Review of the Literature on OrthoBiologics Injections for Rotator Cuff Tendinopathy and Partial Tears

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Background: Rotator cuff tendinopathy is the leading cause of shoulder pain leading to long term debility and decreased overall function. More than 50% of the general population by the age of 60 will be affected by rotator cuff tendinopathy. Rotator cuff tears themselves account for as high as 20%-40% of shoulder disease and often lead to activity limitations and pain. Management is usually dependent on severity, starting with conservative interventions including Tylenol, oral or topical NSAIDs, activity modifications and physical therapy. If first line modalities are ineffective, patients are often advised to trial corticosteroid injections. Although corticosteroid injections have been shown to be beneficial for acute or subacute tendinitis, providing short-term relief, they are also known to inhibit collagen synthesis, and place tendons at increased risk of rupture. If acceptable levels of pain relief or functionality are not achieved, surgical options are then considered. Platelet-Rich Plasma (PRP) has emerged as an alternative treatment option for soft tissue healing and has shown promise in the recent literature. PRP has been used for treatment of many musculoskeletal injuries. Platelets play a key role in wound healing by recruitment of white blood cells and regenerative cells such as fibroblasts through the release of multiple growth factors that signal a healing cascade. Despite the prevalence of rotator cuff tendinopathies and tears, current literature is mixed on the efficacy in treating rotator cuff injuries. Challenges include limited reporting on PRP processing methods, classification of PRP, final PRP composition, and long term outcomes. The goal of this review is to compare some of the most recent randomized controlled trials involving OrthoBiologics, specifically PRP, in the management of rotator cuff pathology.

Methods: This review investigates the literature surrounding PRP use for treatment of rotator cuff pathology including tendinopathy and partial tears. PubMed was used to locate randomized control trials for rotator cuff pathology over the past 2 decades using key phrases such as “Platelet rich plasma,” “OrthoBiologics,” “rotator cuff tears,” “rotator cuff tendinopathy”. All records were independently reviewed by the Author and fellow physiatrist, Christopher Meadows, MD.

Results: 3 articles were identified that met inclusion criteria. Kesikburun et al assessed the efficacy of subacromial injection of PRP versus saline in the treatment of partial or complete rotator cuff injuries. Centeno et al compared PRP + Bone marrow concentrate vs exercise therapy in the treatment of partial rotator cuff tears. Yu Cai et al investigated PRP vs Sodium Hyaluronate + PRP vs sodium hyaluronate vs normal saline (control) for treatment of partial thickness rotator cuff tears.

Kesikburun et al outcome measures included the Western Ontario Rotator Cuff Index (WORC), Shoulder Pain and Disability Index (SPADI), and the Visual Analog Scale (VAS) while performing the Neer Sign, a movement often used to assess for subacromial impingement syndrome. They found no statistically significant differences in treatment groups compared to controls, however, both groups showed significant improvements from baseline (Figure 1).

Centeno et al outcome measures included Disabilities of the Arm, Shoulder, and Hand (DASH) and numeric pain scale (NPS). They concluded a significant improvement in the PRP+BMC group compared to exercise alone (Figure 2).

Cai et al primary outcome included the Constant Score. Secondary outcomes including VAS and American Shoulder and Elbow Surgeons (ASES). Their study demonstrated PRP and PRP+SH to be effective in treating partial-thickness rotator cuff tears (PTRCT) (Figure 3).

Discussion: many challenges exist in quantifying biological treatments. These include varieties in initial injury classification such as distinguishing acute from subacute and chronic, and partial versus complete rotator cuff injuries. Further, it is rare for studies to characterize the specific site of injury within the “rotator cuff” muscle group, for example, both a supraspinatus and infraspinatus injury would be classified as a rotator cuff tendinopathy, however, these may not equally respond to similar treatment methods. Even further, the characterization of PRP is often not included in the methods to provide uniformity across studies such that identifying the ideal PRP composition for treatment methods is not well defined.

