Journal of Advanced Biomedical Sciences
Homepage: http://jabs.fums.ac.ir
Online ISSN: 2783-1523
Fasa University of Medical Sciences

Comparison of Treatment Outcomes for Tennis Elbow: Corticosteroid Injection and Casting vs. Acupuncture and Physiotherapy

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Article Info

Article Type:
Original Article

Article History:
Received
12 Dec 2023
Received in revised form
30 Dec 2023
Accepted
01 Jan 2024
Published online
15 Jan 2024

Publisher:
Fasa University of Medical Sciences

Abstract

Background & Objectivs: Today, despite the existence of numerous treatments for tennis elbow, the search for more effective methods continues due to the limited efficacy of these existing approaches. This study aimed to compare the results of tennis elbow treatment in two groups: patients receiving corticosteroid injection and casting, and patients receiving acupuncture and physiotherapy.

Materials & Methods: This quasi-experimental study, conducted in Jiroft in 2021, investigated the effectiveness of different treatment approaches for tennis elbow. Fifty patients diagnosed with tennis elbow were randomly divided into two groups of 25 each. One group received a combination of corticosteroids and casts, while the other group received acupuncture and physiotherapy. A pain line was used to assess pain levels based on VAS criteria. Data were analyzed using SPSS-26 statistical software, employing Chi-square, Fisher's Exact, Mann-Whitney, one-way ANOVA, Kruskal-Wallis, and Kolmogorov-Smirnov tests.

Results: The majority of patients were female (66%) and housewives (46%). There was a significant difference in pain outcomes between the two groups: physiotherapy alone and physiotherapy combined with corticosteroids and casts. This difference was observed across various conditions (pain at rest, pain during activity, and amount of pain evoked during activity) ($p < 0.05$). In simpler terms, corticosteroids and casts were more effective in reducing pain from tennis elbow compared to acupuncture and physiotherapy. Additionally, corticosteroids and casts had a greater effect on hand movement (supination, pronation, extension, and flexion) compared to acupuncture and physiotherapy.

Conclusion: Our findings indicate that treatment of tennis elbow with a combination of corticosteroid injection and casting is more effective than acupuncture or physiotherapy alone. Corticosteroid injections themselves are also an effective way to relieve tennis elbow pain.

Keywords: Tennis Elbow, therapeutics, injections, acupuncture, orthopedics, patients

Cite this article: Heydari S, Jafarnezhad A, Faryabi R, Raesi R, Goroohi M, Mehralizade A, Amiri Ghanatsaman F, Daneshi S. Comparison of Treatment Outcomes for Tennis Elbow: Corticosteroid Injection and Casting vs. Acupuncture and Physiotherapy. JABS.2024; 14(1): 67-76.
DOI: 10.18502/jabs.v14i1.14808

Introduction

Tennis elbow is a common soft tissue injury of the elbow caused by overuse and micro-tears in the extensor muscles that extend the wrist. While frequently seen in athletes, it can affect anyone who performs repetitive motions in their daily activities or jobs. Professions such as painting, butchery, carpentry, and plumbing carry a higher risk due to the repetitive movements required (1). Tennis elbow presents as pain and tenderness on the outer elbow, sometimes radiating to the forearm and back of the hand (2-4). These symptoms often worsen with arm use and frequent wrist movements (5). The condition is most common between the ages of 35 and 55 and typically affects the dominant arm (6-8). Recovery time for tennis elbow can range from 6 months to 2 years (9).

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The most common causes of tennis elbow are overuse and repetitive straining of the forearm muscles and tendons. However, a direct blow or collision to the elbow can also cause it (10-12). Diagnosis usually relies on a medical history and physical examination, though imaging tests may be needed in some cases (13).

Studies have shown that the wrist extensor carpi radialis brevis tendon is the most common source of pain and dysfunction in patients with tennis elbow (14). However, no single, specific therapeutic intervention has been identified as the most effective treatment (15). Tennis elbow can heal on its own, but this process may take several weeks or months (16, 17). Simple treatments such as rest, cold compresses (plural), and avoiding activities that aggravate the injured tendons and muscles can alleviate the pain (18, 19). Invasive treatments such as surgery are reserved only for severe and resistant cases (20). Individuals with jobs that involve frequent manual tasks, such as lifting objects, should avoid such activities until the pain subsides (21).

