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Platelet Rich Plasma (P.R.P) Treatment: A View

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ABSTRACT
The ability of PRP to provide huge amounts of growth factors and various proteins, which are able to stimulate the healing process, represents the key factor for widespread clinical use. In various tissues, including the musculoskeletal, mending process takes quite a while because of restricted blood flexibly and moderate cell turnover. The use of PRP speeds up the neovascularization and therefore increases the blood supply and nutrients influx necessary for cell regeneration in damaged tissue. Also, by increasing the blood supply, PRP stimulates the requirement, proliferation and differentiation of the cells, which are involved in the healing process. The enthusiasm for the utilization of PRP in dermatology has as of late expanded. It is being utilized in a few unique applications as in tissue recovery, wound recuperating, scar update, skin reviving impacts, and alopecia. PRP is a natural item characterized as a part of the plasma division of autologous blood with a platelet concentration over the gauge. It is gotten from the blood of patients gathered before centrifugation.

Keywords: *Platelet Rich Plasma, PRP, Alopecia.*

INTRODUCTION
Platelet-rich plasma (PRP) is otherwise called platelet-rich growth factors (GFs), platelet-rich fibrin (PRF) lattice, PRF, and platelet concentrate. The idea and portrayal of PRP began in the field of hematology [1]. Hematologists made the term PRP during the 1970s so as to portray the plasma with a platelet tally over that of fringe blood, which was at first utilized as a transfusion item to treat patients with thrombocytopenia [2]. After ten years, PRP began to be utilized in maxillofacial medical procedure as PRF. Fibrin had the potential for adherence and homeostatic properties, and PRP with its calming attributes animated cell expansion [3]. Hence, PRP has been utilized prevalently in the musculoskeletal field in sports wounds. With its utilization in proficient sportspersons, it has pulled in across the board consideration in the media and has been widely utilized right now. Other clinical fields that likewise use PRP are heart medical procedure, pediatric medical procedure, gynecology, urology, plastic medical procedure, and ophthalmology [4,5].

PLATELET BIOLOGY
All blood cells get from a typical pluripotent immature microorganism, which separates into various cell lines. Every one of these cell arrangement contains forerunners that can separate and develop. Platelets, likewise called thrombocytes, create from the bone marrow.

Platelets are nucleated, discoid cell components with various sizes and a thickness of around 2 μm in width, the

littlest thickness of all blood cells. The physiological include of platelets coursing in the blood stream ranges from 150,000 to 400,000 platelets for every μL.

Platelets contain a few secretory granules that are significant to platelet work. There are 3 sorts of granules: thick granules, o-granules, and lysosomes. In every platelet there are roughly 50-80 granules, the most plenteous of the 3 sorts of granules. Platelets are essentially liable for the conglomeration procedure. The principle work is to add to homeostasis through three procedures: bond, actuation, and conglomeration. During a vascular sore, platelets are actuated, and their granules discharge factors that advance coagulation [6]. Platelets were thought to have just hemostatic action, in spite of the fact that as of late, logical research and innovation has given another point of view on platelets and their capacities. Studies propose that platelets contain a plenitude of GFs and cytokines that can influence aggravation, angiogenesis, undifferentiated cell movement, and cell multiplication [7].

PRP is a characteristic wellspring of flagging particles, endless supply of platelets in PRP, the P-granules are degranulated and discharge the GFs and cytokines that will change the pericellular microenvironment. The absolute most significant GFs discharged by platelets in PRP incorporate vascular endothelial GF, fibroblast GF (FGF), platelet-determined GF, epidermal GF, hepatocyte GF, insulin-like GF 1, 2 (IGF-1, IGF-2), matrix metalloproteinases 2, 9, and interleukin 8 [1,8].

CLASSIFICATION OF PRP

Characterizing the type of PRP used will lead to a better understanding of PRP, and data available will be easier to sort and interpret. Furthermore, this terminology would serve as a basis for further research on the topic.

In 2009, Dohan Ehrenfest *et al.* [9] proposed a classification of 4 main families of preparations following 2 principle parameters**:** presence or absence of cell content (such as leucocytes) and the fibrin architecture:

1) **Pure PRP or leucocyte-poor PRP**: the preparation obtained is without leucocytes and shows a low-density fibrin network after activation.
2) **Leucocyte and PRP:** the preparations contain leucocytes and show a low-density fibrin network after activation.
3) **Pure PRF or leucocyte-poor PRF:** preparations are without leucocytes and with a high-density fibrin network. Unlike pure PRP or PRP containing leukocytes, these products cannot be injected and exist in an activated gel form.
4) **Leucocyte-rich fibrin and PRF:** products are preparations with leucocytes and with a high-density fibrin network.

