

Evaluation of the clinical results of single injection technique and peppered injection technique in lateral epicondylitis

Rahul Kumar^{1,*}, Vinay N²

^{1,2}Department of Orthopaedics, VMMC and Safdarjung Hospital, New Delhi.

*Corresponding Author:

E-mail: dr.rahul_kumar@yahoo.com

ABSTRACT:

Introduction: Lateral epicondylitis/lateral epicondylalgia, or tennis elbow is a common pathology of both athletes and non-athletes, affecting 1 to 3 % of the population at large. The choice of treatment options for this condition is even more controversial. There are many treatment options available to the clinician, but their use is often based on anecdotal evidence. Various treatments ranging from conservative to more invasive measures have been described with varying degrees of success, with no conclusive scientific evidence to support any particular treatment protocol.

Methodology: A minimum of 30 patients each for single injection and peppered injection technique were included in the sample. The Single Injection Technique –was performed by penetrating the skin at the identified area of maximum tenderness. The Peppered Injection Technique also began with penetration of the skin at the area of maximal tenderness. The outcome was measured by VAS, Tenderness and grip strength.

Results: In our study The mean VAS score in single injection group was, 2.80 at 3 month, 2.83 at 6 month and 3.37 at 12 month. In peppered injection group, mean VAS score was, 1.30 at 3 month, 0.90 at 6 month and 1.13 at 12 month.

Conclusion: Peppered Injection Technique is advantageous than single technique.

Keywords: Extensor muscle; lateral epicondylitis; “peppered” technique; tennis elbow.

Access this article online	
Quick Response Code:	Website: www.innovativepublication.com
	DOI: 10.5958/2395-1362.2015.00030.4

INTRODUCTION

Tennis elbow or Lateral epicondylitis, is a condition characterised by pain in the lateral region of the elbow at the origin of the extensor muscles or the wrist and fingers. Tennis elbow develops mostly in the fifth and sixth decade and was first defined by Runge in 1873¹. This condition, affecting 1 to 5% of the population, is also known as tendinosis, is the degeneration at the tendon attachment on lateral epicondyle and is caused by repetitive microtrauma².

Pain in the vicinity of lateral epicondyle of the elbow is a disability well known in the field of orthopaedic surgery. The term tennis elbow is actually a misnomer because the condition is commonly seen in non tennis players. It may occur in patients performing any activity that involves repeated supination and pronation of the forearm with elbow in extension³.

Tennis elbow is usually regarded as a minor ailment but it may persist as a nagging pain or flare up so severely as to prevent even a minor activity. It is at this period of exacerbation that the patient usually calls for help⁴. The anatomic basis of the

injury to the extensor carpi radialis brevis (ECRB) origin appear to be multifaceted, involving hypovascular zones, eccentric tendon stresses and a macroscopic degenerative response.⁵

Lateral epicondylitis usually represents a degenerative process involving the origin of the extensor tendons at the lateral elbow. It is thought that mechanical overload and repetitive stress lead to tendinosis with microtrauma to the origin of extensor carpi radialis brevis muscle (ECRB) and eventually partial injury. Progressive degeneration due to an immature reparative response may progress to a full thickness tendon tear³. Studies have shown that trauma such as direct blows to the epicondyle, a sudden forceful pull, or forceful extension have caused more than half of these injuries⁶. Periostitis, fibrositis, radial nerve entrapment, extensor tears, infection, an intraarticular abnormality, and orbicular ligament inflammation have all been suggested as other causes³.

Lateral epicondylitis is now viewed as a distinct entity, identified primarily by the clinical symptoms. The most consistent feature of the syndrome is the production of pain during extension of the wrist in radial deviation. This movement is performed by the extensor carpi radialis longus and brevis. Symptoms include pain over the lateral side of elbow induced by gripping or resisted extension movement of the wrist. The patient may also have pain in the region of the shoulder and neck in long standing cases. Symptoms are usually mild, but occasionally there is significant pain and disability

severe enough to cause a working man to leave his job.^{3,7}

The other causes of pain on lateral side of elbow like radial tunnel syndrome, instability following lateral ligament complex injury, lateral compartment arthritis and osteochondritis of the capitulum must be excluded before a diagnosis of tennis elbow can be made⁸.

