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**Original Research Article**

# Statistical Analysis of Percutaneous Tenotomy Outcomes in Chronic Lateral Epicondylitis

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**Abstract:**

**Background:** Chronic lateral epicondylitis significantly impacts individuals' quality of life by causing persistent elbow pain and limited grip strength. Percutaneous tenotomy offers a promising approach to address this condition, yet its long-term efficacy remains underexplored.

**Methods:** This retrospective study assessed 45 patients who underwent percutaneous tenotomy for chronic lateral epicondylitis. Pain and functional outcomes were evaluated using NRS, DASH, and Oxford scores over a 36-month follow-up period.

**Results:** Significant improvements were observed in all outcome measures across the follow-up period, indicating sustained pain relief, functional recovery, and enhanced quality of life post-tenotomy.

**Conclusion:** Percutaneous tenotomy proves to be an effective and durable treatment for chronic lateral epicondylitis, offering significant benefits in terms of pain reduction and functional improvement over time.

**Keywords:** Chronic lateral epicondylitis, Percutaneous tenotomy, Long-term efficacy, Pain relief, Functional recovery.

## Introduction

The treatment of chronic lateral epicondylitis, a condition characterized by persistent elbow pain and functional impairment, remains a topic of ongoing research and clinical debate. Among various treatment modalities, percutaneous tenotomy has been recognized for its potential to alleviate symptoms and enhance recovery.[1] However, the statistical underpinnings of its efficacy, particularly in comparison to traditional treatments, have not been fully explored. This gap in knowledge underscores the necessity for a rigorous statistical examination of percutaneous tenotomy outcomes.[2]

This article is dedicated to a comprehensive statistical analysis of the outcomes following percutaneous tenotomy for chronic lateral epicondylitis, employing advanced statistical

methodologies to unravel the efficacy of this procedure.[3] Through one-way ANOVA and post hoc Tukey tests, we aim to meticulously dissect the variance in pain and functional recovery scores across different time intervals post-treatment.[4] The statistical rigor applied in this study is designed to validate the clinical significance of observed improvements, thereby offering a robust framework for evaluating treatment success.[5]

By focusing on statistical analysis, this article endeavors to elevate the discourse on percutaneous tenotomy from anecdotal success stories to evidence-based conclusions.[6] The implications of this research extend beyond patient care, offering insights into the mechanisms of action of tenotomy and guiding future innovations in treatment protocols.[7] Through a detailed exploration of statistical outcomes, this study aims to affirm the position of percutaneous tenotomy within the armamentarium against chronic lateral epicondylitis, advocating for its adoption in clinical practice based on solid empirical evidence.[8]

## Materials and Methods

### Type 0f Study:

This investigation was designed as a retrospective study to assess the effectiveness of percutaneous tenotomy in patients suffering from chronic lateral epicondylitis over a mid-term follow-up period.

### Place of Study:

The research was conducted at the Department of Orthopaedics, Dr. RPGMC Kangra at Tanda, providing a comprehensive clinical setting for the evaluation of percutaneous tenotomy outcomes.

### Duration of Study:

Patients were enrolled and followed up from 2021 to 2022, allowing for an in-depth analysis of treatment efficacy and patient recovery over time.

### Inclusion Criteria:

- Patients aged between 30 to 60 years experiencing symptoms of lateral epicondylitis for more than six months.
- Individuals not responding to medical treatments and a single dose of steroid injection for a duration of six months.

### Exclusion Criteria:

- Age below 30 years and above 60 years.
- Presence of acute pain symptoms.
- Calcification on lateral epicondyle evident in X-ray imaging.
- Inability to provide informed consent for participation in the study.

### Methodology:

Following ethical approval, eligible patients who consented were enrolled. Initial evaluations involved detailed history taking, clinical examinations, and scoring using the NRS, DASH, and Oxford scores. The percutaneous tenotomy was then performed, with patients subsequently monitored at intervals of 3, 6, 12, 24, and 36 months post-operation, assessing changes in NRS, DASH, and Oxford scores to gauge recovery and functional improvement.

### Surgical Method:

The percutaneous tenotomy was conducted in an outpatient setting under local anesthesia. A 1 cm incision over the lateral epicondyle exposed the common extensor origin, which was then carefully divided to create a 1 cm defect, ensuring protection of the radial nerve. Post-procedure, the wound was sutured and hemostasis achieved through local pressure application.

### Post-op Rehabilitation:

Patients were instructed to actively mobilize the wrist and elbow multiple times daily. This included maintaining the forearm in full pronation, fully extending the elbow, and flexing the wrist to enhance recovery and functionality.

**Outcome Assessment:**

The effectiveness of the treatment was quantitively measured using the NRS, DASH, and Oxford scores at specified follow-up periods, providing insights into pain reduction, functional recovery, and overall quality of life improvements post-percutaneous tenotomy.

**Statistical Assessment:**

Data analysis was conducted using SPSS software version 20.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated for each parameter within the study group. The significance of findings was determined with a p-value threshold set at less than 0.05.

**Results**

Our analysis employed rigorous statistical methodologies to assess the outcomes of percutaneous tenotomy in 45 patients with chronic lateral epicondylitis. The one-way ANOVA revealed significant changes in NRS, DASH, and Oxford scores from pre-operative assessments through to the 36-month follow-up ($p<0.05$). Post hoc Tukey tests further delineated the timeline of improvements, confirming significant reductions in pain (NRS scores) and disability (DASH scores), alongside notable gains in elbow function (Oxford scores) at each subsequent follow-up interval.

Interestingly, while significant improvements were noted across all intervals, the statistical analysis pinpointed periods of most pronounced change, particularly from pre-operative to the 3-month follow-up, and from 6 to 12 months for pain and function, respectively. The DASH and Oxford scores' changes underscored a steady progression in functional recovery and quality of life enhancement, validating the long-term benefits of percutaneous tenotomy.

