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AUTOLOGOUS BLOOD INJECTIONS IN TENNIS ELBOW - THE INDIAN EXPERIENCE

Orthopaedics

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ABSTRACT

Lateral epicondylitis, is a common problem which presents to every orthopaedician in the out- patient department. Histopathological reports over the years have shown that is not an inflammatory process but a degenerative condition termed 'tendinosis'. In recent years, it is hypothesized that blood contains platelet derived growth factors that induce fibroblastic mitosis, and chemotactic polypeptides such as transforming growth factor cause fibroblasts to migrate and specialize and have been found to induce healing cascade. With this there has been an emergent rise in platelet rich plasma injections and autologous blood injections for the treatment of lateral epicondylitis and other similar conditions. The objective of the study was to evaluate the efficacy and role of autologous blood injection versus local corticosteroid injection in the management of lateral epicondylitis.A prospective, randomized study was done. 80 patients were included in the study. 40 patients received 2 milliliter autologous blood drawn from contralateral cubital vein + 1 milliliter 2% Lignocaine, and 40 patients received 2 milliliters local corticosteroid (Triamcinolone acetate 40 mg) + 1 milliliter 2% Lignocaine at the lateral epicondyle. Outcome was measured using 'Visual analogue score', 'Nirschl staging' and 'Verhaar et al staging'. Chi square test and Unpaired T test was applied to calculate the significance of results. Follow-up was done for a total 6 months at various intervals. In Corticosteroid injection group till 4 weeks there was significant improvement with 57.5% of patients completely relieved of pain. Many of these patients reported recurrences at 12 weeks and 6 month follow up. The rate of recurrence was 20% at the end of 6 months.In autologous blood injection group at 4th week follow up, 17.5% of patients were completely free of pain. However, at the end of 6 months follow up, 92.5% of patients were completely free of pain. There was no recurrence.Autologous blood injection technique for lateral epicondylitis offered a better treatment with no side effects, cheap and with minimum recurrence rate.

KEYWORDS

Lateral epicondylitis; Corticosteroid; Autologous blood; Tendinosis; Tennis Elbow

INTRODUCTION

Lateral epicondylitis as a clinical entity was first described in 1873 and was associated with extended use of arm in writing.[1]Later it was documented that lateral epicondylitis developed in workers in a variety of occupations including carpenters, plumbers, violinists, typists and even in sportsmen (the popular name Tennis elbow emerged with tennis players presenting with this). Overuse was defined in 1990 as the level of repetitive microtrauma sufficient to overwhelm the tissues' ability to adapt, therefore leading to injury.[2]Now, the consensus is that lateral epicondylitis or tennis elbow is initiated as a micro tear most often within the origin of extensor carpi radialisbrevis (ECRB). It is grouped now into an entity called "tendinosis". Although the term tendinitis is used frequently and often indiscriminately, histopathological studies have shown that specimens of tendon obtained from areas of chronic overuse do not contain large numbers of macrophages, lymphocytes, or neutrophils.[3] Rather, tendinosis appears to be a degenerative process that is characterized by the presence of dense populations of fibroblasts, vascular hyperplasia, and disorganized collagen. Some authors have described tendinosis as a degenerative process and others have described it as a dysfunctional, immature tendon repair.This constellation of findings has been termed angiofibroblastic hyperplasia.[4] Regardless of what it is called, tendinosis is the result of failed tendon-healing after repetitive microtrauma. The single most important diagnostic finding is the location and reproducibility of pain.Upon examination, the patient has a point of maximal tenderness just distal (5-10 mm) to the lateral epicondyle in the area of the ECRB muscle.[4] A number of clinical tests have been suggested for the evaluation of Tennis elbow, of which Cozen's test and Mill's manoeuvreare the commonest to be practiced.Diagnosis is based on clinical tests and further investigations are usually done only to rule out when other pathologies are suspected. There are numerous treatment modalities for lateral epicondylitis, both conservative and operative. Many methods of treatment are available but benefits of most are unclear. The choice of treatment for individual cases remains controversial because it is empirical and based on personal experience of the physician treating the patient.

