

## Comparative study between autologous blood versus corticosteroid injection for lateral epicondylitis of elbow

Naveen PR<sup>1,\*</sup>, Chaitanya PR<sup>2</sup>, Shivakumar GV<sup>3</sup>

<sup>1,3</sup>Assistant Professor, <sup>2</sup>Associate Professor, Dept. of Orthopaedics, SIMS, Shivamogga

**\*Corresponding Author:**

Email: drnaveenpr@gmail.com

### Abstract

**Background:** Lateral epicondylitis often known as tennis elbow is a common cause for pain in the lateral side of the elbow. It has been shown that a local injection of autologous blood in a case of lateral epicondylitis provides cellular and humoral factors to the site of lesion and triggers a healing cascade. The aim of this study was to compare the outcomes of the autologous blood injection and local corticosteroid injection in the treatment of tennis elbow.

**Materials & Methods:** A single blinded prospective randomized study was performed. Total of 40 patients were deputed sequentially into two groups of 20 patients each, A (Autologous Blood Injection) and B (Steroid Injection). Group A received 2 ml of autologous venous blood and mixed with 1 ml of 2% lignocaine solution; Group B patients received 80 mg of methyl Prednisolone acetate and 1ml of 2% lignocaine solution. Patients were evaluated before injection and on subsequent consultations at 4 weeks, 12 weeks & 6 months.

**Results:** Before the injection, the mean VAS scores and Nirschl stages were similar in group A and group B, in group A mean VAS score 7.37 in group B 7.47 with an insignificant P value of 0.74, mean Nirschl stage in group A and group B was 5.84 and 6.05 respectively with P value of 0.45. Group B had better pain relief at 4 weeks post procedure in comparison to group A. After 4 weeks, VAS score and Nirschl stage started decreasing in group A, but to the contrary in group B average VAS pain score raised from 1.68 to 1.88 and Nirschl stage too increased from 1.50 to 1.84 at 12 weeks & 6 months of follow up of patients respectively.

At the six-month follow-up 90% patients had complete pain relief in group A in comparison to only 45% in group B; Seven out of 20 (35%) patients had recurrence of pain at 6 months of follow up in group B but none of the patients reported recurrence of pain or disability in group A.

**Conclusion:** Injection of autologous blood is an efficient treatment modality for lateral epicondylitis, which is simple, cheap, with less side-effect and minimum recurrence rate.

**Keywords:** Lateral epicondylitis, Tennis elbow, Local corticosteroid, Autologous blood injection, RCT.

### Introduction

Lateral epicondylitis is a common reason for lateral elbow pain, though called tennis elbow it's more commonly seen in the general population than in the tennis players with an incidence of 1% to 3%. Male and females are affected equally and tennis elbow is usually seen in fourth and fifth decade of life.<sup>(1,2)</sup> Lateral epicondylitis is commonly diagnosed in manual laborers and people involved with extensive physical work but recently more number of software engineers and people working with desktops are affected by tennis elbow. The disorder arises as a result of repeated movements of the wrist extensors because of over usage causing micro trauma to the muscles. Symptoms mainly consist of pain over the lateral aspect of elbow, reduced grip strength which may result in considerable disability in routine activities.<sup>(3)</sup>

Even though tennis elbow can be diagnosed with ease just based on clinical history & examination but there has been no consensus regarding the ideal treatment protocol.<sup>(4,5)</sup> Formerly, the lesion in tennis elbow was considered to be inflammatory in nature, but now it has been shown that the disease is primarily degenerative. Microscopically evident neovascularization and fibroblastic degeneration within

the substance of extensor tendons, particularly affecting the extensor carpi radialis brevis.<sup>(6,7)</sup> Extensor carpi radialis brevis is more frequently involved than extensor carpi radialis longus and extensor digitorum communis.<sup>(8)</sup>

In spite of short term pain relief after local injection of steroid<sup>(9,13,15)</sup> it provides no advantage over exercise and physiotherapy on long term.<sup>(11,12)</sup> However, local corticosteroid injection in the treatment of tennis elbow is a favorite among orthopaedicians.

