Journal of Orthopaedic Surgery 2014;22(3):333-7

Injection of autologous blood versus corticosteroid for lateral epicondylitis: a randomised controlled study

Hasan Onur Arik,[1] Ozkan Kose,[2] Ferhat Guler,[2] Gokmen Deniz,[3] Omer Faruk Egerci,[2] Mehmet Ucar[4]
[1] Orthopaedics and Traumatology Department, Yozgat State Hospital, Turkey
[2] Orthopaedics and Traumatology Department, Antalya Education and Research Hospital, Turkey
[3] Orthopaedics and Traumatology Department, Batman Medical Park Hospital, Turkey
[4] Physical Medicine and Rehabilitation, Medical Faculty, Bozok University, Turkey

ABSTRACT

Purpose. To compare the efficacy of autologous blood injection versus corticosteroid injection for lateral epicondylitis.
Methods. 21 men and 59 women (mean age, 45.2 years) presenting with lateral epicondylitis were randomised to receive either autologous blood injection (2 ml of autologous venous blood mixed with 1 ml of 2% prilocaine hydrochloride) or corticosteroid injection (1 ml of 40 mg methylprednisolone acetate mixed with 1 ml of 2% prilocaine hydrochloride) given by a single physician. Patients were assessed before (day 0) and after (days 15, 30, and 90) treatment for elbow pain (using a visual analogue scale [VAS]), function (using the patient-rated tennis elbow evaluation [PRTEE] questionnaire), and grip strength (using a hydraulic hand dynamometer). Patients were followed up at 6 months by telephone to assess elbow pain using the VAS.
Results. No complications (infection, skin atrophy, neurovascular damage, or tendon rupture) were noted. 10 patients reported increased pain for up to 2 days after autologous blood injection. In both groups, the VAS score for elbow pain, PRTEE score, and grip strength improved significantly after treatment (p=0.0001), but the pattern of improvement differed. Compared with autologous blood injection, corticosteroid injection improved all 3 scores at a faster rate over the first 15 days (p=0.0001), and then started to decline slightly until day 90. After autologous blood injection, all 3 scores improved steadily and were eventually better (p=0.0001). If a 37% decrease in PRTEE is defined as complete recovery, 38 (95%) of patients with autologous blood injection and 25 (62.5%) of patients with corticosteroid injection achieved complete recovery (p=0.0001).
Conclusion. Autologous blood injection was more effective over the follow-up period than corticosteroid injection in improving pain, function, and grip strength. It is recommended as a first-line injection treatment because it is simple, cheap, and effective.

Key words: *blood; steroids; tennis elbow*

Address correspondence and reprint requests to: Dr Ozkan Kose, Orthopaedics and Traumatology Department, Antalya Education and Research Hospital, Turkey. Email: drozkankose@hotmail.com

INTRODUCTION

Lateral epicondylitis is a common cause of lateral elbow pain, with a prevalence of 1% to 3% in the general population aged 45 to 54 years.[1,2] It is considered a degenerative process (rather than an inflammatory process), characterised by angiofibroblastic degeneration or hyperplasia within the common extensor tendon, particularly affecting the extensor carpi radialis brevis.[3]

Treatment can be conservative ('wait and see', activity modification, rest, bracing, physical therapy, non-steroidal anti-inflammatory drugs, and local injections) or surgical (open, percutaneous, or arthroscopic release of the extensor origin, debridement and denervation of the lateral epicondyle, and anconeus rotation).[4,5] The most common treatment is local injection of corticosteroid combined with local anaesthetics. Autologous blood injection delivers blood borne cellular and humoral mediators to stimulate the regeneration process within the tendon.[6] This study compared the efficacy of autologous blood injection versus corticosteroid injection for the treatment of lateral epicondylitis.

MATERIALS AND METHODS

This study was approved by the local ethics committee and carried out in accordance with the Declaration of Helsinki. Informed consent was obtained from each patient. The diagnosis of lateral epicondylitis was made based on presentation of pain in the lateral epicondyle exacerbated by physical activities, tenderness over the origin of extensor carpi radialis brevis 5 to 10 mm distal to the lateral epicondyle, and finger palpation and pain around the extensor origin during forced dorsiflexion of the wrist and middle finger.

Between May 2012 and May 2013, 21 men and 59 women (mean age, 45.2 years) presenting with lateral epicondylitis were randomised to receive either autologous blood injection (2 ml of autologous venous blood collected from the antecubital fossa of the ipsilateral side mixed with 1 ml of 2% prilocaine hydrochloride) or corticosteroid injection (1 ml of 40 mg methylprednisolone acetate mixed with 1 ml of 2% prilocaine hydrochloride) given by a single physician. Patients were instructed to abstain from heavy work; non-steroidal anti-inflammatory drugs or physiotherapy was not prescribed.

