilage matrix. The platelet alpha-granules contain a range of important growth factors; therefore, they provide an obvious and readily accessible source of autogenous growth factors. Platelet-rich plasma (PRP) is defined as an autologous concentration of human platelets in a small volume of plasma[16]. PRP is also a concentration of several fundamental protein growth factors proved to be actively secreted by platelets to initiate mesenchymal tissue healing. These growth factors stimulate cell proliferation, migration, differentiation, and matrix synthesis and can affect chondrocyte metabolism, chondrogenesis and improve cartilage healing in vivo[17,18].PRP also contains plasmatic proteins, such as fibrin, fibronectin, and vitronectin, which act as mesenchymal cell adhesion molecules. It is believed that PRP can augment or stimulate healing with the same biologic healing process that normally occurs in the human body after injury.

Methodology

After getting approval from the ethical committee of the hospital, the study was conducted at the orthopaedic department at R D GARGI HOSPITAL, Ujjain. 25 patients of Lateral Epicondylitis who did not get relief from conservative management were selected. All patients were treated with three injections of autologous PRP and followed up for a minimum period of six months.

Inclusion Criteria

- All patients with Lateral epicondylitis consenting for participation in the research study
- Patients who had not gone for any kind of surgical intervention

Exclusion Criteria

- All operated cases of lateral epicondylitis
- Patients with severe co-morbidities/not fit for procedure
- Patients who had taken any steroid injection within 3 months

The primary analysis included local tenderness, Grip test, Cozen test, The Disabilities of the Arm, Shoulder and Hand(DASH) score , Nirschl Pain Score and Visual Analogue Scale(VAS) for pain which were used for clinically assessing the outcome and improvement at different follow up periods of 1,4 and 24 weeks.Radiological investigations like X ray imaging, MRI and Ultrasound was performed. In plain radiographic examination calcification within the extensor mass origin or intra-articular pathology could be seen[19]. MRI scans of 90% symptomatic patients before treatment may demonstrate edema and thickening of the extensor origin[20-22]. Ultrasound examinationin Lateral Epicondylitis identifies focal hypo-echoic areas ,peritendinous fluid, intrasubstance tears and thickening of common extensor origin[23].

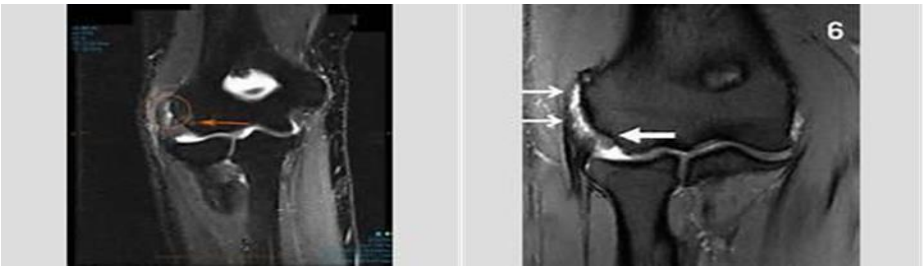


Fig 2:X-Ray imaging

Procedure

Patient was placed supine and 10 ml of patient‟s blood was taken out from a peripheral vein in a sterile syringe which was then transferred to a pre-heparinized centrifuge tube which was kept in the centrifuge for 10 minutes at 3500 rpm. By this procedure the autologous blood was separated in three different layers of lowermost Red Blood Cells, the uppermost Plasma and the intermediate layer of White Blood Cells and Platelets. The whole Platelet-Rich Plasma and the buffy coat was taken out by a syringe & needle. The affected elbow was painted and draped. PRP would be then injected into the common extensor origin at the site of maximum tenderness under all aseptic precautions.Needle would be then withdrawn & punctured wound used to be sealed off with tincture benzoin. After the injection patient was kept in the same supine position for fifteen minutes and then sent home with the instructions of limiting the use of the injected arm for approximately a day. They were also advised to use acetaminophen and tramadol for pain. The patients were then followed up for the observation of outcome of infusion of autologous PRP.

