**ABSTRACT**

**Objective:** The objective is to compare the efficacy, in terms of pain relief and functional improvement, of autologous whole blood and corticosteroid injection in managing lateral epicondylitis (Tennis elbow).

**Methods:** This was a comparative study conducted in Department of Orthopedics, National Institute of Medical Sciences Jaipur, Rajasthan, India. Eighty patients diagnosed to be having lateral epicondylitis were included in this study on the basis of predefined inclusion and exclusion criteria. The patients were divided into 2 groups on the basis of whether they were given autologous whole blood (Group B) or corticosteroid injection (Group S). Efficacy of both the treatment modality was compared in terms of Pain relief (as assessed by reduction in visual analogue score [VAS] score) and functional improvement (as assessed by improvement in Mayo Elbow performance score). SPSS 22.0 software was used for statistical analysis and p<0.05 was taken as statistically significant.

**Results:** A total of 80 patients were included in this study out of which there were 37 (46.25%) males and 43 (53.75%) females with a M: F ratio of 1:1.16. The mean age of patients in group B and group S was found to be 52.36±9.90 years and 48.46±10.12 years, respectively. The mean age of patients in both the groups was found to be comparable with no statistically significant difference (p=0.0866). At the time of 4 weeks, 8 weeks, and 12 weeks follow–up, the mean VAS score in Group B was less as compared to group S and the difference was found to be statistically highly significant (p<0.0001). At the time of 4 weeks, 8 weeks, and 12 weeks’ follow-up, the mean MEPS in Group B was more as compared to group S, and the difference was found to be statistically significant (p<0.05).

**Conclusion:** For lateral epicondylitis, whole blood injection demonstrated superior efficacy in terms of pain relief and functional improvement as compared to injection of corticosteroid.

**Keywords:** Tennis elbow, Lateral epicondylitis, Autologous whole blood, Corticosteroids.

**INTRODUCTION**

Lateral epicondylitis, commonly known as tennis elbow, is a common musculoskeletal condition affecting the extensor tendons of the forearm, specifically the common extensor tendon originating at the lateral epicondyle of the humerus [1]. Lateral epicondylitis is characterized by degenerative changes rather than inflammatory processes, despite its historical terminology. Individuals engaged in professions or sports that involve frequent and forceful use of the forearm, such as carpentry, painting, or playing racquet sports, are at an increased risk. Poor technique during sports or work-related activities can also contribute to the strain on the tendons [2]. Age plays a role, as the risk tends to increase with advancing age, possibly due to the natural aging process and decreased tendon flexibility. In addition, inadequate muscle strength and improper equipment, such as using a tennis racket with an inappropriate grip size, may contribute to the development of lateral epicondylitis. The primary etiology is often attributed to repetitive overuse, leading to microtrauma and subsequent degeneration of the extensor tendon [3]. Clinically, patients with lateral epicondylitis typically present with lateral elbow pain exacerbated by gripping and wrist extension, often hindering daily activities and affecting work performance. Diagnosis is primarily clinical, with the presence of localized tenderness at the lateral epicondyle and pain upon resisted wrist extension. Imaging studies are rarely necessary but may be employed to rule out other potential causes of symptoms [4].

In the management of lateral epicondylitis, various conservative approaches are employed, including rest, physical therapy, nonsteroidal anti-inflammatory drugs, and bracing [5]. When conservative measures fail to provide relief, more invasive interventions, such as injections, become a crucial aspect of treatment. Two commonly employed injection therapies for lateral epicondylitis are autologous whole blood and corticosteroids. These interventions aim to reduce pain and promote healing, but their mechanisms of action differ significantly [6].

Autologous whole-blood injections involve drawing the patient's blood and re-injecting it into the affected area, typically at the origin of the extensor tendon. This approach harnesses the regenerative potential of platelets and growth factors within the patient's blood to stimulate tissue repair. In contrast, corticosteroid injections target inflammation by delivering potent anti-inflammatory agents directly to the site of injury. While corticosteroids can provide rapid relief of symptoms, concerns about their potential adverse effects, including tendon atrophy and impaired healing, have fuelled interest in alternative therapies such as autologous whole blood [7].