Several non-invasive treatments have been proposed for tennis elbow (22), including exercise therapy (23-25), corticosteroid injections (26, 27), medication (28, 29), laser therapy (30), electrical stimulation (31, 32), ergonomic modifications (33), bracing with counterforce, acupuncture (34, 35), and splinting. While corticosteroid injections are common for persistent tennis elbow (36), they can have negative side effects and high recurrence rates (37). Similarly, the effectiveness of acupuncture and dry needling requires further investigation (35). Physiotherapy and short-term use of orthotics have shown promise in reducing pain and improving blood flow (38). Surgery remains a last resort for severe and chronic cases (39). Currently, no single treatment demonstrates definitive superiority, highlighting the need for further research to identify the most effective approach for tennis elbow (40).

This has resulted in many beta errors in studies, thereby significantly reducing their ability to detect group differences. Consequently, the present study compares two treatment methods for tennis elbow: corticosteroid injection and casting versus acupuncture and physiotherapy.

Materials & Methods

The present study is quasi-experimental. The study population consisted of patients with tennis elbow who were referred to orthopedic clinics based on the diagnoses of specialist physicians. Inclusion criteria were pain and tenderness around the lateral epicondyle, which worsened with active wrist extension, a positive result on one of the diagnostic tests (Kazen 3 or Mills 4), and pain when making a fist.

Exclusion criteria also included injections into the affected area within the previous 6 months of a diagnosis of diabetes, pregnancy, peripheral nerve entrapment at the doctor's discretion, and cervical radiculopathy. Participants who were eligible provided informed consent. They completed and signed the consent form to participate in the research project. Then, all participants participated in the pretest to evaluate the research variables including pain at rest, pain during activity, and evoked pain.

In the present study, a total of 40 patients were evaluated based on previous studies (41). Twenty patients received corticosteroids and limb plastering, while another twenty received acupuncture and physiotherapy. The sample size was calculated with a 95% confidence level and 90% power based on the results of pilot studies involving 20 people. It was calculated using the following formula so that 25 people were allocated to each group, resulting in a total sample size of 50 people across the groups of corticosteroid and limb plaster recipients, as well as acupuncture and physiotherapy recipients.

$$n=\frac{\left(s_1^2+s_2^2\right)\left(z_{1-\frac{\alpha}{2}}+z_{1-\beta}\right)^2}{d^2}=\frac{\left(s_1^2+s_2^2\right)\left(z_{1-\frac{\alpha}{2}}+z_{1-\beta}\right)^2}{\left(\bar{x}_2-\bar{x}_1\right)^2}$$

$$=\frac{(5.85+6.01)(1.64+1.56)^2}{(4.5-2.94)^2}$$

$$\cong 50$$

d2: is the difference between the means of the two groups, which has reached the power of two

In this study, a pain ruler was used to determine the amount of pain based on VAS criteria. analogical measure of vision is linear pain 100 mm long,

with one end of the line indicating maximum pain (score 100) and the other end indicating no pain.

To measure pain, the person was instructed to determine the severity of the pain according to the length of the line. The validity and reliability of this device in measuring pain were very high. In this blinding method, the person marked the location of pain on the line. Then, by placing a graduated ruler on the line, the researcher measured the amount of pain in millimeters. To assess aroused pain, the subjects were asked to rate their pain specifically during the chin test, when the hand had no activity. To assess pain at rest, participants were asked to rate their pain when the hand was inactive. To assess pain during activity, participants were asked to rate their pain during an activity they performed in the past 24 hours. Following the pre-test, the participants were randomly divided into two groups: one receiving a corticosteroid injection and plastering, and the other receiving acupuncture and physiotherapy. Data collection involved demographic information questionnaires and follow-up information based on the researcher's checklist and VAS test. After data collection and initial processing, the data were entered into SPSS statistical software version 26 for descriptive and inferential analysis.To address the research questions and objectives, descriptive statistical methods were used first. These included one- and two-dimensional frequency distribution tables, statistical graphs, and descriptive statistics indices. Inferential statistical tests were then employed, including Fisher's exact test, chi-square (X^2) test, Student's t-tests, and one-way analysis of variance. All participants in this research provided informed consent and participated voluntarily. Before conducting surveys and measurements, the researcher provided participants with all necessary information about the study. Participants were also reassured about the anonymity and confidentiality of their data. Data collection adhered to all relevant rules and regulations. This study builds upon a General Medicine dissertation conducted at Jiroft University of Medical Sciences.