Advances in understanding of the anatomy and patho-physiology of epicondylitis have shaped current treatment practices. The choice of treatment for each individual case remains controversial and is based on the personal experience of the treating physician⁷. The initial treatment is almost always conservative, because symptoms in most patients improve with time and rest⁴. However, they produce unsatisfactory outcome that can lead to chronicity and pervasiveness of the symptoms in many cases. In addition, considering that they are work related disorder, the patient cannot avoid uncomfortable experiences at work due to pain and low work capacity. The workman who is prevented from earning his livelihood by pain over the outer aspect of his elbow regards the condition as an economy calamity⁹.

Over 40 different treatment options have been described, including wait and see, activity modifications and physical therapy, orthoses, oral and topical anti inflammatory drugs, steroid injections, platelet – rich plasma, botulinum toxin, extraporeal shock wave therapy, laser irradiation and arthroscopic and open surgical intervention^{10,11}. The peppering technique was first described in 1964 by Puce et al. In peppering technique multiple injections reach the bone through the degenerative tendons and granulation tissue, causing local hematoma. It is believed that this bleeding may initiate a healing process².

However, corticosteroid injection is a mainstay of treatment and a widely accepted practice due to its ease of administration, its cost effectiveness and efficacy. Although widely used, conflicting evidence exists to support the use of steroid injection to treat lateral epicondylitis. No injection technique has been universally advocated, leading to variable clinical results. In addition, no evidence in the literature supports the single vs peppered-injection technique¹⁰.

The aim of the study is to evaluate the clinical results of single injection technique and peppered injection technique in lateral epicondylitis.

METHODOLOGY

Study population: Patients presented to the O.P.D or emergency services was recruited for the study after fulfilling the selection criteria and was accordingly followed up. Before recruiting a patient, informed written consent was taken from the patient.

Sample Size and Method of Calculation: A minimum of 30 patients each for single injection and peppered injection technique were included in the sample.

SELECTION CRITERIA

Inclusion criteria:

1. Adult patients of either sex >18yr old.
2. Symptomatic lateral epicondylitis.
3. Patients with lateral epicondylitis not responding to ultrasonic / LASER therapy.

Exclusion criteria:

1. Patients younger than 18yrs.
2. Patients who had received >3 injections to that elbow in <6 months.
3. History of trauma to the elbow
4. Evidence of neurologic source of pain (radial nerve entrapment or cervical radiculopathy)
5. Intra-articular pathology (Osteochondritis Dissecans, Osteo or Inflammatory arthritis, Posterolateral rotatory instability or Plica).
6. Infective pathology of the elbow like tuberculosis.
7. Lytic pathology of the elbow and benign tumors of elbow.

All patients included in the study were evaluated thoroughly using detailed history and complete physical examination with special emphasis on treatment taken so far.

Initial workup:

1. Routine blood investigations including ESR, RA factor, HLA B27 if required.
2. Good quality X-Ray elbow AP & Lat view.
3. Non contrast M.R.I.

Randomization:

The patients who fit to inclusion criteria were divided into two groups to receive two different mode of treatment.

The technique adopted was Block randomization. In this each block was made of 4 units like ABBA, BBAA, ABAB etc where A is meant for one treatment and B is meant for other treatment. This randomization was also based on Double blinding technique

Injection Technique

Positioning:

The patient was placed in a seated position with the affected arm resting comfortably on the examination table. The elbow was flexed to approximately 90 with the palm pronated so that it was flat on the table.

Portals and injection technique:

The point of maximum tenderness was identified by palpation and marked. The skin was prepared using betadine and alcohol. The injection of 1ml of

10mg/ml triamcinolone was mixed with 1ml of 2% lidocaine. A 25-gauge needle was used for the injection. 3 Injections was injected over area of maximum tenderness at 2 weeks interval. The Single Injection Technique – was performed by penetrating the skin at the identified area of maximum tenderness. The needle was advanced to the bone and slowly pulled back a few millimeters. The entire quantity of the syringe was deposited at this location and the needle was then withdrawn. The Peppered Injection Technique also began with penetration of the skin at the area of maximal tenderness. The needle was then advanced to the bone and then withdrawn a few millimeters. A small amount of steroid/anesthetic was delivered. The needle was withdrawn without removing it from the skin and was moved back and forth approximately 30 to 40 times to form a hematoma around the epicondyle. A crepitation or cracking sensation may be felt, and redirection should be continued until this sensation ceases.

Post injection management

Patient’s area was cleaned with alcohol post injection and a sterile bandage was applied. Patients was instructed to use oral inflammatory drugs and ice to control local discomfort from the injection for 2 days. Patients was advised to avoid strenuous activity for 3 weeks. Strengthening exercise for extensor muscles.

