Comparison between Percutaneous Needle Release and Local Corticosteroid Injection for the Treatment of Tennis Elbow

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Purpose: *The goal of treatment of tennis elbow is to treat tendinosis. Percutaneous needle release is one of the treatment options but does not have comparative outcomes with standard treatments. To compare the clinical outcomes between percutaneous needle release and local corticosteroid injection in tennis elbow disease.*
Methods: *A prospective randomized controlled study was conducted. Forty-nine tennis elbow patients were divided into two groups by randomization. Twenty-four patients were assigned to the corticosteroid injection group and 25 patients were assigned to the percutaneous needle release group. Both groups were assessed for visual analog scale (VAS), grip strength, and infection before treatment and 2 weeks, 1, 2, 3, and 6 months after the procedures.*
Results: *All demographic data, baseline VAS, and grip strength were not statistically different between groups. The difference of VAS compared to baseline at 2 weeks, 1, 2, 3, and 6 months were 5.86, 6.14, 5.57, 5.09, and 4.85 for the corticosteroid group and 2.68, 3.93, 4.74, 4.38, and 4.35 for the percutaneous needle release group, respectively. The difference of grip strength compared to baseline at 2 weeks, 1, 2, 3, and 6 months were 8.73, 10.42, 10.83, 9.55, and 8.55 for the corticosteroid group and 3.43, 4.65, 7.80, 6.88, and 7.06 for the percutaneous needle release group, respectively. The improvement of VAS and grip strength in the corticosteroid group was superior to the percutaneous needle release group, but there was statistical significance only at 2 weeks and 1 month follow ups (P = <0.001, <0.001, 0.001, 0.005, respectively). No case of infection was detected during the follow up period.*
Conclusion: *A corticosteroid injection improved pain and grip strength in tennis elbow disease more than percutaneous needle release, but was statistically significant only at 2 weeks and 1 month after treatments.*

Keywords: *Tennis elbow disease, lateral epicondylitis, percutaneous needle release, tenotomy, pain, grip strength*

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Introduction

Tennis elbow is lateral elbow pain from tendinosis at the extensor carpi radialis brevis (ECRB) origin. It is caused by repetitive trauma at the ECRB origin leading to a degenerative process and tendinosis. Patients usually present with pain at the lateral of the elbow and weakness of grip strength. First line of treatment for tennis elbow begins with medication. If medical treatment has failed, a corticosteroid injection is one of the treatment options. However, it has side effects such as local skin atrophy, depigmentation of skin, and muscle wasting[1-3]. Percutaneous needle release is an alternative treatment option; however, it breaks up scar tissue, creates bleeding, and stimulate healing process[4-6]. It had good results under ultrasound guide from John M, et al.'s data in 2008[7] and Jiaan Z, et al.'s data in 2008[8] and a prospective study in 2012[9]. There was a retrospective study in 2007, they used percutaneous needle release by 18-gauged needles to make the surface at the ECRB origin raw and they had excellent results in 76% of participants and 66% were completely pain free[10] as in Grundberg's prospective cohort study in 2000[11]. The previously mentioned study was a retrospective study and did not compare to other treatments. Therefore, we created a randomized controlled study to compare outcomes of percutaneous needle release with the standard treatment, corticosteroid injection.

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Objective

The primary objective of this study was to compare the improvement of pain measured by the visual analog scale (VAS) between percutaneous

needle release and corticosteroid injection in treatment outcomes of tennis elbow disease.

The secondary objective was to compare the improvement of grip strength and serious complications such as infection between two groups.

Materials and Methods

The study participants were patients diagnosed with tennis elbow disease in the outpatient department, Faculty of Medicine, Srinakharinwirot University, between May 2011 and May 2013. Inclusion criteria were participants older than 18 years with lateral elbow pain, tenderness at the lateral epicondyle, and for whom pain occurs at the lateral epicondyle of a fully extended elbow with resisted wrist extension or positive Cozen's test[12] and failure from medical treatment for 1 month. Exclusion criteria were participants who had elbow stiffness, inflammatory arthropathy at the elbow, have a history of injection, surgery, fracture, or deformity of the elbow joint, and individuals who were diagnosed with cervical radiculopathy or cervical disc disease. Informed consent of the study was obtained before all procedures were initiated. Participants were interviewed with a case record form for demographic data which composed of sex, age, education, occupation, location, religion, height, weight, and duration of the symptoms. Visual analog scale and grip strength were recorded before the procedure.

