Platelet-Rich Plasma Compared With Other Common Injection Therapies in the Treatment of Chronic Lateral Epicondylitis

Tristan Rodik and Brendon McDermott

Clinical Scenario: Lateral epicondylitis (LE) is a relatively common pathology capable of producing chronic debilitation in a variety of patients. A newer treatment for orthopedic conditions is platelet-rich plasma (PrP) local injection. Focused Clinical Question: Is PrP a more appropriate injection therapy for LE than other common injections such as corticosteroid or whole blood? Summary of Key Findings: Four studies were included: 1 randomized controlled trial (RCT), 2 double-blind RCTs, and 1 cohort study. Two studies involved comparisons of PrP injection to corticosteroid injection. One of the studies involved a 2-y follow-up while another involved a 1-y follow-up. Another study involved the comparison of PrP injection with whole-blood injection with a 6-mo follow-up. The final study included a PrP-injection group and control group. The 2 studies involving PrP vs corticosteroid injections with 2-y and 1-y follow-ups both favored PrP over corticosteroid injection in terms of pain reduction and function increases. The third study favored PrP injections over whole-blood injections at 6 mo regarding pain reduction. All studies demonstrated significant improvements with PrP over comparison injections or no injection. Clinical Bottom Line: PrP injections provide more favorable pain and function outcomes than whole blood and corticosteroid injections for 1–2 y after injection. Strength of Recommendation: Consistent findings from RCTs suggest level 1b evidence in support of PrP injection as a treatment for LE.

Keywords: elbow, orthopedics, orthopaedics, nonathlete
due to increased pain reduction and function outcomes. The third study favored PrP injections over whole-blood injections at 6 months regarding pain reduction, and the other 2 studies demonstrated favorable outcomes with the use of PrP injection compared with a control group.

**Clinical Bottom Line**

There is strong evidence to support PrP injections as more effective in reducing pain in patients with LE when compared with alternative or no injection therapy.

**Strength of Recommendation:** There is level 2 evidence in support of PrP in reducing pain rather than whole-blood or corticosteroid injections in patients who present with LE. Although the studies presented were RCTs, 1 of them did present relatively low external validity.

**Search Strategy**

**Terms Used to Guide Search Strategy**

- **Patient/Client group:** patients presenting with lateral epicondylitis
- **Intervention:** platelet-rich plasma injection
- **Comparison:** injection, corticosteroid, autologous blood
- **Outcomes:** pain and function

**Sources of Evidence Searched**

- PubMed
- MEDLINE (Ebsco)
- Literature cross-referenced for further resources

**Inclusion and Exclusion Criteria**

**Inclusion**

- Patients with lateral epicondylitis
- Treated with PrP, corticosteroid, or whole-blood injections
- Minimum 6-month follow-up
- Human subjects
- Articles in English published during or after 2005
- Minimum level 2 evidence

**Exclusion**

- Included patients without lateral epicondylitis
- Not available in English
- Follow-up less than 6 months
- Journals published before 2005
- Level of evidence below 2

**Results of Search**

Five relevant studies were found and are presented in Table 1. However, only 4 studies are presented in Table 2 because 2 of the studies contained the same subjects but 1 contained a 1-year follow-up and the other a 2-year follow-up.

**Best Evidence**

The studies included were identified as the best match in accordance with inclusion and exclusion criteria and due to the patient-centered outcomes assessed. Selection of these studies best compared PrP and other injection treatments for LE.

**Implications for Practice, Education, and Future Research**

Corticosteroid injections present a high frequency of relapse and recurrence in patients presenting LE. At 6 weeks after corticosteroid injection, success rates were 92%, but at 52 weeks the success rate dropped to 69%. However, studies have found that PrP can stimulate tendon-healing processes, as opposed to decreasing inflammation.

Platelets have a strong role in homeostasis and the normal healing process through growth-factor secretion. These growth factors function in transforming growth-factor beta, vascular endothelial growth factor, and epithelial-growth-factor-enhancing tissue regeneration. PrP contains a higher concentration, a mean of 539% greater, of platelets than whole blood. One study reported that 3.31 million platelets were injected into each patient.

Few studies are currently available that include PrP injection as a focused treatment for LE. In the studies reviewed for this critically appraised topic, comparisons of PrP with whole-blood injections, corticosteroid injections, and bupivacaine (control group) occurred. In the studies that described their injection protocol, the time

| Table 1 Summary of Study Designs of Articles Retrieved |
|-----------------|-----------------|-----------------|
| Level of evidence | Study design | Reference |
| 1 | Randomized controlled trial | Peerbooms et al⁶ |
| 1 | Randomized controlled trial | Gosens et al⁵ |
| 1 | Randomized controlled trial | Thanasaas et al⁴ |
| 2 | Cohort study | Mishra and Pavelko⁷ |
| 2 | Randomized controlled trial | Mishra et al⁸ |
Table 2  Characteristics of Included Studies

