RESEARCH PAPER

Clinical Outcomes, Compliance and Patient Satisfaction Following Use of a Novel Tennis Elbow Splint in Lateral Epicondylitis

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Abstract

Background: Lateral epicondylitis, commonly known as tennis elbow, is a painful overuse condition that can substantially affect upper-limb function and daily activities. Splinting is a commonly used conservative approach, and the present study evaluated the clinical outcomes, compliance, and patient satisfaction following use of a novel tennis elbow splint.

Methods: A prospective single-arm quasi-experimental interventional study was conducted among 50 patients with lateral epicondylitis aged 18–65 years. Participants with symptoms lasting more than 6 weeks and less than 12 months were included. All participants were provided with the novel tennis elbow splint and followed for 8 weeks. Clinical outcomes were assessed using the Visual Analog Scale (VAS), grip strength measured by hand dynamometer, and Patient-Rated Tennis Elbow Evaluation (PRTEE) at baseline and during follow-up. Compliance with splint use and patient satisfaction were also assessed. Pre- and post-intervention outcomes were compared using appropriate statistical tests, with $p<0.05$ considered statistically significant.

Results: Mean VAS score decreased progressively from 6.86 ± 0.78 at baseline to 2.58 ± 1.19 at 8 weeks, representing a mean reduction of 4.28 points ($p<0.001$). Mean grip strength increased from 18.42 ± 4.31 kg to 28.73 ± 3.92 kg, with an improvement of 10.31 kg ($p<0.001$). PRTEE score decreased from 63.84 ± 9.62 to 22.16 ± 6.83, representing a mean improvement of 41.68 points ($p<0.001$). Good compliance was observed in 38.0%, moderate compliance in 50.0%, and poor compliance in 12.0%. Overall, 80.0% of participants showed clinical improvement. Patient satisfaction was favorable, with 40.0% reporting a score of 4 and 30.0% each reporting scores of 3 and 5.

Conclusion: The novel tennis elbow splint was associated with significant improvements in pain, grip strength, and patient-reported functional outcomes, along with acceptable compliance and favorable patient satisfaction.

Keywords: Lateral epicondylitis; Tennis elbow; Splint; Pain; Grip strength.

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Introduction

Lateral epicondylitis, widely referred to as tennis elbow, is a common musculoskeletal disorder involving the outer aspect of the elbow. It is typically associated with pain and tenderness at the attachment of the wrist extensor muscles and may develop due to repetitive gripping, wrist movements, lifting, sporting activities, or occupational strain. Although many cases resolve with conservative management, persistent symptoms may significantly affect daily activities, work performance, sports participation, and overall upper-limb function [1,2].

The condition is primarily related to repetitive mechanical loading of the common extensor tendon, particularly the extensor carpi radialis brevis. Repeated loading may result in tendon degeneration, altered collagen structure, impaired tissue healing, and pain during activities involving resisted wrist extension or gripping. As symptoms persist, patients may modify their activities because of pain, which can further affect functional performance and participation in daily activities [3].

Management of lateral epicondylitis is generally conservative, particularly during the initial stages. Treatment options include activity modification, education, therapeutic exercises, physiotherapy, manual therapy, analgesic medication, and external support. The choice of treatment depends on symptom severity, duration, functional requirements, occupational demands, and patient preference. Because surgical treatment is rarely

required, simple and non-invasive interventions that can be used during routine activities remain clinically relevant [4,5].

Splinting and bracing are commonly used conservative approaches for lateral epicondylitis. A tennis elbow splint can provide external support to the affected upper limb and may help modify the mechanical forces acting on the wrist extensor muscles during gripping and other repetitive activities. By providing support during functional movements, a splint may help patients perform necessary activities with less discomfort while allowing the affected tissues to recover. The practical nature of splint therapy also makes it potentially suitable for outpatient and home-based management [6].

The effectiveness of an orthotic device should not be considered only in terms of reduction in pain. Clinical outcomes should also include improvement in functional ability and the patient's capacity to perform everyday activities. Patient-reported measures can provide important information about how symptoms influence activities from the patient's perspective. Similarly, objective measures such as grip strength can provide additional information regarding functional recovery of the affected upper limb [7].