Subsequently, all participants were randomized into two groups by a randomization protocol to undergo treatment with either percutaneous needle release or steroid injection. All procedures were performed by the same physician of the Department of Orthopedic Surgery, Faculty of Medicine, HRH Princess Maha Chakri Sirindhorn Medical Center. A flow chart of patients' allocation and follow up, as per the CONSORT statement, is shown in Figure 1.

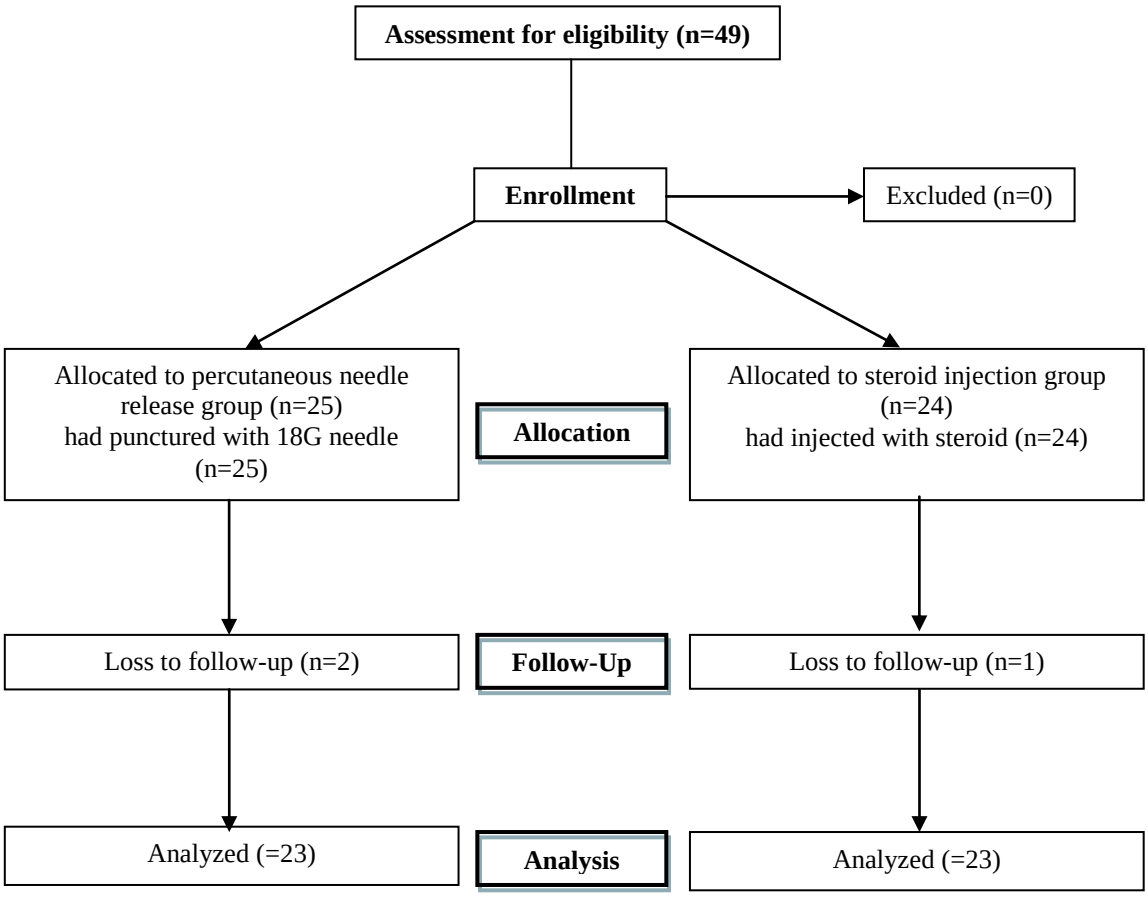

Fig. 1 Flowchart of patients' allocation and analysis (as per CONSORT statement)

Percutaneous needle release was done by using an 18 gauge needle punctured 1 time through the skin at the lateral epicondyle on the area of maximal tenderness, and then punctured 5 times at the extensor carpi radialis brevis origin to create bleeding. This procedure was performed after 1% lidocaine without adrenaline injection. Corticosteroid injections were administered by 10 mg of triamcinolone with 1 ml. of 1% lidocaine without adrenaline injected at the extensor carpi radialis brevis origin.