<table>
<thead>
<tr>
<th>Article</th>
<th>Thanasas et al⁴</th>
<th>Gosens et al⁵</th>
<th>Mishra and Pavelko⁷</th>
<th>Mishra et al⁸</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>RCT</td>
<td>Double-blind RCT</td>
<td>Cohort study</td>
<td>Double-blind RCT</td>
</tr>
<tr>
<td>Participants</td>
<td>28 consecutive patients diagnosed with chronic LE. Symptoms were present for 3 or more mo before intervention. Participants were split into a whole-blood-injection group or PrP injection and evenly distributed with 14 in each group. Participants had not had any injection therapy before this study. Block randomization was used to establish groups.</td>
<td>100 consecutive patients with LE. 49 participants were assigned to the corticosteroid group and 51 to PrP. Participants were scheduled for injection therapy between May 2006 and January 2008. All participants had LE for longer than 6 mo and pain of at least 50 on a VAS scale of 0–100 mm. Participants were at least 18 with a mean age of 47 y. The majority of participants were women. The majority of affected sides was the right elbow. Participants were randomly assigned by a computer program.</td>
<td>20 participants were included in the study with 15 in the PrP injection group and 5 serving as controls. All participants had a VAS score of at least 60/100 for at least 3 mo. The mean duration of symptoms for the PrP group was 15.3 mo with a mean participant age of 48.1 y. The mean duration of symptoms for the control group was 11.8 mo with a mean participation age of 42.2 y.</td>
<td>225 participants were included in the study with 112 receiving PrP injections and 113 serving as controls. All participants had a VAS score of at least 50/100 mm for at least 3 mo. The mean patient age in the control group was 47.4 y and the PrP-injection group 48.4 y. 12 sites were used for this study.</td>
</tr>
<tr>
<td>Intervention investigated</td>
<td>1 group was treated with a single injection of whole blood, the other group with 1 injection of PrP. Both groups received their injections into the deep aspect of the origin of the wrist extensors. Injections were conducted with ultrasound guidance. No nonsteroidal anti-inflammatory or cortisone was prescribed during follow-up. Oral paracetamol and ice therapy were allowed. Both groups were instructed to refrain from heavy labor for 1 wk. Flexibility and eccentric-loading programs were implemented. Reevaluations were conducted at 6 wk, 3 mo, and 6 mo after injection.</td>
<td>1 group was treated with corticosteroid injections, the other with PrP injections. Both groups received injections into the area of most tenderness and into the common extensor tendon. After injection no arm movement occurred for 15 min and complete rest ensued for 24 h after. Acetaminophen was allowed but no nonsteroidal anti-inflammatory agents. Stretching and strengthening programs were implemented, and after 4 wk normal sporting or recreational activity was allowed.</td>
<td>2 injections were given for each participant of both groups into the area of most pain and into the common extensor or flexor tendon. After injection no arm movement occurred for 15 min and complete rest ensued for 24 h. Participants were given a stretching protocol to follow for 2 wk. 4 wk postinjection, participants were allowed to return to normal sporting or recreational activity.</td>
<td>2–3 mL of prepared PrP was injected into the extensor carpi radialis brevis tendon; the control group received 2–3 mL of bupivacaine. Patients reported pain with resisted wrist extension. Baseline pain of resisted wrist extension was then compared at 4, 8, 12, and 24 wk post-PrP injection.</td>
</tr>
<tr>
<td>Outcome measures</td>
<td>Primary Outcome: Liverpool elbow score to assess range of motion, daily activities, and ulnar nerve status. Secondary Outcome: VAS on a scale of 0–10 to measure pain.</td>
<td>Primary Outcome: DASH. Secondary Outcome: VAS. Both outcomes were measured before injection and 8 weeks, 12 weeks, 26 weeks, 52 weeks, and 104 weeks postinjection.</td>
<td>Primary Outcome: A modified Mayo elbow score. Secondary Outcome: VAS.</td>
<td>Primary Outcome: Tennis Elbow Questionnaire. Secondary Outcome: VAS with resisted wrist extension.</td>
</tr>
</tbody>
</table>

(continued)
Main findings

Pretreatment VAS scores were 6.0 for the whole-blood group and 6.1 for the PrP-injection group. The PrP-injection group displayed better improvements in VAS scores than the whole-blood group at every reevaluation but was only significant at 6 wk. At 6 wk postinjection the PrP group displayed a mean improvement of 3.8 in VAS scores with the whole-blood group displaying a mean improvement of 2.5. No significant differences were noted according to the Liverpool score.

Level of evidence

9/11 on PEDro Scale

Validity score

Conclusion

PrP injection has been shown to decrease pain more quickly than whole-blood injections and may provide a better treatment protocol due to PrP-injection safety and reduction of cost.

A single injection of PrP was shown to improve function and decrease pain more than corticosteroid injections during a 2-y follow-up with no reported complications.

