



A COMPARATIVE STUDY BETWEEN AUTOLOGOUS BLOOD INJECTION AND EXTENSOR TENDON RELEASE FOR RESISTANT TENNIS ELBOW

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ABSTRACT

Tennis elbow or lateral epicondylitis is a common condition affecting the active population. Various conservative and surgical modalities exist regarding treatment but there is no universal consensus regards to the individualising the management. In this study we compare the outcome of resistant tennis elbow cases treated with autologous blood injection and open surgical release. Both modalities of management gave encouraging results in resistant cases but no statistically significant difference between the two modalities. In resistant cases of tennis elbow, biological treatment accelerating the repair process (use of Autologous blood injection) should be considered before performing surgery.

KEY WORDS: *Tennis elbow, resistant, Lateral epicondylitis, autologous, biological*



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INTRODUCTION

Tennis elbow also known as epicondylalgia, epicondylolysis, or lateral epicondylitis was introduced by Runge due to its association with lawn tennis.¹ Lateral epicondylitis is a misnomer, it is due to degeneration of a tendon and not due to an inflammation. Common origin of the extensor muscles of the forearm is going for degeneration, among which extensor carpi radialis brevis is most commonly involved. Tennis elbow affects a majority of daily activities of living because it produces significant weakness of grip strength, particularly with the elbow in extension. It should be treated aggressively to prevent the significant morbidity. The diagnosis of tennis elbow is quite straight forward, but there is no consensus on the optimal treatment strategy. Various studies shows variety of treatment approaches exist with contradictory and different mechanisms of action.² In the management of tennis elbow so many treatment options suggests that no single treatment has gained universal acceptance. Many studies suggested that 90% of patients will improve after conservative line of management. In patients with persisting pain and disability after 6 months of conservative measures, surgery may be indicated in about 10% of the resistant cases. Surgical modalities available are surgical release of common extensors and debridement of degenerated tendons which can be performed either through per-cutaneous, arthroscopic or open technique. The healing process in tennis elbow is accelerated by the delivery of platelet derived growth factors (PDGF) and these factors can be delivered by injecting autologous blood or platelet rich plasma.⁶ Advantage of autologous blood injection is its cost-effectiveness and it can be done as an a day-care procedure. In our study, we have tried to compare the outcome between autologous blood injection and open extensor tendon release in resistant tennis elbow patients during the period from october 2014 to september 2016 at our institution.

MATERIALS AND METHODS

In our institution 29 Tennis Elbow patients resistant to conservative treatment were selected for this prospective study. The study period is from october 2014 to september 2016. The study was conducted after the approval of the Ethical Committee in our Institution. 17 patients were treated with autologous blood injection and 12 patients treated with extensor tendon release based on our inclusion and exclusion criteria. Only resistant cases were included in the study.

Occupation

Manual workers : 14 patients (48.3%)
Housewife : 15 patients (51.7%)

Inclusion criteria

1. At least 6 months of unsuccessful conservative therapy, with ≥ 2 individual treatments with physiotherapy and ≥ 2 individual treatments with other forms of therapy.
2. 2-wks interval since the last therapy
3. Pain interfering with Daily Activities of Living
4. 20-60 years

5. Duration > 6 months
6. Reproducible pain provoked by resisted wrist extension (the Thomsen test) of ≥ 4 mm on the 10-mm visual analog scale.

Exclusion Criteria

1. Local arthritis, rheumatoid arthritis.
2. Neurological findings (e.g., Entrapment of cervical nerves, cervical disc herniation, carpal tunnel syndrome and similar neurological findings).
3. Previous surgery on lateral epicondyle
4. Bilateral symptoms
5. >60yrs of age
6. Pregnancy
7. Thrombopathy, anticoagulant therapy
8. Hypothyroid

Age and Sex Distribution

Extensor tendon release was done in 12 patients of which 7 were males and 5 were females. The autologous blood injection group which consists of 17 patients, out of which 11 were females and 6 were males.

Pre-operative assessment

All patients were evaluated using clinical (Thomson test), radiological methods (Plain AP and Lateral view of Elbow) and staged using NIRSCHL staging system.

Nirschl Staging of lateral epicondylitis

- Phase 1: mild pain with exercise, resolves within 24 hrs
Phase 2: pain after exercise, exceeds 48 hrs
Phase 3: pain with exercise, does not alter activity
Phase 4: pain with exercise, alters activity
Phase 5: pain with heavy activities of daily living
Phase 6: pain with light activities of daily living, intermittent pain at rest
Phase 7: constant pain at rest, disrupts sleep

X-rays

1. Standard Antero-posterior View
2. Lateral view (R/O arthritis)

Further evaluation of morbidity using

1. Nirschl staging system
2. Visual Analog Pain Scale (VAS)
3. DASH Score

Successful treatment of tennis elbow is defined as more than 25% reduction in disabilities of the arm, shoulder and hand (DASH) score or visual analog scale without re-intervention after 1 year.³

Other conservative line of management like NSAIDS, Physiotherapy has been discontinued 2 weeks prior to surgery

Timing of intervention

Cases that were resistant to conservative measures for 6 months were included in the study.

Allocation of Groups

Those patients satisfying our inclusion and exclusion criteria were selected for our study and equally allotted to both groups

- | | | |
|---------|---|----------------------------|
| GROUP A | : | Extensor tendon release |
| GROUP B | : | Autologous blood injection |

Detailed informed consent has been obtained from each patient.