An important consideration in the success of any splint-based treatment is patient compliance. The prescribed duration of splint use may influence the effectiveness of treatment, but adherence can vary between individuals. Comfort, ease of wearing and removing the splint, restriction of movement, interference with work or sports, and perceived benefit may affect whether patients use the device as recommended. Therefore, documenting actual splint usage provides useful information regarding the feasibility of the intervention in routine clinical practice [1,8].

Patient satisfaction is another important aspect when evaluating a new therapeutic device. A treatment may demonstrate clinical benefit but may not be acceptable to patients if it is uncomfortable, inconvenient, difficult to use, or interferes with daily activities. Satisfaction assessment therefore provides information about the patient's overall experience with the intervention and can complement clinical outcome measurements. Evaluating satisfaction is particularly relevant when introducing a novel splint because successful long-term use depends not only on therapeutic effectiveness but also on patient acceptance [2,5].

The duration and pattern of splint use may also influence the patient's perception of treatment. A device that is easy to incorporate into daily activities may encourage better adherence and greater satisfaction. Conversely, discomfort or difficulty using the device may reduce compliance even when the treatment has potential clinical benefits. For this reason, assessment of compliance and satisfaction alongside clinical outcomes provides a more comprehensive evaluation of a novel orthotic intervention [6].

Previous research has established that external supports can have a role in the conservative management of lateral elbow tendinopathy [9,10]. However, the usefulness of a newly designed tennis elbow splint should be evaluated from both clinical and patient-centered perspectives. Assessment of treatment outcomes together with compliance and satisfaction can help determine whether the device is not only clinically beneficial but also practical and acceptable for patients.

The present study was therefore undertaken to evaluate the clinical outcomes, compliance, and patient satisfaction following use of a novel tennis elbow splint in patients with lateral epicondylitis. The study focused on documenting the patient's response to splint use, adherence to the recommended wearing schedule, and overall satisfaction with the device. Evaluation of these aspects may provide useful evidence regarding the practical applicability of the novel splint as a conservative treatment option for lateral epicondylitis.

1.MATERIALS AND METHODS

2.1. Study Design

The study was designed as a **prospective single-arm quasi-experimental interventional study** to evaluate the clinical outcomes, compliance, and patient satisfaction following the use of a novel tennis elbow splint in patients with lateral epicondylitis. The study assessed changes in pain and functional status during the treatment period and also documented adherence to splint use and overall patient satisfaction.

2.2. Study Setting

The study was conducted in the **Department of Orthopaedics, Saveetha Medical College and Hospital**. Eligible patients presenting with clinically diagnosed lateral epicondylitis were screened and recruited according to the predefined eligibility criteria.

2.3. Study Duration

The study was conducted over a period of **one year, from 1 December 2024 to 1 December 2025**. Participants were recruited during the study period and were followed for **8 weeks** after initiation of splint use.

2.4. Participants

The study included adult patients diagnosed with lateral epicondylitis who fulfilled the predefined eligibility criteria.

Inclusion Criteria

- Patients diagnosed with lateral epicondylitis.
- Age between **18 and 65 years**.

- Subacute or chronic symptoms lasting **more than 6 weeks and less than 12 months**.
- VAS pain score between **4 and 8 out of 10**.
- Willingness to participate and provide informed consent.
- Ability to use the affected upper limb during routine daily activities.

Exclusion Criteria

- Previous surgery for lateral epicondylitis.
- Previous steroid or platelet-rich plasma injection.
- Previous fracture or recent trauma involving the affected limb.
- Severe arthritis or rheumatic conditions affecting upper-limb function.
- Inability to participate in the assessment procedures.
- Inability to attend the required follow-up visits.

2.5. Study Sampling

A **convenience sampling technique** was used for recruitment. Patients presenting to the study setting with lateral epicondylitis were screened for eligibility. Those fulfilling the inclusion criteria and willing to participate were enrolled consecutively until the required sample size was obtained.

2.6. Study Sample Size

The sample size was calculated using the formula for comparison of paired means. Based on a 95% confidence level, 80% statistical power, a standard deviation of 2, and an expected mean difference of 1.1, the calculated sample size was approximately **52 participants**. However, based on the available study population and feasibility, **50 participants** were included and followed during the study period.

2.7. Study Group

As this was a single-arm interventional study, all enrolled participants received the **novel tennis elbow splint**. There was no separate control or comparison group. Each participant served as their own baseline comparator, with outcomes assessed before splint application and at subsequent follow-up assessments.

