PLATELET-RICH PLASMA (PRP) TREATMENT FOR EQUINE OSTEOARTHRITIS

Alexandra Franquès Pla
Facultat de Veterinària UAB
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FACULTAT DE VETERINÀRIA

UAB Universitat Autònoma de Barcelona

Introduction and objectives

Musculoskeletal injuries are the main cause of poor performance in horses and approximately 60% of lameness is related to osteoarthritis (OA). PRP improves tissue regeneration and has been widely used in equine medicine, although few data are available regarding efficacy of this treatment in horses with OA. The aim of this study is to review the most evidence based human and animal clinical trials and to compare the effectiveness of PRP intra-articular injections with hyaluronic acid or placebo injections for the treatment of human and equine osteoarthritis.

Osteoarthritis

Osteoarthritis is a disorder of movable joints, characterized by degeneration and loss of articular cartilage and the development of new bone on joint surfaces. Repetitive mechanical forces cause damage to healthy subchondral bone, cartilage and synovia leading to the release of proteolytic enzymes that cause cartilage fibrillation and breakdown of the proteoglycan network.

Platelet-rich plasma (PRP)

Platelet-rich plasma (PRP) is a blood-derived product with platelet concentrations 2-8 times above baseline levels. α-granules from activated platelets release a large amount of growth factors (TGFβ, PDGF, HGF, VEGF, IGF, FGF, CTGF) (Figure 1) which promote proliferation, differentiation, chemotaxis and migration of various cell types and stimulate extracellular matrix synthesis. Some growth factors (VEGF, PDGF, TGFβ and FGF) also stimulate and increase tissue angiogenesis. Growth factors TGFβ and PDGF are the most measured.

PRP decreases nociception by inhibiting pro-inflammatory cytokines and prostaglandins, stimulating hyaluronic acid production and restoring homeostasis balance.

Osteoarthritis	PRP action mechanisms
Synovium	Synovyocites are a rich source of prostaglandins, cytokines and matrix metalloproteinases that contribute to the cartilage matrix depletion.	FGF increases hyaluronic acid production and secretion in synovyocites.
Cartilage	Metalloproteinases, catabolic cytokines (IL-1 and TNFα), nitric oxide and prostaglandin E_2 degradate cartilage extracellular matrix and inhibit the synthesis of proteoglycans and type II collagen.	Growth factors promote chondrocyte proliferation and differentiation and the synthesis of type II collagen and proteoglycans. TGFβ has antiinflamatory properties as it inhibits catabolic cytokines (IL-1, TNFα) and stimulates IL-1 receptor antagonist.
Bone	There is loss of balance between resorption and remodeling functions of osteoclasts and osteoblasts. IL-1 stimulates osteoblast-like cells causing osteophytosis.	PDGF, VEGF and IGF stimulate osteoblast proliferation and differentiation in subchondral bone.

Table 1. Osteoarthritis pathogenic mechanisms and PRP action mechanisms

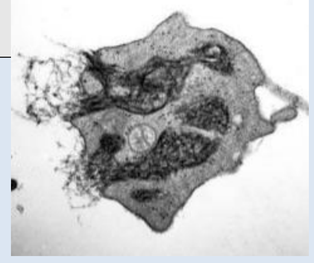

Figure 1

References	Species	Duration (months)	Treatment	PRP injections /intervals(week)	Spinning approach	PRP activation	WBC	Platelet concentration
Patel *et al** 2013	Human	6	PRP vs saline	1-2/3	Single spinning	+	-	<5xbaseline
Görmeli *et al** 2015	Human	6	PRP vs HA	3/1	Double spinning	+	NA	>5xbaseline
Kon *et al* 2011	Human	6	PRP vs HA	3/2	Double spinning	+	+	>5xbaseline
Filardo *et al** 2012a	Human	12	PRP vs HA	3/1	Double spinning	-	+	5xbaseline
Cerza *et al** 2012	Human	6	PRP vs HA	4/1	Single spinning	-	-	>5xbaseline
Say *et al* 2013	Human	6	PRP vs HA	1	Single spinning	+	NA	<5xbaseline
Filardo *et al** 2011	Human	24	PRP	3/3	Double spinning	+	NA	>5xbaseline
Filardo *et al* 2012b	Human	12	PRGF vs PRP	3/3	Single vs double spinning	+	-/+	<5xbaseline
Sánchez *et al** 2012	Human	6	PRGF vs HA	3/1	Single spinning	+	-	<5xbaseline
Dallari *et al** 2016	Human	12	PRP vs HA	3/1	Double spinning	+	NA	NA
Cook *et al** 2015	Canine	6	PRP vs saline	5/1-3	Single spinning	+	-	<5xbaseline
Silva *et al** 2013	Canine	3	PRP vs nutraceutical	3/2	Single spinning	+	-	<5xbaseline
Abellanet 2007	Equine	36	PRP	1-3/1-2	Double spinning	+	+	<5xbaseline

Table 2. Clinical studies using PRP injections to treat osteoarthritis
*Randomised controlled trial
NA: not applicable; PRP: platelet-rich plasma; WBC: white blood cells

Conclusions

Human, canine and equine clinical trials with an evidence degree level between 1 and 2 evaluating the use of intra-articular PRP for osteoarthritis treatment show better clinical outcomes in those groups treated with PRP injections than those groups treated with hyaluronic acid or placebo. PRP is more effective in joints with early osteoarthritis. The large variability in PRP composition between each clinical trial make it difficult to reach any firm conclusions regarding efficacy of PRP. Multiple injections of PRP with low WBC concentration and 2-5 times over baseline platelet concentration is recommended.

Larger, randomized clinical trials are needed to assess the effectiveness of PRP in treating osteoarthritis.