A meta-analysis of 185 studies on treatment of humeral epicondylitis showed glaring deficits in the scientific quality of the investigations, with no superior treatment approach.[5] In a comprehensive review of the treatment for humeral epicondylitis, no significant difference was found with low energy lasers, acupuncture, extracorporeal shockwave therapy, or steroid injection.[6] Cortisone injection has been used during the pain-reduction phase of recalcitrant conditions. Traditional physical therapy and cortisone injection were compared in 70 patients with humeral epicondylitis.The cortisone injection produced initial relief in 91% of patients compared to 47% undergoing physical therapy. After 3 months, 51% of the cortisone injection group and only 5% in the physical therapy group had a return of primary symptoms.

In a double-blind randomized controlled trial of autologous platelet-rich plasma in patients with humeral epicondylitis, 49% had a successful response (25% reduction in visual analog score and Disabilities of the Arm, Shoulder and Hand score) in the cortisone group compared with 73% in the platelet-rich plasma group.[7] It is hypothesized that mitogens such as platelet derived growth factor induce fibroblastic mitosis and chemotactic polypeptides such as transforming growth factor cause fibroblasts to migrate and specialize and have been found to cause angiogenesis. A specific humoral mediator may promote the healing cascade in the treatment of tendinosis as well.[5]

METHODOLOGY

The study group were all confirmed patients of lateral epicondylitis willing for treatment and attended the Orthopaedic OPD of the hospital from September 1st, 2011– September 1st, 2013. The sample size was 80 patients which were selected after calculations done with statistician. It was a randomized control trial comparing the efficacy of autologous blood injection with local corticosteroid injection in patients with lateral epicondylitis. Consent was taken from the participants. No blinding procedure could be followed because it was difficult to blind either patient or investigator in regard to drawing and injecting autologous blood. A randomization of the patients was done using the chit system. Cases were injected with autologous blood injection and controls were injected with local Corticosteroid injection at lateral epicondyle.Inclusion Criteria were the following: cases of lateral epicondylitis, men and women above eighteen years of age with a pain in the lateral aspect of elbow, tenderness over the common extensor origin, and a positive Cozen's test.Exclusion Criteria were the following:patients receiving steroid injections within three months before blood injection, a history of substantial trauma, previously treated by surgery for lateral epicondylitis, Other causes of elbow pain such as osteochondritisdessicans of capitellum, lateral compartment arthosis, varus instability, radial head arthritis, posterior interosseous

nerve syndrome, cervical disc syndrome, synovitis of radiohumeral joint, cervical radiculopathy, fibromyalgia, osteoarthritis of elbow and carpel tunnel syndrome. Patients were divided into two groups:

Group A / autologous blood injection group:
Patients were infiltrated with an injection of 2 milliliters autologous blood drawn from contralateral cubital vain and 1 milliliter 2% Lignocaine, at the lateral epicondyle according to the below mentioned technique.

Group B / Local Steroid with local anesthetic injection group:
Patients were infiltrated with an injection of 2 milliliters of local corticosteroid (Triamcinolone acetate 40mg) mixed with 1 milliliter2% Lignocaine, at the lateral epicondyle according to the below mentioned technique.

Injection technique: With patient in supine or sitting posture, elbow was painted and draped. The bony anatomical landmarks were identified. Two milliliters of autologous blood were drawn from the contralateral cubital vein and mixed with 1 milliliter of 2% lignocaine. The elbow was flexed to 90° with the palm facing down. The needle was introduced proximal to the lateral epicondyle along the supracondylar ridge and gently advanced in to the undersurface of the extensor carpi radialisbrevis. And then a small adhesive sterile dressing was given at the injection site, which was advised to be removed after 1 day. Controls were injected with 2 milliliter local corticosteroid (Triamcinolone acetate 40 mg) mixed with 1milliliter 2% lignocaine in the same technique as described above.Outcomes were measured using VAS score, Nirschl staging of lateral epicondylitis as well as Verhaar et al staging.The statistical testsChi square test and Unpaired T test was applied to calculate the significance of results.