Despite the prevalence of lateral epicondylitis and the various treatment options available, there exists a notable gap in our understanding of the comparative effectiveness of autologous whole blood versus corticosteroid injections. While both interventions have
been individually studied, there is a scarcity of high quality, direct comparative studies that evaluate their relative efficacy, safety, and long-term outcomes. This knowledge gap leaves clinicians grappling with the decision of which injection therapy to prioritize, lacking evidence-based guidance to inform their treatment decisions [8].

This research paper aims to address this critical gap in the existing literature by conducting a comprehensive comparative study on the injection of autologous whole blood versus corticosteroid for lateral epicondylitis. By systematically evaluating and comparing the outcomes of these two interventions, our study intends to provide evidence-based insights into the optimal choice of injection therapy for patients with lateral epicondylitis.

METHODS

This was a comparative study conducted in the Department of Orthopedics, National Institute of Medical Sciences Jaipur, Rajasthan, India. The duration of the study was 1 year. 80 patients diagnosed to be having lateral epicondylitis (tennis elbow) were included in this study on the basis of a predefined inclusion and exclusion criteria. Written and informed consent was obtained from all the patients before enrolling them in the study. The sample size was calculated by formula $n = Z^2 \cdot P \cdot (1-P)/d^2$ using OPENEPI software version 3 on the basis of pilot studies done on the topic of body lateral epicondylitis assuming 90% power and 95% confidence interval, the sample size required was 38 patients. Based on central limit theorem, the sample size was determined to be enough if it was more than 38 thus 40 patients were included in each group. Total 80 patients were divided into 2 groups of 40 patients each. Patients were randomized by simple randomization (alternate patient in each group). Demographic details such as age, gender, and occupation of all the patients were noted. Height and weight were noted and body mass index of each patient was calculated. A detailed history was obtained in terms of presence of any chronic systemic illness such as hypertension, diabetes mellitus, arthritis or any autoimmune disorder.

A thorough general clinical examination as well as a local examination was done. The presence of tenderness over the lateral epicondyle was noted. Basic investigations such as complete blood count, C-reactive protein, erythrocyte sedimentation rate and rheumatoid factor were done. Anteroposterior and oblique X-ray of affected elbow was done in all cases. Local ultrasound was also done in all the cases. Magnetic resonance imaging was done in selected cases. The diagnosis of lateral epicondylitis was made on the basis of clinical features and imaging abnormalities such as Thickening of the common extensor tendon along with diffuse heterogeneity and areas of focal hypochoegenicity on ultrasound. Patients were divided into following 2 groups by simple randomization-

- Group B: 2 mL of autologous venous blood mixed with 1 mL of 2% prilocaine hydrochloride injected proximal to the lateral epicondyle under the surface of the extensor carpi radialis brevis by peppering technique under strict aseptic precautions.
- Group S: 1 mL of 40 mg methylprednisolone acetate mixed with 1 mL of 2% prilocaine hydrochloride injected proximal to the lateral epicondyle under the surface of the extensor carpi radialis brevis by peppering technique under strict aseptic precautions.

After the injection small sterile dressing was applied over the injection site. Upper limb rest 48 h was advised and the patient was asked to avoid strenuous activities or weight lifting of the affected upper limb for at least 10 days. Passive stretching of the extensor muscles was advised after 3 days of injection unless there was a significant pain in which case passive stretching was postponed till pain is subsided. Patients were assessed for pain by visual analogue scale (VAS) [9] and for functional status by Mayo Elbow Performance Score (MEPS) score [10] at the time of presentation and at the time of each follow up visits. The patients were followed up at 2 weeks, 4 weeks, 8 weeks and 12 weeks. A VAS up to 3 was taken as pain relief and VAS score of more than 3 was considered suboptimal pain relief. Functional outcome was assessed by Mayo Elbow score. SSPS 21.0 software was used for statistical analysis and p<0.05 was taken as statistically significant.

Inclusion criteria
1. Patients diagnosed to be having lateral epicondylitis (Tennis elbow) on the basis of clinical features and imaging
2. Gave informed written consent to be part of the study
3. Age more than 18 years
4. Failed to respond to conservative management for 3 months.