Results

This study involved 50 participants: 25 received corticosteroids and plastering, while the other 25 received acupuncture and physiotherapy. Table 1 presents the mean age, standard deviation, minimum and maximum values, and the results of the two-independent-samples t-test used to compare the age of the acupuncture and physiotherapy group with the corticosteroid and plastering group.

Table 1. Results of independent t-test to compare the two groups of acupuncture and physiotherapy and corticosteroids and casts in terms of age

Groups	Minimum (maximum)	Mean±SD	P-value
Acupuncture and physiotherapy	29 (58)	44.4±8.63	0.79
Corticosteroids and casts	25 (66)	43.72±9.28	

The mean age in the acupuncture and physiotherapy group was 44.48 years (SD = 6.63), while the mean age in the corticosteroid and plastering group was 43.72 years. The age range in the acupuncture and physiotherapy group was 29 to 58 years, while the range in the corticosteroid and plastering group was 25 to 66 years. Although the acupuncture and physiotherapy group appeared to have a slightly higher average age, this difference was not statistically significant ($p > 0.05$).

According to Table 2, 28% of participants in the acupuncture and physiotherapy group were men, while 40% of participants in the

corticosteroid and plastering group were men. Overall, the study population was 34% male (17 people) and 66% female (33 people). There was no statistically significant difference in gender distribution between the twogroups ($p > 0.05$). Occupationally, housewives formed the majority in both the acupuncture and physiotherapy group and the corticosteroid and plastering group. No statistically significant difference ($p > 0.05$) was found in occupational distribution between the groups.

Table 2. Frequency distribution of sex and job in treatment groups by acupuncture, physiotherapy, corticosteroids, and casts

Variable	Groups		P-Value
	Acupuncture and physiotherapy	Corticosteroids and casts	
Male	7 (28.00)	10 (40.00)	
Female	18 (72.00)	15 (60.00)	
Job			0.22
Employee	6 (24.00)	2 (8.00)	
Self-employment	3 (12.00)	2 (8.00)	
Farmer	4 (16.00)	9 (36.00)	
Unemployed	0 (0.00)	1 (4.00)	
Housewife	12 (48.00)	11 (44.00)	

Table 3 presents the results of the t-tests comparing the acupuncture and physiotherapy group with the corticosteroid and plastering group on four measures: pain at rest, pain during activity, amount of pain evoked during activity, and weight gain in kilograms. The acupuncture and physiotherapy group appeared to have a higher average pain score at rest compared to the corticosteroid and plastering group. This difference was statistically significant ($p < 0.05$). Conversely, the corticosteroid and plastering group experienced a statistically significant ($p < 0.05$) increase in weight gain compared to the acupuncture and physiotherapy group.

Table 3. The T-test to compare the two groups of treatment with acupuncture, physiotherapy, corticosteroids, and casts in terms of pain at rest, pain during activity, amount of pain evoked during activity, and weight gain in kilograms

Variable	Treatment group		p-value
	Acupuncture and physiotherapy	Corticosteroids and casts	
The amount of pain at rest	6.78±1.84	2.94±2.16	0.001
The amount of pain during activity	5.3±1.42	1.44±1.64	0.001
The amount of pain evoked during activity	4.5±1.56	1.8±2.16	0.001
Weight gain	4.36±2.34	8.08±5.36	0.003

Table 4 shows the mean rankings and the results of the Mann-Whitney U test used to compare the acupuncture and physiotherapy group with the corticosteroid and plastering group on four movement measures: hand supination rate, hand pronation rate, hand extension rate, and hand flexion rate. Individuals in the corticosteroid and plastering group received higher average rankings for all four movement measures compared to the acupuncture and physiotherapy group. This difference in treatment methods regarding the studied factors was statistically significant ($p < 0.05$).

Table 4. Mann-Whitney test results to compare the two groups of acupuncture and physiotherapy and corticosteroids and plaster casts in terms of the degree of supination of the hand, hand bromination, hand extension, flexion in the hand

Variable	Treatment group	Average ratings	Mann-Whitney U	p-value
The extent of hand supination	Acupuncture and physiotherapy	18.34	133.5	0.001
	Corticosteroids and casts	32.66		
Hand bronchial rate	Acupuncture and physiotherapy	18.34	133.5	0.001
	Corticosteroids and casts	32.66		
The number of hand extensions	Acupuncture and physiotherapy	20.9	197.5	0.016
	Corticosteroids and casts	30.1		
Flexion rate in hand	Acupuncture and physiotherapy	19.56	164	0.002
	Corticosteroids and casts	31.44		