Buffered PrP injections may be an alternative to surgery in individuals who have severe elbow tendinosis and have had failed nonoperative treatment. PrP-treated individuals experienced significant long-term improvements with no reported complications.

Abbreviations: RCT, randomized controlled trial; LE, lateral epicondylitis; PrP, platelet-rich plasma; VAS, visual analog scale; DASH, Disabilities of the Arm, Shoulder, and Hand.
from withdrawal of the patient’s blood to PrP injection was approximately 30 minutes.\textsuperscript{6,7} Four of the studies\textsuperscript{4,6–8} injected 2 to 3 mL of PrP into each patient, and the study\textsuperscript{7} that compared PrP with whole-blood injected 3 mL of whole blood. The study that compared PrP with a corticosteroid injected 1 mL into the patient.\textsuperscript{9}

After the PrP injection, participants were instructed to rest for 15 minutes and limit use of their arm for the next 24 hours.\textsuperscript{5–7} After 24 hours, participants were instructed on a stretching and strengthening program for 2 weeks; 4 weeks after the injection, patients could return to sporting or recreational activities.\textsuperscript{5–7} In another study patients were reassessed after 1 week and instructed on stretches and eccentrically loaded exercises to be performed twice per day for 5 weeks.\textsuperscript{4} However, 1 study\textsuperscript{8} did not mention any at-home instruction given to the participants.

Two studies reported that some patients experienced pain and discomfort at the injection site that slowly subsided within the first week after injection.\textsuperscript{4,8} The pain and discomfort reported occurred in 2 of 112 patients receiving PrP injections.\textsuperscript{8} However, another study reported no complications at any period after the injection.\textsuperscript{7} Thanasa et al\textsuperscript{4} found that the PrP-injection group presented better VAS scores at 6 weeks, 3 months, and 6 months during follow-up. However, the difference was significantly better than with whole blood at 6 weeks and no other follow-up time point.\textsuperscript{4} Other research,\textsuperscript{8} when comparing PrP injections with a control group, found that the difference in improvement was only significant at 24-week follow-up and not at any time sooner. Improvements of 46% in VAS scores and 42% in Mayo elbow scores were noted at 4 weeks in another study.\textsuperscript{7} Later, at 8 weeks after injection, patients reported an improvement of 60% in VAS scores and a 52% improvement in Mayo elbow scores over baseline.\textsuperscript{7} Six months after the injection an improvement of 81% in VAS scores and 72% in Mayo elbow scores over baseline was noted in the PrP-injection group.\textsuperscript{7} At the final follow-up (mean 25.6 months, range 12–38) a 93% improvement in VAS over baseline was recorded, and 93% of the patients reported satisfaction with the PrP treatment.\textsuperscript{7}

In 1 study, corticosteroid injections provided better short-term outcome, but PrP injections provided better long-term outcomes.\textsuperscript{6} Four weeks after injection, PrP patients reported a 21% improvement in their VAS scores and the corticosteroid patients reported a 32.8% improvement. In addition, at 4 weeks, Disabilities of the Arm, Shoulder, and Hand (DASH) scores improved 15.7% in PrP patients and 25.8% in corticosteroid patients. Eight weeks after the injection, a 33.1% improvement of VAS scores was recorded for PrP patients and corticosteroid patients reported a 34.8% improvement. Recordings of VAS and DASH scores were also recorded at 12 weeks, 6 months, and 1 year (although this study continued in a later publication).\textsuperscript{5} At 1 year the PrP patients reported a mean improvement of 63.9% in their VAS score, with the corticosteroid group reporting a 24% improvement.

During a 2-year follow-up investigation, the PrP group recorded a DASH score of 17.6 ± 24 and a VAS score of 21.3 ± 28.1.\textsuperscript{5} The corticosteroid group recorded a DASH score of 36.5 ± 23.8 and a VAS score of 42.4 ± 26.8. Recurrence rate and need for future treatment was higher in the corticosteroid group than in the PrP group.\textsuperscript{5} A noteworthy finding is that the PrP group presented DASH scores that were worse before their injection than at their 26 week follow-up.\textsuperscript{7} One study reported that PrP injections are twice as expensive as corticosteroid injections, but surgery is twice as expensive as PrP injections in cases of LE, although those findings were reported in Sweden.\textsuperscript{3} Other reports\textsuperscript{8} have shown that surgery can cost upward of $12,000 for chronic lateral epicondylar tendinopathy, while PrP injections cost as little as $1000.

Future research is needed to study the effects of PrP injections on LE in the athletic population. While the highlighted research articles provide favorable evidence on long-term outcomes when using PrP injections for LE, nonathletic populations were used. Therefore, evidence is lacking as to whether PrP injections provide favorable outcomes for those participating in competitive sports. More research is warranted regarding other orthopedic injuries and tendinopathies beyond LE.

References