Kesikburun et al did not find significant improvements with PRP injections compared to a placebo, possibly because their study included patients without rotator cuff tears, and both groups received a standardized 6-week exercise program. While this program led to significant improvements in both groups, the moderate effect seen in the PRP group may not have been enough to outperform the placebo. In contrast, Centeno et al and Cai et al showed more pronounced benefits of PRP and PRP combinations, especially when compared to placebo or exercise alone. The differences in outcomes may also reflect the underlying pathology, as tendinopathies without tears may improve more with physical therapy alone, while tendon tears may require additional interventions like PRP. Further research could clarify the role of PRP in treating various stages and types of rotator cuff injuries, potentially by excluding patients who have not failed physical therapy or by comparing PRP treatments without adjunct physical therapy. In conclusion, while PRP treatments appear safe and show promise in improving pain and function in patients with rotator cuff injuries, further studies are needed to identify optimal treatment protocols and better define the patient populations that benefit most.

Figure 1:

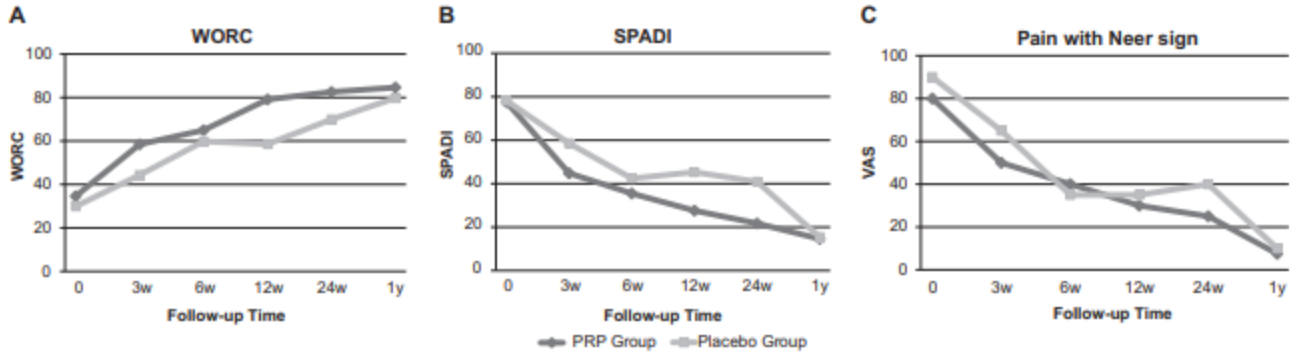


Figure 4. Changes in the WORC (A), SPADI (B), and VAS (C) scores over time. PRP, platelet-rich plasma; SPADI, Shoulder Pain and Disability Index; VAS, visual analog scale; WORC, Western Ontario Rotator Cuff Index.

Figure 2:

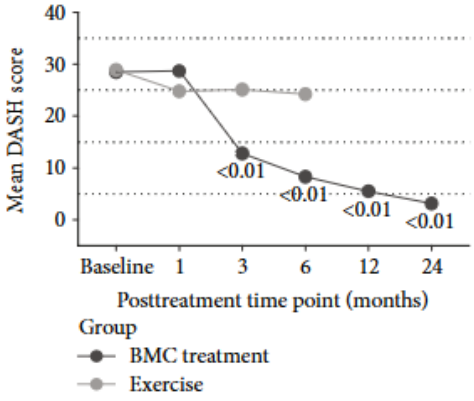


FIGURE 2: DASH scores at baseline and follow-up time points. Displayed p values reflect comparison to baseline. Exercise N: 9, 10, 5; treatment N: 23, 22, 24, 24, 23, 17.