Autologous blood provides necessary growth factors to the site of disease which helps in the healing of tennis elbow.<sup>(10,16)</sup> Currently there are only few studies which compare the outcome results of corticosteroid with autologous blood injection hence this prospective randomized study was taken up to evaluate the treatment outcome results of the autologous blood injection when compared with corticosteroid in the treatment of lateral epicondylitis.

### Materials and Method

Study was conducted at McGann teaching hospital associated with Shivamogga Institute of Medical Sciences, Shivamogga. Our study was single blinded prospective randomized study, and it was cleared by

institutional ethical committee. Patients aged more than 20 years and diagnosed with lateral epicondylitis elbow were enrolled in our study. All the patients were thoroughly evaluated with history, clinical examination and investigations like X ray, Magnetic Resonance imaging and nerve conduction studies whenever required to rule other causes for lateral elbow pain like osteochondritis dissecans, synovitis of radiohumeral joint, radiocapitulum arthritis, posterior interosseous nerve syndrome, cervical radiculopathy, instability in varus,

**Inclusion criteria:** 1) Age more than 20 years. 2) No previous history of treatment for tennis elbow.

**Exclusion criteria:** 1) History of previous injury to elbow. 2) Previous interventions for lateral epicondylitis. 3) Patients receiving steroid injections (local or systemic) for any other medical illness during last three months of starting of the study. 4) Associated medical co morbidities like malignancies, autoimmune diseases, bleeding tendencies. 5) Presence of other elbow ailments causing lateral elbow pain.

Each patient presenting with complaint of pain in the lateral elbow region to OPD were assessed with history and clinical examination including Cozen's test and Mill's maneuver.<sup>(12)</sup>

After obtaining informed consent, 40 patients fulfilling criteria for inclusion and exclusion were deputed sequentially into two parallel groups, A (Autologous Blood Injection) and B (Steroid Injection), of 20 cases in each group. Equal randomization was done using computer generated randomization. Patients were given the right to withdraw from the study at any time of the study.

**Interventions:** Group A patients were injected with 2 ml of autologous blood mixed with 1 ml of 2% lignocaine solution drawn from the same or contralateral upper limb. In Group B patients were injected with 80 mg of methyl Prednisolone acetate & 1ml of 2% lignocaine. All the patients were injected in the OPD under strict aseptic precautions by a single orthopaedician. Patient was kept in supine position with elbow in 90° flexion and the palm was made to face the ground, bony points were identified; then a 24 Gauge needle was introduced proximal to the lateral epicondyle and was forwarded to the under surface of the extensor carpi radialis brevis,<sup>(16)</sup> peppering technique was followed while injecting the content. A small sterile dressing was applied. Upper limb rest for not more than 48 hours was advised and patient was asked to avoid strenuous activities of the upper limb for at least 2 weeks. Passive stretching of the extensor muscles was advised as soon as the pain subsided.

**Outcome and Evaluation:** The outcome and evaluation was carried out to assess the amount of the pain and the amount of disability in the pre-injection phase, and on subsequent consultations at 4 weeks, 12 weeks & 6 months (the final follow up). The pain was

assessed by using the Visual Analogue scale (VAS) and the disability was assessed by Nirschl staging.<sup>(17)</sup>

Outcome and evaluation assessment was carried out by an independent observer, who was blinded to the type of intervention received by the individual patient.

**Statistical Analysis:** Chi square test was utilized to compare the pre injection baseline pattern of both the groups. Paired t test was used for serial analysis of groups and unpaired t test was used for comparing the groups. P value of < 0.05 was considered to be statistical significant.

**Baseline characteristics:** Baseline data like age, gender, side of involvement, dominance of limb, duration of symptoms before injection, and mean pre injection VAS and Nirschl stage were compared in both the groups. After application of statistical tests, the difference in the two groups was found to be non significant.

