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ORIGINAL RESEARCH

The Role of Platelet-Rich Plasma in Inducing Musculoskeletal Tissue Healing in Chronic Tendinopathies

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ABSTRACT

Background: Platelet-rich plasma [PRP] has received increasing interest across many musculoskeletal disciplines and has been widely applied clinically to stimulate tissue healing in numerous anatomical regions. The known actions of platelet-derived factors suggest that PRP may have significant potential in the treatment of pathological conditions of cartilage, tendon, ligament, and muscle.

Purpose: The aim of this manuscript is to review current literature regarding the biology of PRP and the efficacy of using PRP to augment healing of tendon ligament and muscle injuries, as well as early osteoarthritis.

Methods: A comprehensive literature review of musculoskeletal applications of PRP was performed, including basic science and clinical studies such as randomized controlled trials, case controlled series, and case series.

Results: The most compelling evidence to support the efficacy of PRP is for its application to tendon damage associated with lateral and medial epicondylitis. Although some promising studies have been reported supporting the use of PRP in osteoarthritis and ligament and muscle injuries, it currently remains unknown whether PRP effectively alters the progression of osteoarthritis or aids the healing of ligament and muscle tissues.

Conclusion: The rationale for the use of PRP to improve tissue healing is strong, but the efficacy for many musculoskeletal applications remains unproven. PRP has been shown to be a safe treatment. A number of questions regarding PRP remain unanswered, including the optimal concentration of platelets, what cell types should be present, the ideal frequency of application, or the optimal rehabilitation regimen for tissue repair and return to full function.

Keywords: platelet-rich plasma, ligament, healing, osteoarthritis, tendon

INTRODUCTION

The impact of musculoskeletal pathologies is immense and the widespread clinical burden has encouraged the search for products that effectively augment healing. Biologic healing utilizes the normal mechanisms for tissue repair and incorporates these at the site of injury. Blood components such as platelets migrate to the injury site and play an important role in tissue repair. Platelets contain various growth factors and cytokines that initiate and promote healing by stimulating cell migration, cell proliferation, angiogenesis, and matrix synthesis. Platelet-rich plasma (PRP) has received increasing interest across many musculoskeletal

disciplines and has been widely applied clinically to stimulate tissue healing in numerous anatomical regions. PRP is formed by isolating and concentrating platelets from peripheral blood and is the plasma fraction of autologous blood having a platelet concentration above baseline. [1-3]

The term PRP can be defined as the volume fraction of blood plasma, which has an increased concentration of platelets, from a baseline serum level. This number corresponds to a platelet count about 4–5 times higher than that contained in the blood, it usually ranges from 150,000 to 350,000/microlitre

PRP was used for the first time in 1987 by Ferrari *et al* with the purpose of reducing the transfusion of homologous blood products following open heart surgeries. Its use in orthopedic surgery began a decade ago Initially used with bone grafts to augment spinal fusion and fracture healing Indications have expanded widely

OBJECTIVES

- To evaluate the effectiveness of Platelet rich plasma injections in inducing pain relief in chronic tendinopathies.

MATERIALS AND METHODS

SOURCE OF PATIENTS

All patients visiting the outpatient Department of Orthopaedics, Mediciti Institute of Medical Sciences, hyderabad, during the period of June 2015 to June 2016, fulfilling the eligibility criteria.

METHODS OF COLLECTION OF DATA

SAMPLE SIZE

A prospective study of 60 cases satisfying the eligibility criteria visiting the outpatient Department of Orthopedics, Mediciti institute of Medical sciences, during the study period are be taken up for study.

PERIOD OF FOLLOW UP

1month – 3 months – 6months

INCLUSION CRITERIA

Both the genders aged 20 to 70 years were recruited from OPD. Chronic tendinopathy with Pain $\geq$ 3 months. Failed other modalities of management – Analgesics and physical therapy

EXCLUSION CRITERIA

- Isolated infection at injection site
- Platelet dysfunction
- Critical thrombocytopenia
- Immunocompromise patients
- Anticoagulation therapy
- Chronic Liver Disease
- Recent use of Corticosteroids