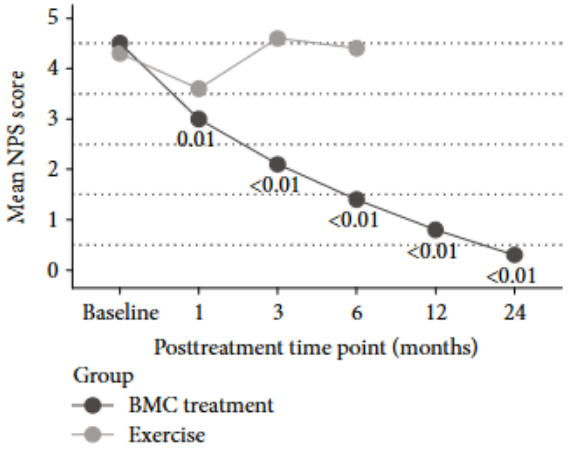
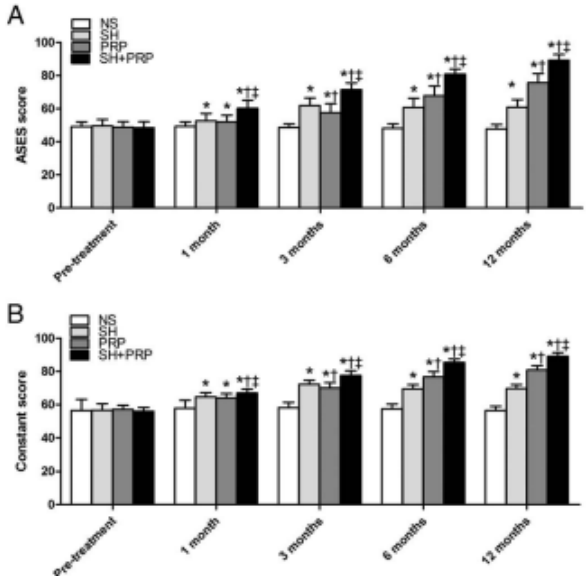


FIGURE 4: NPS scores before and after BMC treatment. Displayed p values reflect comparison to baseline. Exercise N: 9, 10, 5; BMC treatment N: 23, 22, 24, 23, 23, 17.

Figure 3:



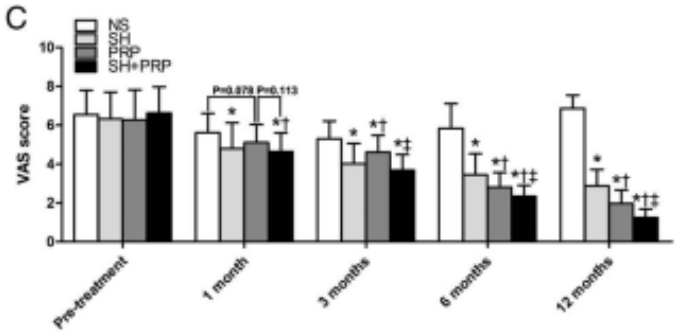


FIGURE 3—A, B, and C, The mean ASES scores, Constant scores, and VAS scores of the four groups, respectively. *$P < 0.01$ vs NS. †$P < 0.01$ vs SH. ‡$P < 0.01$ vs PRP.

CAI, YU, et al. “Sodium Hyaluronate and Platelet-Rich Plasma for Partial-Thickness Rotator Cuff Tears.” *Medicine & Science in Sports & Exercise*, vol. 51, no. 2, Feb. 2019, pp. 227–233, https://doi.org/10.1249/mss.0000000000001781. Accessed 2 Apr. 2021.

Centeno, Christopher, et al. “A Randomized Controlled Trial of the Treatment of Rotator Cuff Tears with Bone Marrow Concentrate and Platelet Products Compared to Exercise Therapy: A Midterm Analysis.” *Stem Cells International*, vol. 2020, 30 Jan. 2020, pp. 1–10, https://doi.org/10.1155/2020/5962354. Accessed 27 Oct. 2020.

Kesikburun, Serdar, et al. “Platelet-Rich Plasma Injections in the Treatment of Chronic Rotator Cuff Tendinopathy.” *The American Journal of Sports Medicine*, vol. 41, no. 11, 26 July 2013, pp. 2609–2616, https://doi.org/10.1177/0363546513496542.