Mishra *et al.* [10] proposed another classification based on the presence or absence of white blood cells, activation status, and platelet concentration, based on the coefficients of an increase in the platelet and leukocyte concentration in PRP compared to the whole-blood baseline, as well as on PRP activation [11]. The classifications were not consensual and there is still the intent to search a classification for PRP that could characterize the injected PRP in order to compare the efficacy of different studies.

An important point of discussion is that in the previous classifications, the authors did not take into account the final volume of the preparation, the presence or absence of red blood cells (RBCs) in PRP, and the doses of platelets in the final volume of PRP obtained. In 2016, Magalon *et al.* [11] proposed the DEPA classification (Dose, Efficiency, Purity, Activation) that focuses

on the quantity of platelets obtained by the PRP kits as well as on product purity and on platelet activation prior to injection.

The DEPA Classification is based on 4 Different Components:

1) **Dose of injected platelets:** Calculated by multiplying the platelet concentration in PRP by the obtained volume of PRP. As indicated by the infused portion (estimated in billions or a great many platelets), it ought to be ordered into
   a) Exceptionally high portion of infused platelets of >5 billion.
   b) High dose of injected platelets, from 3 to 5 billion.
   c) Medium dose of injected platelets, from 1 to 3 billion.
   d) Low dose of injected platelets, <1 billion.

2) **Efficiency of the Production:** Corresponds to the percentage of platelets recovered in the PRP from the blood. It is categorized as follows:
   a) High device efficiency, if the recovery rate in platelets is >90%.
   b) Medium device efficiency, if the recovery rate in platelets is between 70 and 90%.
   c) Low device efficiency, if the recovery rate is between 30 and 70%.
   d) Poor device efficiency, if the recovery rate is <30% and corresponds to the relative composition of platelets, leucocytes, and RBCs in the obtained PRP.

3) **Purity of the PRP obtained:** Correlates to the relative composition of platelets, leucocytes, and RBCs in the obtained PRP. It is described as
   a) Very pure PRP, if the percentage of platelets in the PRP, compared with RBCs and leucocytes, is >90%.
   b) Pure PRP, between 70 and 90% of the platelets.
   c) Heterogeneous PRP, if the percentage of platelets is between 30 and 70%.
   d) Whole-blood PRP, if the percentage of platelets in the PRP is <30% compared with RBCs and leucocytes.

4) **Activation Process:** If an exogenous clotting factor was used to activate platelets, such as autologous thrombin or calcium chloride.

PRP PROCEDURE

The PRP treatment is a four-step process as explained below –

1) Collection of Blood Sample

As the first step of the PRP hair loss treatment or any of indicated treatment process, take a 20 ml blood sample.

2) Separation of Platelets

Use the centrifuge technique for the separation of platelets from the blood generally spped up 3000 to 4000 per minute for 10 to 15 minutes. The twofold turn technique guarantees the ideal grouping of platelets that are rich in development factors.

3) Extraction and Activation of PRP from the Blood

Concentrate Platelet Rich Plasma (PRP) from the rest of the layers of Platelet Poor Plasma (PPP), and red blood cells in the tube. Before injecting the PRP into a patient's scalp, activate the growth factors in the plasma using an activating agent.

4) Insertion of PRP Into Affected Area With Injections

In the last step, inject the PRP extracted from the blood safely into the affected area on the scalp with the use of micro- needles or other indicated diseases with help of micro needles.

Few drops of platelet-rich blood plasma are obtained from this process. After that, apply the anesthetic cream to the area that gets injected. PRP liquid is then injected. This PRP infusion methodology may cause mellow agony and disturbance for 2-3 days. The PRP process generally takes approximately 30-60 minutes (Figure 1).