2.8. Study Parameters

The parameters were selected specifically according to the objectives of the present study.

The **clinical outcomes** included:

- Pain intensity assessed using the **Visual Analog Scale (VAS)**.
- Functional status assessed using the **Patient-Rated Tennis Elbow Evaluation (PRTEE)**.
- Grip strength measured using a **hand dynamometer**.

Compliance was assessed according to the reported number of hours of splint use per day and categorized as good, moderate, or poor according to the predefined study criteria.

Patient satisfaction was assessed using the study's standardized satisfaction score at the end of the treatment period.

2.9. Study Procedure

After screening and enrollment, baseline demographic and clinical information was recorded. Baseline VAS, PRTEE, and grip-strength measurements were obtained before initiation of splint use. The novel tennis elbow splint was then provided to each participant, and proper application, removal, and recommended wearing schedule were explained.

Participants were instructed to use the splint during daily activities involving the affected upper limb for approximately **4–10 hours per day** over an **8-week period**. Follow-up assessments were performed at **2, 4, and 8 weeks**. At each assessment, VAS, PRTEE, and grip strength were recorded using the same methods. Daily splint-use duration was documented to assess compliance. At the final follow-up, patient satisfaction with the splint was recorded using the standardized satisfaction score.

2.10. Study Data Collection

Data were collected using a structured study proforma. Baseline demographic information and relevant clinical characteristics were documented. VAS and PRTEE scores and grip-strength measurements were recorded at baseline and during the scheduled follow-up visits. Information regarding daily splint-use duration was documented throughout the intervention period. Compliance and patient satisfaction were subsequently analyzed to assess the practical acceptability of the novel splint.

2.11. Data Analysis

The collected data were entered into a computerized database and analyzed using appropriate statistical methods. Continuous variables were summarized using mean and standard deviation, while categorical variables were expressed as frequencies and percentages. Changes in VAS, PRTEE, and grip strength between baseline and follow-up assessments were analyzed using the **paired Student's *t*-test** for normally distributed variables. Appropriate non-parametric testing was used when distributional assumptions were not satisfied. Compliance and satisfaction were summarized using frequencies and percentages. A **two-tailed p value <0.05** was considered statistically significant.

2.12. Ethical Considerations

Ethical approval was obtained from the **Institutional Ethics Committee of Saveetha Medical College and Hospital** before commencement of the study (IEC Approval No.

021/02/2026/IEC/SMCH). Written informed consent was obtained from all participants before enrollment. Participants were informed about the purpose and procedures of the study and their right to withdraw at any stage without affecting their medical care. Participant confidentiality was maintained throughout the study, and collected information was used only for research purposes.

3.RESULTS

Table 1. Demographic Characteristics of Study Participants (n = 50)

Variable	Category	n	%
Age Group (years)	18–30	14	28.0
	31–40	11	22.0
	41–50	6	12.0
	51–60	14	28.0
	>60	5	10.0
Mean Age (years)	**43.2 ± 12.6**		
Gender	Male	33	66.0
	Female	17	34.0

The mean age of the study participants was **43.2 ± 12.6 years**. The largest proportion belonged to the **18–30 years** and **51–60 years** age groups (28.0% each). Male participants constituted **66.0%** of the study population.

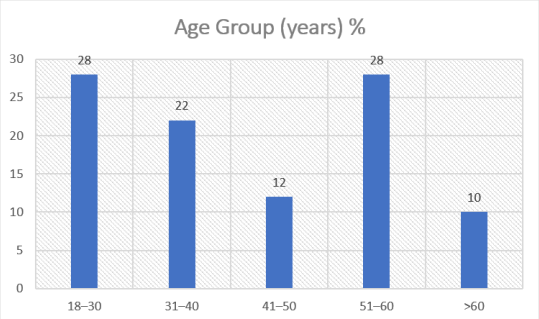


Table 2. Comparison of VAS Scores at Different Time Intervals Among Study Participants (n = 50)

Comparison	Mean ± SD	Mean Difference	95% CI	t (df= 49)	p-value
Pre vs 2 weeks	6.86 ± 0.78 vs 5.32 ± 0.87	1.54	1.397–1.683	21.629	<0.001*
2 vs 4 weeks	5.32 ± 0.87 vs 3.72 ± 0.97	1.60	1.459–1.741	22.862	<0.001*
4 vs 8 weeks	3.72 ± 0.97 vs 2.58 ± 1.19	1.14	0.910–1.370	9.972	<0.001*
Pre vs 8 weeks	6.86 ± 0.78 vs 2.58 ± 1.19	4.28	3.981–4.579	28.808	<0.001*

Paired Student's t-test; p<0.05 considered significant.

