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Platelet Rich Plasma Injection Treatment Outcomes in Patellar Tendinopathy

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Abstract

Background: Platelet rich plasma (PRP) refers to the processed product of autologous peripheral blood with a concentration of platelets higher than baseline. This product has garnered interest for 30 years as a potential method of regenerative medicine. PRP injections have shown to be an effective treatment for patellar tendinopathy. However, some concerns remain with regards to empiric treatment of tendinopathy with PRP injections.

Objective: This article aims to investigate the outcomes of platelet rich plasma injections in patients with patellar tendonitis.

Methods: A systematic literature search was conducted using the University of Texas Rio Grande Valley (UTRGV) online database. The search included the terms "patellar tendonitis" and "platelet rich plasma" to identify relevant studies assessing the efficacy of PRP injections in treatment of patellar tendonitis.

Results: A total of 12 studies were reviewed, eight of the reviewed articles supporting PRP injections as a viable treatment option for patellar tendonitis. Four studies suggested that PRP injections, when administered with other conservative treatment options, showed no appreciable increase in recovery rate.

Conclusion: In conclusion, there is evidence that supports PRP injections may be a viable adjunctive treatment option for patellar tendonitis. However, more clinical trials should be performed to determine individual PRP injection benefits when compared to other conservative treatment options.

Keywords: Platelet rich plasma; Patellar tendinopathy; PRP injection; Knee; Sports

Introduction

Patellar tendinopathy (PT), also referred to as "jumper's knee," is a pathology of the knee which primarily results from microtears in the patellar tendon [1-4]. As implied by "jumper's knee," sports that emphasize activity requiring speed and power generation through the leg extensors, such as jumping, puts stress on the patellar tendon. This stress accumulates over time, causing PT [5]. The definition of platelet rich plasma (PRP) is an autologous blood sample which has platelet concentration above an established baseline [1]. Due to the variation in blood samples across a patient population and preparation type, there is variability in the contents of an individual injection of PRP [6]. While other injection options do not contain this drawback, understanding the basis for this variability is essential. Primarily, the

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preparation of PRP starts with drawing peripheral blood from the patient, followed by a 2 step centrifugation process to separate the red blood cells from the plasma, and then the platelets and white blood cells from the clotting factors [7]. Variables such as the type of collecting tube and centrifuge speed cause differences in the final concentration of platelets and leukocytes in the PRP product [6]. PRP end products are further divided into leukocyte rich or leukocyte poor variations. While leukocytes play an important role in tissue repair and healing, it may also create an unwanted inflammatory effect. Additionally, there is limited evidence on which preparation provides the most benefit [8].

What is known is there are certain components of PRP, including insulin-like growth factor, epidermal growth factor, vascular endothelial growth factor, platelet-derived growth factor, and transforming growth factor, which stimulate healing of tendon and cartilage [9]. This provides additional physiologic benefit due to the naturally low blood supply of these areas [10].

Methods

A systematic literature search was conducted using the University of Texas Rio Grande Valley (UTRGV) online database. The search included the terms “patellar tendonitis” and “platelet rich plasma” to identify relevant studies assessing the efficacy of PRP injections in treatment of patellar tendonitis. Upon initial search, 32 articles were relevant. However, after exclusion criteria was applied, 12 total articles were deemed appropriate for analysis. For the

Table 1: PNT- percutaneous needle tenotomy, BM-MSCs - bone marrow mesenchymal stem cells, GRoC - Global rating of change, LR-PRP - lymphocyte rich platelet rich plasma, LP-PRP - lymphocyte poor platelet rich plasma.

Author (Year)	Study Design	Sample Size	PRP Type	Placebo	Longest Follow-Up	Primary Outcome(s)	PRP vs Placebo
Scott et al. [11]	Single-blind RCT	57	LR-PRP & LP-PRP	Saline placebo	12 months	VISA-P, pain, GRoC	No difference vs placebo at any time
Herrero et al. [12]	Multicenter RCT	23	LP-PRP with PNT	PNT	26 weeks	VISA-P	No difference vs control
Kirschner et al. [13]	Double-blind RCT	40	LR-PRP with PNT	PNT	104 weeks	Pain	No added benefit of PRP
Dragoo et al. [18]	Double-blind RCT	23	LR-PRP with PNT	PNT	26 weeks	VISA-P	Improvement at 12 weeks, no difference after
Vetrano et al. [20]	RCT	46	PRP	Shockwave therapy	12 months	VISA-P, VAS, modified Blazina	PRP superior at 6 and 12 month follow up
Rodas et al. [22]	Double-blind RCT	20	LP-PRP	BM-MSC injection	6 months	*	BM-MSC injection superior at 6 months
Abdelbary & Bassiouny [21]	Comparative study	20	PRP	High-volume injection	12 months	VAS	PRP superior at all stages
Gosens et al. [15]	Prospective cohort	36	PRP	None	18 months	VISA-P, VAS	Significant improvement
Filardo et al. [14]	Prospective cohort	31	PRP	None	6 months	Tegner, EQ VAS and pain level	Significant improvement
Dallaudière et al. [16]	Pilot study	41	PRP	None	Up to 32 months	VAS, WOMAC	Significant improvement
Kon et al. [17]	Pilot study	20	PRP	None	6 months	Tegner, EQ VAS, SF 36 questionnaires	Significant improvement
Wasterlain et al. [19]	Double-blind RCT	11	PRP with PNT	PNT	12 weeks	VISA, Tegner, Lysholm, SF-12 questionnaires	PRP superior at 12 weeks