INVESTIGATIONS

- Complete Blood Picture
- CT, BT
- RBS
- HIV

- HBsAg

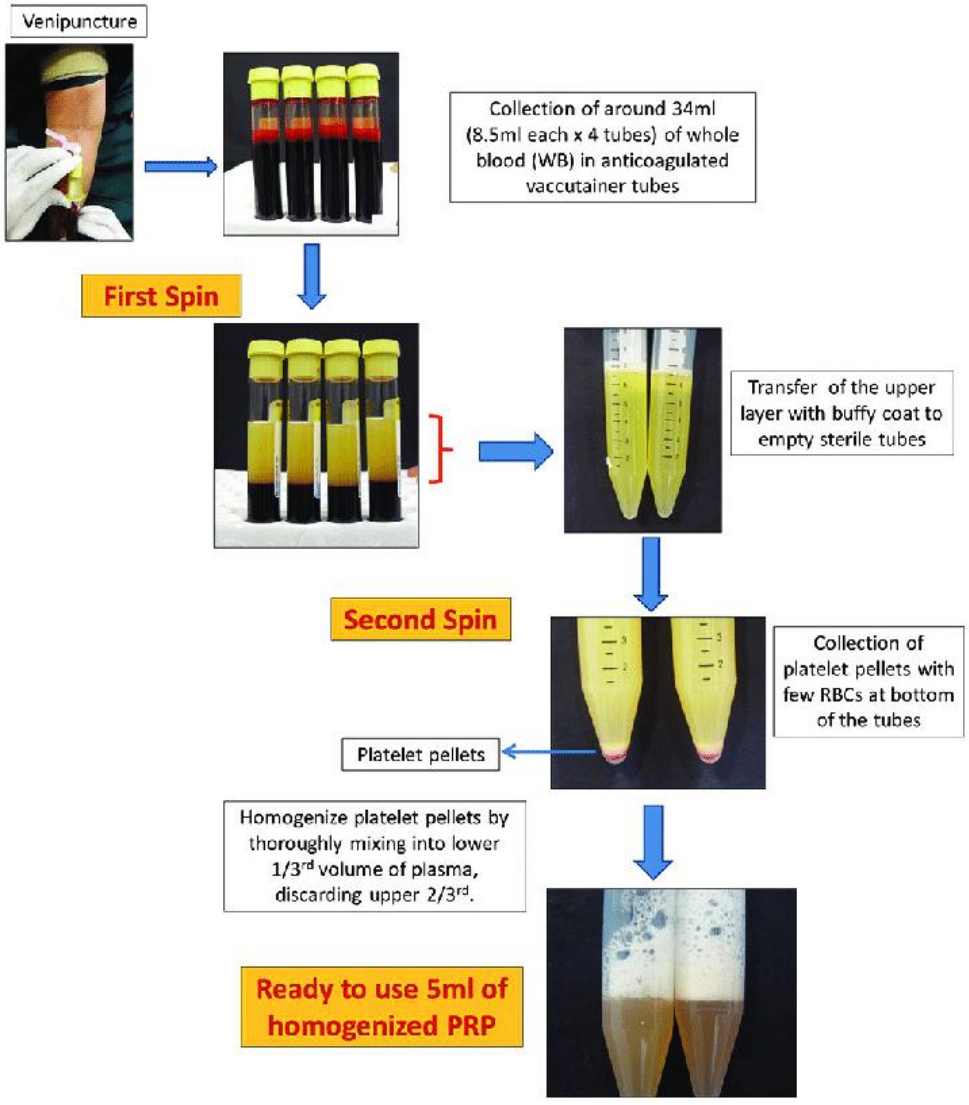
METHODOLOGY

When performing PRP injections, the amount of blood utilized depends somewhat on the problem that is to be tackled.

Elbow, foot, or hand - 22 ml of whole blood Shoulder, knee, or hip joint - 60 ml of whole blood 22 ml of whole blood typically produces 3 ml of PRP. 60 ml of whole blood will produce anywhere from 7 to 10 ml of PRP. Each subject underwent a single injection of PRP. At baseline, an antecubital blood drawn of 20 mL was concentrated in a centrifuge machine to yield 3.5 cc of PRP and a supra-physiological concentration of white blood cells. The lesion was marked and the area sterilely prepped. All injections were done under ultrasound guidance. A two-part injection process was used. An needle first placed 3 mL of 1% xylocaine proximal to the tendinopathic area. The needle was then re-inserted at the proximal aspect of the lesion and slowly removed while infiltrating of 3.5 mL of PRP.

- Ice may be used after the Procedure.
- In-person assessment occurred at 4, 12 weeks and at 24 weeks.
- Patients were discouraged from using NSAIDS and starting new therapies.
- Participants were advised to use relative rest including 2 days off work, then to slowly advance over 2 weeks and return to activity as tolerated.

