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Platelet Rich Plasma (PRP) injections

by Dr George Pitsis

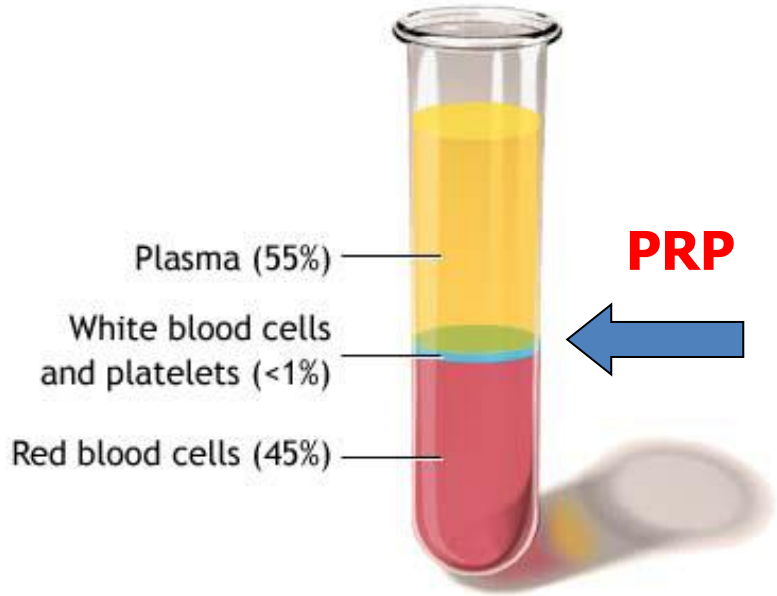
Platelet Rich Plasma (PRP) injections have in the more recent years attracted significant attention as a clinical tools to assist with treatment of musculo-tendinous injuries.

Interest in PRP injections was born out of the use of Autologous Blood Injections (ABI) as a way of improving the clinical results that had already been achieved with ABI in assisting with treatment of soft tissue injuries.

Autologous Blood Injections

For over a decade, research was performed on animal models to study the effect of ABI into tendons. Early studies performed by Taylor and colleagues in 2002 showed significant increase in tendon strength by 12 weeks. It soon followed a year later that clinical studies in athletes would be performed, with promising results. Edwards and Calandruccio described a nearly 80% success rate with reduction of pain being one component in athletes suffering from “lateral epicondylitis”.

Platelet Rich Plasma (PRP) injections



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As interest in ABIs grew, so did the question as to why it worked to assist with soft tissue healing. Much work has gone into this area, and 5 major growth factors in platelets have been isolated as most likely having a role to play in soft tissue injury repair. These are:

1. PDGF – Platelet Derived Growth Factor, involved with protein DNA and Synthesis, cellular migration and proliferation, various other growth factor expression, angiogenesis, mitogen for fibroblasts
2. VEGF – Vascular Endothelial Growth Factor, involved with angiogenesis
3. TGF-B1 – Transforming Growth Factor – Beta 1, involved in matrix synthesis, and cellular migration and proliferation, key regulator in balance between fibrosis and myocyte regeneration
4. EGF – Epidermal Growth Factor, involved in cellular migration and proliferation
5. bFGF – basic Fibroblast Growth Factor, involved in cellular migration, and angiogenesis

Intuitively, it would make sense in the normal course of soft tissue injury that platelets would hold a significant function in soft tissue repair. Initially, platelets are involved with haemostasis, central to blood clotting and minimising blood loss. It logically follows platelets that have accumulated at the site of injury locally release growth factors critical in soft tissue repair.

The natural process of soft tissue (tendon) healing and repair is briefly summarised. During the first 2 days, an inflammatory response is induced by neutrophil migration, followed by macrophages. Activated macrophages are involved in releasing multiple growth factors, including the ones already listed above. At day 3, angiogenesis begins, with concurrent fibroplasia and collagen synthesis, and subsequent tendon healing and repair. A significant amount of remodelling occurs with re-alignment of collagen fibrils adding to tendon strength over time.

So how does PRP help the injured person? The theory is a few weeks after trauma, the growth factor levels in the local tissues and initial healing cascade diminish. The purpose of a PRP injection is to reproduce this initial environment of healing to achieve further tissue repair.

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Many studies and review articles, some listed in the reference section, have now been performed on the effectiveness of PRP injections in assisting with tendon, muscle, and ligament healing and rehabilitation. The majority of the studies performed to date have shown significant benefit with reduction of pain and increase in function exceeding that of cortisone injections. There are more recent well documented level 1 evidence papers[1, 2, 15] in the literature which have cemented PRP injections as being well-accepted gold standard preferred treatments for a number of conditions.

WADA and PRP injections

Initial controversy surrounded ABIs under the 2004 WADA guidelines that "prohibited blood doping, including the use of autologous, homologous, or heterologous blood or red blood cell products of any origin." The intention at the time was to ban the use of large volumes of blood doping in endurance athletes, especially cyclist, who were renowned in the use of this technique to gain an edge against their component. Of course, it was banned as it not only increased the risk of developing deep Venous Thromboses (DVTs) and subsequent Pulmonary Emboli (PEs) which have caused deaths in otherwise extremely fit and healthy athletes, but it was seen as cheating and against the "Spirit of Sport". From the point of view of ABI and PRP injections, only 2ml of the patient's blood is re-injected, and poses no performance benefit to the athlete, apart from helping them recover from recalcitrant injuries.