## Results

### VAS pain score

VAS pain score	ABI (SD)	Steroid Injection	P Value
Pre injection	7.37(0.90)	7.47(1.07)	0.74
4 weeks	3.32(1.06)	1.62(0.67)	<0.001
12 weeks	0.78(1.0)	1.68(0.66)	<0.01
6 Months	0.56(0.81)	1.88(1.08)	<0.001

### Nirschl Stage

Nirschl stage	ABI (SD)	Steroid Injection	P Value
Pre injection	5.84(0.90)	6.05(0.78)	0.45
4 weeks	2.47(0.90)	1.58(0.75)	<0.01
12 weeks	0.48(0.96)	1.50(0.93)	<0.01
6 Months	0.32(0.45)	1.84(0.37)	<0.001

Out of 40 patients, 25 were male and 15 female; Group A had 13 males and 7 female patients having an average age of 44.3 years (24-64); Group B comprised of 12 males and 8 females and average age of 43.8 years (22-63). All the patients in group A and group B were right hand dominant, with involvement of right side in all patients and majority of patients in both groups being employed as manual laborers in farms or for construction work.

Pre-injection, the mean VAS scores for pain and Nirschl stages were similar in group A and group B.(Group A mean-7.37 & Group B mean-7.47) with P value of 0.74, mean Nirschl stage in group A and group B was 5.84 and 6.05 respectively with P value of 0.45.

VAS score and Nirschl stage at pre injection, 4 weeks, 12 weeks and 6 months were as in table II and table III. Group B had better pain relief at 4 weeks after injection in comparison to group A, as evident in table 2 and 3. But at 12 weeks & 6 months follow up group A fared better than group B with average VAS pain score of 0.78 & 0.56 at 12 weeks and 6 months respectively

in comparison to 1.68 & 1.88 in group B; Nirschl stage also followed the similar pattern as of VAS pain score.

After 4 weeks VAS pain score and Nirschl stage continued to decrease in group A, but to the contrary in group B average VAS pain score raised from 1.68 to 1.88 and Nirschl stage too increased from 1.50 to 1.84 at 12 weeks & 6 months of follow up respectively.

There was significant difference between the groups in VAS score (0.56 versus 1.88) and Nirschl stage (0.32 versus 1.84) at 6 months of follow up. At the six-month follow-up 90% patients had complete pain relief in group A in comparison to only 45% in group B. Seven out of 20 (35%) patients had recurrence of pain at 6 months of follow up in group B but none of patients reported recurrence of pain or disability in group A.

None of patients in neither group A and group B had any untoward complications.

## Discussion

In our study autologous blood was deemed to be more effective than corticosteroid in terms of pain reduction & functional recovery at 6 months after injection, with 90% relieved of pain in autologous blood group compared to only 45% in corticosteroid group.

In 2003 Edwards and Calandruccio<sup>(16)</sup> reported 79% recovery after injecting autologous blood, in their prospective case series study. Karimi Mobarakeh et al.<sup>(20)</sup> had 85% results; in 2013, with similar type of study. Connell et al.<sup>(21)</sup> in 2006 injected autologous blood for tennis elbow under ultrasonography guidance and had 94.2% success rate in pain relief using VAS and Nirschl stage parameters.

In previous few randomized controlled studies conducted by Kazemi M et al<sup>(22)</sup> Dojode CM<sup>(23)</sup> Jindal N et al<sup>(24)</sup> HO Arik et al<sup>(25)</sup> comparing autologous blood injection versus corticosteroid injection for lateral epicondylitis, they found that corticosteroid injection relieved pain faster and only for short term whereas autologous blood injected patients had slower and sustained relief in pain and recurrence rate is negligible when compared to steroid injected patients. Our study findings were similar to other RCTs comparing the autologous blood and steroid injection for lateral epicondylitis.

Initially the primary lesion in lateral epicondylitis was considered to be inflammatory in nature<sup>(14)</sup> and steroids were injected to counter the inflammation.