Patients with a history of recent trauma, congenital or neuromuscular disease, upper limb surgery, rheumatic disease, cervical disc pathology, carpal tunnel syndrome, abnormality of the upper limb, systemic corticosteroid treatment, local injection treatment, or an allergic reaction to local anaesthetics or corticosteroids were excluded.

Patients' occupations were categorised according to physical demand as sedentary, light, medium, heavy, and very heavy.[7] Patients were assessed before (day 0) and after (days 15, 30, and 90) treatment for elbow pain (using a visual analogue scale [VAS]), function (using the Turkish version of the patient-rated tennis elbow evaluation [PRTEE] questionnaire[8]), and grip strength (using a hydraulic hand dynamometer according to the American Society of Hand Therapists guidelines[9]). The PRTEE consists of 15 questions in 3 subscales: pain (n=5), specific activities (n=6), and daily activities (n=4); the total score ranges from 0 (best) to 100 (worst).[10] Patients were followed up at 6 months by telephone to assess elbow pain using the VAS.

Continuous and categorical variables were

Table 1
Baseline characteristics of both groups

Variables	Autologous blood injection (n=40)	Corticosteroid injection (n=40)	p Value
Mean±SD age (years)	43.7±7.8	46.7±8.4	0.096
No. of males:females	11:29	10:30	0.500
No. of left:right side involvement	9:31	14:26	0.162
No. of dominant:non-dominant side involvement	33:7	27:13	0.098
Mean±SD duration of symptoms (months)	4.3±3.2	4.5±3.5	0.844
Mean±SD visual analogue scale for pain	6.9±1.2	6.8±1.3	0.679
Mean±SD patient-rated tennis elbow evaluation	66.7±12.8	62.2±15.6	0.165
Mean±SD grip strength (pounds)	60.4±21.2	57.1±21.9	0.871
Physical demand (no. of patients)			0.458
Sedentary	2	4	
Light	2	0	
Medium	25	21	
Heavy	3	4	
Very heavy	8	11	

compared using the Student's *t* test and Chi-square test, respectively. Within-group differences were compared using the paired sample *t*-test. A p value of <0.05 was considered statistically significant.

Table 2
Between- and within-group comparison of visual analogue scale (VAS) for elbow pain, patient-rated tennis elbow evaluation (PRTEE) score, and grip strength

Variable	Day 0	Day 15	Day 30	Day 90	Day 180	p Value
Mean±SD VAS for elbow pain						
Autologous blood injection	6.9±1.2	5.3±1.4	3.6±1.2	2.1±1.1	0.6±1.3	0.0001
Corticosteroid injection	6.8±1.3	1.7±0.9	2.5±1.1	3.7±1.9	2.7±2.9	0.0001
p Value	0.679	0.0001	0.0001	0.0001	0.0001	
Mean±SD PRTEE score						
Autologous blood injection	66.7±12.8	51.2±16.3	34.3±12.3	19.4±9.1	-	0.0001
Corticosteroid injection	62.2±15.6	19.5±9.7	25.0±11.4	34.5±17.5	-	0.0001
p Value	0.165	0.0001	0.001	0.0001		
Mean±SD % gain in hand grip strength (pounds)						
Autologous blood injection	-	8.3±14.3	21.8±19.0	34.9±29.1	-	0.0001
Corticosteroid injection	-	24.3±24.9	20.3±21.7	20.0±25.8	-	0.0001
p Value	-	0.001	0.748	0.018		

