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Autologous platelet rich plasma versus ultrasound therapy: What works better in elbow tendinopathies?

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Abstract
The specific goal of this study is to compare the efficacy of commonly used ultrasound therapy and autologous PRP in relieving the pain and improving functional status of patients with elbow tendinopathies.
This was a prospective study of 60 patients who were diagnosed to have elbow tendinopathies for the period from April 2017 to June 2018. The recruited participants were randomized into two groups: Group A were given a single dose of Autologous PRP injection and group B were given low intensity Pulsed Ultrasound Therapy for a duration of 3 times a week for 3 weeks. The patient's clinical outcome was measured by using VAS and MAYO Elbow Performance Score.
At the end of 3 weeks there was a 16% and 10.6% decrease in VAS score and there was improvement in MAYO score by 9.2% and 3.9% respectively in PRP and US group. At the end of 6 weeks, VAS score had decreased by 40% and 31% while the MAYO score improved by 22.4% and 15% in PRP and US groups respectively.
At the end of 12 weeks, VAS score decreased by 68.9% and 53.8%. MAYO score had improved to 32.4% and 20.8% in PRP and US groups respectively.
In our study, autologous platelet rich plasma was found to give better results compared to Ultrasound therapy. But the values were significant only after 12 weeks. Platelet rich plasma and Ultrasound therapy can be used both in acute and chronic cases.

Keywords: Tendinopathy, autologous PRP, platelet rich plasma

Introduction
Elbow tendinopathies affect a substantial portion of recreational and professional athletes and those in many occupations involving repetitive work. 7.4% of industrial workers and 40-50% of tennis players in the USA are at some time affected by it [1, 2]. The frequency of lateral epicondylitis is reported between 1 to 3% among normal non-athlete population [2, 3]. It is characterized by activity-related pain, focal tendon tenderness, and decreased strength and movement in the affected area.
One of the commonly used physiotherapy modality in treatment of elbow tendinopathies is ultrasound therapy [4]. It is suggested that the application of US to injured tissues will increase the rate of healing & enhance the quality of the repair [5, 6]. One of the newer methods to treat elbow tendinopathies is to use autologous platelet rich plasma which contain powerful growth factors. A recent review of common growth factors suggested platelet rich plasma may be useful for tendon and ligament healing *in vivo* [7, 8]. While PRP therapy for tendinopathies has attracted significant scientific exposure in recent years, fundamental inconsistencies still exist within the literature [9, 10]. The specific goal of this study is to compare the efficacy of commonly used ultrasound therapy and autologous platelet rich plasma in relieving the pain and improving functional status of patients with elbow tendinopathies.

Material and Methods
This was a prospective study of 60 patients (61 elbows) who were diagnosed to have elbow tendinopathies (lateral and medial epicondylitis) for the period from April 2017 to June 2018 at Sanjay Gandhi institute of trauma and orthopedics (SGITO), Bangalore Baptist Hospital (BBH) and Akash institute of medical sciences and research centre (AIMSRC). Patients included in the study were adult patients with clinically diagnosed acute and chronic elbow epicondylitis.

Patients were excluded if they were pregnant, had local skin infection at the site of the procedure, a history of local injection of any medications into the site.

Research method: Adult patients visiting the orthopedic department with elbow pain underwent clinical examination to diagnose elbow tendinopathies. Assessment of pain score by visual analogue scale and functional status by Mayo clinical performance index were done at the time of presentation. The recruited participants were then block randomized by a computer-generated random number sequence into one of the two groups:

Group A: were given a single dose of Autologous platelet rich plasma injection of approx 1.5- 2ml. Patients were sent home with instructions to limit their use of the arm for approximately 24 hours and use only Tab Paracetamol / ice packs for pain relief. Patients were asked to keep track of the number of tablets taken. Use of Non steroidal anti inflammatory medications was strictly prohibited. After 24 hours, patients were asked to start standardized stretching protocol for 3 weeks. At 6 weeks after the procedure, patients were allowed to proceed with normal sporting or recreational activities as tolerated. (Double spin method is used to prepare PRP. 8.5ml of whole blood is taken in 2 containers (B D Franklin Lakes Nj USA) with Acid Citrate Dextrose-A and centrifugation was done with 1500 rpm for 6 min. Buffy coat and plasma was transferred to another container and centrifuged at 2500rpm for 15min. Lower 1/4th of the tube which contains platelet rich plasma was extracted and injected to local site with aseptic precautions).

