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## The Combination of Platelet Rich Plasma and Corticosteroids in Musculoskeletal and Musculotendinous Pathologies

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## Background

- 126 million Americans reported to have a musculoskeletal or musculotendinous pathology in 2012<sup>1</sup>
- Combined direct and indirect cost of these injuries in 2015 was \$874 billion<sup>1</sup>
- Corticosteroid injections have been the mainstay of invasive management after conservative methods fail
- Long-term effects of corticosteroids
  - Intra-articular injections for knee osteoarthritis resulted in cartilage volume loss<sup>10</sup>
  - Harm to flexor tendons, neurovascular structures, and compromised integrity<sup>7, 11</sup>
- Platelet Rich Plasma
  - Sample patient blood → Centrifuge → Separate plasma and platelets from other blood products → Reconcentrate the platelets into the plasma
  - Platelets release growth factor beta, vascular endothelial growth factor, platelet derived growth factor, transforming growth factor<sup>12, 13</sup>
  - Reproduction of cells and regeneration of tissue
  - New application in the management of musculoskeletal and musculotendinous pathologies
- The goal of this literature review is to discuss possible improved outcomes and patient satisfaction when combining platelet rich plasma with corticosteroids in the management of musculoskeletal and musculotendinous pathologies in adults 18 years or older, versus the use of PRP or corticosteroid injections alone.

## Methods

**Inclusion Criteria:** Corticosteroid injections, platelet rich plasma injections, musculoskeletal and musculotendinous pathologies, short and long-term effects, pain, function, mobility, strength, and satisfaction

**Exclusion Criteria:** Articles with patient populations under 18 years old, articles that did not address a musculoskeletal/musculotendinous pathology, outcomes besides those mentioned above

**Search Engines:** Scott Memorial Library and PubMed

**Search Terms:** “PRP vs Corticosteroid”, “platelet rich plasma versus corticosteroids”, “platelet rich plasma AND corticosteroid”, “long-term effects of corticosteroid injections”, “PRP combined with corticosteroids”, “platelet rich plasma”

**Filters:** Article type for clinical trials, meta-analysis, randomized control trials, systematic review, peer-reviewed journals only, publication date within the past five years

Article 1: Platelet-Rich Plasma Has Better Long-Term Results than Corticosteroids or Placebo for Chronic Plantar Fasciitis: Randomized Control Trial<sup>2</sup>

- Three-arm randomized control trial

Article 2: PRP versus Steroids in a Deadlock for Efficacy: Long-term Stability versus Short-Term Intensity - Results from a Randomised Trial<sup>3</sup>

- Randomized control trial

Article 3: Single Intra-Articular Platelet-Rich Plasma versus Corticosteroid Injections in the Treatment of Adhesive Capsulitis of the Shoulder: A Cohort Study<sup>4</sup>

- Cohort study

Article 4: Platelet-Rich Plasma versus Corticosteroid Intra-Articular Injections for the Treatment of Trapeziometacarpal Arthritis: A Prospective Randomized Controlled Clinical Trial<sup>5</sup>

- Prospective randomized control trial

Article 5: Ultrasound-Guided Subacromial-Subdeltoid Bursa Corticosteroid Injections: A Study of Short- and Long-Term Outcomes<sup>6</sup>

- Prospective, longitudinal, analytical study

Article 6: Protective Nature of Platelet-Rich Plasma Against Chondrocyte Death when Combined with Corticosteroids or Local Anesthetics<sup>14</sup>