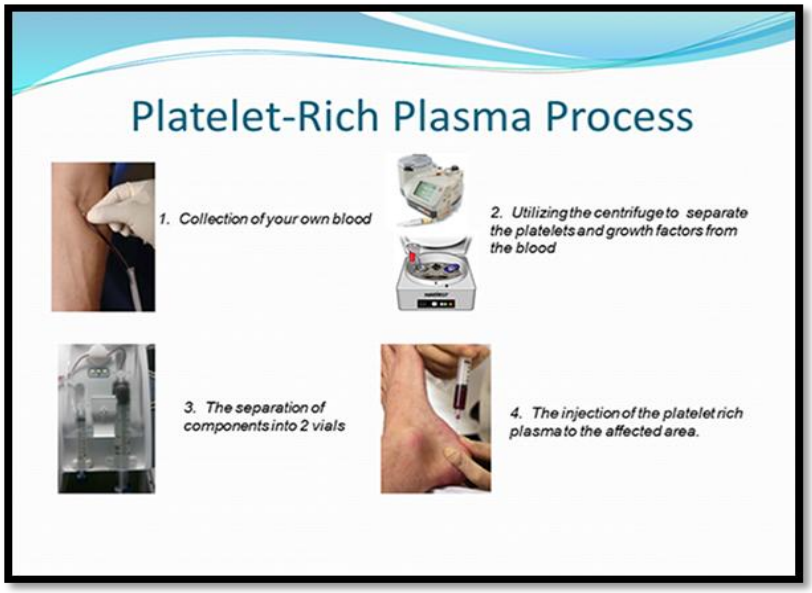

Fig. 1. Process of Platelet-Rich Plasma

PRP MECHANISM OF ACTION

Platelets are the cells in the blood answerable for tissue recuperating and new cell development. At the point when blood containing these platelets is centrifuged (as in PRP), the seven development factors present are amassed in a gigantic sum. These growth factors act as 'fertilizer' for our bodies stem cells.

1) Activation of these stem cells has many positive results:
2) Synthesis of Collagen (dermal thickening and wrinkle reduction)
3) Neovascularization / Formation of new blood vessels (skin's rosy glow)
4) Stimulation of fat growth (improved volume under the skin)
5) Synthesis of Keratinocytes (new skin cells) Enhancement of Smooth Muscle (improved tone)

COMPONENTS OF PRP

To understand what PRP therapy is and how it works, it is first essential to understand each individual component. It will surprise you to know that PRP has every kind of cell needed by the body to heal injuries and recreate the tissues.

Platelets

Each time you have an injury, the platelets in your blood act quickly to clot and stop further bleeding, effectively closing the wound. Platelets are the basic framework of cells that damaged tissues use to regenerate around. These cells have the capability to transform themselves into the exact kind of tissues that they are aiming to heal. Platelets contain two kinds of storage granules, dense and α. When the platelets are activated, they release these granules and support healing.

Dense Storage Granules

The dense storage granules cause the clotting action you see when the blood sets on a wound. They contain:

1) **Adenosine triphosphates:** They store the energy you need.

2) **Adenosine diphosphates:** They help in the transfer of energy between cells.
3) **Serotonin**: A natural relaxant that also relieves pain
4) **Calcium**: A mineral needed for the regeneration of cells

"α" Storage Granules

The "α" storage granules assist in the healing since they contain growth factors and cytokines that act as messengers between the cells.

Together, the granules work to heal the injury in three stages:

1) **Inflammation**: That's the swelling you see when blood rushes to the site.
2) **Proliferation**: The quick growth of new cells for healing
3) **Remodeling**: Regeneration of the tissues to replace the damaged parts.

Other Components of PRP

1) **Vascular Endothelial Growth Factors:** They help with the growth of the cells that line the inner surface of your blood vessels.
2) **Epidermal Growth Factors:** They help with skin regeneration.
3) **Transforming Growth Factors:** They stimulate the creation of normal cells.
4) **Fibroblast Growth Factors:** They help in the building of the layer of collagen and structure under the skin.
5) **Hepatocyte Growth Factors:** They can help with the repair of the cells of the liver.
6) **Insulin-like Growth Factors:** They help in the creation of the tissues and bones.

HEALTH BENEFITS OF PRP

PRP (Platelet Rich Plasma), is one of the most preferred treatments for soft tissue and musculoskeletal injuries. Many world class athletes have been treated with this procedure. Additionally PRP has cosmetic significance in skin and hair rejuvenation. PRP is effective because it contains healing factors, growth factors and many other proteins isolated from a patient's own blood which act as tissue repair facilitators. During this procedure, a small volume of the patients' blood is drawn and then separated with centrifuge. The top component is called platelet rich plasma. PRP helps in recovery of damaged tendons, ligaments, some mild forms of arthritic conditions and fractures. Many studies support the use of PRP in musculoskeletal injuries and cosmetic practices and the associated results are promising. Researchers are trying out PRP injections across a number of applications [9-12].