Fig 3:Materials required for PRP

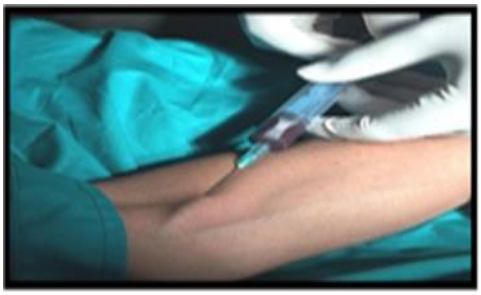


Fig 4:Blood withdrawn from Cubital vein

Fig 5:Collected in pre Heparinized tubes and centrifuged

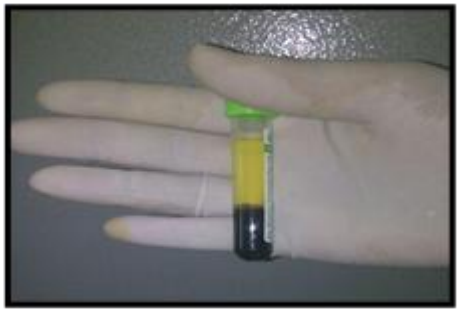


Fig 6:Separated layers of blood after centrifugation

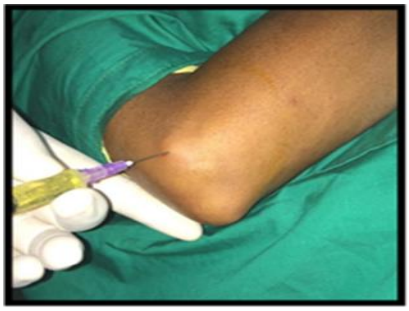


Fig 7:PRP being injected in lateral epicondylar region

Follow Up and Evaluation

- Baseline scoring and 1st cycle of procedure was done
- 1st week follow up and 2nd cycle of procedure was done
- 4th week follow up and 3rd cycle of procedure was done
- 24th week follow up was done

Clinical evaluation using DASH score ,Nirschl score , VAS score and Grip score at baseline and every follow up

Observation and Results

The study comprised of evaluation of role of autologous Platelet Rich Plasma in the final functional outcome of 25 patients of the age group 28 to 71 years of Lateral Epicondylitis. The maen age was 42 years. All the patients were treated with three injections of autologous Platelet Rich Plasma and followed up for a minimum period of 24 weeks

- Average age was 42 years with a male to female ratio of 13 to 12.
- Amongst the 25 patients 11 were affected on the left side and 14 were affected on the right side.
- Evaluation was done at baseline, 1st week, 4th week and 24th week by DASH score, Nirschl score, VAS score and Grip score .

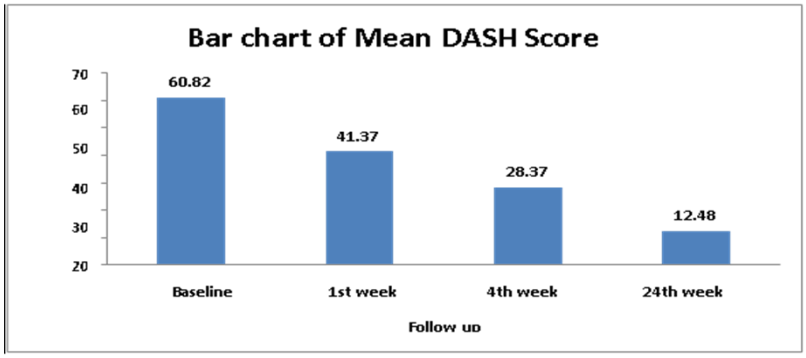


Fig 8:Bar chart of mean DASH Score

Mean DASH Score: In our study we found that mean DASH score improved significantly ($p < 0.000$) with each follow up with a mean value of 60.82 at pre injection cycle to 12.48 at final follow up

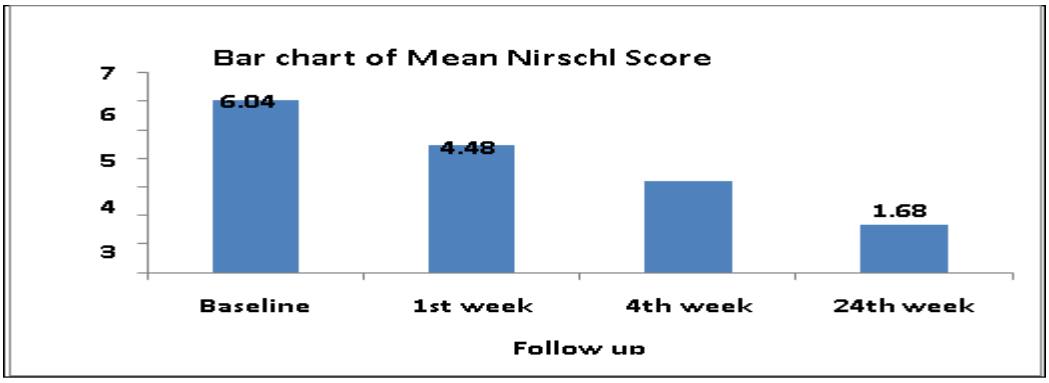
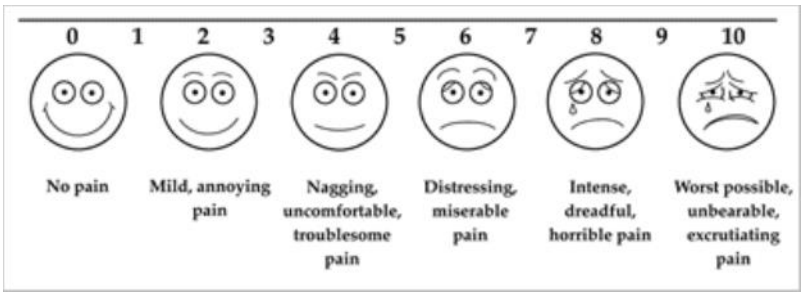


Fig 9:Bar chart of mean Nirschi score

Nirschl Score: In our study we found that mean Nirschl score improved significantly ($p < 0.000$) with each follow up with a mean value of 6.04 at pre injection cycle, 4.48 at 1st follow up, 3.2 at 2nd follow up and 1.68 at final follow up.