After the procedure all participants were educated with forearm extensor stretching exercises and prescribed 1 gram per dose and 4 grams per day of paracetamol for pain control.

We followed up at 2 weeks, 1, 2, 3, and 6 months to evaluate pain with visual analog scale and grip strength with a digital hand dynamometer. All data of each follow up were compared to baseline data then recorded. The incidence of infection was recorded at every visit.

The sample size calculation was based on data from a previous study (Espanda et al., 2010)[13]. The authors reviewed that the mean of the VAS of the control group was 2.84 (SD 2.02), and the mean in the treatment group was 1.19 (SD 1.43). The calculated sample size was 24 subjects per group with a power of 80% and type I error of 5%. Statistical analyses were performed using SPSS of Windows version 20.0.

Demographic data was divided into quantitative data and qualitative data. Quantitative data distributions were analyzed with Kolmogorov-Smirnov test. If data was normally distributed, it would be presented with mean±standard deviation (SD). If data did not have a normal distribution it would be presented with median (Interquartile range). Data in this category were age, height, weight, duration, VAS, and grip strength. Qualitative data were presented as a percentage. Data in this category were sex, education, occupation, location, and religion.

The differences between quantitative demographic data were tested by independence *t*-test or Wilcoxon Rank Sum test depending on the distribution of the data; qualitative demographic data were tested by Chi-square test.

Results of treatment in both groups were VAS, grip strength and incidence of infection. We compared the improvement of VAS and grip strength at 2 weeks, 1, 2, 3, and 6 months with independence *t*-test or Wilcoxon Rank Sum test depending on distribution of data. A P-value < 0.05 was considered statistically significant. Incidence of infection was presented as a percentage.

Results

During the study period, 49 tennis elbow participants were recruited and randomized into 2 groups, percutaneous needle release and corticosteroid injection. The patients' demographic data were summarized in table1 and table 2. Mean age, height, weight, duration of disease, baseline VAS, and baseline grip strength were 43.76 years, 161 centimeters, 56.8 kilograms, 9.92 weeks, 6.64, and 19.21 kilograms in the percutaneous needle release group, and were 49.04 years, 160 centimeters, 57.58 kilograms, 8.17 weeks, 7.43, and 16.62 kilograms, respectively (Table 1). Other demographic data were sex, education, occupation, location, and religion. All data were not significantly different between groups.

Table 1 Demographic data of the population

Characteristics	Needle release (n=25)	Steroid injection (n=24)	Mean difference	95%CI	*P*-value
Age (years) (Mean±SD)	43.76±7.74	49.04±10.68	5.28	-0.061-10.625	0.053
Height (cm) (Mean±SD)	161±7.7	160±7.62	0.83	-5.240-3.573	0.705
Weight (kg) (Mean±SD)	56.8±13.0	57.58±10.90	0.78	-6.129-7.695	0.821
Duration (Mean±SD)	9.92±10.0	8.17±5.48	-1.75	-6.414-2.908	0.453
VAS (Mean±SD)	6.64±1.84	7.43±1.39	-0.80	-0.141-1.736	0.094
Grip strength (Mean±SD)	19.21±10.0	16.62±7.07	-2.60	-7.590-2.408	0.302

Two participants in the percutaneous needle release group were lost to follow up at 3 months and one participant in the steroid injection group was lost to follow up at 2 months.

Pain perception was assessed by visual analog scale (VAS) and compared to baseline data before the procedure, the mean difference between the 2 groups at 2 weeks, 1, 2, 3, and 6 months follow up were 3.19, 2.21, 0.38, 0.70, 0.50 respectively. The improvement of VAS was superior in the corticosteroid group at 2 weeks and 1 month follow up (P<0.001), but were the same at 2, 3, and 6 months follow up (P=0.194, 0.343, 0.535) (Table 2).

Grip strength was assessed by a digital hand dynamometer and compared to baseline data before the procedure in the same way as VAS. The mean difference between the 2 groups at 2 weeks, 1, 2, 3, and 6 months follow up were 5.31, 5.77, 2.03, 2.66, 1.49 kilograms, respectively. The improvement of grip strength was superior in the corticosteroid group at 2 weeks and 1 month follow up (P=0.001, 0.005), but not statistically significant at 2, 3, and 6 months follow up (P=0.057, 0.145, 0.369) (Table 3). There was no incidence of infection at all follow ups in both groups.