EVALUATION OF RESULTS: evaluation was done prior to the injection and at 3, 6 and 12 month post injection.

The evaluation was based on:-

1. Tenderness grading at the lateral epicondyle.

2. The Visual Analog Pain scale (VAS): was used for evaluation of pain experienced by the patient.
3. Roles & Maudsley Score: for clinical assessment.
4. Grip strength of both hands: Patients was reviewed in a separate clinic by a physiotherapist. The physiotherapist measured the grip strength of both hands using a hand dynamometer. Measurements was made with the elbow fully extended and with it flexed to 90 degrees. The mean of the 2 measurements will be recorded as the grip strength.
5. Any complication: was reviewed and managed accordingly.

STATISTICAL ANALYSIS

The results will be statistically analysed by using chi square test.

RESULTS

The mean age of our patients was 39.5 years for single injection group and 37.7 years for peppered injection group. The range was 21-60 years.30 patients each were taken for single and peppered injection technique. In single injection group, 16.7% of the patients (n=5) were between 21-30 years, 33.3% (n=10) were in the age group 31-40 years, 36.7% (n=11) of the patient were in the age group 41-50 years while the rest 13.3% (n=04) were in the age group of 51- 60 years. In peppered injection group, 26.7%of the patients (n=8) were in the age group of 21-30years, 33.3% (n=10) were in the age group of 31-40years, 26.7% (n=8) were in the age group of 41-50 years, 13.3%(n=04) were in the age group of 51-60 years. Maximum number of patients was between 31-40 years of age group.

Table 1: Age and Gender Distribution between Two Groups

Age Groups	SINGLE		PEPPERED		P value
	Frequency	%	Frequency	%	
21 - 30 yrs	5	16.7%	8	26.7%	0.761
31 - 40 yrs	10	33.3%	10	33.3%	
41 - 50 yrs	11	36.7%	8	26.7%	
51 - 60 yrs	4	13.3%	4	13.3%	
Total	30	100%	30	100%	
Mean ± SD	39.53 ± 9.83		37.77 ± 10.17		0.497

Table 2: Showing Comparison of Vas Score B/W 2 Groups

VAS	SINGLE		PEPPERED	
	Mean ± SD	Min - Max	Mean ± SD	Min - Max
Pre inj	7.83 ± 0.79	6 - 9	8.13 ± 0.73	7 - 9
3 months	2.80 ± 0.89	2 - 5	1.30 ± 1.09	0 - 6
6 months	2.83 ± 1.51	0 - 7	0.90 ± 1.06	0 - 5
12 months	3.37 ± 1.88	0 - 7	1.13 ± 1.61	0 - 6

The mean VAS score in single injection group was, 2.80 at 3 month, 2.83 at 6 month and 3.37 at 12 month. In peppered injection group, mean VAS score was, 1.30 at 3 month, 0.90 at 6 month and 1.13 at 12 month.

Table 3: Showing Comparison B/W Affected and Unaffected Side at 3, 6 And 12 Month Interval in Single and Peppered Injection Technique.

	SINGLE		PEPPERED	
	Grip Strength of Affected Side	Grip Strength of Unaffected Side	Grip Strength of Affected Side	Grip Strength of Unaffected Side
Pre inj	23.10 ± 8.41	38.73 ± 8.72	26.97 ± 8.72	42.73 ± 8.21
3 months	32.80 ± 7.14	38.07 ± 7.64	40.53 ± 7.43	43.40 ± 7.43
6 months	32.67 ± 7.40	38.27 ± 7.18	41.60 ± 7.05	43.40 ± 7.26
12 months	31.20 ± 8.45	38.67 ± 7.11	40.60 ± 7.03	43.07 ± 7.62

In single injection group, at 3 month post injection mean grip strength in involved side was 32.80kg, at 6 month mean grip strength of involved side was 32.67 kg and 31.20 at 12 month post injection. . In peppered injection group, at 3 month post injection mean grip strength was 40.5 kg, at 6 month mean grip strength of involved side was 41.6kg and 40.6 kg at 12 month post injection

Table 4: Showing Comparison of Tenderness B/W 2 Groups.