Visual Analog Scale for Pain:The Pain, the Patient perceive is graded on a visual scale and the score calculated.



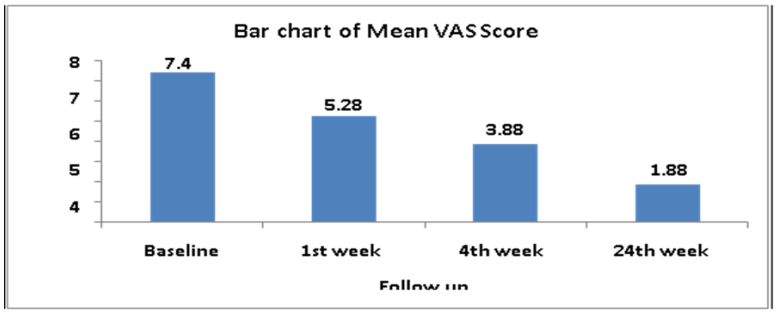


Fig 10:Bar chart of mean VAS Score

In our study we found that mean VAS score improved significantly (p< 0.000) with each follow up with a mean value of 7.4 at pre injection cycle to 1.88 at final follow up

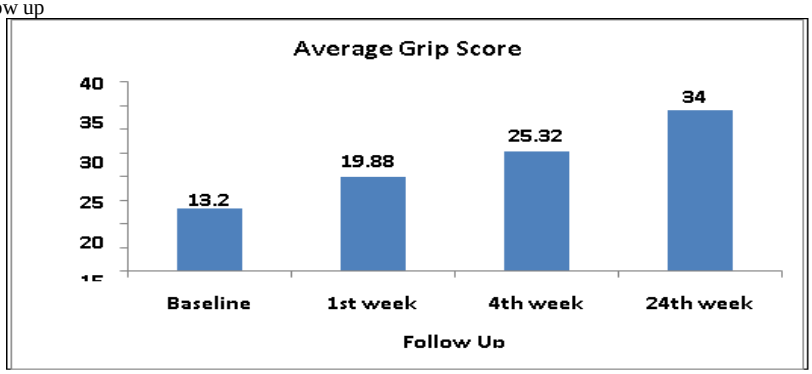


Fig 11:Average grip score

In our study we found that mean Grip score showed significant improvement (p< 0.000) with each follow up with a mean value of 13.20 at pre injection cycle, 19.88 at 1st follow up, 25.32 at 2nd follow up and 34.00 at final follow up.

Discussion

Lateral epicondylitis results from the combined effect of repetitive wrist extension and alternating forearm pronation and supination [24,25]. It is characterized by microtears of tendon followed by an incomplete reparative response which leads to chronic pain and decreased functional ability of the upper extremity. The most common cause is angiofibroblastic degeneration of the origin of ECRB(Extensor Carpi Radialis Brevis)[26].Non surgical treatment of Lateral epicondylitis is the mainstay of management which involves a variety of options, including rest, physical therapy, non steroidal anti inflammatory drugs, local cortisone injection, autologous platelet rich plasma injection , botulinum toxin injections, Extracorporeal Shock Wave Therapy(ESWT), supportive forearm bracing and local modalities. No single mode of treatment is effective in all the patients. Corticosteroid injection was considered as a gold standard treatment in the past but it was found to be associated with fat atrophy, tendon rupture and skin pigmentation[27].They had a high frequency of relapse and recurrence . Surgical procedures also have their own drawbacks. PRP has evolved as a very effective treatment of lateral epicondylitis. The concentrated growth factors within PRP work together to help in the healing response within the damaged tendon. Klein et al in his study suggested that Transforming Growth Factor Beta (TGFβ) significantly increases type 1 collagen production in tendon sheath fibroblasts[28]. Allan Mishra and Terri Pavelko in their study observed 93% reduction in pain on comparison with the pre injection status after injecting PRP for chronic lateral epicondylitis. PRP is a safe and effective treatment option for lateral epicondylitis. At the end of the study the data demonstrated a significant and almost linear improvements in DASH, Nirschl, VAS and Grip scores at baseline, 1, 4 and 24 week follow up. The patients did not experience any adverse effect and were satisfied after the treatment, in all the age groups thus supporting the fact that autologous PRP injection represent a valuable treatment option for lateral epicondylitis and is becoming an increasingly popular treatment for lateral epicondylitis. PRP after initially inhibiting the inflammatory process then sets the stage for healing. The findings of

the study suggest a "Practice Changing Evidence"[29] in the results, that suggests improvement in pain scores and function.

Conclusion

The Epidemic of Modernization coupled with effective health care delivery has led to an expanded lifespan of human beings. The focus of health care providers is undergoing a drift towards non-communicable and degenerative disorders. The results obtained in this study indicate that autologous Platelet Rich Plasma injection in patients with Lateral Epicondylitis produced significant improvement in reducing pain, restoring functions and returning to previous activities. It also did not provoke any local or systemic adverse effects. The safety of autologous PRP makes it an attractive option for the treatment of lateral epicondylitis.

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