A baseline VAS score, Nirschl staging of the pain at lateral epicondyle as well as Verhaar et al pain scoring was recorded. After the procedure, patients were asked to report immediately if any increase in pain was noted and were asked to follow up at 1 week, 4 weeks, 12 weeks and 6 months interval after the intervention.

RESULTS

Age group encountered in the study ranged from 18 years to 67 years. Peak incidence at fourth decade of life was seen. The mean age of patients in autologous blood injection group was 43.85 and in corticosteroid injection group was 42.73. Out of the 80 participants, 33 were males and 47 were females. In corticosteroid injection group 15 were males and 25 were females. In autologous blood injection group 18 were males and 22 were females. Out of the 80 participants, 62 participants had their right side elbow affected and 18 had their left side affected. Out of the 80 participants, 67 participants had their Dominant elbow affected and 13 had their Nondominant elbow affected. The mean duration of the condition in all 80 patients suffering from lateral epicondylitis was 8.49 weeks. The mean duration of the condition in corticosteroid injection group was 8.28 weeks. The mean duration of the condition in autologous injection group was 8.7 weeks. Out of 80 participants who received local corticosteroid and autologous blood injections, 27 participants used to perform manual labour and 53 participants used to do non manual work. This difference was found to be statistically significant with a P value = 0.033.

VAS and Nirschl scores at the time of presentation (before injection)

Table no.1:Outcome values (VAS and Nirschl scores) at the time of Presentation (before injection)

	Local corticosteroid injection	Autologous blood injection	P Value	Inference
Mean VAS Score	7.7	7.75	0.857	N.S
S.D	1.181	1.296		
Mean Nirschl stage	5.3	5.4	0.66	N.S
S.D	0.966	1.057		

P value for VAS Score is 0.857 and P value for Nirschl score is 0.66 which are statistically not significant. Hence the outcome values before the injection are comparable.

Followup at 1st week

Table No.2: Outcome values at 1st week

	Corticosteroid injection group	Autologous blood injection group	P Value	Inference
Mean VAS Score	4.78	7.23	<0.001	S
S.D	2.006	1.915		
Mean Nirschl stage	3.25	5.1	<0.001	S
S.D	1.391	1.429		

P value for VAS Score is <0.001 and P value for Nirschl score is <0.001 which are statistically significant. Hence the decrease in pain at 1st week is statistically significant in corticosteroid injection group compared to autologous blood injection group.

Follow up at 4th week

Table No.3: Outcome measures at 4th week

	Corticosteroid injection group	Autologous blood injection group	P Value	Inference
Mean VAS Score	1.83	2.93	0.045	S
S.D	2.49	2.336		
Mean Nirschl stage	1.23	2.13	0.017	S
S.D	1.702	1.604		

P value for VAS Score is 0.045 and P value for Nirschl score is 0.017 which are statistically significant. Hence the decrease in pain at 4th week is statistically significant in corticosteroid injection group compared to autologous blood injection group.

Follow up at 12th week

Table No.4: Outcome measures at 12th week

	Corticosteroid injection group	Autologous blood injection group	P Value	Inference
Mean VAS Score	1.73	0.48	0.003	S
S.D	1.987	1.664		
Mean Nirschl stage	1.2	0.35	0.005	S
S.D	1.471	1.122		

P value for VAS Score is 0.003 and P value for Nirschl score is 0.005 which are statistically significant. Hence at 12th week, the decrease in pain is statistically significant in autologous blood injection group compared to corticosteroid injection group.

Follow up at 6 month

Table No.5: Outcome measures at 6 months.

	Corticosteroid injection group	Autologous blood injection group	p Value	Inference
Mean VAS Score	1.98	0.4	<0.001	S
S.D	2.118	1.661		
Mean Nirschl Stage	1.33	0.28	0.001	S
S.D	1.492	1.109		

P value for VAS Score is <0.001 and P value for Nirschl score is 0.001 which are statistically significant. Hence at 6 month, the decrease in pain is statistically significant in autologous blood injection group compared to corticosteroid injection group.

The severity of pain during baseline and during followup at 1 week, 4 weeks, 12 weeks and 6 months.