Discussion

Despite the numerous methods proposed for treating tennis elbow in recent decades, insufficient scientific evidence remains to definitively select the best approach (32, 36). This lack of clarity could stem from various factors, including the self-limiting nature of the disease itself (36, 42, 43). Therefore, this study aimed to determine and compare the outcomes of tennis elbow treatment in two groups: patients receiving corticosteroid injection and casting, and patients treated with acupuncture and physiotherapy. The study population primarily consisted of middle-aged females who were housewives. Kivi et al. (44) suggest a possible explanation for the higher prevalence of lateral epicondylitis in women aged 40-60: a decrease in tendon elasticity, particularly at the junction point, coinciding with repetitive biomechanical stress at midlife. Hutson's study (45) reported a similar age range for peak prevalence (30-55 years old), with a rarity in individuals under 30 and a higher incidence with increasing age. Rayan et al. (46) further support the link between gender and prevalence, noting a higher rate in women and a correlation with age and time spent on hand-intensive tasks. Housewives, in particular, may be more susceptible due to the repetitive nature of their daily activities (gardening, cleaning, cooking) that strain the forearm muscles and tendons.

This study found a significant difference between the acupuncture and physiotherapy group and the corticosteroid and plastering group in terms of pain response across various conditions (pain during rest, pain during activity, and amount of pain evoked during activity). Plaster casts appeared to be more effective in reducing elbow pain in tennis players compared to acupuncture and physiotherapy. Previous research supports these findings. Tonks et al. (47) observed significant pain reduction and

functional improvement in groups receiving topical corticosteroid injections, with these benefits persisting at the 3-month and 6-month follow-up assessments. However, Shakoori et al. (48) reported that only pain intensity, and not other aspects of pain, significantly decreased in the injection group compared to the phonophoresis group during their study period. Several studies support the use of corticosteroids for pain relief in certain conditions.

Newcomer et al. (49) found no significant difference in clinical outcomes between corticosteroid and placebo groups, but the corticosteroid group did experience a significant reduction in pain severity. Arti et al. (50) reported that the corticosteroid-treated group showed the highest increase in grip strength, the greatest pain relief, and the largest decrease in pain scores compared to other treatment groups at the first follow-up. However, it's important to note that the phrasing used in the study by Arti et al. regarding grip strength scoring might require clarification (81% grip strength (respectively), Score 1) and 83% of the healthy side (score 1), score against 4 and final score of 6). Jansen et al. (51) found that 30% of patients achieved permanent and complete pain relief after receiving a steroid injection and taking anti-inflammatory drugs. This study suggests that corticosteroid injection and casting may be more effective in promoting recovery for patients with tennis elbow compared to acupuncture and physiotherapy.

This study found that corticosteroid injection and casting had a greater effect on hand movement compared to acupuncture and physiotherapy. Patients in the corticosteroid and casting group achieved greater range of motion in terms of supination, pronation, extension, and flexion than those in the acupuncture and physiotherapy group. Jansen et al. (51) support these findings. Their study showed that corticosteroid injection and casting in patients with tennis elbow reduced wrist extensor activity, lessened pain, and improved grip strength in both flexion and extension.

Several studies support the use of conservative physiotherapy for tennis elbow. Bisset et al. (32) and Emanet et al. (52) found that these approaches, including laser therapy, shockwave therapy, and exercise, offer longer-lasting therapeutic effects and fewer side effects compared to corticosteroid injections. However, it's important to note some limitations in the study by Arti et al. (50). While they report an initial average grip strength of 78% (score 3) and 47% (score 1) in flexion and extension of the affected elbow, respectively, they also state that scores decreased from treatment in all groups. This suggests the scoring system used might require further explanation.

Several studies have investigated the effectiveness of topical corticosteroid injections for tennis elbow. Assendelf et al. (24) reported that these injections were relatively safe and provided short-term benefits (lasting 2 to 6 weeks). Other research supports these findings, indicating that topical corticosteroids can reduce pain, improve overall recovery, and even enhance punching power in patients compared to placebo or other supportive treatments (23, 53). However, studies like the one by Kim et al. (25) suggest a potential limitation: while these injections may reduce pain in the short term (around 2 weeks) compared to physiotherapy, they might not have a lasting impact on overall patient outcomes by the 6-week mark.