Table 2 Visual analog scale improvement (Compared to baseline data)

VAS Difference	N	Mean±SD	Mean difference	95%CI	*P*-Value
2 weeks					
-Needle	25	2.68±1.62	3.19	2.23-4.15	<0.001
-Steroid	24	5.86±1.72			
1 month					
-Needle	25	3.94±1.97	2.21	1.15-3.26	<0.001
-Steroid	24	6.14±1.68			
2 months					
-Needle	25	4.74±2.50	0.83	-0.44-2.09	0.194
-Steroid	23	5.57±1.82			
3 months					
-Needle	23	4.38±2.73	0.70	-0.78-2.18	0.343
-Steroid	23	5.09±2.39			
6 months					
-Needle	23	4.35±2.99	0.50	-1.12-2.12	0.535
-Steroid	23	4.85±2.61			

Table 3 Grip strength improvement (Compared to baseline data)

Grip strength Difference	N	Mean±SD	Mean difference	95%CI	*P*-Value
2 weeks					
-Needle	25	3.43±4.77	5.31	2.24-8.37	0.001
-Steroid	24	4.85±2.61			
1 month					
-Needle	25	4.65±7.90	5.77	1.83-9.71	0.005
-Steroid	24	10.42±5.55			
2 months					
-Needle	25	7.80±5.03	3.03	-0.09-6.14	0.057
-Steroid	23	10.83±5.81			
3 months					
-Needle	23	6.88±5.58	2.66	-0.95-6.27	0.145
-Steroid	23	9.55±6.94			
6 months					
-Needle	23	7.06±5.93	1.49	-1.81-4.79	0.369
-Steroid	23	8.55±5.55			

Discussion

The improvement of VAS and grip strength was superior in the corticosteroid group but statistically significant only at 2 weeks and 1 month follow up. After 2 months follow up the data did not show any significant difference between the groups. Percutaneous needle release could improve the pain and grip strength as effectively as corticosteroid injection, but not before 2 months after treatment because the treatment of tendinosis with percutaneous needle release took about 6 weeks to heal due to the pathophysiology of the healing process.

Tendinosis is caused by chronic overuse injuries that were the result of multiple microtrauma events leading to disruption of the internal structure of tendons and degeneration of the cells and matrix which failed to mature into normal tendon. The main principle for treatment of tendinosis is to stimulate neurovascularization by producing focused local bleeding as in percutaneous needle release to create a healthy scar with the least possible structural damage to surrounding tissues[(1)]. On the other hand, corticosteroid may not correct this condition with the same mechanism, it acts directly by decreasing the inflammation at the site of tendinosis with a shorter period of time compared with the percutaneous needle release method[(2)].

Lakhey S et al.[(10)] found 76.20% of patients had excellent or good outcomes, may be because of the pre-operative steroid injection (average 2.90 mg) and a post-operative wrist brace that was applied until the pain was resolved. The time to achieve a completely pain free elbow ranged from 1 day to 3 months (average 60.30 days) which were very close to outcomes from percutaneous needle release in this study.

Pain from tendinosis at the lateral epicondyle or extensor carpi radialis brevis origin can be treated with laceration and bleeding[(1)] from needle puncture, but it takes time for the healing process that is composed of the clotting phase, inflammatory phase, proliferative phase, and ends with remodeling or maturation that comes with neovascularization and healthy scarring[(1)].

Percutaneous needle release could be an alternative low invasive treatment option for patients who failed conservative treatments and who were not ready for surgery or did not want to take the risks of corticosteroid injections which have the side effects such as local skin atrophy, skin depigmentation, and muscle wasting that can increase bony prominence from lateral epicondyle of humerus. Additionally, the percutaneous needle release procedure is not expensive.

The advantage of this study is that it is a randomized controlled trial. The limitations of this study are that the results in the percutaneous needle release group were limited to individuals who had no history of steroid injections before. Furthermore, the follow up period time was only 6 months, and so might not reflect long term outcomes and relapse of disease.

Based on our study, future research should be performed to investigate the recurrence rate from percutaneous needle release in long term follow ups, incidence of other complications, such as extensor origin rupture, and percutaneous needle release outcomes in post-corticosteroid injection patients.