HAIR LOSS

PRP injection is injected into the scalp to promote hair growth and prevent hair loss. PRP may also be effective in treating baldness caused by androgenic alopecia due to hormonal disorders. Androgenic alopecia can occur in both men and women. This happens due to the susceptibility of hair follicles resulting in gradual thinning hairs. According to research Trusted Source from 2014, PRP injections are effective in treating androgenic alopecia, which is also known as male pattern baldness.However, further research is still needed to prove the ability of PRP injections in treating baldness (Figure 2).

UNDER-EYE CIRCLES

Dark circles that appear under eyes are commonly caused by shadows that come from aging. The contours of the skin around the eyes change and often increase as a person grows older. This changing skin gives the appearance of dark circles, which can be unsightly. PRP infusions work to address dark circles and under-eye pigmentation in light of the fact that the plasma can fix and restore under-eye tissue. Platelets, stem cells, growth factors, and cytokines can all be found in PRP.

When PRP is injected through a process called microneedling, healing that works gradually to remove dark circles is induced (Figure 3).

Fig. 2. PRP injection is injected into the scalp to promote hair growth and prevent hair loss.

Fig. 3. PRP Facial and Hair Treatment

Fig. 4. PRP infusion for treatment of Under Eye Dark Circles

PRP injections repair the skin under the eyes where the dark circles are seen. Many patients report seeing results from their treatment in as few as two days after a session. However, it is important to note that it can take time to see the complete results of a PRP injection (Figure 4).

VAMPIRE FACIAL

A vampire facial is a blend of microneedling and PRP. Platelet Rich Plasma (PRP) is a concentrate of platelet-rich plasma protein derived from the whole blood after it has been processed by spinning in a centrifuge to remove the red cells. The PRP has a more noteworthy convergence of development factors than the entire blood. What's more, development factors are what our cells make that can assist tissue with mending and fix, which implies it, can help with a wide range of skin issues (figure 5 and 6).

Fig. 5. Vampire Facial

Fig. 6. Microneedling

The treatment has become more popular in recent years especially with patients who are looking into more natural ways of rejuvenating their face or body, without using Botox or fillers. The PRP injections can help stimulate collagen. Joined with microneedling, the treatment can bring about scar reduction, revision of sun harm,

and limiting scarce differences and pores. As because the PRP is coming out of your own blood, there are no risks of side effects. Nonetheless, patients who have blood issues or take blood thinners should avoid this kind of system.

Uses: Used to Treat

Facial PRP can be used on skin almost anywhere on the body.

1) Fine lines and wrinkles
2) Dull, tired skin
3) Décolletage
4) Smokers lines
5) Hands
6) Suitable for around the eyes
7) Scars
8) Stretch marks
9) Scars/acne scars

PRP FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Platelet Rich Plasma (PRP) contains various growth factors, mesenchymal stem cells, cytokines, and other elements that assist in the healing of both hard and soft tissues. In the wake of setting up the PRP serum, specialists bring it into the lungs by method of the PRP nebulizer. The plasma and mending factors append to the air sacs or lung endothelial cells and start a fixing instrument with the goal that they recover. Furthermore, PRP medicines for COPD contain vitronectin, fibronectin, and fibrin. These components can bring down irritation levels and help mend the harmed lung tissues. As the swelling goes down, the lungs and airways produce less of mucus and sputum. Accordingly, patients notice a steady improvement in relaxing. By bringing the PRP serum into the lungs with the assistance of a nebulizer, specialists can guarantee that mending components, development elements, platelets, and foundational microorganisms arrive at the alveoli directly for effectiveness.

PRP FOR JOINT PAIN AND TENDONITIS

The newest in the field of medical treatments that are intended to heal damage to the tissue and reduce overall inflammation is PRP injections. These all-natural injections utilize platelets from your very own body to heal you. PRP is simply short for the term platelet-rich plasma.

Tendon Injuries: Tendons are intense, thick groups of tissue that associate muscle to bone. They are typically delayed to recuperate after injury. PRP injections to treat chronic tendon problems, such as tennis elbow, Achilles tendonitis at the ankle, and jumper's knee, or pain in the patellar tendon in the knee (Figure 7).