Multiple studies suggest that a combination of oral NSAIDs and physiotherapy offers more advantages in the medium-term (beyond 6 weeks) and long-term (beyond 6 months) compared to corticosteroid injections (27, 53, 54). While corticosteroid injections boast a higher success rate in the short term (92% vs. 47% for physiotherapy), they are more likely to lead to recurrences in thelong run (53). Additionally, nearly all patients treated with steroid injections experience a

return of severe symptoms at some point (8).

Smidt et al. (53) conducted a study involving 185 patients with lateral epicondylitis (tennis elbow). The study compared three treatment options: topical steroid injections, physiotherapy, and a no-intervention control group. The researchers concluded that physiotherapy offered the best long-term treatment strategy, while topical steroid injections provided a more pronounced effect in the short term.

Uygur et al. (55) investigated the use of dry needling compared to corticosteroids for treating lateral epicondylitis (tennis elbow). Their findings showed that both treatments were effective. However, the study suggests that dry needling may lead to significantly greater improvements in PRTEE scores at the 6-month mark compared to corticosteroid therapy. While corticosteroids offer short-term pain relief, repeated injections should be avoided. This is because they may not only damage tendons in the long term but also potentially reduce the success rate of surgery.

Several studies have investigated the effectiveness of acupuncture for treating tennis elbow. For example, Affaitati et al. (56) compared acupuncture to other treatments. In their study, acupuncture needles were inserted into trigger points located in the extensor muscles of the inflamed area (lateral epicondylitis). A placebo needle was also used as a control to compare the effects of the actual acupuncture treatment.

Langevin et al. (57) investigated the use of dry acupuncture for treating pain in specific shoulder muscles: the muscles under the spine, the upper trapezius, latissimus dorsi (large round muscle), and anterior deltoid. Their study found that dry acupuncture significantly reduced pain in these muscles, with reductions of 77%, 58%, 49%, and 38%, respectively. Dry acupuncture is thought to work by stimulating the release of endorphins, the body's natural pain relievers (58). In a study, Rothschild et al. found that dry acupuncture in tight muscle bands relieved chest pain in the spine, neck, shoulders, and chest, although further studies are needed to confirm these findings (59). Dry acupuncture reduces muscle pain by affecting the activity of trigger points. It seems that with effective treatment of myofascial trigger points in the extensor muscles, the strain on the extensor muscles is reduced and the patient's pain is consequently reduced. The tight bands in the extensor muscles lead to chronic strain on the tendon joints of the extensors, which ultimately worsens the patient's symptoms.

The only limitation of the present study is the lack of complete cooperation between patients and incomplete hospital records, which according to the evaluation of the study over a long period has attempted to solve the problem. Because the present study was performed on patients in Jiroft with a small sample size and studies in this field are few, further studies with a larger sample size and a longer follow-up period are needed to confirm the effects of these methods and determine if they should be chosen as the preferred treatment method.

Conclusion

Based on the findings of this study and previous research, corticosteroid injections with casting may be a more effective treatment for tennis elbow compared to acupuncture and physiotherapy. Additionally, corticosteroid injections appear to be effective in reducing pain associated with tennis elbow.

Acknowledgments

This research originated from the dissertation of a Doctor of Medicine student at Jiroft University of Medical Sciences. The study was registered with the ethics committee under code IR.JMU.RE.1400.031 and received financial support from the university. The authors gratefully acknowledge the Vice-Chancellor for Research, the esteemed professors, advisors, and

all those who contributed to this research.

Conflict of Interest

The authors declare that there is no conflict of interest in this study. We certify that this submission is a original work, and is not currently under consideration for publication in any other journal.

Funding

We did not receive any funding for the present study.

Ethical Considerations

This study was approved by the Research Ethics Committee of Jiroft University of Medical Sciences; Jiroft , Iran.

Code of Ethics

It was registered under the ethical code IR.JMU.RE.1400.031 and financially supported by the university.

Authors' Contributions

Conceived and designed the study: SH, RF and RR. Performed the experiments: MG, AA, SH and SD. Analyzed the data: SD and AJ. Contributed reagents/materials/analysis tools: FAG, SD and AJ. Drafted and revised the manuscript: SD and AJ.

Data Availability Statement

Data are available on request from the authors.

List of Abbreviations

VAS: Visual Analogue Scale
ANOVA: Analysis of variance

Declarations

Ethical approval and informed consent: This study was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the Declaration of Helsinki and its later amendments or comparable ethical standards. No animal studies were conducted by the authors for this research.

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