But later, studies showed that Lateral epicondylitis was a misnomer as histologically tendons does not show any signs of inflammation, rather neovascularisation and fibroblastic degeneration. Microscopy shows an excess of fibroblastic activity and neovascularisation, this combination of features is called angiofibroblastic hyperplasia.<sup>(7,26,27,28)</sup>

There is zone of hypovascularity or watershed zone 1 to 2 cm distal to attachment of ECRB & ECRL

tendons, with repeated injury causing micro trauma and tear in tendon and failed normal healing response due to hypovascularity and hypoxia causes tendinosis or tendinopathy.<sup>(29,30)</sup>

Ljung BO et al<sup>(31,32)</sup> claimed the increased levels of calcitonin gene-related peptide, substance P, and Neurokinin 1-receptors in tendon insertions may be related to pain in patients with lateral epicondylitis.

Corticosteroid injection reduces these neuropeptides can explain the dramatic relief in pain, but corticosteroids do not address the underlying pathobiology of lateral epicondylitis, so corticosteroid has superior short-term results but intermediate or long-term results were inferior to autologous blood injection.<sup>(33)</sup>

Chemical mediators of cellular activity like FGF, PDGF, TGF are carried in the blood and are known to be mitomorphogenic.<sup>(26,34,35)</sup> Injecting autologous blood in a relatively atraumatic manner will initiate the inflammatory cascade and helps in healing in an otherwise degenerative process.

Connell et al.<sup>(21)</sup> reported the ultrasonographic evidence of tendon reparation, such as decreased interstitial clefts and anechoic foci within the tendon, and decreased pathological vascularity after autologous blood injection for lateral epicondylitis.

Even though Platelet-rich plasma (PRP) delivers higher levels of growth factors for stimulation of regeneration but yields similar results to autologous blood in terms of pain reduction and functional improvement at 6 months<sup>(36,37)</sup> but the need for surgical intervention was higher after platelet-rich plasma injection than autologous blood injection (20% vs. 10%).<sup>(37)</sup>

Disadvantage of PRP injection is requirement of specialized equipment for preparation of Platelet-rich plasma, which is expensive, not available at smaller set ups and its time-consuming.

Kapetanios G<sup>(40)</sup> studied the effects of repeated small doses of local corticosteroid into tendons on healing, formation of adhesions, and the biomechanical properties in rabbits and found significant decreases in tendon weight, amount of adhesions, load to failure, and energy to failure in the cortisone group compared to the saline group.

Considering the current available literature and based on our present study injection of autologous blood for lateral epicondylitis has better long term effects when compared to corticosteroid. Steroid injection known to cause side-effects such as post-injection pain, sepsis, tendon rupture, local skin atrophy, post-injection flare, facial flushing, hyperglycaemia and hypersensitivity reactions.<sup>(14,38,39)</sup>

The major drawback of our study was short time follow up. Long time follow up studies are required to test the ability of blood injection to maintain its analgesic effect for a considerable longer time. Further studies are required to know the exact number and

spacing of injections if there is unsatisfactory outcome after single dose of injection. Both the patients and physician were not blinded to the treatment modality and this may have caused bias.

## Conclusion

Injection of autologous blood significantly reduced the pain and improved the pain scores clinical function when compared to corticosteroid injection at six months follow up, even though there was initial drastic improvement in pain scores after corticosteroid injection at four weeks but many patients had recurrence. So autologous blood injection is efficient treatment modality for lateral epicondylitis, which is simple, cheap, with less side-effect and minimum recurrence rate.