Group B: were given low intensity Pulsed Ultrasound Therapy for a duration of 3 times a week for 3 weeks. Patients underwent standard stretching exercises for a period of 3 weeks. Patients were allowed to take only Tab Paracetamol 1 gm for pain relief. Patient's pain score and functional outcome were assessed on the 3rd week and then on 6th week and allowed to proceed with normal sporting and recreational activities as tolerated. Patient was then finally assessed on the 12th week and statistical analysis was done.

In both groups, If pain of the patient increased by more than 3 levels or patient was not willing to continue the study, or if patient had taken more than 3 tablets /day on 3 consecutive days/week for 2 weeks the study was discontinued and the patient was given option to either undergo further blood and radiological investigations or to take the next level of treatment.

Outcome measures: The patient's clinical outcome was measured by using the visual analog scale (VAS) and the MAYO Elbow Performance Score. The data analysis was done using relevant statistical methods. Continuous variables were presented as means (standard deviation) and categorical variables were expressed as actual numbers and percentages.

Results and Observation

The mean age group in patient's under PRP group and US group were 41.53 years and 42.55 years respectively and out of 60 patients, 22 were males and 38 were females. Even though the females were higher in number compared to males, the values were not statistically significant. The patients with onset of symptoms less than 4 weeks were considered acute and more than 4 weeks were considered chronic cases. In our study, in the PRP group, there were 10 acute cases and 22 chronic cases and in the US group there were 16 acute and 13 chronic cases. On evaluating the results, it was found that out of total 61 cases, elbow tendinopathies on the right side was 42 and on the left side was 19. The values were statistically significant stating that incidence of right sided elbow tendinopathies were more than left.

Comparison of vas and mayo scores throughout treatment

The VAS score was evaluated prior to the treatment and was found that the mean score in Group A was 4.48 and in group B was 4.03. The mean MAYO score in group A was found to be 60.24 and in group B was found to be 67.241. At the end of 3 weeks of treatment, VAS score in group A patient was reduced to mean of 3.74 and in group B it was reduced to 3.60 while mean MAYO score in group A was 66.355 and in group B it was 70. VAS score at the end of 6 weeks in group A was 2.65 and in group B was 2.76 while the MAYO score in group A was found to be 77.726 and in group B was 79.052. VAS score at the end of 12 weeks was 1.39 in group A and 1.86 in group B. The P value of 0.01 was found to be statistically significant at 12 weeks. MAYO SCORES were evaluated at the end of 12 weeks and the mean value in group A was found to be 89.081 and in group B was found to be 84.914. The values were statistically significant with p value of 0.008.