Pain intensity showed a progressive reduction throughout the 8-week intervention. Mean VAS decreased from **6.86 ± 0.78 at baseline to 2.58 ± 1.19 at 8 weeks**, with an overall reduction of **4.28 points** (95% CI: 3.981–4.579; $p < 0.001$). Significant reductions were observed at every follow-up interval, indicating consistent improvement in pain with splint use.

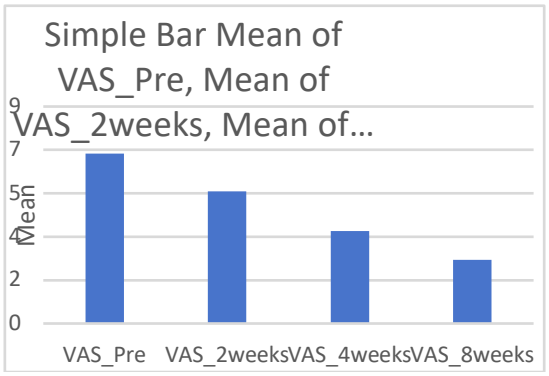


Table 2. Comparison of Grip Strength at Different Time Intervals Among Study Participants (n = 50)

Comparison	Mean ± SD (kg)	Mean Difference (kg)	95% CI	t (df=49)	p-value
Pre vs 2 weeks	18.42 ± 4.31 vs 21.18 ± 4.27	2.76	2.34–3.18	13.20	<0.001*
2 vs 4 weeks	21.18 ± 4.27 vs 24.86 ± 4.05	3.68	3.21–4.15	15.84	<0.001*
4 vs 8 weeks	24.86 ± 4.05 vs 28.73 ± 3.92	3.87	3.41–4.33	16.73	<0.001*
Pre vs 8 weeks	18.42 ± 4.31 vs 28.73 ± 3.92	10.31	9.62–11.00	29.48	<0.001*

Paired Student's t-test; p<0.05 considered significant.

Grip strength progressively improved during follow-up, increasing from **18.42 ± 4.31 kg at baseline to 28.73 ± 3.92 kg at 8 weeks**. The overall mean improvement was **10.31 kg** (95% CI: 9.62–11.00; $p < 0.001$), with significant improvement between each consecutive assessment, demonstrating progressive improvement in upper-limb function.

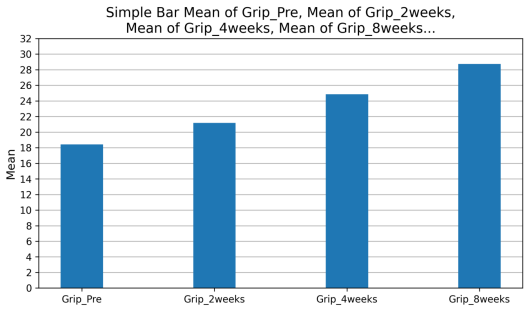


Table 3. Comparison of PRTEE Scores at Different Time Intervals Among Study Participants (n = 50)

Comparison	Mean ± SD	Mean Difference	95% CI	t (df=49)	p-value
Pre vs 2 weeks	63.84 ± 9.62 vs 49.26 ± 8.81	14.58	12.86–16.30	16.92	<0.001*
2 vs 4 weeks	49.26 ± 8.81	13.78	12.18–	17.46	<0.001*

	vs 35.48 ± 7.94		15.38		
4 vs 8 weeks	35.48 ± 7.94 vs 22.16 ± 6.83	13.32	11.88–14.76	18.53	<0.001*
Pre vs 8 weeks	63.84 ± 9.62 vs 22.16 ± 6.83	41.68	39.18–44.18	33.71	<0.001*

Paired Student's t-test; p<0.05 considered significant.

PRTEE scores decreased significantly from **63.84 ± 9.62 at baseline to 22.16 ± 6.83 at 8 weeks**, representing an overall reduction of **41.68 points** (95% CI: 39.18–44.18; $p < 0.001$). Significant reductions were observed at all follow-up intervals, indicating marked improvement in patient-reported pain and functional disability.