Table No.6: Mean VAS score for the two groups

Followup period	Corticosteroid injection group Mean VAS Score	S.D.	Autologous blood injection group Mean VAS Score	S.D.	p Value	Inference
Before injection	7.7	1.181	7.75	1.296	0.857	N.S
1st week	4.78	2.006	7.23	1.915	<0.001	S
4 weeks	1.83	2.49	2.93	2.336	0.045	S
12 weeks	1.73	1.987	0.48	1.664	0.003	S
6 month	1.98	2.118	0.40	1.661	<0.001	S

Graph no.1: Mean VAS score pre- and post-procedure at 1 week, 4 weeks, 12 weeks, 6 months

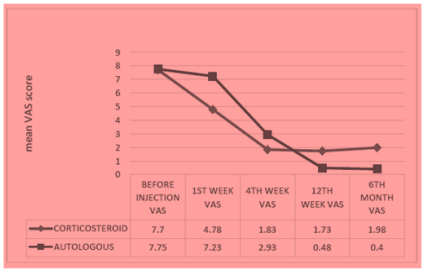


Table No.7: Mean Nirschl staging for the two groups

Followup period	Corticosteroid injection group Mean Nirschl Staging	S.D	Autologous blood injection group Mean Nirschl Staging	S.D	P Value	Inference
Before injection	5.3	0.966	5.4	1.057	0.66	N.S
1st week	3.25	1.391	5.1	1.429	<0.001	S
4 weeks	1.23	1.702	2.13	1.604	0.017	S
12 weeks	1.20	1.471	0.35	1.122	0.005	S
6 month	1.33	1.492	0.28	1.109	0.001	S

Graph no.2: Mean Nirschl staging pre- and post-procedure at 1week, 4weeks, 12weeks and 6 months

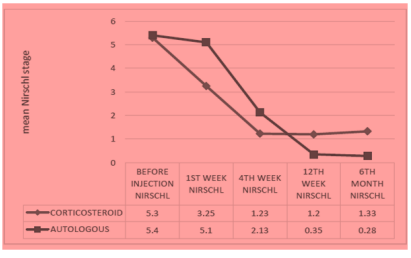


Table no.8: Before Injection Verhaar et al Scoring System

			GROUP CORTICOSTEROID	GROUP AUTOLOGOUS	Total
BEFORE INJECTION VERHAAR	F	Count	13	14	27
		% within BEFORE INJECTION VERHAAR	48.1%	51.9%	100.0%
		% within GROUP	32.5%	35.0%	33.8%
	P	Count	27	26	53
		% within BEFORE INJECTION VERHAAR	50.9%	49.1%	100.0%
		% within GROUP	67.5%	65.0%	66.2%
Total		Count	40	40	80
		% within BEFORE INJECTION VERHAAR	50.0%	50.0%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

F = Fair
P = Poor

P value for Verhaar et al scoring system before injection in both corticosteroid and autologous blood injection group is 0.813 which is statistically not significant. Hence the outcome values before the injection are comparable.

Graph no.3: Before Injection Verhaar et al staging in both the groups

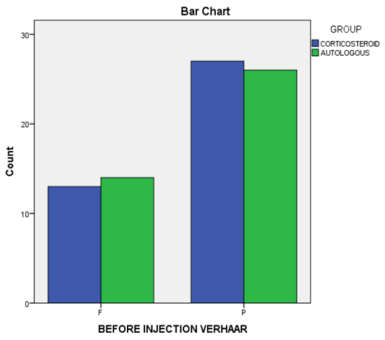


Table no. 9: Verhaar et al Scoring system after 1 week of injection

			GROUP CORTICOSTEROID	GROUP AUTOLOGOUS	Total
1ST WEEK VERHAAR	F	Count	13	14	27
		% within 1ST WEEK VERHAAR	48.1%	51.9%	100.0%
		% within GROUP	32.5%	35.0%	33.8%
	G	Count	21	4	25
		% within 1ST WEEK VERHAAR	84.0%	16.0%	100.0%
		% within GROUP	52.5%	10.0%	31.2%
	P	Count	6	22	28
		% within 1ST WEEK VERHAAR	21.4%	78.6%	100.0%
		% within GROUP	15.0%	55.0%	35.0%
Total		Count	40	40	80
		% within 1ST WEEK VERHAAR	50.0%	50.0%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

F = Fair
G = Good
P = Poor

P value for Verhaar et al scoring at 1st week is <0.001 which is statistically significant. 21 patients in the corticosteroid injection group while 4 patients in autologous blood injection group had 'Good' relief of pain. Hence the decrease in pain at 1st week is statistically significant in corticosteroid injection group compared to autologous blood injection group.