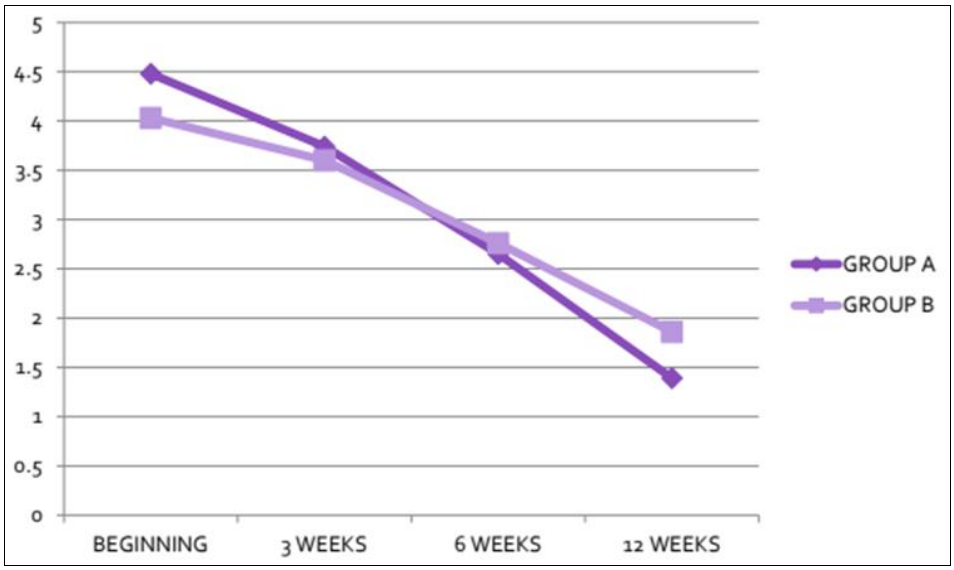

Fig 1: Comparision of VAS score throughout treatment

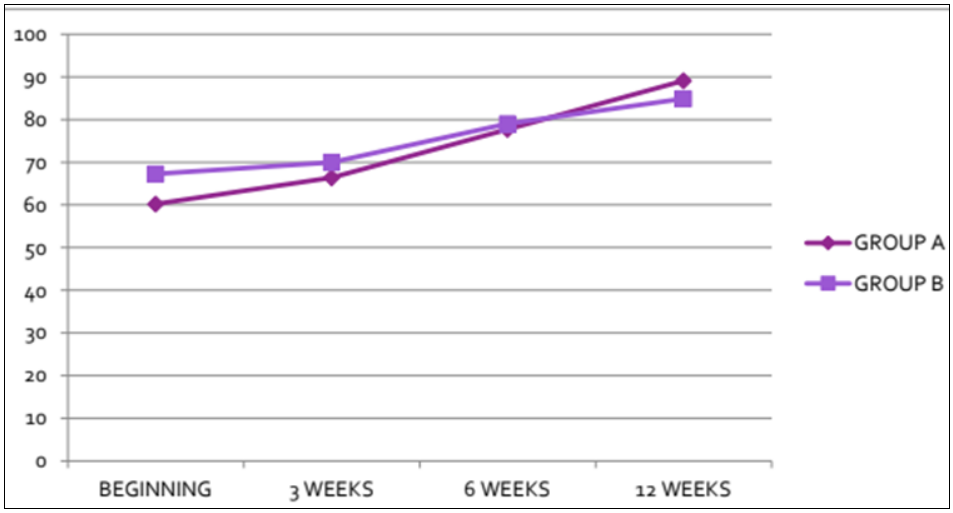

Fig 2: Comparision of mayo score throughout treatment

Evaluation of acute cases: VAS and MAYO scores were evaluated for acute cases who were treated in group A and it was noted that mean VAS score was 4.80, 3.80, 2.70 and 1.20 at beginning, 3rd week, 6th week and 12th week respectively. MAYO scores were evaluated and found to be 60.75, 67.9, 79.7, 93.1 at beginning, 3rd week, 6th week and 12th week respectively.

In group B it was noted that the mean VAS score was 4.0, 3.63, 2.56, 1.88 at beginning, 3rd week, 6th week and 12th week respectively. MAYO scores were evaluated and found to be 66.4, 68.2, 78.7, 84.3 at beginning, 3rd week, 6th week and 12th week respectively.