* - Victorian Institute of Sport Assessment for pain (VISA-P), self-reported tendon pain during activity (visual analog scale [VAS]), muscle function by dynamometry, tendon thickness and intratendinous vascularity by ultrasonographic imaging and Doppler signal, ultrasound tissue characterization (UTC) echo type changes, and magnetic resonance imaging (MRI) T2-weighted mapping changes

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article to be considered for analysis it must be a primary article and comparing a PRP and non-PRP treatment strategy, Due to limited article availability, no distinction was made between lymphocyte rich and lymphocyte poor formulations of PRP injections in the analysis.

Results

Of the 12 studies that were analyzed, eight of them supported PRP injections as an appropriate treatment strategy that provides clear benefit compared to placebo. Four studies failed to find a difference in long term outcome of PRP (Table 1).

Discussion

The evidence for platelet-rich plasma (PRP) injections for patellar tendinopathy remains unclear, with outcomes varying per article. Pilot and prospective cohort studies commonly report symptomatic improvement following PRP injection. However, some randomized controlled trials (RCTs), particularly when compared to percutaneous needle tenotomy (PNT), did not show long term improvement of PRP over placebo [11-13].

Several pilot and comparative studies showed improvements in pain and function after PRP injections. In one study, long term improvement in VISA-P scores were reported at 6 months [14]. Gosens et al. [15] similarly showed improved scores in VISA-P and VAS at a mean follow up of 18 months. Long-term symptom improvement was also described in additional pilot studies [16,17]. Collectively, these findings suggest an association between PRP treatment and clinical improvement.

Some placebo-controlled RCTs have shown limited or no long-term benefit of PRP. Scott et al. [11] found no significant differences between leukocyte-rich PRP, leukocyte-poor PRP, and saline injection at either 6 or 12 months. Similarly, Herrero et al. [12] and Kirschner et al. [13] reported no benefit of leukocyte-poor PRP and PNT compared with PNT alone at 26 week and 104 week follow-up, respectively.

However, there may be a positive short term prognosis for PRP injections. Dragoo et al. [18] reported improved pain and function at 12 weeks in patients receiving PRP compared with PNT. Although, this benefit was not sustained at later follow-up intervals. Additionally, one RCT reports improvement following PRP injection at 12 weeks [19].

Studies comparing PRP with other active interventions rather than placebo report mixed results. Superior outcomes with PRP compared with focused shockwave therapy were reported at 6 and 12 months, although the absence of a placebo control limits conclusions regarding true treatment efficacy [20]. Additionally, better clinical outcomes with PRP compared with high-volume injection were observed at 6 months [21]. However, one study found worse clinical outcome at 6 months with leukocyte-poor PRP compared with bone marrow–derived mesenchymal stem cell injection [22].

The lack of standardized primary outcomes available complicates in depth analysis of existing literature. Differences in PRP formulation, injection technique, number of injections, post-procedural rehabilitation protocols, and primary outcome measures likely contribute to inconsistent findings. Additionally, follow-up duration varied widely, with short-term benefits reported more frequently than sustained long-term improvements. Standardization of these variables and additional studies will likely allow for better analysis.

Conclusion

While symptomatic improvement in several cohort and pilot studies was reported, PRP injections do not demonstrate consistent superiority over placebo or standard interventions. However, there is durable evidence for the short-term benefits of PRP injections. These findings suggest that PRP should be considered an adjunctive or short-term therapy rather than a first-line treatment for patellar tendinopathy. While PRP is a promising field for the treatment of patellar tendinopathy, a larger body of standardized literature is needed to elucidate a clear long-term benefit.

Conflict of interests

The authors declare that they have no conflict of interests.

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