Graph no.4: Verhaar et al Scoring system after 1 week of injection

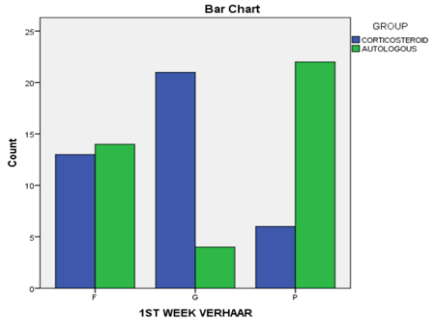


Table no.10: Verhaar et al Scoring system after 4 weeks of injection

			GROUP CORTICOSTEROID	GROUP AUTOLOGOUS	Total
4TH WEEK VERHAAR	E	Count	23	17	40
		% within 4TH WEEK VERHAAR	57.5%	42.5%	100.0%
		% within GROUP	57.5%	42.5%	50.0%
	F	Count	5	12	17
		% within 4TH WEEK VERHAAR	29.4%	70.6%	100.0%
		% within GROUP	12.5%	30.0%	21.2%
	G	Count	10	10	20
		% within 4TH WEEK VERHAAR	50.0%	50.0%	100.0%
		% within GROUP	25.0%	25.0%	25.0%
	P	Count	2	1	3
		% within 4TH WEEK VERHAAR	66.7%	33.3%	100.0%
		% within GROUP	5.0%	2.5%	3.8%
Total		Count	40	40	80
		% within 4TH WEEK VERHAAR	50.0%	50.0%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

F = Fair
G = Good
P = Poor
E = Excellent

P value for Verhaar et al scoring at after 4 weeks is 0.251 which is statistically not significant. 23 patients in the corticosteroid injection group and 17 patients in autologous blood injection group had 'Excellent' relief of pain. 10 patients each in corticosteroid injection group and in autologous blood injection group had 'Good' relief of pain Hence the decrease in pain at 4th week is not statistically significant.

Graph no.5: Verhaar et al Scoring system after 4 weeks of injection

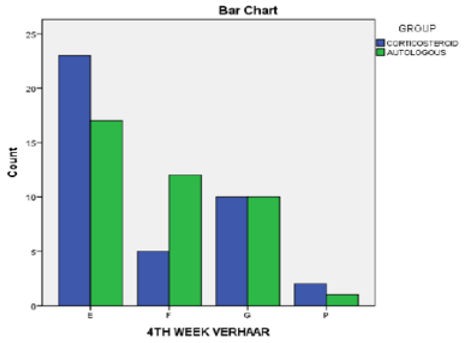


Table no.11: Verhaar et al Scoring system after 12 weeks of injection

			GROUP		Total
			CORTICOSTEROID	AUTOLOGOUS	
12TH WEEK VERHAAR	E	Count	21	38	59
		% within 12TH WEEK VERHAAR	35.6%	64.4%	100.0%
		% within GROUP	52.5%	95.0%	73.8%
	F	Count	6	1	7
		% within 12TH WEEK VERHAAR	85.7%	14.3%	100.0%
		% within GROUP	15.0%	2.5%	8.8%
	G	Count	13	0	13
		% within 12TH WEEK VERHAAR	100.0%	0.0%	100.0%
		% within GROUP	32.5%	0.0%	16.2%
	P	Count	0	1	1
		% within 12TH WEEK VERHAAR	0.0%	100.0%	100.0%
		% within GROUP	0.0%	2.5%	1.2%
Total		Count	40	40	80
		% within 12TH WEEK VERHAAR	50.0%	50.0%	100.0%
		% within GROUP	100.0%	100.0%	100.0%

F = Fair
G = Good
P = Poor
E = Excellent

P value for Verhaar et al scoring at 12th week is <0.001 which is statistically significant. 21 patients in the corticosteroid injection group while 38 patients in autologous blood injection group had 'Excellent' relief of pain. Hence the decrease in pain at 12th week is statistically significant in autologous blood injection group compared to corticosteroid injection group.