Conclusion

Improvements of pain and grip strength from corticosteroid injection were superior to percutaneous needle release, but statistically significant only at 2 weeks and 1 month in a total of 6 months follow up. Percutaneous needle release is one treatment option for tennis elbow patients who do not want to take risks from corticosteroid injection.

Conflict of interest

We declare that we have no conflict of interest.

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การศึกษาเปรียบเทียบผลของการรักษาโรคจุดเกาะเอ็นที่ข้อศอกด้านนอกอักเสบ โดยใช้วิธี เลาะจุดเกาะเอ็นที่ข้อศอกด้านนอกผ่านทางผิวหนัง เทียบกับวิธีฉีดสารคอร์ติโคสเตียรอยด์

เกรียงศักดิ์ เล็กเครือสุวรรณ, พบ, ยิ่งยง ต่ออุดม, พบ

วัตถุประสงค์: *เพื่อเปรียบเทียบระดับความเจ็บปวดและกำลังในการบีบมือที่ดีขึ้นหลังจากการรักษาด้วยวิธี เลาะจุดเกาะเอ็นที่ข้อศอกด้านนอกผ่านทางผิวหนัง เทียบกับวิธีฉีดสารคอร์ติโคสเตียรอยด์ ในโรคจุดเกาะเอ็น ที่ข้อศอกด้านนอกอักเสบ*

วิธีการศึกษา: *ทำการศึกษาในผู้ป่วยโรคจุดเกาะเอ็นที่ข้อศอกด้านนอกอักเสบจำนวน 49 รายที่เข้ารับการรักษา ที่โรงพยาบาลศูนย์การแพทย์สมเด็จพระเทพรัตนราชสุดาฯ สยามบรมราชกุมารี โดยได้แบ่งกลุ่มตัวอย่างเป็น 2 กลุ่ม ได้แก่ กลุ่มที่ 1 (กลุ่มทดลอง) คือกลุ่มที่ได้รับการรักษาโดยการเลาะจุดเกาะเอ็นที่ข้อศอกด้านนอกผ่านทางผิวหนัง กลุ่มที่ 2 (กลุ่มควบคุม) คือกลุ่มที่รักษาโดยการฉีดสารคอร์ติโคสเตียรอยด์ที่ตำแหน่งจุดเกาะของกล้ามเนื้อ extensor carpi radialis brevis หลังจากนั้นนัดหมายผู้ป่วยเพื่อประเมินผลการรักษาที่ 2 สัปดาห์และ 1,2,3,6 เดือนตามลำดับ โดยใช้แผนภูมิ " visual analog scale" (VAS) เพื่อบอกระดับความเจ็บปวดของผู้ป่วย ออกมาเป็นตัวเลข และทดสอบกำลังในการบีบมือโดยเครื่องวัดกำลังการบีบมือที่แสดงผลเป็นตัวเลข (หน่วยเป็นกิโลกรัม) และวิเคราะห์ผลทางสถิติ*

ผลการศึกษา: *ผู้ป่วยที่เข้าร่วมการศึกษาทั้งหมด 49 รายแบ่งเป็นกลุ่มที่ได้รับการรักษาโดยการเลาะจุดเกาะเอ็นที่ข้อศอกด้านนอกผ่านทางผิวหนัง 25 ราย และกลุ่มที่รักษาโดยการฉีดสารคอร์ติโคสเตียรอยด์ 24 ราย พบว่าระดับความเจ็บปวดที่ลดลงและกำลังในการบีบมือที่ดีขึ้นในกลุ่มที่รักษาโดยการฉีดสารคอร์ติโคสเตียรอยด์ที่ 2 สัปดาห์ และ 1 เดือนดีกว่ากลุ่มที่ได้รับการรักษาโดยการเลาะจุดเกาะเอ็นที่ข้อศอกด้านนอกผ่านทางผิวหนัง แต่หลังจาก 2 เดือน ผลการรักษาไม่แตกต่างกัน*

สรุป: *การรักษาโรคจุดเกาะเอ็นที่ข้อศอกด้านนอกอักเสบโดยวิธีการเลาะจุดเกาะเอ็นที่ข้อศอกด้านนอก ผ่านทางผิวหนังให้ผลการรักษาเทียบเท่ากับการฉีดสารคอร์ติโคสเตียรอยด์ซึ่งเป็นการรักษาตามมาตราฐาน หลังจากการรักษา 2 เดือน*