

**Case Report**

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# A Case Study of Non- Union of Right Second Metatarsal Bone by Using Activated Platelet Rich Plasma Gel



**Madhav Rayate\* and Parag Jhaveri**

*Fellow Regenerative Medicine, Stemreg-X Bio intelligence & Therapeutics Pvt Ltd, India*

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**\*Corresponding author:** Dr. Madhav Rayate, Fellow Regenerative Medicine, Stemreg-X Bio intelligence & Therapeutics Pvt. Ltd, Navi Mumbai, India, Tel: +918433824538; Email: madhavrayate@gmail.com

## Abstract

Non-union of fractures is conditions, happened due to infection, poor Nutrition or other underlined multiple disorders. Nonunion of fracture bone more than 6 months is consider as chronic one & unhealthy. Platelet rich Plasma is cocktail of various growth factors including VEGF, EGF, PDGF, FGF, IGF. All these factors play role in healing of nonunion fractures. in this Case We reported that Percutaneously Injected Activated PRP at the site of nonunion of fracture help in union of fracture site. We noted its promising case of PRP gel application in Nonunion.

**Keywords:** Platelet rich plasma gel; Regenerative Medicine; Nonunion; Growth Factors

## Introduction

Platelet Rich Plasma is rich source of cytokines and growth factors, it is Autologous product in which large volume of blood processed and collect platelet rich concentrate for therapeutic use [1,2]. platelet rich plasma has unique properties of osteogenesis and Angiogenesis Which rebuild blood circulation and help in Union of fracture. Cytokines are useful for fracture healing, Bone morphogenic Protein -7 shows healing effect in

Nonunion in clinical study [3]. Upon activation of PRP, Platelet Granule release cytokines like platelet derived growth factor (PDGF), Transforming growth factor (TGF-b), insulin like growth factor (IGF) [4]. PRP has Antimicrobial properties which is useful to eliminate micro bacterial flora from fracture side [5]. Due to 30 growth factor and cytokine cocktail, application of PRP showing promising result in nonunion.

## Case Report



**Figure 1:** Oblique and Anteroposterior view.

28 years old Man had accidental injury on 14 November 2014, open fracture of right second metatarsal was noted. He was treated at that time by orthopedic doctor. He was coming to me on November 2015, radiographic view shows Nonunion of second metatarsal fracture without open wound (Figure 1). After clinical evaluation of patient, we decided to go for fluoroscopic guided Activated PRP injection at nonunion site. We give multiple injection of PRP, we evaluate patient radiologically and clinically at 4 weeks interval up-to 6 months.

### PRP Gel

We collect patient 30ml whole peripheral blood each time in centrifuge tube with anticoagulant solution and 10 ml whole blood without anticoagulant [6,7]. Centrifuged at 1500 rpm for 8 minutes. We got three layers upper most layer is Platelet poor plasma (PPP), lower layer contains RBC and middle thin white layer is buffy coat. We collect Buffy Coat and upper Platelet poor plasma in another centrifuge tube and one more time it was centrifuged at 1500 rpm for 6 minutes. We collect lowermost 1/3 part and discard upper 2/3 part. lower 1/3 part is concentrated platelet rich plasma.

### Autologous Thrombin

We kept previously collected 10 ml whole blood without anticoagulant for 15 minutes at room temperature until completion of clot formation then we centrifuge at 2500 rpm for 10 minutes, supernatant serum contains thrombin, we mixed thrombin 1ml into 4 ml PRP along with 0.5ml Calcium gluconate solution (0.05 gm/ml) just 5 minutes before injecting into operating site. 18-gauge needle introduced into gap of nonunion fracture site by fluoroscopic guidance and activated PRP gel injected there without exposing nonunion site by using local anesthesia with lignocaine 2%. We injected total three doses of Activated PRP gel at 1-month interval.

### Outcome Measurements



**Figure 2:** Anteroposterior and oblique of right second metatarsal non-union view of right second metatarsal Fracture before PRP gel treatment. non-union after 3 months post PRP.

Evaluation of fracture healing was confirmed by clinically and radiologically, serial radiological views were taken at

every 4 weeks interval by two planes, healing of nonunion bone confirmed radiologically by bridging callus formation and crossing of bone trabeculae network at each follow up visit (Figures 2 & 3). Clinically we confirmed union by absence of pain, improvement in range of motion of affected extremities. Stress testing manually shows absence of motion at fracture site. We followed patient up to 6 months.



**Figure 3:** Oblique and Anteroposterior view of second metatarsal non-union After 6 months post PRP.

### Discussion

Several factors play role in union of fractures like type of fracture, site of fracture, infection. Infected nonunion is promising to manage, honestly speaking to manage infected nonunion is achieved by two ways by resolving local infection through debridement of wound and removing foreign body, secondly by systemic antibiotic coverage. PRP gel contains various growth factors and cytokines which help in healing. Bielecki et al. [8,9] performed Microbiological study of Platelet rich gel (PRG), they found strong antibacterial properties against MSSA (methicillin-sensitive staphylococcus aureus).

Mechanism of antibacterial properties of PRP is not yet established on the basis of available statistical data. Platelets delivered growth factors and cytokines at site of injury [10-13]. Evidence shows platelets has direct action against microorganism by antibody mediated cell cytotoxicity [14-17]. Few trials found antibacterial peptides delivered by platelets after stimulation by using thrombin [5]. PRP contains significant number of leucocytes which increased above base line level [13,18]. Neutrophils deal with killing of bacteria and lymphocytes stimulate antigen specific immunity [19,20]. Systemic antibiotic infusion enhances PRP mediated antibacterial properties [21].

PRP gel is actually convenient biomaterial used for union of fracture site [6,22,23] in this single case study we noticed despite infection, union of nonunion fracture end were established by delivering PRP gel at gap of fracture site. Further randomized multicenter clinical trials need to be carried out. PRP is biological product regularly used in various orthopedic indications for regeneration, pain management and healing purpose.

## Conflict of Interest

There are no conflicts of interest.

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