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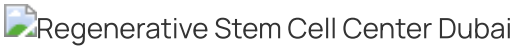
Platelet-Rich Plasma Therapy (PRP)



Cartilage is the tough but flexible tissue that covers the ends of your bones at a joint and supports other parts of your body. Healthy cartilage protects bones by preventing them from rubbing against each other. Cartilage injuries have ended many athletes' careers-including that of former two-sport star Bo Jackson-and the general wear-and-tear of the joint-cushioning tissue is something that almost everyone will endure as they age. Unfortunately, repairing cartilage remains difficult: Without blood flowing through it, cartilage has a hard time healing on its own and no chance of regenerating once it's gone.

A **new era in the treatment** of orthopedic and musculoskeletal conditions is now being firmly established. The use of platelet rich **plasma (PRP)** and other **biologic** materials has captured the interest of not only medical practitioners but more importantly, patients. The theoretical benefit is that conditions previously treated with medications such corticosteroids and non-steroidal anti-inflammatory agents could now be treated with a more natural solution, a preparation made from the blood of the person being treated. To many people, this sort of treatment is very attractive and desirable. There are many questions about PRP: What is it; how was it first used; how does it work; is it safe; is it effective; what kind of conditions can be treated? The hope is that after reading this primer, that one will walk away with strong basic knowledge.

What is it?

PRP is a preparation made from a patient's own blood. The collection is a simple and safe procedure where a volume of 20-60cc of blood is obtained, not too much different than a blood draw when labs are checked at a doctor's office. The blood is then mixed with an anticoagulant so that a blood clot does not form in the tube or vessel, using EDTA or in some cases heparin. Next, a centrifuge is used to separate the mixture into three distinct layers based on the size of the cells. In the top layer where there are not many cells, but mostly serum and proteins, this is called the platelet poor layer or PPP (platelet-poor plasma). The middle layer is called the buffy coat, and it contains some smaller white blood cells and most of the platelets and is aptly called PRP or platelet-rich plasma. The final layer is composed mostly by red blood cells. This process can be done manually in a lab by

a hematologist, or by using one of the commercially available devices that will perform the separation. When the separation has been completed the PRP is ready for use.

What is so special about platelets?

Inside the platelets are bodies called a-granules, and inside these granules are a collection of important factors that are important for healing and regeneration. Just a few of the well-known proteins or cytokines that are found in the a-granules include VEGF (vaso-endothelial growth factor), PDGF (platelet-derived growth factor), IGF (insulin derived growth factor), and TGF-b (transforming growth factor beta). PRP is a preparation that is mostly injected into areas of injury or degeneration, and because of the potent factors that are found within the platelets, when they become active, these factors stimulate a healing or regenerative response at the site of interest. Activating the platelets with calcium chloride or with thrombin is being reported less recently, so this is an area that many do not worry about any longer. But there is a choice concerning the presence of white blood cells (WBCs) either being included or excluded in final preparation. Many agree that for extra-articular problems like tennis elbow, or jumper's knee that a preparation with WBCs is warranted without activation because the damaged collagen in the area of interest will activate the platelets. For intra-articular injections, there is general consensus that preparations lacking WBCs are better for the joint environment and are therefore recommended.

Prior to treatment it is important to cease all NSAID or corticosteroid use, as these medications will interfere with the regenerative process; narcotics and paracetamol are indicated to ensure adequate pain control post-treatment. Most will institute a short period of immobilization and limited weight-bearing for 2-3 days, then initiate a gentle stretching program that will advance to joint mobilization and eventual strengthening. PRP is not a panacea or a magic bullet, it is a healing response treatment, and sometimes positive results can be delayed, so informing the client that it may be 6-8 weeks to realize improvement is important. Also warning the patient about pain flares is also important, especially when using the kits that do not remove the WBCs, in most instances the flare will last from 1-2 days.

How is it used?

PRP was first used in the early 90s by oral and maxillofacial surgeons who were trying to find ways to improve the fixation of dental implants being placed. What was found is that when PRP was used, improved bone growth occurred. Later PRP was used in orthopedics to successfully treat conditions like tennis elbow, heel spurs, and delayed healing of long bones. More recently, PRP has been used to treat tendonitis of shoulder, elbow, knee, ankle, as well as arthritic conditions of the ankle, knee, hip, shoulder, hand, and foot. The most popular area of use of PRP has been in plastics/ dermatology/ aesthetics medicine where the so called 'vampire facelift' was popularized by celebrities for a surgery-free procedure that promised to erase years from one's face.

How does it work?

What is so neat about PRP is how it works. Years ago, scientists unraveled some of the action mechanisms in the lab, and what was found is that the PDGF (platelet-derived growth factor) activates pericytes. Later it was discovered that these pericytes were inactivated mesenchymal stem cells. Once these cells become activated, they act as 'general directors' of healing and regeneration and release a myriad of cytokines and other factors that have trophic, anti-inflammatory, mitogenic, anti-scarring, and anti-infection attributes. In the case of the dental implants, osteoblasts were activated by the pericytes to realize improved bony in-growth of the implants. This action has been confirmed by laboratory investigations. In the case of osteoarthritis of the knee, the cartilage that is lost as an after-effect of the normal aging process is not 'regrown' but the environment is altered so that there is less pain, and less further loss of the knee cartilages. In many respects it alters the progression or worsening of the disease, and it is hoped by many that surgeries, such as knee replacements, are delayed or avoided altogether. Today, PRP is used in many areas of medicine in the US and Europe for treating musculoskeletal problems, plastics, aesthetics, dermatology, general surgery, ENT, rheumatology, primary care, pain management, and physical medicine and rehabilitation. Negative side effects and complications are uncommon as with many current treatments and medications in use today.

Side Effects and Complications

There have been very few reported side effects or complications from the use of PRP in clinical practice. Most of the reported complications stem from the preparation of the PRP, and not the PRP itself. It is important that the practitioner has a comprehensive knowledge of how PRP works, the different ways to prepare, whether activation is required for the condition being treated, and if white blood cells are needed in the preparation for clinical effectiveness. With so many different companies providing many different types of kits, it is really important to know one is administering. Preparation of the PRP in a closed system, or in preparation hood is one way to make sure that the PRP is not contaminated, and should be done routinely. Some have questioned the effectiveness, and rightly so, as the indications of use, correct preparation, and treatment regimens have still not completely been worked out by high-level scientific investigations for all areas of treatment.

There has been an exponential increase in the number of studies for the evaluation of safety, as well as efficacy in treating many common musculoskeletal conditions in the last 10 years. Randomized controlled trials have been completed and show efficacy for knee osteoarthritis, tennis elbow, plantar fasciitis, and to augment the repair of rotator cuff tear and have demonstrated positive two years + results.

Summary

PRP is a viable and inexpensive option for the treatment of common musculoskeletal conditions. PRP is safe and efficacious for the treatment of a myriad of conditions. The use of commercially available kits helps to create a consistent product as well as making sure to maintain sterility during any procedures. Preparations with WBCs are indicated for the common enteropathies like tennis elbow, plantar fasciitis, jumpers knee, and Achilles tendonitis. For intra-articular problems like OA of the knee and shoulder, it is best to administer PRP without WBCs, as this will decrease the pain

flare. After a short period of immobilizations and limited weight bearing followed by a gentle stretching program, patients are usually back to work within a week.

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