PRE INJECTION TENDERNESS	SINGLE		PEPPERED	
	Frequency	%	Frequency	%
GRADE 2	12	40.0%	16	53.3%
GRADE 3	18	60.0%	14	46.7%
Total	30	100%	30	100%

In single group, pre injection tenderness revealed that 40% of the patients were in Grade 2 and 60% of patients were in grade3. In Peppered group, pre injection tenderness revealed that 53.3% of the patients were in Grade 2 and 46.7% of patients were in grade3.

Table 5: Showing Comparison of Tenderness At 12 Month Interval B/W 2 Groups

Tenderness at 12 months	SINGLE		PEPPERED	
	Frequency	%	Frequency	%
GRADE1	2	6.7%	1	3.3%
GRADE2	8	26.7%	2	6.7%
NO TENDERNESS	20	66.7%	27	90.0%
Total	30	100%	30	100%

In single group, post injection tenderness at 12 months revealed that 66.7% of the patients did not have tenderness. In Peppered group, post injection tenderness at 12 months revealed that 90% of the patients did not have tenderness.

Table 6: Showing R & M Score At Base Line / Preinjection

R&M at Baseline	SINGLE		PEPPERED	
	Frequency	%	Frequency	%
FAIR	7	23.3%	12	40.0%
POOR	23	76.7%	18	60.0%
Total	30	100%	30	100%

Table 7: Showing Comparison in R & M Score at 12 Month B/W2 Groups

ROM at 12 months	SINGLE		PEPPERED	
	Frequency	%	Frequency	%
EXCELLENT	6	20.0%	25	83.3%
GOOD	14	46.7%	2	6.7%
FAIR	3	10.0%	2	6.7%
POOR	7	23%	1	3%
Total	30	100%	30	100%

DISCUSSION

Lateral epicondylitis or tennis elbow is one of the most regularly encountered disorders of the elbow that can cause significant pain and dysfunction. Over the past 100 years since its first description, there have been many theories regarding the etiology of tennis elbow, with different treatment methods suggested for this condition^{1,2,3}The argument that tennis elbow is a self limiting condition without any intervention cannot be upheld for those patients in whom symptoms have been troubling their daily activities for nearly 1-2 years. The most widely accepted theory is that this is caused by micro or macro tears in the tendon of extensor carpi radialis brevis (ECRB) and treatment has been directed at this. Greenbaum et al^{12,13} suggested that even in the most controlled situation it was not possible to separate the origin of the ECRB from the common extensor tendon, which suggests that the pathology cannot be isolated to a single structure.

The treatment of the tennis elbow has been the subject of much debate. Greater than 90% of tennis elbow patients can be successfully treated non-operatively², which comprises chiefly of rest, activity modification, analgesics, and local steroid injection. In our study, the mean VAS score in single injection group was, 2.80 at 3 month, 2.83 at 6 month and 3.37 at 12 month. In peppered injection group, mean VAS score was, 1.30 at 3 month, 0.90 at 6 month and 1.13 at 12 month.

For elbow with single injection group mean VAS score decreased from 7.8 to 3.37 and for peppered injection group mean VAS score decreased from 8.1 to 1.1, there was significant improvement in both the groups. On comparing both the groups at 3(p=0.26), 6(p=0.29) and 12(p=0.64) month there was no significant difference. Altay et al.¹¹ did similar study and found no significant difference between two groups on visual analog pain scale at 4, 8 and 24 weeks (p<0.05). Both groups improved significantly over time, with more than 80% of subjects reporting improvements from baseline to 6 months (p<0.5). Bellapant and colleagues¹⁴ compared peppered and single injection techniques in 19 patients and found no significant difference in mean VAS score between the group.

Tenderness: In single injection group, at 3 month post injection 43.3%(n=13) had grade 1 tenderness, 3.3%(n=1) had grade 2 tenderness and 53.3% (n=16) had no tenderness ,at 6month post injection 16.7%(n=5) had grade1 tenderness , 3.3 % (n=1) had grade2 tenderness and 80% (n=24) had no tenderness ,at 12 month post injection, 26.7%(n=8) had grade2 tenderness and 66.7 % (n=20) had no tenderness .In peppered injection group, at 3 month post injection 13.3%(n=4) had grade1 tenderness and 86.7%(n=26) had no tenderness, at 6 month post injection 3.3%(n=10) had grade1 tenderness and 96.7%(n=29) had no tenderness, at 12 month post injection, 6.7%(n=2) had grade2 tenderness and 90%(n=27) had no tenderness .On comparing tenderness among both groups p value came out to be 0.017 , 0.126 and 0.145 at 3 month, 6 month and 12 month respectively, result is significant at 3 month. Dogramaci and colleagues¹⁵ divide 75 patients in two groups and showed that all groups showed improvement at 3 and 6 months, the corticosteroid group injected with peppering technique had superior outcome at 6 months.