Fig 1: PRP Isolation Methods



Anticoagulant: EDTA
first spin: 2000 rpm
Second spin: 4000 rpm
sterile EDTA tubes

RESULTS

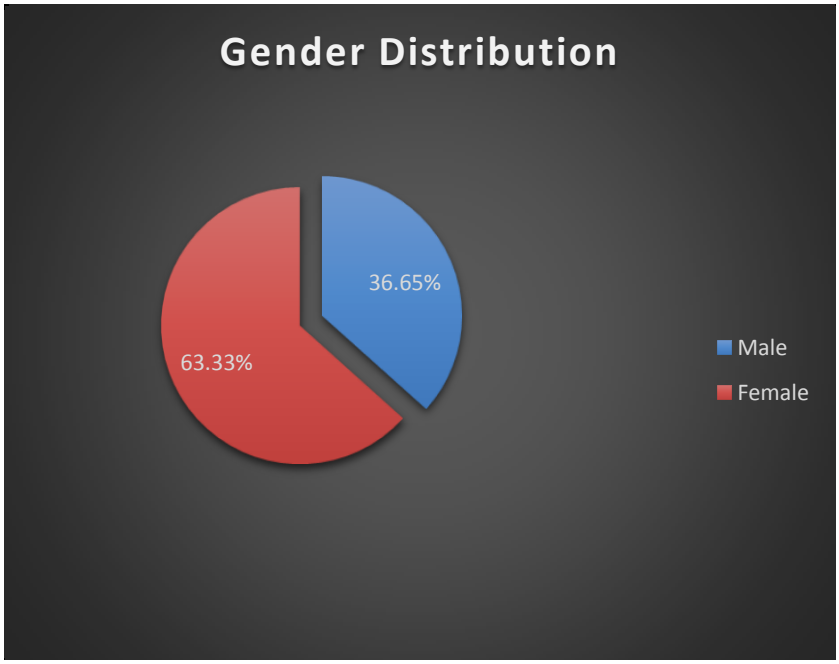


Fig 2: Gender distribution

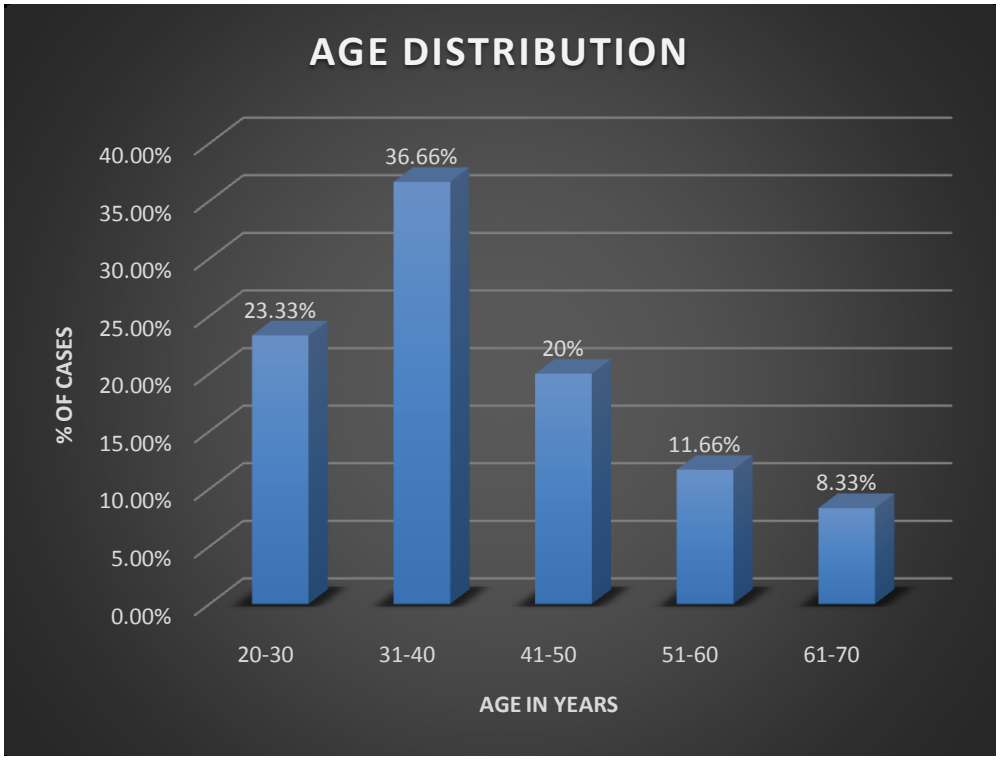


Fig 3: Age distribution

COMPLICATIONS

- Infection,

- Fever,
- Allergic reaction,
- Bleeding,
- Swelling,

- **Persistent increased pain**
- There are no complications observed in our study

VAS SCALE

- The primary outcome measure for all participants was a score on a 0-10 visual analog scale (VAS) assessing current resting pain at baseline and at 4, 12, and 24 weeks.
- The VAS is widely used in clinical medicine and as a research tool. Its utility as an outcome measure in chronic pain has been formally assessed

