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Orthopaedics

Platelet-Rich Plasma Injections and Surgery: Short-Term Outcomes and Long-Term Prognosis

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Platelet-rich plasma (PRP) is a blood derivate that contains a high value of platelet concentration, a variable number of red blood cells and white blood cell according to the method of preparation. Platelet-derived growth factors are powerful and promising molecules that could be useful in the management of sport-associated injuries, such as tendinopathies, muscular lesions, and cartilage damages, and to improve graft tissue healing. Uncontrolled studies on tendinopathy reported nearly universally good-to-excellent results after treatment with PRP, but this was not the case when controlled studies were undertaken. The studies that augmented surgically repaired tendons or ligaments do not allow reaching a definitive conclusion—too many variables could influence the outcomes. To understand which disorders are more susceptible to the effects of PRP, more basic science studies and better designed clinical studies comparing a standardized PRP formulation are necessary.
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Platelet-rich plasma (PRP) is a blood derivate that contains a high value of platelet concentration, about >5 times normal value (1,000,000 platelet/μL on 5 mL of plasma).[1] PRP should be composed by a variable number of red blood cells (RBC) and white blood cell according to the method of preparation.[2-4] Since the 1980s, PRP was used to promote wound healing,[5] and 10 years later, the production of PRP improved to obtain a complete separation of plasma by small blood volume.[6,7] PRP is now used in many fields of medicine, including maxillofacial surgery, plastic surgery, sport medicine, and orthopedic and trauma surgery, where it is applied in the management of tendinopathy, acute and chronic muscular lesions, muscular fibrosis, capsular laxity, osteoarthritis, synovitis, and lesions of meniscus or articular cartilage. The mechanism of action of PRP is still debated, and it may act by increasing and stimulating the natural healing process. The molecules contained in PRP preparation can act as adjuvant, especially in the phases of inflammation and proliferation of the matrix.[8-11]

PRP preparations have many chemical and biological properties, including a role as "Biological glue," and act in coagulation and hemostasis, wound healing, at times, providing a scaffold for stem or primary cell migration and differentiation.[12] In addition, PRP has a role in intra-articular restoration of hyaluronic acid, balancing joint angiogenesis, increase in glycosaminoglycan chondrocyte synthesis and cartilage matrix, and antiinflammatory, antibacterial, and analgesic roles.[12]

A large number of PRP products are available, as there is no a standardized method that shows better results than others.

Many factors, such as whole-blood volume, type of anticoagulant, centrifuge force and time (device-related factors), final volume of PRP, platelet concentration, factor increase in platelet concentration, platelet capture efficiency, number of white blood cells, number of RBC, and concentration of fibrinogen, can produce marked differences between the various methods of preparation.[2]

Applications of PRP in Orthopedics

Tendons

Tendon disorders are common, especially affecting athletes and middle-aged individuals, both sedentary and active in sport (Table 1).[13-20]

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Table 1 Study Characteristics and Results

Study	Patients	Technique	Follow-Up	Rating Scale and Outcomes	Conclusion
Edwards and Calandruccio[23]	28	2-3 peritendinous infiltrations	9.5 months	Nirschl staging score: 6.5 → 2.0 VAS: 7.8 → 2.3	Autologous blood injections could be an alternative treatment for lateral epicondylitis when traditional nonsurgical modalities have failed
Connell et al[25]	35	2-3 peritendinous infiltrations	6 months	Median nirschl score: 6.0 → 0.0 Median VAS score: 9.0 → 0.0	Autologous blood injection is a primary technique for the treatment of lateral epicondylitis
Suresh et al[26]	20	2-3 peritendinous infiltrations	10 months	Median nirschl score: 6.0 → 1.0 Median VAS score: 9.0 → 0.0	Autologous blood injection is an effective treatment for refractory medial epicondylitis
Gani et al[24]	26	1-2 peritendinous infiltrations	8 months	Mean VAS: 3.3 → 1.2	Autologous blood injection is an effective to relief symptoms
Mishra and Pavelko[27]	20	Group A: 15 patients 1 PRP injection; group B: 5 patients 1 bupivacaine + epinephrine injection	25.6 months	Mayo elbow score: group A: 50.3 → 86.3; group B: 49.5 → 56.5 VAS: group A: 80.3 → 32; group B: 86 → 72	PRP significantly reduced pain and increased function
Peerbooms et al[28]	100	Group A: 51 patients 1 PRP injection; group B: 49 patients 1 CCS injection	12 months	DASH: group A: 161.3 → 54.7; group B: 131.2 → 108.4 VAS: group A: 70.1 → 25.3; group B: 65.8 → 50.1	PRP reduced pain and significantly increased function, exceeding the effect of corticosteroid injection
Lee and Ahmad[33]	64	Group A: 32 patients 1 PRP injection; group B: 32 patients 1 CCS injection	6 months	Mean VAS: group A: 7.3 → 3.6; group B: 6.9 → 2.4	Autologous blood injection is efficacious, but corticosteroid is superior in terms of speed and probably extent of improvement
Kiter et al[32]	54	Group A: 1-3 PRP injection; group B: 1-2 CCS injection; group C: dry needling	6 months	Mean AOFAS: group A: 71.6 → 80.9; group B: 65.7 → 80.1; group C: 64.1 → 78.2 Mean VAS: group A: 7.6 → 2.4; group B: 7.3 → 2.6; group C: 6.4 → 2	Although PRP was able to reduce symptoms, no significant differences were noted among the 3 groups
Kalaci et al[34]	100	Group A: PRP injection; group B: CCS injection; group C: CCS injection + dry needling; group D: dry needling + anesthetic	6 months	Mean VAS: group A: 6.8 → 3.5; group B: 7.0 → 1.5; group C: 7.2 → 1.0; group D: 6.7 → 3.4	Combined corticosteroid injections and dry needling are effective and produce better clinical results than PRP
Randelli et al[36]	53	Group A: intraoperative application of PRP; group B: control group	24 months	Mean Constant: group A: 82.4; group B: 78.7 Mean UCLA: group A: 33.3; group B: 31.3 Mean SST: group A: 11.3; group B: 10.9 Mean SER: group A: 4.3; group B: 4	Autologous PRP reduced pain in the first postoperative months, but at last follow-up, there were no differences. The long-term results of subgroups of grade 1 and 2 tears suggest that PRP positively affected cuff rotator healing