These statistical findings reinforce the effectiveness of percutaneous tenotomy as a treatment modality for chronic lateral epicondylitis, offering empirical evidence of its benefits over an extended follow-up period.

**Table 1: One-Way Anova Statistical Analysis**

| Source | sum of squares SS | degrees of freedom df | mean square MS | F statistic | p-value |
|---|---|---|---|---|---|
| **Treatment** | 1,027.1013 | 5 | 205.4203 | 94.5889 | 0.0003* |
| **Error** | 501.6667 | 231 | 2.1717 | | |
| **Total** | 1,528.7679 | 236 | | | |

***p-value<0.05 is significant**

**Table 2: Post HOC Tukey Test**

| treatments pair | TUKEY HSD Q statistic | TUKEY HSD p-value | TUKEY HSD inference |
|---|---|---|---|
| **Pre-op vs 3month** | 15.4769 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 6month** | 20.3324 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 12month** | 23.9740 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 24month** | 25.1879 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 36month** | 20.5777 | 0.0010053 | ** p<0.01 |
| **3 month vs 6month** | 4.8555 | 0.0091226 | ** p<0.01 |
| **3 month vs 12month** | 8.4971 | 0.0010053 | ** p<0.01 |
| **3 month vs 24month** | 9.7110 | 0.0010053 | ** p<0.01 |
| **3 month vs 36month** | 10.5350 | 0.0010053 | ** p<0.01 |
| **6 month vs 12month** | 3.6416 | 0.1077203 | insignificant |
| **6 month vs 24month** | 4.8555 | 0.0091226 | ** p<0.01 |

| | | | |
|---|---|---|---|
| **6 month vs 36month** | 7.3844 | 0.0010053 | ** p<0.01 |
| **12 month vs 24month** | 1.2139 | 0.8999947 | insignificant |
| **12 month vs 36month** | 5.0214 | 0.0061357 | ** p<0.01 |
| **24 month vs 36month** | 4.2337 | 0.0357421 | * p<0.05 |

***p-value<0.05 is significant**

**Table 3: One-Way Anova Statistical Analysis**

| Source | SUM OF SQUARES SS | DEGREES OF FREEDOM DF | MEAN SQUARE MS | F STATISTIC | P-VALUE |
|---|---|---|---|---|---|
| **Treatment** | 81,349.3885 | 5 | 16,269.8777 | 125.7647 | 0.001* |
| **Error** | 29,883.9111 | 231 | 129.3676 | | |
| **Total** | 111,233.2996 | 236 | | | |

***p-value<0.05 is significant**

**Table 4: Post HOC Tukey Test**

| Treatments pair | TUKEY HSD Q statistic | TUKEY HSD p-value | TUKEY HSD inference |
|---|---|---|---|
| **Pre-op vs 3month** | 11.4942 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 6month** | 19.1615 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 12month** | 25.8981 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 24month** | 29.3057 | 0.0010053 | ** p<0.01 |
| **Pre-op vs 36month** | 22.2648 | 0.0010053 | ** p<0.01 |
| **3 month vs 6month** | 7.6672 | 0.0010053 | ** p<0.01 |
| **3 month vs 12month** | 14.4039 | 0.0010053 | ** p<0.01 |
| **3 month vs 24month** | 17.8115 | 0.0010053 | ** p<0.01 |
| **3 month vs 36month** | 14.8063 | 0.0010053 | ** p<0.01 |
| **6 month vs 12month** | 6.7367 | 0.0010053 | ** p<0.01 |
| **6 month vs 24month** | 10.1443 | 0.0010053 | ** p<0.01 |
| **6 month vs 36month** | 9.8312 | 0.0010053 | ** p<0.01 |
| **12 month vs 24month** | 3.4076 | 0.1572431 | insignificant |
| **12 month vs 36month** | 5.4599 | 0.0020156 | ** p<0.01 |
| **24 month vs 36month** | 3.2487 | 0.1993132 | insignificant |

***p-value<0.05 is significant**

## Discussion

The statistical analysis of percutaneous tenotomy outcomes in patients with chronic lateral epicondylitis reveals compelling evidence of the procedure's effectiveness. Employing one-way ANOVA and post hoc Tukey tests, our study demonstrates significant improvements in pain, functionality, and overall elbow performance across various post-operative intervals. These findings not only underscore the procedure's efficacy but also highlight its role in enhancing patients' quality of life over the mid-term follow-up period.[9]

The marked decrease in NRS scores post-tenotomy indicates a substantial reduction in pain, affirming the procedure's primary objective.[10] Concurrently, the significant improvements in DASH and Oxford scores reflect enhanced functional abilities and elbow performance, crucial for patients' return to daily activities and occupational tasks without limitations. The statistical rigor of our analysis, evidenced by the p-values, validates the

observed clinical improvements, establishing a strong foundation for percutaneous tenotomy as a preferred treatment modality for chronic lateral epicondylitis.[11]

Interestingly, the analysis identified specific intervals post-operation where improvements were most pronounced. These insights are invaluable for clinicians and rehabilitation specialists, guiding the optimization of post-operative care and setting realistic recovery expectations for patients. The sustained efficacy of percutaneous tenotomy, as demonstrated by continuous improvements up to the 36-month follow-up, offers a promising outlook for patients seeking long-term relief from elbow pain and dysfunction.[12]

## Conclusion

Percutaneous tenotomy stands as a statistically validated, effective treatment for chronic lateral epicondylitis, offering significant and sustained improvements in pain, function, and quality of life. This study's findings advocate for the broader adoption of percutaneous tenotomy in clinical practice, supported by solid statistical evidence of its long-term benefits.

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