Fig. 7. PRP for Tendons Injury Treatment.

When you opt for PRP injections, they can treat a variety of orthopedic conditions, some chronic injuries as well.

The platelets that are taken from your blood have specialised growth factors. These growth factors are a type of chemical that helps to alert the body to start the healing process in that area. When PRP injections are placed into a specific injury area of the body, the brain will naturally stimulate the body's ability to heal in that region.

Acute Injuries: These PRP injections to treat acute sports injuries, such as pulled hamstring muscles or knee sprains.

Postsurgical Repair: Sometimes PRP injections after surgery to repair a torn tendon (such as a rotator cuff tendon in the shoulder) or ligaments (such as the anterior cruciate ligament, or ACL).

Frozen Shoulder: Depending on the severity, it is recommend everything from physical therapy to surgery to treat frozen shoulder and loosen the joint. Over 90% of patients improve with straightforward medicines like non-intrusive treatment, steroid infusions, and non-steroidal calming meds. For cases that are much more severe, platelet-rich plasma (PRP) therapy could be a viable option (Figure 8).

Fig. 8. PRP for treating Frozen Shoulder

The platelets release growth factors that are part of the natural healing process. PRP invigorates blood stream, re-establishes protein found in delicate tissue, fortifies ligament, and advances framework development. These development factors quicken the recuperation for patients experiencing an assortment of wounds including frozen shoulder.

Tennis Elbow

Tennis elbow or epicondylitis as doctors call it is a condition that typically affects people between the ages of 30 and 50 years. Although called "tennis" elbow, just 5% of the patients actually play the sport. Characterized by pain on the outside of the elbow just below the joint, the condition results from overusing the arm and wrist.

While most patients recover with rest, you may need to get treatment if the pain is too severe or lasts for a longer time. One of the most effective treatments that has emerged in recent times is PRP for tennis elbow that works to repair the causes of the pain in place of simply masking the discomfort. Rely on PRP for tennis elbow to get relief from the pain and inflammation in your elbow caused by making repetitive movements while performing certain tasks or playing a sport. Trust PRP treatment to mend the influenced tissues and ligaments for better development (Figure 9).

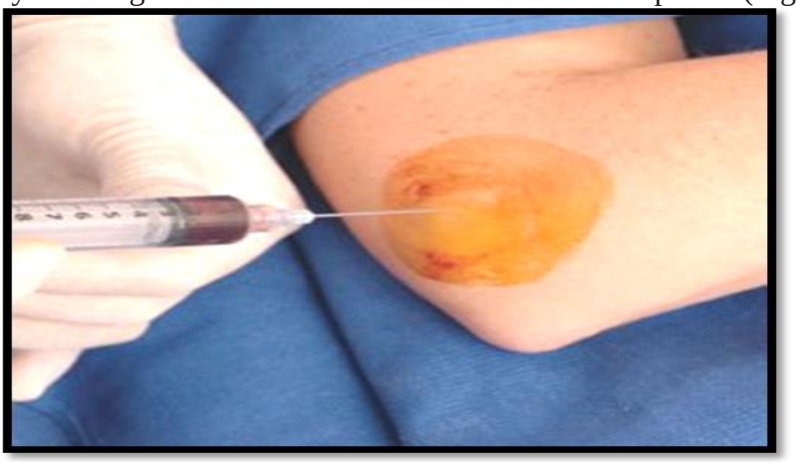

Fig. 9. PRP for treating Tennis Elbow

PRP therapy provides effective results without the risk of adverse effects since doctors create the serum from the blood of individual patients observing strict sterile conditions and care.

Helps Manage Lower Back Pain

Chronic lower back pain affects a significant proportion of the global population. It can lead to loss of mobility and perpetual discomfort for the patients. Studies and reports distributed in 2015 in the Epoch Times found that platelet-rich plasma can treat already untreated cases viably, prompting more than 90 percent improvement in the side effects. PRP infusions lead to noteworthy enhancements in the domains of stance, portability, strength, and pain (Figure 10).