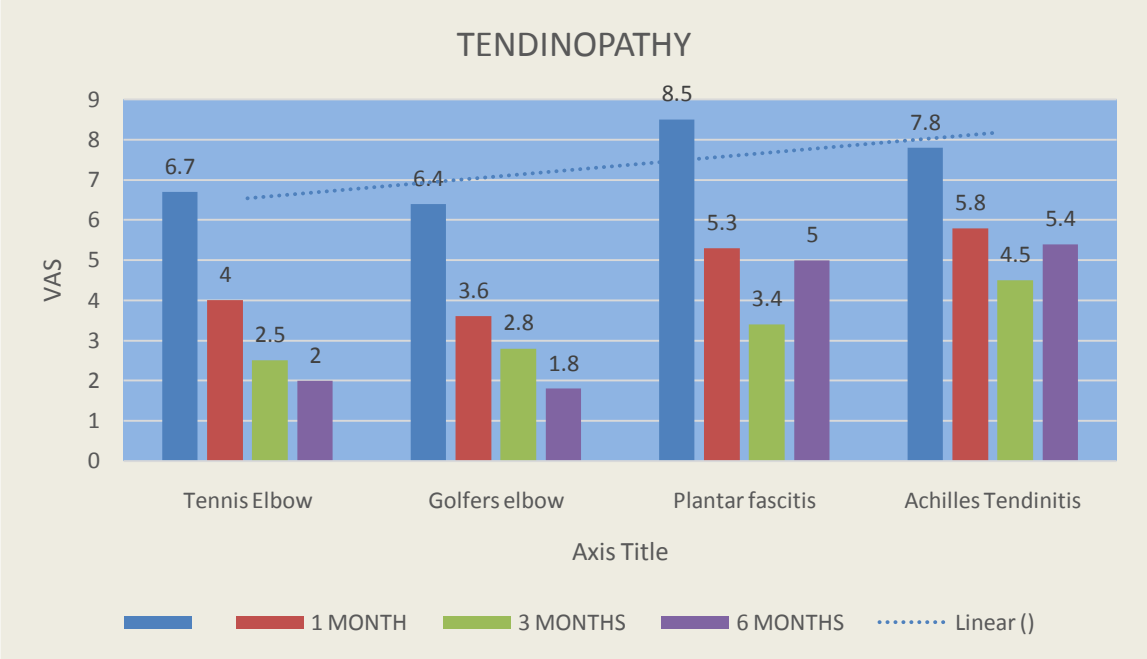


Fig 4: Duration of Tendinopathy

DISCUSSION

For over 20 years, PRP has been used in a variety of conditions with promising implications. Regenerative medicine has opened a new emerging window for the restoration of tissues with severe injuries using plateletrich plasma (PRP). PRP currently is considered investigational because there is insufficient data to support the use of PRP for all indications. The possibility of using patients' growth factors to enhance reparative processes in tissues with low healing potential, and the safety of these methods, explain the wide use of this biological approach [7]. We argue that patients should only be offered PRP for musculoskeletal injuries within the context of welldesigned clinical trials, with informed consent, highquality verbal explanations, and supporting written information . Even with recent advances in understanding PRP, there are still many unknowns about the factors and processes that make the treatment effective for musculoskeletal conditions. As we have seen from our study, the data is pretty much all over the place now, with studies both reporting positive effects, and others showing small or no benefits at all. Currently, PRP therapies have remained unsatisfactory in terms of therapeutic expectations because many individuals do not acquire sufficient benefits from PRP. While limited, current evidence suggests the use of PRP to be

safe. [4,5] Medical ethics is anchored by the concepts of beneficence (doing good) and nonmaleficence (do no harm). Because it is an autologous preparation, PRP is inherently safe and therefore free from concerns over transmittable diseases such as HIV, hepatitis, West Nile fever, and Cruetzfeldt-Jacob disease (CJD). Because PRP is derived from your own blood ("autologous" transplantation), there is no chance of having an allergy or immune reaction either. [6] In recent years, there has been a shift in treatment approaches for musculoskeletal conditions. The focus is being shifted toward a more exercise-based, biopsychosocial approach with using active treatments and a patient-centered focus and using less a "one-size-fits-all" approach. We now know that exercise is medicine, and is helpful in 26 health conditions (e.g., type 2 diabetes, hypertension, coronary heart disease, pulmonary diseases, musculoskeletal disorders (osteoarthritis, osteoporosis, back pain, rheumatoid arthritis). Best practice recommendations for musculoskeletal pain now recommend that care should be patient-centered, and that management of MsK pain should be by addressing physical activity and/or exercise. These recommendations come to play especially when we have conditions like osteoarthritis and tendinopathy, where we could benefit from a more holistic approach, targeting activity, exercise, and self-management. [8]

CONCLUSION

A single intralesional injection of PRP under ultrasound guidance resulted in a safe, significant, sustained improvement in pain. This suggests that PRP has the potential to heal the muscle-tendon unit of the chronic tendinopathies and may be a primary nonsurgical treatment for chronic tendinopathies where conservative management is not satisfactory. Improvements in pain are consistent with those reported in other studies of PRP for chronic musculoskeletal pain. PRP is an evolving treatment modality gaining momentum in primary care, rehabilitation, and sports medicine applications.

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