Table 3
Studies of lateral epicondylitis treatment*

Studies	Design	No. of patients	Treatment	Outcome measures	Follow-up (months)	Recovery
Edwards and Calandruccio,[6] 2003	Prospective case series	28	ABI	VAS, Nirschl staging	9.5	79%
Connell et al.,[13] 2006	Prospective case series	35	Ultrasonography-guided ABI	VAS, Nirschl staging	6	94.2%
Gani et al., [14] 2007	Prospective case series	26	ABI	VAS, Nirschl staging	8	58%
Kazemi et al.,[22] 2010	Single-blinded RCT	60 (30/30)	ABI vs. CSI	VAS, Nirschl staging, QDASH score, grip strength, algometry	2	ABI is better than CSI at 8 weeks
Ozturan et al.,[26] 2010	RCT	57 (18/20/19)	ABI vs. CSI vs. extracorporeal shockwave therapy	VAS, Thomsen Provocative Test, Functional scale	12	83.3% vs. 50% vs. 89.9%, respectively
Creaney et al.,[28] 2011	Double-blinded RCT	130 (70/60)	ABI vs. PRP	PRTEE, necessity for surgery	6	72% vs. 66%; necessity for surgery: 10% vs. 20%, respectively
Wolf et al.,[25] 2011	Single-blinded RCT	28 (10/9/9)	ABI vs. CSI vs. placebo	VAS, DASH, PRFE	6	No differences between groups in all outcome measures at 6 months
Thanasas et al.,[27] 2011	RCT	28 (14/14)	ABI vs. PRP	VAS, Liverpool Elbow Score	6	Equally effective
Dojode,[23] 2012	RCT	60 (30/30)	ABI vs. CSI	VAS, Nirschl staging	6	90% vs. 47%, respectively
Massy-Westropp et al.,[30] 2012	Prospective case series	38	ABI	VAS, PRTEE	60	Improvement in VAS and PRTEE; improvement in grip strength in women but not in men
Jindal et al.,[24] 2013	Single-blinded RCT	50 (25/25)	ABI vs. CSI	VAS, Nirschl staging	1.5	ABI is better than CSI
Karimi Mobarakeh et al.,[29] 2013	Prospective case series	29	ABI	VAS, Nirschl staging	6	85%, patient satisfaction: 85%
Present study	RCT	80 (40/40)	ABI vs. CSI	VAS, PRTEE, grip strength	6	95% vs. 62.5%, respectively

* ABI denotes autologous blood injection, VAS visual analogue scale for pain, RCT randomised controlled trial, CSI corticosteroid injection, QDASH Quick Disabilities of the Arm, Shoulder and Hand questionnaire, PRP platelet-rich plasma, PRTEE patient-rated tennis elbow evaluation, and PRFE patient-rated forearm evaluation

RESULTS

11 men and 29 women (mean±standard deviation [SD] age, 43.7±7.8 years) received an autologous blood injection, whereas 10 men and 30 women (mean±SD age, 46.7±8.4 years) received a corticosteroid injection. All patients completed the 6-month follow-up. The baseline characteristics of both groups were similar (Table 1). No complications (infection, skin atrophy, neurovascular damage, or tendon rupture) were noted. 10 patients reported increased pain for up to 2 days after autologous blood injection.

In both groups, the VAS score for elbow pain, PRTEE score, and grip strength improved significantly after treatment (p=0.0001), but the pattern of improvement differed (Table 2). Compared with autologous blood injection, corticosteroid injection improved all 3 scores at a faster rate over the first 15 days (p=0.0001), and then started to decline slightly until day 90. After autologous blood injection, all 3 scores improved steadily and were eventually better (p=0.0001). If a 37% decrease in PRTEE is defined as complete recovery (or minimum clinically important difference),[11] 38 (95%) of patients with autologous blood injection and 25 (62.5%) of patients with corticosteroid injection achieved complete recovery (p=0.0001).

DISCUSSION

Autologous blood injection was more effective than corticosteroid injection in terms of pain control, functional recovery, and grip strength. The complete recovery rate at 3 months was 95% after autologous blood injection and 62.5% after corticosteroid injection. Corticosteroid injection enabled a rapid but temporary improvement in the first month.[12]

Autologous blood injection stimulates the inflammatory cascade within the degenerated tendon by providing cellular and humoral mediators for regeneration.[6] Ultrasonographic evidence of tendon reparation, such as decreased interstitial clefts and anechoic foci within the tendon, and decreased pathological vascularity have been reported.[13] The recovery rates after autologous blood injection have been reported to be 79% after a mean of 9.5 months,[6] 94.2% after 6 months,[13] and 58% after 8 months.[14] Poorer outcomes may reflect the chronic refractory nature of the condition and longer duration of symptoms.

Lateral epicondylitis was initially assumed to be an inflammatory process, and thus corticosteroid injection was used.[15] However, histological studies have demonstrated non-inflammatory angiofibroblastic tendinosis, neovascularisation, and mucoid degeneration in lateral epicondylitis specimens.[16–18] The presence of substance P, calcitonin gene-related peptide, and Neurokinin 1-receptors in tendon insertions may be related to pain.[17,18] Reduction of these neuropeptides by corticosteroid injection can reduce the pain dramatically.[19] However, the underlying pathology remains and the recurrence rate is high. Corticosteroid injection has superior short-term effects but no intermediate or long-term effects.[20,21]

In a review of 12 studies for treatment of lateral epicondylitis, the use of autologous blood, corticosteroid, platelet-rich plasma, placebo, or extracorporeal shock wave therapy were compared (Table 3).[6,13,14,22–30] Autologous blood injection was more effective in the long term than corticosteroid injection in improving pain and tenderness, although corticosteroid injection enabled faster pain relief. Extracorporeal shock wave therapy was also more effective than corticosteroid injection in the long term.[26] One study reported no significant difference between autologous blood injection, corticosteroid injection, and placebo.[25] Lateral epicondylitis is a self-limiting disease and relief of symptoms is related to duration of time.[25] Platelet-rich plasma has higher levels of growth factors for stimulation of regeneration, and yields similar results to autologous blood in terms of pain reduction and functional improvement at 6 months.[27,28] However, the need for surgical intervention was higher after platelet-rich plasma injection than autologous blood injection (20% vs. 10%).[28] In addition, preparation and application of platelet-rich plasma requires specialised equipment, which is expensive and time-consuming.