PRP harvesting

Many methods exist in the way in which PRP is generated. Initially, venesection is performed using an aseptic technique to attain the blood. This is introduced aseptically into the kit with an anti-coagulant present, and then centrifuged to separate the whole blood into layers according to density. In between the red blood cells on the bottom and the blood plasma on the top lies the white buffy coat rich in platelets as well as white blood cells. Various techniques, including well developed commercial options, exist to extract the platelets, resulting in platelet rich plasma. The technique used in our clinic results in 6 to 12 times increased concentrations of platelets.

As anti-inflammatory drugs interfere with platelet function, these must be ceased at least 10 days prior to harvesting.

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PRP injection

With the PRP prepared, local anaesthetic is added. The combined injectate is carefully guided under sterile conditions to the site of injury with an ultrasound, corresponding to the site of maximal pain and tenderness. Immediate relief from the local anaesthetic indicates a successfully targeted injection and confirms the correct diagnosis of causing the patient's symptoms.

Adverse side effects

There are little in the way of major side effects. Tiny risks of infection and adverse side effects from the local anaesthetic exist. However, the most common problem that exists is ache and pain, which is widely variable from very little to significant lasting from one day to a few weeks. Analgesia is prescribed and icing is recommended.

Applications of PRP

PRP has wide applications in assisting with soft tissue heeling. The majority of the research and success however has been with tendinopathy, especially with tendinosis and partial tears. Common tendons include elbow common extensor (tennis elbow) and flexor (golfer's elbow) tendons, patella, proximal hamstring, Achilles, gluteal and rotator cuff tendons to name a few. Plantar fasciosis and partial tears also respond extremely well to PRP injections.

There are also applications of PRP injections for use with people who suffer osteoarthritis of their joints, with good to excellent results. Orthokine injections are an alternative for use in osteoarthritic joints.

Is must be kept in mind PRP injections are an adjunct to an comprehensive conservative treatment plan, and are most successful when used in this way. Performing a concurrent rehabilitation program, correcting biomechanical predisposing causes, and using various other treatment modalities ensure the best outcome.

PRP continues to work for 6 weeks or more. Various protocols exist, and it is not uncommon to repeat the injection. The injections may be repeated earlier than 6 weeks, depending on the circumstances. Occasionally more than 3 injections are required.

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References

1. Mishra A, Skrepnik N, Edwards S, et al. Platelet-Rich Plasma Significantly Improves Clinical Outcomes in Patients with Chronic Tennis Elbow. AJSM Vol. 20, No. 10, July 3 2013.

2. Peersbooms J, Sluimer J, Bruijin D, et al. Positive Effect of an Autologous Platelet Concentrate in Lateral Epecondylitis in a Double-Blind Randomised Control Trial: Platelet-Rich Plasma versus Corticosteriod Injection with a 1-Year Follow-up. Am J Sports Med 2010 38: 255.

3. de Vos R, Weir A, van Schie H, et al. Platelet-Rich Plasma Injection for Chronic Achilles Tendinopathy. JAMA Vol. 303 No.2, Jan 13 2010.

4. Foster T, Puskas B, Mandelbaum B, et al. Platelet-Rich Plasma. Am J Sports Med 2009 37: 2259.

5. Mishra A, Pavelko T. Treatment of Chronic Elbow Tendinosis with Buffered Platelet-Rich Plasma. Am J Sp Med. 2006; 10 (10): 1 – 5.

6. Sanchez M, Anitua E, Orive G, et al. Platelet-Rich Therapies in the Treatment of Orthopaedic Sport Injuries. Sports Med 1 May 2009; Vol 39; Issue 5; 345 – 354.

7. Hall M, Band P, Meislin R, et al. Platelet-Rich Plasma: Current Concepts and Application in Sports Medicine. J Am Acad Orthop Surg 2009; 17; 602 - 608.

8. Sampson S, Gerhardt M, Mandelbaum B. Platelet Rich Plasma Injection Grafts for Musculoskeletal Injuries: a review. Curr Rev Musculoskelet Med 2008 1: 165-174.

9. Creaney L & Hamilton B. Growth Factor Delivery Methods in the Management of Sports Injuries: the State of Play. Br J Sports Med 2008; 42; 314 - 320.

10. Hall M, Band P, Meislin R, et al. Platelet-Rich Plasma: Current Concepts and Application in Sports Medicine. J Am Acad Orthop Surg 2009; 17; 602 - 608.

11. Gamradt S, Rodeo S, and Warren R. Platelet-Rich Plasma in Rotator Cuff Repair. Tech Orthop March 2207; Vol. 22 No. 1; 26 - 33.

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12. Everts P, Overdevest E, Jakimowicz J, et al. The use of Autologous Platelet - Leukocyte Gels to Enhance the Healing Process in Surgery. Surg Endosc 2007 21: 2063 - 2068.

13. Eppley B, Woodell J, Higgins J. Platelet Quantification and Growth Factor Analysis from Platelet-Rich Plasma: Implications for Wound Healing. Plastic Recon Surg: Nov 2004; Vol. 11; Issue 6; 1502 - 1508.

14. Hamilton B. Therapeutic Use of Autologous Blood Products in Track and Field. 2006 IAAF World Anti-Doping Symposium. Session 3.

15. Fitzpatrick J, Bulsara M, and Zheng M. The Effectiveness of Platelet-Rich Plasma in the Treatment of Tendinopathy - A meta-analysis of Randomised Controlled Clinical Trials. AJSM Vol. 45, No. 1, 2017

16. Fitzpatrick J, Bulsara M, McCrory P, et al. Analysis of Platelet-Rich Plasma Extraction – Variation in Platelet and Blood Components Between 4 Common Commercial Kits. Orth J Sports Med, 5(1), 2017.

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