Grip Strength: The grip strength on the affected side and the normal side were measured before and after the steroid injection for each patient and strength on the two sides were compared. In single injection group, at 3 month post injection mean grip strength in involved side was 32.80kg, at 6 month mean grip strength of involved side was 32.67 kg and 31.20 at 12 month post injection.

In peppered injection group, at 3 month post injection mean grip strength was 40.5 kg, at 6 month mean grip strength of involved side was 41.6 kg and 40.6 kg at 12 month post injection. While comparing mean grip strength of single injection group with peppered injection group, at pre injection single group had mean grip strength of 23.10±8.41kg and peppered had mean grip strength of 26.97±8.72kg with p=0.086, so it was comparable. While comparing the mean grip strength of affected hand in both groups p value came out to be 0.001, <0.001, <0.001 at 3, 6 and 12 month respectively, the result was significant. Okcu and colleagues¹⁶ performed a randomized study using a single corticosteroid injection and peppered injection technique. The

patients followed an average of 21 months, the group that received the peppering technique had significant better outcome.

CONCLUSION

Long-term clinical success in the treatment of lateral epicondylitis depends on the injection method. The peppering technique appears to be more effective than the single injection technique in the long-term.

REFERENCES:

1. Putnam MD, Cohen M. Painful conditions around the elbow. *Orthop Clin North Am* 1999;30:109-18.
2. Kraushaar BS, Nirschl RP. Current concepts review. Tendinosis of the elbow (tennis elbow). Clinical features and findings of histological, immunohistochemical, and electron microscopy studies. *J Bone Joint Surg Am* 1999;81:259-78.
3. Nirschl RP, Pettrone FA, Tennis elbow: the surgical treatment of lateral epicondylitis. *J Bone Joint Surg [Am]* 1979; 61-A:832-9.
4. Connard RW, Hooper WR. Tennis elbow: its cause, natural history, conservative and surgical management. *J Bone Joint Surg* 1973; 55-A:1177-82.
5. Schneeberger AG, Masquelet AC. Arterial vascularization of the proximal extensor carpi radialis brevis tendon. *Clin Orthop*. 2002;398:239-44.
6. Kurppa, K. Waris, P. and Rokkanen, P. Tennis elbow: Lateral elbow pain syndrome. *Scand j. work environ. & health* 5 (1979): suppl. 3, 15-18. A review of the etiology, occurrence and pathogenesis of "tennis elbow" is presented.
7. Calvert PT, Allum RL, Macpherson IS. Simple lateral release in treatment of tennis elbow. *J Royal Society Med* 1985;78:912-15.
8. Garden RS: Tennis elbow. *J Bone and joint Surg* 1961;43-b:100-106.
9. Cho BK, Kim YM, Kim DS. Mini-open muscle resection procedure for lateral and medial epicondylitis. *Clin Ortho Surg* 2009; 1(3):123-7.
10. Labelle H, Guibert R, Joncas J, Newman N, Fallaha M, Rivard CH. Lack of scientific evidence for the treatment of lateral epicondylitis of the elbow. An attempted meta-analysis. *J Bone Joint Surg Br.* 1992; 74(5):646-651.
11. Rabago D, Best TM, Zgierska AE, Zeisig E, Ryan M, Crane D. A systematic review of four injection therapies for lateral epicondylitis: prolotherapy, polidocanol, whole blood and platelet-rich plasma [published online ahead of print November 21, 2008]. *Br J Sports Med.* 2009; 43(7):471-481.
12. Greenbaum B, Itamura J, Vangsness CT et al. Extensor carpi radialis brevis: An anatomical analysis of its origin. *J Bone Joint Surg* 1999; 81-B : 926-929.
13. Greenbaum B. The pathoanatomy and histopathology of tennis elbow. *Curr Opinion Orthopaedics* 2001 ; 12 ; 353-355.
14. Mau, C.: Die Behandlung der Epicondylitis Humeri. *Chirurg, III, 5, 1931.*
15. Hansson, K. G., And Horwich, I. D. : Epicondylitis Humeri. *J. Am. Med. Assn., XCIV, 1557, 1930.*
16. Merlini, A.: L'epicondilit omerale. *Arch. di Ortop., XLIV, 546, 1928.*