Graph no.6: Verhaar et al Scoring system after 12 weeks of injection

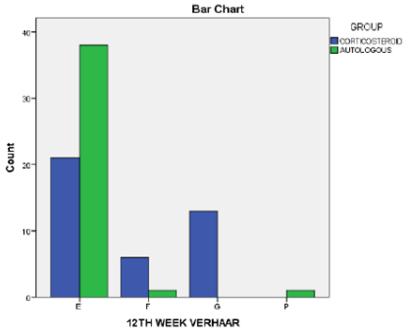
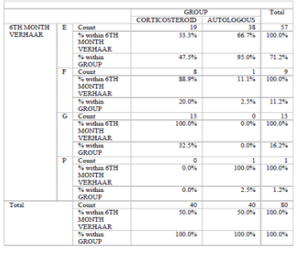


Table no.12: Verhaar et al staging after 6 months of injections



F = Fair
G = Good
P = Poor
E = Excellent

P value for Verhaar et al scoring at 6 months is <0.001 which is statistically significant. 19 patients in the corticosteroid injection group while 38 patients in autologous blood injection group had 'Excellent' relief of pain. Hence the decrease in pain at 6 months is statistically significant in autologous blood injection group compared to corticosteroid injection group.

Graph no.7: Verhaar et al Scoring system after 6 months of injection

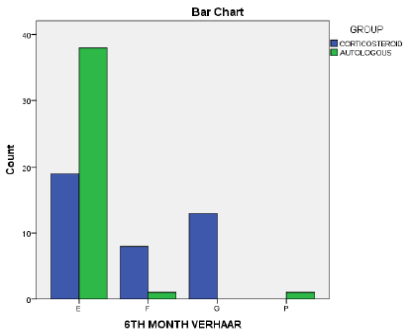


Table No. 13: Maximum benefit reached in weeks

	Corticosteroid injection group	Autologous blood injection group
Maximum benefit reached at average weeks	6.35	11.5
S.D	5.568	5.643

Maximum benefit reached at an average of 6.35 weeks in corticosteroid injection group. Maximum benefit reached at an average of 11.5 weeks in autologous blood injection group. P value is <0.001 which is significant. Thus corticosteroid injection group shows statistically significant early maximum benefit.

Graph no.8: Maximum benefit reached in weeks

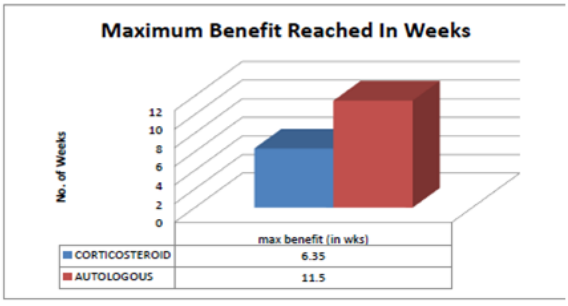


Table No.14: Recurrence rate

	Corticosteroid injection group	Autologous blood injection group
Number of patients completely relieved of pain at 4 weeks	23	7
Number of recurrences	8	0
Recurrence rate	20%	0

Up to 4 weeks there was significant improvement with 23(57.5%) patients completely relieved of pain in patients treated with a corticosteroid injection and 7(17.5%) in autologous blood injection group. 8 patients in corticosteroid injection group reported recurrences at 6month follow up. The rate of recurrence was 20% in corticosteroid injection group. The rate of recurrence was 0% in autologous blood injection group. P= <0.001 which is significant. Thus corticosteroid injection group showed statistically significant high recurrence ratecompared to autologous blood injection group. Also, the corticosteroid injection group showed statistically significant complete improvement of pain at 4th week of followup.