## References

- Allander E. Prevalence, incidence, and remission rates of some common rheumatic diseases or syndromes. *Scand J Rheumatol.* 1974;3:145–53.
- Shiri R, Viikari-Juntura E, Varonen H, Heliövaara M. Prevalence and determinants of lateral and medial epicondylitis: a population study. *Am J Epidemiol* 2006;164:1065–74.
- Dorf ER, Chhabra AB, Golish SR, et al. Effect of elbow position on grip strength in the evaluation of lateral epicondylitis. *J Hand Surg [Am].* 2007;32:882–886.
- Labelle H, Guibert R, Joncas J, et al: Lack of scientific evidence for the treatment of lateral epicondylitis of elbow. An attempted meta-analysis. *J Bone Joint Surg Br* 1992, 74(5):646–651.
- Eli T, Sayegh BS, Robert J, Strauch MD Does Nonsurgical Treatment Improve Longitudinal Outcomes of Lateral Epicondylitis Over No Treatment? A Meta-analysis. *Clin Orthop Relat Res* (2015) 473:1093–1107 DOI 10.1007/s11999-014-4022-y.
- Nirschl RP: Tennis elbow tendinosis: pathoanatomy, nonsurgical and surgical management. In *Repetitive motion disorders of the upper extremity*. Edited by Gordon SL, Blair SJ, Fine LJ. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1995:467–479.
- Kraushaar BS, Nirschl RP. 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.
- Ljung BO, Lieber RL, Fridén J. Wrist extensor muscle pathology in lateral epicondylitis. *J Hand Surg Britain.* 1999;24:177-183.
- Tonks JH, Pai SK, Murali SR: Steroid injection therapy is the best conservative treatment for lateral epicondylitis: a prospective randomised controlled trial. *Int J Clin Pract* 2007, 61:240–246.
- Maffulli N, Longo UG, Denaro V. Novel approaches for the management of tendinopathy. *J Bone Joint Surg Am.* 2010;92:2604–2613.
- Bisset L, Beller E, Jull G, et al: Mobilisation with movement and exercise, corticosteroid injection, or wait and see for tennis elbow: randomized trial. *BMJ* 2006, 333:939–944.
- Smidt N, van der Windt DA, Assendelft WJ, et al. Corticosteroid injections, Physiotherapy, or a wait-and-see policy for lateral epicondylitis: a randomised controlled trial. *Lancet* 2002;359:657–662.
- Nirschl RF, Sobel J. Conservative treatment of tennis elbow. *Phys Sports Med* 1981;9:43–54.
- Baily RA, Brock BH. Hydrocortisone in tennis elbow: a controlled series. *Proc R Soc Med* 1957;50:389–390.
- Leadbetter WB. Corticosteroid injection therapy in sports injuries. In: Leadbetter WB, Buckwalter JA, Gordon SL, eds. *Sports-induced inflammation*. Rosemont: American Academy of Orthopaedic Surgeons, 1990:527–545.
- Edwards SG, Calandruccio JH. Autologous blood injections for refractory lateral epicondylitis. *J Hand Surg Am* 2003;28-A:272–278.
- Nirschl RP. Elbow tendinosis/tennis elbow. *Clin Sports Med* 1992;11:851–870.
- Muto T, Kokubu T, Mifune Y, et al. Temporary inductions of matrix metalloproteinase-3 (MMP-3) expression and cell apoptosis are associated with tendon degeneration or rupture after corticosteroid injection. *J Orthop Res.* 2014;32(10):1297-1304.
- Osborne H. Stop injecting corticosteroid into patients with tennis elbow, they are much more likely to get better by themselves! *J Sci Med Sport.* 2010;13(4):380-381.
- Karimi Mobarakeh M, Nemati A, Fazli A, Fallahi A, Safari S. Autologous blood injection for treatment of tennis elbow. *Trauma Mon* 2013;17:393–5.
- Connell DA, Ali KE, Ahmad M, Lambert S, Corbett S, Curtis M. Ultrasound-guided autologous blood injection for tennis elbow. *Skeletal Radiol* 2006;35:371–7.
- Kazemi M, Azma K, Tavana B, Rezaiee Moghaddam F, Panahi A. Autologous blood versus corticosteroid local injection in the short-term treatment of lateral elbow tendinopathy: a randomized clinical trial of efficacy. *Am J Phys Med Rehabil* 2010;89:660–7.
- Dojode CM. A randomised control trial to evaluate the efficacy of autologous blood injection versus local corticosteroid injection for treatment of lateral epicondylitis. *Bone Joint Res* 2012;1:192–7.
- Jindal N, Gaury Y, Banshiwal RC, Lamoria R, Bachhal V. Comparison of short term results of single injection of autologous blood and steroid injection in tennis elbow: a prospective study. *J Orthop Surg Res* 2013;8:10.
- HO Arik et al. Injection of autologous blood versus corticosteroid for lateral epicondylitis: randomised controlled study *Journal of Orthopaedic Surgery* 2014;22(3):333-7.
- Iwasaki M, Nakahara H, Nakata K, et al. Regulation of proliferation and osteochondrogenic differentiation of periosteum-derived cells by transforming growth factor-B and basic fibroblast growth factor. *J Bone Joint Surg [Am]* 1995;77-A:543–554.
- Ahmad Z, Siddiqui N, Malik SS, et al. Lateral epicondylitis: a review of pathology and management. *Bone Joint J.* 2013;95(9):1158-1164.
- Regan W, Wold LE, Coonrad R, Morrey BF Microscopic histopathology of chronic refractory lateral epicondylitis. *Am J Sports Med.* 1992 Nov-Dec;20(6):746-9.
- Altan L, Kanat E. Conservative treatment of lateral epicondylitis: comparison of two different orthotic devices. *Clin Rheumatol.* 2008 Aug. 27(8):1015-9.
- Jafarian FS, Demneh ES, Tyson SF. The immediate effect of orthotic management on grip strength of patients with lateral epicondylitis. *J Orthop Sports Phys Ther.* 2009 Jun. 39(6):484-9.
- Ljung BO, Alfredson H, Forsgren S. Neurokinin 1-receptors and sensory neuropeptides in tendon insertions at the medial and lateral epicondyles of the humerus. *Studies on tennis elbow and medial epicondylalgia. J Orthop Res* 2004;22:321–7.