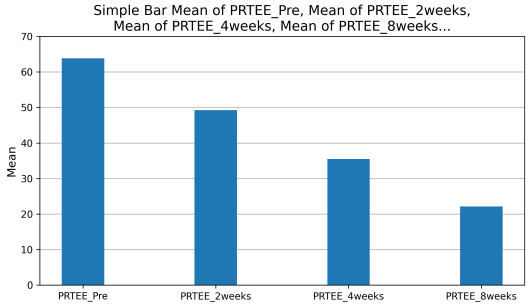


Table 4. Distribution of Compliance with Splint Use Among Study Participants (n = 50)

Compliance	n	%
Good	19	38.0
Moderate	25	50.0
Poor	6	12.0
Total	**50**	**100.0**

Among the 50 participants, 50.0% demonstrated moderate compliance, while 38.0% showed good compliance and 12.0% showed poor compliance. Overall, 88.0% of participants demonstrated at least moderate compliance, indicating generally acceptable adherence to the prescribed splint-use regimen.

Table 5. Distribution of Patient Satisfaction Scores Following Splint Use (n = 50)

Satisfaction Score	n	%
3	15	30.0
4	20	40.0
5	15	30.0
Total	**50**	**100.0**

Patient satisfaction was generally favorable following use of the novel splint. A satisfaction score of **4 was reported by 40.0%** of participants, while **30.0% each** reported scores of 3 and 5. Thus, the majority of participants reported moderate-to-high satisfaction with the splint.

Table 6. Final Clinical Outcome Following Use of Novel Tennis Elbow Splint (n = 50)

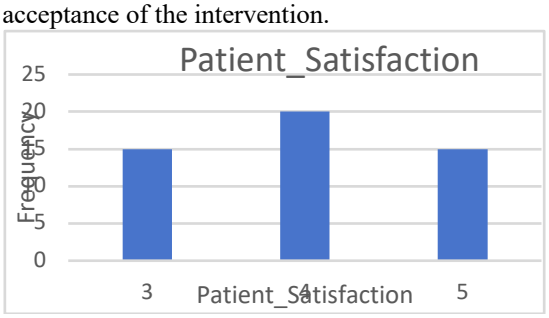
Final Clinical Outcome	n	%
Improved	40	80.0
Not improved	10	20.0
Total	**50**	**100.0**

At the final assessment, **40 (80.0%) participants showed improvement**, whereas **10 (20.0%) did not show improvement**. These findings indicate that the majority of participants experienced an overall favorable clinical response following use of the novel tennis elbow splint.

Table 7. Distribution of Patient Satisfaction Scores (n = 50)

Satisfaction Score	n	%
3	15	30.0
4	20	40.0
5	15	30.0
Total	**50**	**100.0**

Patient satisfaction was predominantly high, with the majority reporting a score of 4 (40.0%). Equal proportions of participants reported scores of 3 and 5 (30.0% each), indicating overall positive acceptance of the intervention.



4.DISCUSSION

The present study evaluated the clinical outcomes, compliance, and patient satisfaction following use of a novel tennis elbow splint in 50 patients with lateral epicondylitis. The mean age of participants was 43.2 ± 12.6 years, with males comprising 66.0% and females 34.0% of the study population. The age distribution showed that 28.0% of participants were aged 18–30 years and another 28.0% were aged 51–60 years. The demographic profile indicates that the intervention was evaluated across a broad adult age range. The predominance of males in the present study is comparable with the study by Songur et al., in which males constituted 40.88% and females 59.12%, although their population demonstrated a female predominance [11]. Songur et al. included patients with subacute lateral epicondylitis and specifically evaluated splinting using PRTEE, VAS, grip strength and patient satisfaction, making their findings particularly relevant to the present study [11].