	Corticosteroid injection group	Autologous blood injection group
Number of patients completely relieved of pain	18	37

After 6 months of follow up, 18 (45%) patients in corticosteroid injection group were completely relieved of pain whereas 37 (92.5%) participants in autologous blood injection group were completely relieved of pain. P value = <0.001 which is significant. Thus autologous blood injection group had statistically significant more number of patients completely relieved of pain.

Complications

Only four patients (10%) had local skin atrophy in corticosteroid injection group while one patient (0.025%) in autologous blood injection group had this problem. P value = 0.157 which is non-significant. There was no statistical significance related to post intervention local skin atrophy. No patients reported elbow stiffness, infection, reflex sympathetic dystrophy, post injection flare, facial flushing, neurovascular damage or tendon rupture or other untoward complications.

DISCUSSION

Tennis Elbow is a common problem encountered in Orthopaedic practice and general practice. In this current study, the mean age encountered was 42.73 years in the corticosteroid injection group and 43.85 years in the autologous blood injection group (Range: 18 to 67 years); the peak incidence was seen in fourth decade of life. Contrary to other studies more number of female patients in this current study may be because females at this study area are more involved with household work which causes repetitive stress at the extensor carpi radialisbrevis origin causing micro trauma, a relevant etiology for the initiation of the disease. In this current study, out of the 80 participants, 67(83.75%) participants had their dominant elbow affected and 13 (16.25%) participants had their nondominant elbow affected. Parameters like age, sex, side of elbow involved, dominance of upper limb involved, duration of symptom and type of occupation of the patients were comparable. The mean VAS score and Nirschl staging and Verhaar et al staging before injection in both the groups were comparable. Corticosteroid injection group showed statistically significant decrease in VAS score, Nirschl stage, and Verhaar et al stage at 1st week and 4th week compared to autologous blood injection group. At 12th week and at 6 month follow up autologous blood injection group showed statistically significant decrease in VAS score, Nirschl staging and Verhaar et alstaging compared to corticosteroid group. After 6 months of follow up, 18 (45%) patients in corticosteroid injection group were completely relieved of pain whereas 37 (92.5%) participants in autologous blood injection group were completely relieved of pain. This was highly statistically significant with a P value of <0.001. In Corticosteroid injection group till 4 weeks there was significant improvement with 57.5% of patients completely relieved of pain. Many of these patients reported recurrences at 12 weeks and 6month follow up. The rate of recurrence was 20% in corticosteroid injection group. In autologous blood injection group at 4th week follow up, 17.5% of patients were completely free of pain. At the end of 6 months there was no recurrence. This was statistically significant with a P value of <0.001. Maximum benefit reached at an average of 6.35 weeks in corticosteroid injection group. Maximum benefit reached at an average of 11.5 weeks in autologous blood injection group. This was statistically significant with a P value of <0.001.Only four patients (10%) had local skin atrophy in corticosteroid injection group while one patient (0.025%) in autologous injection group had this problem. Between two groups there was no statistical significance related to post intervention local skin atophy. (p = 0.157) showing that the local steroid infiltration or autologous blood injection done with proper care gives rise to negligible complication.

CONCLUSION

Autologous blood injection technique for lateral epicondylitis has numerous advantages like it is minimally traumatic and offering an excellent relief of pain with a low recurrence rate. In-fact, it has a reduced risk for immune-mediated rejection and devoid of potential complications such as hypoglycemia, skin atrophy, tendon tears associated with corticosteroid injection. It is simple to acquire and prepare, easy to carry out as outpatient procedure and most importantly it is inexpensive. This is such an important factor for a country like India where cost of treatment matters considering buying steroid injections or even preparing platelet rich plasma in a centrifuge machine in case of PRP (platelet rich plasma) injections.In our study the drawback was that it was difficult to blind either patient or investigator in regard to drawing and injecting autologous blood. However, this study offers encouraging results of autologous blood which we presume addresses the pathophysiology of lateral epicondylitis unlike all the other non-operative modalities. In the near future we hope further large scale studies will be carried out and investigators can define this process of healing by growth factors in blood in detail and enhance our knowledge on treatment of lateral epicondylitis and other disabling tendinosis.

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