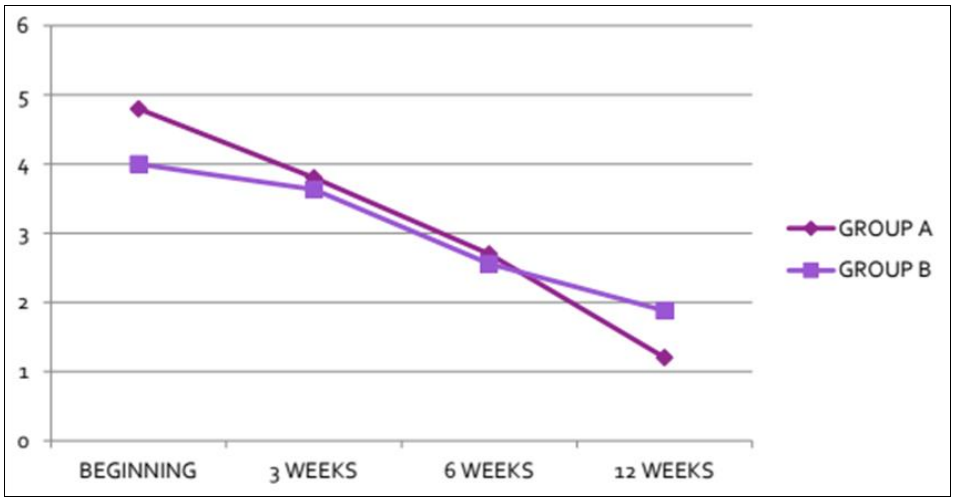

Fig 3: Comparision of VAS score in acute case

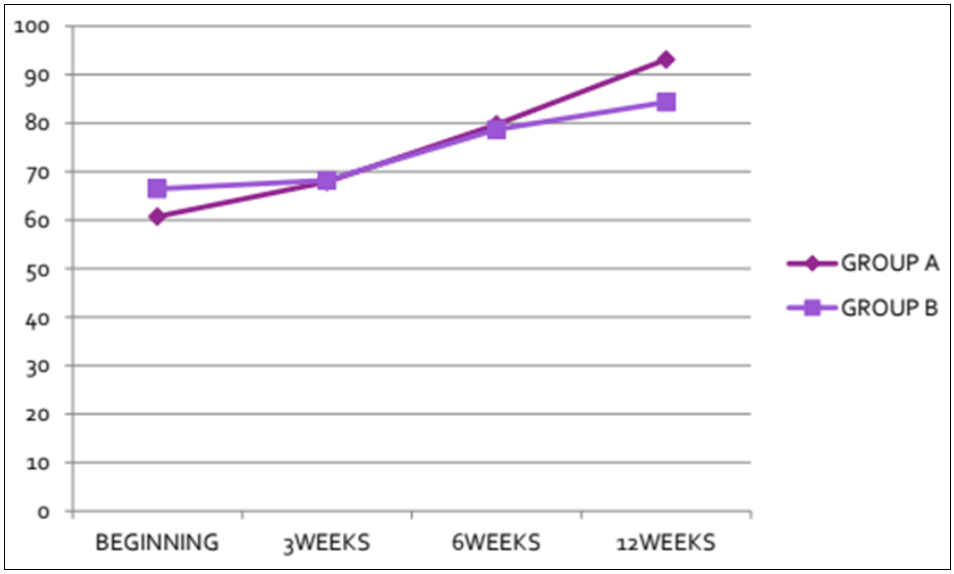

Fig 4: Comparision of mayo score in acute case

Evaluation of chronic cases: VAS and MAYO scores were evaluated for chronic cases who were treated in group A and it was noted that mean VAS score was 4.36, 3.77, 2.73 and 1.48 at beginning, 3rd week, 6th week and 12th week respectively. MAYO scores were evaluated and found to be 59.886, 65.2, 75.9 and 87.265 at beginning, 3rd week, 6th week and 12th week respectively.

VAS and MAYO scores were evaluated for chronic cases who were treated in group B and it was noted that mean VAS score was 4.08, 3.69, 3.08 and 1.85 at beginning, 3rd week, 6th week and 12th week respectively. MAYO scores were evaluated and found to be 68.2, 72.115, 79.4 and 85.577 at beginning, 3rd week, 6th week and 12th week respectively.