Exclusion criteria
1. Age less than 18 years
2. Those who refused written consent to be a part of the study
3. Any previous local intervention such as any local injection
4. Any previous surgery on the affected hand likely to hinder proper functional assessment
5. Conditions likely to affect functional assessment such as autoimmune arthritis or polyarthritis, rheumatoid arthritis, etc.

RESULTS

A total of 80 patients were included in this study out of which there were 37 (46.25%) males and 43 (53.75%) females with a M: F ratio of 1:1.16. Although in both the groups there was a slight female preponderance the gender distribution was found to be comparable in both the groups with no statistically significant difference among the 2 groups (p=0.4939) (Table 1).

In Group B, the most commonly affected age group was 41–50 years (37.50%) followed by 51–60 years (30%). Only 3 (7.50%) patients were below 30 years of age. In Group S, the most common affected age group was 51–60 years (32.50%) followed by 41–50 years (27.50%) and 31–40 years (20.00%). Only 2 (5%) patients were below 30 years of age. The mean age of patients in Group B and Group S was found to be 52.36±9.98 years and 48.46±10.12 years, respectively. The mean age of patients in both the groups was found to be comparable with no statistically significant difference (p=0.0866) (Table 2).

The analysis of patients on the basis of body mass index (BMI) showed that most of the patients with lateral epicondylitis (tennis elbow) were either overweight (45.00%) or obese (32.50%). It was less common in individuals having healthy BMI (16.25%) or underweight individuals (6.25%) (Fig. 1).

Table 1: Gender distribution of the studied cases.

<table>
<thead>
<tr>
<th>Gender distribution</th>
<th>Male</th>
<th>Percentage</th>
<th>Female</th>
<th>Percentage</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group B</td>
<td>19</td>
<td>17.50</td>
<td>21</td>
<td>32.50</td>
<td>0.4939</td>
</tr>
<tr>
<td>Group S</td>
<td>18</td>
<td>22.50</td>
<td>22</td>
<td>27.50</td>
<td>Not</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>40.00</td>
<td>43</td>
<td>60.00</td>
<td>significant</td>
</tr>
</tbody>
</table>

Table 2: Comparison of age distribution in both the groups.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Group B</th>
<th>Group S</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases</td>
<td>Percentage</td>
<td>No. of cases</td>
<td>Percentage</td>
</tr>
<tr>
<td>30 years or less</td>
<td>3</td>
<td>7.50</td>
<td>2</td>
</tr>
<tr>
<td>31–40 years</td>
<td>5</td>
<td>12.50</td>
<td>8</td>
</tr>
<tr>
<td>41–50 years</td>
<td>15</td>
<td>37.50</td>
<td>11</td>
</tr>
<tr>
<td>51–60 years</td>
<td>12</td>
<td>30.00</td>
<td>13</td>
</tr>
<tr>
<td>&gt;60 years</td>
<td>5</td>
<td>12.50</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.00</td>
<td>40</td>
</tr>
<tr>
<td>Mean age</td>
<td>52.36±9.98</td>
<td>48.46±10.12</td>
<td></td>
</tr>
</tbody>
</table>

p=0.0866 (Not significant)
The analysis of the patients on the basis of risk factors showed that out of 80 studied cases the most common risk factor was use of excessive daily use of screwdrivers (28.75%) followed by repeated use of plumbing tool as a profession (26.25%), playing racket sports (12.50%), excessive use of computer (6.25%) and oral steroid therapy (3.75%). In 18 (22.50%) patients, no risk factor could be identified (Fig. 2).

The analysis of the patients on the basis of duration of pain showed that most of the patients had pain since 9–12 months (50%) duration followed by 6 months to 9 months (28.75%) and 3–6 months (8.75%). 10 (12.50%) patients had pain of more than 1 year duration. The mean duration of pain in group B and group S was found to be 10.12±2.86 and 9.46±3.12 months, respectively. The mean duration of pain was found to be comparable in both the groups with no statistically significant difference (p=0.6987) (Table 3).

At the time of presentation, all patients were having severe pain. The mean VAS score in Group B and Group S at the time of presentation was found to be 8.1±2.2 and 7.9±2.32, respectively. After the injection of whole blood (Group B) or steroid (Group S) VAS score was noted during each follow-up visit at 2 weeks, 4 weeks, 8 weeks, and 12 weeks (Fig. 3).

