

Platelet-Rich Plasma: An Aid to Soft Tissue Healing

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Slow or poor-quality healing of soft tissues such as tendons and ligaments is a common clinical problem in horses. Platelets derived from a patient's blood have been used in humans for nearly a decade to treat nonhealing wounds, augment bone grafts, provide hemostasis, and improve healing after invasive surgeries. Similar and novel therapies are applicable to horses and require minimal modification to the devices used for humans. Platelet-rich plasma (PRP) is one such therapy that can be applied to acute and chronic tendon and ligament lesions to aid in healing.

What is PRP, and How is it Made?

PRP is obtained from anticoagulated whole blood via centrifugation and is used autologously (i.e., donor and patient are the same) to avoid graft-versus-host complications. To be considered platelet rich, it should contain about five times the number of platelets as compared with whole blood. Platelets are concentrated in the buffy coat and uppermost portion of the red pack. Compared with whole blood, PRP contains a small amount of red blood cells, plasma, concentrated platelets and white blood cells.

PRP can be injected into a tendon or ligament lesion or applied topically to an external wound. For external applications, calcium, bovine thrombin, or autologous thrombin is mixed with PRP before tissue contact. These products activate platelets, forming a gel.

Procuring PRP is a simple procedure that is accomplished within minutes by using a commercially available device (GenesisCS, Vet-Stem, Poway, CA). Generally, 52ml or whole blood is drawn aseptically from the donor into a 60ml syringe and mixed with 8ml or either acid-citrate-dextrose (ACD) or citrate-phosphate-dextrose (CPD) anticoagulant. The mixture is then transferred to centrifugation tubes and processed patient-side. PRP is ready for application within minutes.

How Does PRP Work?

Platelets and provisional matrix formation play a prominent role in the initiation and maintenance of wound healing. Platelets are activated by exposure to damaged tissue or

by the addition of calcium and/or thrombin. They then release their granular contents containing anabolic growth factors, such as platelet-derived growth factor (PDGF), transforming growth factor- β (TGF- β), and vascular endothelial growth factor(VEGF). These growth factors stimulate progenitor cell localization to the wound, wound fibroblast expansion, and wound matrix production. The fibrin matrix provides a physical framework for fibroblast migration and traps platelets to permit a slow release of growth factors. The platelets also synthesize and secrete growth factors for the balance of their life (5 to 10 days).

Clinical Applications

In tendon and ligament healing, rapid granulation of tissue defects, increased type 1 collagen production, and early organization prior to significant fibrosis are important to optimize healing. In vitro evidence suggests that PRP aids in healing by achieving these goals, and the results of several clinical studies evaluating PRP in human soft tissue healing have been encouraging.

A single evaluated PRP treatment of wounds in horses using platelets and a proprietary activator. This study demonstrated significant histologic differences in a 2.5cm wound model on the forelimbs of horses: Accelerated epithelial differentiation and improved collagen organization were observed in the PRP treatment group.

A recent nonrandomized clinical trial evaluated PRP for the treatment of moderate to severe suspensory body desmitis. Standardbred racehorses were administered a single intralesional injection of PRP and thrombin using ultrasound guidance and then placed in a graded controlled exercise program. The race records of the horses were evaluated for 4 years following treatment. There were no reported complications in the treatment group, and all horses healed and returned to racing. This study supports that PRP can be used safely to augment ligament healing.

PRP Practice

To date, the veterinarians at Ocala Equine Hospital and The Ohio State University have used PRP to treat nearly 400 horses with tendon and ligament injuries of all types. We used it most commonly in the acute phases of injury with or without the concurrent administration of stem cells. PRP appears to have the most profound effect on healing when it can be injected directly into an anechoic lesion prior to significant fibrosis. Old injuries and re-injuries seem to respond less favorably.

There are multiple commercial devices available for generating PRP, but it is important to note that not all of them result in the same product. For this reason, it has been suggested that the PRP that results from use of devices such as the GenesisCS be more aptly named platelet-leukocyte-rich plasma (PLRP). A minority of devices poorly concentrate platelets and/or white blood cells. These differences change the measurable growth factor concentrations and ratios significantly and quite possibly the biological activity.

Benefits of PRP Gel

- “Jumpstarts” healing by increasing growth factor levels at injury site
- Provides a provisional matrix or scaffold for healing
- Works well in combination with stem cells or grafts
- Improves hemostasis
- Anti-inflammatory properties
- Antimicrobial properties
- Simple and rapid patient-side processing and application

References

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