32. Ljung BO, Forsgren S, Friden J. Substance P and calcitonin gene-related peptide expression at the extensor carpi radialis brevis muscle origin: implications for the etiology of tennis elbow. *J Orthop Res* 1999;17:554–9.
33. Krogh TP, Bartels EM, Ellingsen T, Stengaard-Pedersen K, Buchbinder R, Fredberg U, et al. Comparative effectiveness of injection therapies in lateral epicondylitis: a systematic review and network meta-analysis of randomized controlled trials. *Am J Sports Med* 2013;41:1435–46.
34. Gelberman R, An K-N, Banes A, Goldberg V. Tendon. In: Woo SL-Y, Buckwalter JA, eds. *Injury and Repair of the Musculoskeletal Soft Tissues*. Park Ridge, IL: American Academy of Orthopaedic Surgeons, 1988:1–40.
35. Hildebrand KA, Woo SL-Y, Smith DW, Allen CR, Deie M, Taylor BJ, et al. The effects of platelet-derived growth factor-BB on healing of the rabbit medial collateral ligament. An in vivo study. *Am J Sports Med* 1998;26:549–554.
36. Thanasis C, Papadimitriou G, Charalambidis C, Paraskevopoulos I, Papanikolaou A. Platelet-rich plasma versus autologous whole blood for the treatment of chronic lateral elbow epicondylitis: a randomized controlled clinical trial. *Am J Sports Med* 2011;39:2130–4.
37. Creaney L, Wallace A, Curtis M, Connell D. Growth factor-based therapies provide additional benefit beyond physical therapy in resistant elbow tendinopathy: a prospective, single-blind, randomised trial of autologous blood injections versus platelet-rich plasma injections. *Br J Sports Med* 2011;45:966–71.
38. Gottlieb NL, Riskin WG. Complications of local corticosteroid injections. *JAMA* 1980;243:1547–1548.
39. Haslock I, MacFarlane D, Speed C. Intra-articular and soft tissue injections: a survey of current practice. *Br J Rheumatol* 1995;34:449–452.
40. Kapetanos G. The effect of the local corticosteroids on the healing and biomechanical properties of the partially injured tendon. *Clin Orthop Relat Res* 1982;163:170–179.