- Controlled laboratory study

## Results

Title	Groups	Outcomes	Timeline	Findings
Platelet-Rich Plasma Has Better Long-Term Results than Corticosteroids or Placebo for Chronic Plantar Fasciitis: Randomized Control Trial <sup>2</sup>	PRP vs Corticosteroid vs Placebo  90 patient's aged 18 and older who failed conservative treatment for chronic plantar fasciitis	<b>Pain:</b> Visual analogue Scale (VAS)  <b>Pain and Function:</b> Roles and Maudsley Score (R&M)  <b>Patient Satisfaction:</b> Short Form-12 Score	<ul style="list-style-type: none"> <li>Baseline</li> <li>1 week</li> <li>3 weeks</li> <li>3 months</li> <li>6 months</li> <li>12 months</li> <li>18 months</li> </ul>	<p>Patients in the corticosteroid group had greatest improvement in VAS score, R&amp;M score, and Short Form-12 score from baseline to three weeks</p> <p>Patients in the PRP group had greatest improvement in VAS score, R&amp;M score, and Short Form-12 Score from 3 months to 18 months</p> <p>Patients had better outcomes for pain, function, and satisfaction with the corticosteroids over the short-term while PRP had better outcomes over the long-term</p>
PRP versus Steroids in a Deadlock for Efficacy: Long-Term Stability versus Short-Term Intensity - Results from a Randomised Trial <sup>3</sup>	PRP vs Corticosteroid  80 patients 18 years and older who failed conservative treatment for lateral epicondylitis (LE)	<b>Pain:</b> Visual Analogue Scale (VAS)  <b>Function:</b> Disabilities of the arm, shoulder, and hand (DASH) score + Mayo elbow performance score (MEPS) + grip strength score (GSS)	<ul style="list-style-type: none"> <li>Baseline</li> <li>6 weeks</li> <li>3 months</li> <li>12 months</li> </ul>	<p>Patients in the corticosteroid group had less pain and better function at 6 weeks post injection</p> <p>Patients in the PRP group had less pain and better function at 3 and 12 months post injection</p> <p>Ex: Mean VAS for CS at 6 weeks was 13.5 but worsened to 22.75 at 3 months</p>
Single Intra-Articular Platelet-Rich Plasma versus Corticosteroid Injections in the Treatment of Adhesive Capsulitis of the Shoulder: A Cohort Study <sup>4</sup>	PRP vs Corticosteroid  60 patients with adhesive capsulitis of the shoulder	<b>Pain:</b> Visual Analogue Scale (VAS)  <b>Disability:</b> Shoulder Pain and Disability Index (SPADI) score  <b>Function:</b> Range of motion with goniometry  <b>Satisfaction:</b> Interval scale “satisfied”, “partly satisfied”, or “not satisfied”	<ul style="list-style-type: none"> <li>3 weeks</li> <li>6 weeks</li> <li>12 weeks</li> </ul>	<p>No statistically significant difference between groups for mean VAS at 3 weeks post-injection (p=0.06)</p> <p>Statistically significant difference between groups for mean VAS at 6 weeks (p=0.01) and 12 weeks (p=0.001)</p> <p>Statistically significant difference between groups for SPADI score at 12 weeks (p=0.002)</p> <p>75% of patients in PRP group reported “satisfied”, 52% of patients in corticosteroid group reported “satisfied”</p>
Platelet-Rich Plasma versus Corticosteroid Intra-Articular Injections for the Treatment of Trapeziometacarpal Arthritis: A Prospective Randomized Controlled Clinical Trial <sup>5</sup>	PRP vs Corticosteroid  33 patients with TMJ arthritis	<b>Pain:</b> Visual Analogue Scale (VAS)  <b>Function:</b> Shortened disabilities of the arm, shoulder, and hand questionnaire (Q-DASH) score  <b>Satisfaction:</b> “yes” or “no”	<ul style="list-style-type: none"> <li>Baseline</li> <li>3 months</li> <li>12 months</li> </ul>	<p>At 3 months, both the PRP and corticosteroid groups had a statistically significant difference from the mean VAS baseline value (p=0.004 and p=0.001)</p> <p>At 12 months, the PRP group continued to have a statistically significant VAS compared to baseline (p=0.005) while the CS group did not (p=0.105)</p> <p>At 3 months both the PRP and CS groups had statistically significant differences in Q-DASH score compared to baseline (p=0.002 and p=0.014)</p> <p>At 12 months, only the PRP group continued to have a statistically significant Q-DASH score when compared to baseline (p=0.002, p=0.06)</p> <p>At 3 months, patients in corticosteroid group were more satisfied</p> <p>At 12 months, patients in the PRP group were more satisfied</p>
Protective Nature of Platelet-Rich Plasma Against Chondrocyte Death when Combined with Corticosteroids or Local Anesthetics	Methylprednisolone alone vs PRP alone vs PRP plus methylprednisolone vs Depo-Medrol alone vs PRP plus Depo-Medrol  Human articular chondrocytes	Cell viability  Cell proliferation	<b>Viability:</b> 0, 5, 10, and 30 minutes  <b>Proliferation:</b> 4 days	<p>Chondrocyte proliferation for PRP was significantly greater than the separate proliferation of corticosteroids.</p> <p>Chondrocytes that were treated only with a corticosteroid had worse cell viability and proliferation compared to when it was combined with PRP</p>

## Discussion

### Limitations:

- Lack of standardization between preparations of PRP and different types of local anesthetics and corticosteroids
- Small variety of musculoskeletal and musculotendinous pathologies were included in this literature review
- Small sample sizes

### Conclusions:

- All studies revealed that platelet rich plasma injections provided patients with superior pain control, functional status, and satisfaction over the long-term while corticosteroids were the superior injection for the same outcomes over the short-term
- The protective effects of PRP against the degenerative effects of corticosteroids highlights the potential benefit of the combination of these two treatment modalities
- The combination of PRP and corticosteroids for the treatment of musculoskeletal or musculotendinous pathologies may decrease morbidity for patients with such conditions
- It is important for physician assistants practicing in orthopedics to understand the risks and benefits of these injections and be up to date on the ever-evolving practice guidelines

## Further Direction

- Prospective randomized control trials on the combination of PRP and corticosteroids for adults with a musculoskeletal or musculotendinous pathology
- Researchers must determine if the combination of these injections can be given in one injection or given in a series over time
- Pain → VAS
- Function → Validated tool specific to the particular pathology
- Sample sizes greater than 100 patients
- A treatment that provides pain relief while simultaneously improving function and extending time until physiologic breakdown should be the standard of care

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