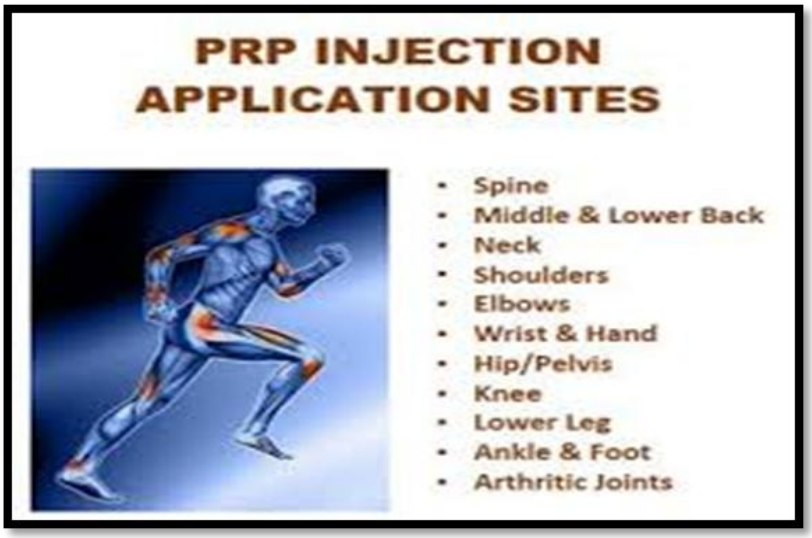

Fig. 10. Application Sites for PRP

PRP for Osteoarthritis or Knee Joints Pain

PRP injections are injected into the knees of people with osteoarthritis. A 2015 study by Trusted Source found that PRP injections were more effective than hyaluronic acid injections (a traditional therapy) for treating osteoarthritis. However, the trial was a small group of 160 people, so larger trials are needed for this to be conclusive.

PRP for Improve The Condition Of Skin Texture

PRP injection therapy has been applied as a therapy for removing wrinkles, acne scars, stretch marks, and sagging skin on the eyes, hands, neck, and face. Not at all like injectable fillers that utilization engineered ingredients, PRP improves skin absconds by setting off the development of new cells and collagen arrangement (figure 11).

Fig. 11. PRP for Skin Treatment

PRP treatment likewise for the most part doesn't cause unfavourably susceptible responses since it starts from the patient's own body, be that as it may, this methodology may even now have infection probability.

Platelet Rich Plasma for Infertility Treatments

PRP therapy has shown astounding success in helping patients with a wide range of cosmetic and medical problems. Researchers have now discovered the efficacy of Platelet Rich Plasma for infertility issues.

1) **For Premature Menopause:** Platelet Rich Plasma for infertility can repair the damage to the ovaries and uterus in case of younger women. In this way, the treatment can help them become capable of conceiving again. Women have talked about how PRP injections worked to regulate their menstrual cycle. To help raise their chances of giving birth, doctors harvest the single egg released naturally and prepare it for IVF implantation.
2) **For Geriatric Pregnancies:** In the case of older women, doctors have now discovered that by injecting the PRP serum into the ovaries, it is possible to stimulate the production of stem cells. PRP can help in improving egg quality after 40 normally. As a result, any remaining follicles mature into viable eggs. Fertility experts or obstetricians harvest the eggs and use them to develop embryos by way of standard IVF procedures. Later, implanting the embryos into the mother’s uterus can help women have babies.

PRP for Chronic Pain

Most often, chronic pain has its roots in an illness or injury you may have suffered at some time in the last few months. When the body suffers any kind of trauma or ailment, the nerves signal to the brain to indicate that the area needs healing. Over time, as the tissues repair, you might start to feel the pain easing and after a point, going away completely.

However, sometimes, when the trauma is accompanied by nerve damage, you may continue to sense pain for a long time afterward. Further, as an injury heals, scar tissue forms in the area. Since the newly-formed tissue is typically tougher, it may not receive an adequate blood supply. Thus, recuperating stops before the site has repaired completely prompting the dull hurt you sense. This is called chronic pain.

PRP in Dental Treatment

Platelets Rich Plasma is a new approach to tissue regeneration and it is becoming a valuable adjunct to promote healing in many procedures in dental and oral surgery. The utilization of PRP in careful practice could have valuable results, reducing draining and upgrading delicate tissue recuperating and bone recovery. Since PRP is liberated from expected dangers for patients, not hard to acquire and utilize, it tends to be utilized as a legitimate assistant in numerous systems in oral and dental medical procedure. Studies led on people have yielded promising outcomes with respect to the use of PRP to numerous dental and oral surgeries (For example Jaw osteonecrosis, tooth extractions, periodontal surgery, and implant surgery).