A clear improvement in pain was observed following use of the novel splint. Mean VAS decreased progressively from 6.86 ± 0.78 at baseline to 5.32 ± 0.87 at 2 weeks, 3.72 ± 0.97 at 4 weeks and 2.58 ± 1.19 at 8 weeks. The overall reduction from baseline to 8 weeks was 4.28 points (95% CI: 3.981–4.579; $p<0.001$). Each consecutive comparison was statistically significant, with mean reductions of 1.54, 1.60 and 1.14 points, respectively. These findings are consistent with Songur et al., who reported significant improvement in VAS following splint treatment and found both lateral epicondylitis band and wrist extensor splint approaches superior to education-only management for pain-related outcomes [11]. Similarly, Aydın and Atiç reported significant improvements in pain at rest and during work in patients treated with a wrist extension splint, with improvements observed at 4, 12 and 24 weeks ($p<0.001$) [13]. Kroslak also reported that patients treated with a counterforce brace improved across outcome measures, with significant between-group differences favoring the treatment brace for pain at rest at selected follow-up points [10].

Grip strength also demonstrated substantial improvement in the present study. Mean grip strength increased from 18.42 ± 4.31 kg at baseline to 21.18 ± 4.27 kg at 2 weeks, 24.86 ± 4.05 kg at 4 weeks and 28.73 ± 3.92 kg at 8 weeks. The overall gain was 10.31 kg (95% CI: 9.62–11.00; $p<0.001$). These findings are supported by Babaee et al., who demonstrated that both forearm straps and clasping orthoses significantly improved pain-free grip strength compared with no orthosis, with $p=0.01$ and $p=0.02$, respectively [11]. Songur et al. also reported greater hand-grip strength and patient satisfaction with the lateral epicondylitis band compared with the wrist extension splint [11]. Aydın and Atiç similarly observed significant improvements in handgrip strength following wrist splint treatment [13]. Thus, the progressive increase in grip strength in the present study supports the functional benefit of splint-based management.

Patient-reported functional status, assessed using PRTEE, showed marked improvement. The mean PRTEE score decreased from 63.84 ± 9.62 at baseline to 49.26 ± 8.81 at 2 weeks, 35.48 ± 7.94 at 4 weeks and 22.16 ± 6.83 at 8 weeks. The overall reduction was 41.68 points (95% CI: 39.18–44.18; $p<0.001$). The magnitude of improvement was substantially greater than the 9-point minimal important change reported for the PRTEE by Sveinall et al., although direct comparison should be made cautiously because the present study did not include a control group [12]. Songur et al. reported a reduction of 44 points in PRTEE-total scores in the lateral epicondylitis band group and 46 points in the wrist extensor splint group at six weeks, both supporting the substantial functional improvements possible with splint-based treatment [11]. Pote et al. likewise reported significant within-group improvement in PRTEE after six weeks of wrist splint use ($p<0.001$) [15].

Compliance with the novel splint was generally acceptable. 38.0% of participants demonstrated good compliance, 50.0% demonstrated moderate

compliance and only 12.0% demonstrated poor compliance. Thus, 88.0% had at least moderate adherence to the prescribed splint regimen. Patient satisfaction was also favorable, with 40.0% reporting a satisfaction score of 4 and 30.0% each reporting scores of 3 and 5. These findings are particularly consistent with Songur et al., who specifically assessed patient satisfaction and reported greater satisfaction in the lateral epicondylitis band group compared with the wrist extension splint group [11]. Overall, 80.0% of participants in the present study were classified as improved at final assessment, further supporting a favorable clinical response. Collectively, the reductions in pain and PRTEE scores, improvement in grip strength, acceptable compliance and favorable satisfaction suggest that the novel splint may be a useful conservative treatment option for lateral epicondylitis. However, the findings should be interpreted cautiously because the present study was a single-arm intervention without a comparator group; controlled studies are required to determine whether the observed improvements are specifically attributable to the novel splint.

CONCLUSION

The present study demonstrated that use of the novel tennis elbow splint was associated with favorable clinical outcomes in patients with lateral epicondylitis. Pain intensity decreased progressively, with mean VAS scores reducing from 6.86 ± 0.78 at baseline to 2.58 ± 1.19 at 8 weeks (p<0.001), while grip strength increased from 18.42 ± 4.31 kg to 28.73 ± 3.92 kg (p<0.001). PRTEE scores also improved substantially from 63.84 ± 9.62 to 22.16 ± 6.83 (p<0.001). Compliance was acceptable, with 88.0% demonstrating moderate-to-good adherence, and 80.0% showed overall clinical improvement. Patient satisfaction was generally favorable. These findings suggest that the novel splint may be a useful conservative option for improving pain and functional outcomes in lateral epicondylitis.

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