Till 2 weeks the reduction in VAS score was found to be comparable in both the groups. However, at the time of 4 weeks, 8 weeks, and 12 weeks’ follow-up, the mean VAS score in Group B was less as compared to Group S and the difference was found to be statistically highly significant (p<0.0001) (Table 4).

Functional outcome in both the groups was assessed and compared by MEPS at presentation and at 2 weeks, 4 weeks, 8 weeks, and 12 months after the injection of whole blood or steroid. The mean MEPS in group B and group S at the time of presentation was found to be 40.24±12.80 and 44.86±13.98, respectively. After the injection of whole blood (Group B) or steroid (Group S) VAS score was noted during each follow up visit at

### Table 3: Comparison of mean duration of pain in studied cases

<table>
<thead>
<tr>
<th>Duration of pain</th>
<th>Group B No. of cases</th>
<th>Percentage</th>
<th>Group S No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3–6 months</td>
<td>4</td>
<td>10.00</td>
<td>3</td>
<td>7.50</td>
</tr>
<tr>
<td>6–9 months</td>
<td>11</td>
<td>27.50</td>
<td>12</td>
<td>30.00</td>
</tr>
<tr>
<td>9 months–1 year</td>
<td>19</td>
<td>47.50</td>
<td>21</td>
<td>52.50</td>
</tr>
<tr>
<td>Above 1 year</td>
<td>6</td>
<td>15.00</td>
<td>4</td>
<td>10.00</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.00</td>
<td>40</td>
<td>100.00</td>
</tr>
<tr>
<td>Mean duration (months)</td>
<td>10.12±2.86</td>
<td></td>
<td>9.46±3.12</td>
<td></td>
</tr>
</tbody>
</table>

p=0.6987 (Not significant) 95% CI=−1.5923–1.0723

### Table 4: Comparison of mean Mayo Elbow performance scores in both groups

<table>
<thead>
<tr>
<th>Mean VAS score</th>
<th>Group B (whole Blood)</th>
<th>Group S (Steroid)</th>
<th>p-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>At presentation</td>
<td>81.2±2.2</td>
<td>7.9±2.32</td>
<td>0.6875</td>
<td>-1861–0.7861</td>
</tr>
<tr>
<td>2 weeks</td>
<td>5.90±1.92</td>
<td>6.4±1.98</td>
<td>0.2367</td>
<td>-0.3482–1.3882</td>
</tr>
<tr>
<td>4 weeks</td>
<td>4.12±1.42</td>
<td>5.68±1.30</td>
<td>&lt;0.0001*</td>
<td>0.9540–2.1660</td>
</tr>
<tr>
<td>8 weeks</td>
<td>3.20±0.94</td>
<td>4.24±0.92</td>
<td>&lt;0.0001*</td>
<td>0.6478–1.4322</td>
</tr>
<tr>
<td>12 weeks</td>
<td>1.90±0.74</td>
<td>3.20±0.94</td>
<td>&lt;0.0001*</td>
<td>0.9234–1.6766</td>
</tr>
</tbody>
</table>

*Significant. CI: Confidence interval; VAS: Visual Analog Score

2 weeks, 4 weeks, 8 weeks and 12 weeks. At the time of final follow-up, the mean MEPS in group B and Group S was found to be 94.12±8.80 and 88.46±11.10, respectively (Fig. 4).

Till 2 weeks the improvement in functional outcome was found to be comparable in both the groups. However, at the time of 4 weeks,
Importantly, both interventions exhibited a favorable safety profile, with minimal and manageable adverse effects. This study suggests that the use of whole blood injection showed superior results compared to steroid injection as reported by the authors such as Kazemi et al.,[19] and Wolf et al.,[20].

CONCLUSION

While autologous whole blood as well as steroid injections demonstrated significant improvement in pain (VAS scores) and functional outcomes (MEPS), the use of whole blood injection showed superior results compared to steroid injection at 4, 8, and 12 weeks of follow-up. Importantly, both interventions exhibited a favorable safety profile, with minimal and manageable adverse effects. This study suggests that whole blood injection presents as a promising therapeutic option for lateral epicondylitis.

CONFLICT OF INTEREST

None.
REFERENCES