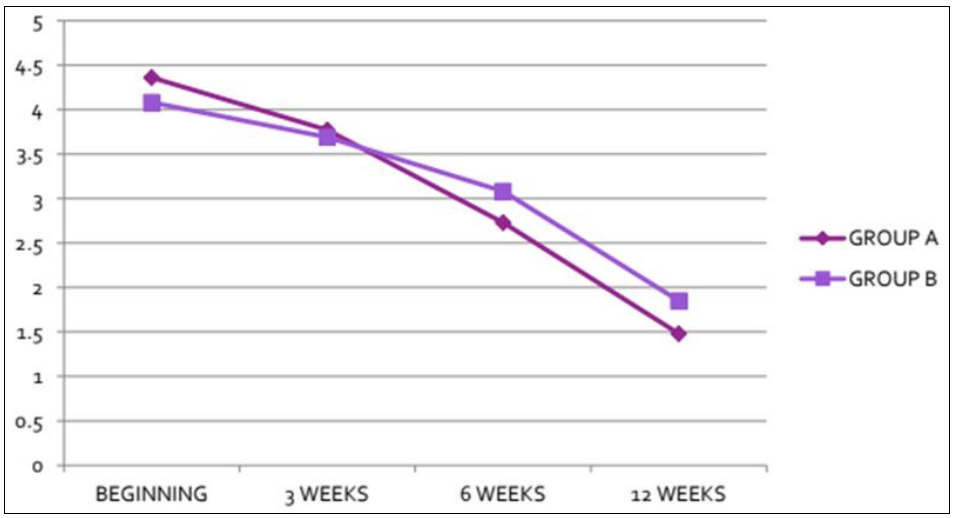

Fig 5: Comparison of VAS score in chronic case

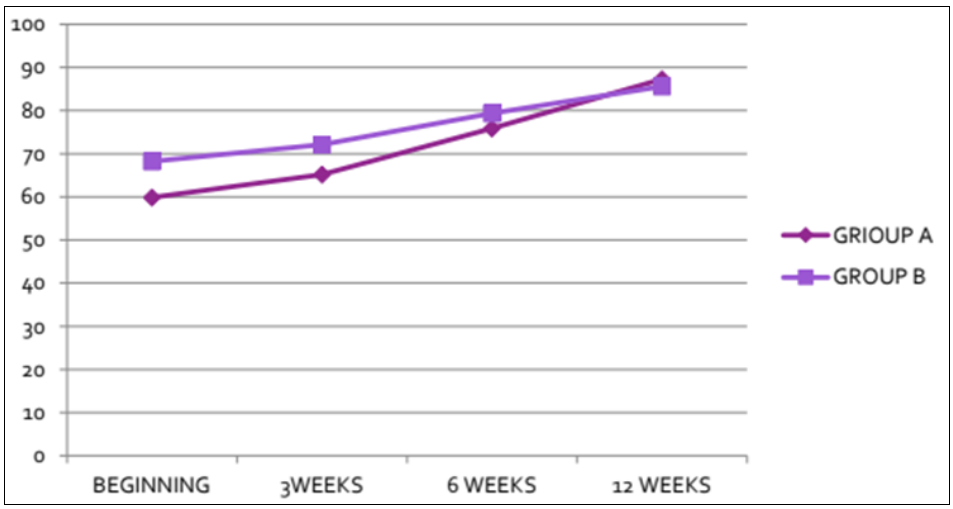

Fig 6: Comparision of mayo score in chronic case

Discussion

The main parameters considered in this study were pain and functional outcome.

In our study, the mean pre-treatment VAS score in PRP and US group was 4.48 and 4.03 respectively. The MAYO score was 60.24 and 67.241 respectively. The values in both the groups were comparable

At the end of 3 weeks there was a 16% and 10.6% decrease of VAS score in PRP and US group respectively and there was improvement in MAYO score by 9.2% and 3.9% respectively in PRP and US group. However it was not statistically significant.

At the end of 6 weeks, it was noted that in the PRP and US group the VAS score had decreased by 40% in the PRP group and 31% in the US group. The MAYO score improved by 22.4% and 15% in PRP and US groups respectively.

At the end of 12 weeks, the VAS score in PRP and US group had decreased by 68.9% and 53.8%. MAYO score had improved to 32.4% and 20.8% in PRP and USG respectively.

In a study by Ankit Varshney *et al*. [11], one month after the procedure, PRP-treated patients reported a mean of 70%improvement in VAS scores and MAYO scores had improved by 29.4% and at the end of 2 months VAS scores had improved by 81% and MAYO score had improved by 41.1%.

On evaluating the data comparing acute cases, the VAS score in the PRP group at beginning, there was a 20% decrease in the VAS score at 3 weeks, 43% decrease at 6 weeks and 75% decrease at 12 weeks. MAYO scores were improved by 13% at 3 weeks, 31% at 6 weeks and 54% at 12 weeks. In the US group there was 9% decrease in VAS score at 3 weeks, 36% decrease at 6 weeks and 55% decrease at 12 weeks. The MAYO scores improved by 3% at 3 weeks, 18% at 6 weeks and 26% at 12 weeks.

In chronic cases, there was 13% decrease in the VAS score at 3 weeks, 37% decrease at 6 weeks and 66% decrease at 12 weeks. MAYO scores were improved by 8% at 3 weeks, 21% at 6 weeks and 46.2% at 12 weeks. In US group there was 9.5%

decrease in VAS score at 3 weeks, 24% decrease at 6 weeks and 54% decrease at 12 weeks. The MAYO scores improved by 5% at 3 weeks, 16% at 6 weeks and 25% at 12 weeks. Autologous platelet rich plasma was found to give better results compared to US therapy, but the values were statistically significant only at 12 weeks.

In this study one patient who had bilateral lateral epicondyle tendinopathy, had initially taken PRP to the right elbow and the left elbow was treated with US therapy. None of the patients had any complications. One patient had an increase in pain following PRP therapy and was advised alternative therapy and the patient was lost to follow up. None of the patients were treated with NSAIDS and any increase in pain was managed in most of the patients with acetaminophen tablets.

Conclusion

Ultrasound and PRP therapies have a theoretical advantage over corticosteroids and other anti-inflammatory treatments, due to the lack of evidence for inflammation in lateral epicondylitis [10]. However controversy prevails over the efficacy of autologous platelet rich plasma and many research articles have suggested the need for a large number of clinical studies before implementing it as first line treatment of elbow tendinopathies [12].

In our study, autologous platelet rich plasma was found to give better results compared to Ultrasound therapy. But the values were significant only after 12 weeks. Platelet rich plasma and Ultrasound therapy can be used both in acute and chronic cases. Pain reduction and functional outcome were better in patients treated with PRP, but the values were statistically significant only after 12 weeks. Physiotherapy exercises (stretching exercises for 3 weeks followed by strengthening exercises) have to be advised for all the patients.

The limitations we faced in our study were that the sample size is small, Patients need to be followed up for longer duration to evaluate for recurrence and sustainability of improvement which was achieved and the cost benefit ratio for the patients in each group were not assessed.

Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Declaration: No funding received

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