One limitation of this study was that the follow-up period was relatively short. Both the physician and the patients were not blinded to the treatment modality and this may have caused bias. A single physician performed all injections and evaluations and this may also have been a source of bias.

CONCLUSION

Autologous blood injection was more effective over the follow-up period than corticosteroid injection in improving pain, function, and grip strength. It is recommended as a first-line injection treatment because it is simple, cheap, and effective.

DISCLOSURE

No conflicts of interest were declared by the authors.

REFERENCES

1. 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.
2. Judson CH, Wolf JM. Lateral epicondylitis: review of injection therapies. Orthop Clin North Am 2013;44:615–23.
3. 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.
4. Faro F, Wolf JM. Lateral epicondylitis: review and current concepts. J Hand Surg Am 2007;32:1271–9.
5. Calfee RP, Patel A, DaSilva MF, Akelman E. Management of lateral epicondylitis: current concepts. J Am Acad Orthop Surg 2008;16:19–29.
6. Edwards SG, Calandruccio JH. Autologous blood injections for refractory lateral epicondylitis. J Hand Surg Am 2003;28:272–8.
7. MacDermid JC, Turgeon T, Richards RS, Beadle M, Roth JH. Patient rating of wrist pain and disability: a reliable and valid measurement tool. J Orthop Trauma 1998;12:577–86.
8. Altan L, Ercan I, Konur S. Reliability and validity of Turkish version of the patient rated tennis elbow evaluation. Rheumatol Int 2010;30:1049–54.
9. Fess EE. Grip strength. In: Casanova JS, editor. Clinical assessment recommendations, 2nd ed. Chicago: American Society of Hand Therapists; 1992:41–45.
10. US Department of Labor, Employment and Training Administration. Appendix C, Components of the Definition Trailer, Dictionary of Occupational Titles. 4th Ed; 1991. http://www.oajl.dol.gov Accessed 17 January 2014.
11. Poltawski L, Watson T. Measuring clinically important change with the Patient-rated Tennis Elbow Evaluation. Hand Ther 2011;16:52–7.
12. Mellor S. Treatment of tennis elbow: the evidence. BMJ 2003;327:330.
13. 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.
14. Gani N, Butt MF, Dhar SA, Farooq M, Mir MR, Kangu KA, et al. Autologous blood injection in the treatment of refractory tennis elbow. Int J Orthop Surg 2007;5:1.
15. Baily RA, Brock BH. Hydrocortisone in tennis elbow; a controlled series. Proc R Soc Med 1957;50:389–90.
16. Alfredson H, Ljung BO, Thorsen K, Lorentzon R. In vivo investigation of ECRB tendons with microdialysis technique—no signs of inflammation but high amounts of glutamate in tennis elbow. Acta Orthop Scand 2000;71:475–9.
17. 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.
18. 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.
19. Mardani-Kivi M, Karimi-Mobarakeh M, Karimi A, Akhoondzadeh N, Saheb-Ekhtiari K, Hashemi-Motlagh K, et al. The effects of corticosteroid injection versus local anesthetic injection in the treatment of lateral epicondylitis: a randomized single-blinded clinical trial. Arch Orthop Trauma Surg 2013;133:757–63.
20. Smidt N, Assendelft WJ, van der Windt DA, Hay EM, Buchbinder R, Bouter LM. Corticosteroid injections for lateral epicondylitis: a systematic review. Pain 2002;96:23–40.
21. 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.
22. 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.
23. 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.
24. 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.
25. Wolf JM, Ozer K, Scott F, Gordon MJ, Williams AE. Comparison of autologous blood, corticosteroid, and saline injection in the treatment of lateral epicondylitis: a prospective, randomized, controlled multicenter study. J Hand Surg Am 2011;36:1269–72.
26. Ozturan KE, Yucel I, Cakici H, Guven M, Sungur I. Autologous blood and corticosteroid injection and extracorporeal shock wave therapy in the treatment of lateral epicondylitis. Orthopedics 2010;33:84–91.
27. Thanasas 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.
28. 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.
29. 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.
30. Massy-Westropp N, Simmonds S, Caragianis S, Potter A. Autologous blood injection and wrist immobilisation for chronic lateral epicondylitis. Adv Orthop 2012:387829.