PRP for Male Sexual Dysfunction

PRP is also used as an experimental or alternative treatment option for:

1) Erectile dysfunction (ED)
2) Peyronie's disease
3) Penis enlargement
4) Sexual performance

RISKS OF PRP INJECTIONS

1) **Pain in the area of the injection:** A moderate amount of discomfort is expected due to the inflammation caused by the injection. This increased inflammation if one of the ways that PRP promotes healing. Inflammation results in repair of the damaged tissues into which the blood has been injected, however it also causes swelling and pain [1,4].
2) **Infection:** The risk of infection is extremely low. Studies have shown the risk of infection after an injection is 1 in 10,000 injections. Signs of infection include fever, chills, and pain, warmth and redness around the area of the injection. Symptoms of an infection could occur up to 10 days after the injection [1,4].
3) **Allergic Reaction:** PRP is made from your own blood and this makes it very unlikely that you will have an allergic reaction. Allergic reactions following PRP injections are considered very rare [1,3].
4) **Bruising**: Sometimes the skin around the area of the PRP injection will appear bruised. This could be normal, based upon your history of bruising.
5) **No Improvement in symptoms:** While this is not necessarily a side-effect, it is important that you know that not all patients respond to a PRP injection. Sometimes the original pain and soreness of the injury remains (it may even get worse), even after an extended rest period after the PRP therapy

CONTRAINDICATIONS OF PRP

1) Coagulopathy
2) Disorders of platelet dysfunction
3) Haemodynamic Instability
4) Severe hypovolemia

5) Severe sepsis
6) Unstable angina
7) Anti-coagulant/Anti-fibrinolytic therapy
8) Platelet count (<1000/uL)
9) Low hemoglobin (<10.9g/dL)
10) Hemodynamic instability (low BP etc)
11) Known dysfunctional platelets or clotting disorder Eg: Giant Platelet Disorder, ITP, hemophilia
12) Active use of pharmacologic blood thinners (*eg*: Coumadin, Xarelto)
13) NSAIDs in the last week
14) Corticosteroid injection at treatment site within 6 weeks of PRP procedure
15) Corticosteroid by mouth or *i.v.* within 6 weeks of PRP
16) Active signs of systemic infection
17) Fever, chills, Nausea, vomiting, advancing rash
18) Active cancer – especially hematopoetic or bone
19) Rash or unclear skin changes at injection site
20) Pregnancy
21) Hypertrophic diseases (scars) and angiogenesis –based disease (psoriasis)
22) Severe metabolic and systemic disorders (Uncontrolled diabetes and severe asthma)

CONCLUSION

PRP is being utilized as another remedial alternative for various pathologies in the field of dermatology, for example, trichology, wound mending, and restorative medication. Right now, the science and component of activity of this treatment should help clinicians in choosing a framework that meets their particular requirements for a given sign. Also, portraying the kind of PRP utilized will prompt an institutionalization of PRP, making it simpler to sort and decipher accessible information. We trust that this audit fills in as a reason for additional examination on the utilization of PRP. It can be said that the efficacy and usefulness of Platelet Rich Plasma (PRP) therapy is indisputable when it comes to treating musculoskeletal injuries and ailments. It is fast gaining popularity amongst practitioners in the medical community, including orthopedic surgeons and physicians. However, an experienced medical practitioner must be consulted before patients decide to proceed with the PRP treatment. This will ensure that the treatment is properly administered to yield the best results.

Even with many reported favourable effects of using PRP with high evidence of safety in managing various clinical settings (especially in the field of dermatology, dentistry, orthopaedics, surgery, and ophthalmology), the use of PRP has major limitations; including the paucity of controlled clinical trials and lack of consensus related to PRP preparation techniques. Yet, PRP remains a viable conservative and alternative therapeutic option either alone or in combination with other conventional therapies with low risk of adverse reactions. As many of reported clinical studies do not have ad-equate statistical power to give conclusive results, further clinical studies are needed with higher level of evidence taking into consideration customizing the preparation method, volume, number of sessions and the period between the sessions for different clinical scenarios. Determining the main bioactive components which are responsible for the clinical effects of PRP and the inter-individual variability of growth factors and cytokines production and the synergy of platelets count, and growth factors will remain as major challenges to achieve standardization of PRP.

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