Anaesthesia and Position

Extensor tendon release (GROUP A) was done under supra-clavicular block with patient in supine position. Autologus blood injection (GROUP B) done under local anaesthesia (2% lignocaine) as an outpatient procedure.

SURGICAL TECHNIQUE

Extensor Tendon Release

Under Supraclavicular block, patient in supine position under pneumatic tourniquet control elbow flexed and

kept over arm table. A three centimeters curved incision made over lateral epicondyle starting 1 cm proximal to lateral epicondyle. The common extensor origin was identified, the plane between extensor carpi radialis longus and extensor digitorum communis was identified. ECRB tendon divided transversely close to its attachment on the lateral epicondyle. Debridement of degenerated tendon has been done and allowed to retract distally. Preservation of the uninvolved common extensor origin and selective release of the involved ECRB alone prevents morbidity.⁴ Drilling of lateral epicondyle at the attachment site was performed with 2.5mm drillbit.⁵ The wound was closed in layers



Figure 1
Incision



Fig 2
Identification of ECRB tendon
Intra-operatively, Extensor carpi radialis brevis was been identified by extension of middle finger

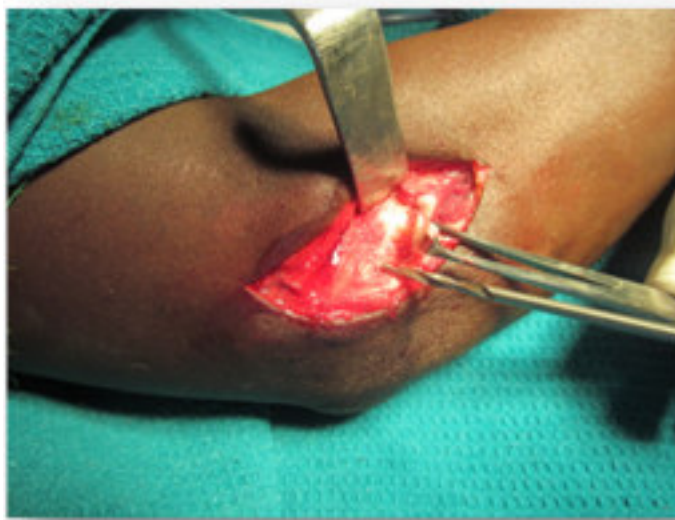


Figure 3
Drilling of lateral epicondyle

Autologous Blood Injection:

Patient arm is adducted, elbow is flexed or extended, forearm is fully supinated, maximal tender point is identified by surgeon's thumb. Under strict aseptic precautions, two millilitres of venous blood withdrawn from unaffected limb mixed with one ml of 2%

Lignocaine, which is then injected into the tendon sheath of extensor carpi radialis brevis by clinical assessment or 0.5 cm distal and anterior to lateral epicondyle. Patient with persistent pain after 6 weeks, repeat injections has been done for improvement of residual pain. Maximum of three injections can be given



Figure4
Autologous Blood injection – technique

Post-Operative Protocol

All patients were initially immobilized with Above Elbow slab with elbow in 90 degree flexion and mid-prone position for first 2 weeks. First look was done on 3rd or 4th day under strict aseptic conditions. Suture removal done between 10 and 12 days. At the end of 2 weeks, slab was removed; active mobilization of wrist and elbow joint was started. At the end of 6th week return to manual work, weight lifting, driving was allowed. Return to athletic and sports activities were allowed at the end of 12th week. All patients were regularly followed up once a month for three months, there-after at three months interval. Functional outcome was evaluated at

6weeks, 6th month and 1 year after the procedure. Both clinical and functional evaluation was done at regular intervals. Clinical examination is done using Thomson clinical test. Functional evaluation was done using NIRSCHL staging, Visual Analog Scale (VAS) and DASH score. All patients were followed up for maximum period of one year and minimum six months.

RESULTS

Our study included 29 resistant tennis elbow patients. Extensor tendon release was done in 12 patients and Autologous blood injection was given in 17 patients.

Table 1
Distribution of Operative and Non-operative group based on age

S. NO	AGE (YEARS)	Operative (N=12)		Non operative (N=17)	
		N	%	N	%
1.	20-29	2	16.7%	1	5.9%
2.	30- 39	6	50%	10	58.8%
3.	40-49	4	33.3%	5	29.4%
4.	50-59	-	-	1	5.9%
TOTAL		12	100%	17	100%
Mean + SD		36.92 ± 6.04		36.35 ± 6.45	
't' value		0.238		0.814	
/ P value				Not significant	

From the above table it is very clear that majority of the operative cases [50%] belongs to the age group of 30-39 years. Similarly majority of the non-operative cases [58.8%] belongs to the age group of 30-39 years. Average age at presentation is 36.6 years.

Table 2
Distribution of operative and non-operative group based on side

Sex / Group	RIGHT	LEFT	TOTAL
GROUP A	10	2	12
GROUP B	13	4	17
Total	23	6	29
Percentage	79.3%	20.7%	100%
P value	0.076 NS	0.131 NS	

From the above table it is very clear that dominant extremity (Right) is involved in 79.3% cases. Left side is involved in 20.7% cases. Tennis elbow is caused by repetitive arm, forearm rotational activities. In our study group 48.3% are manual workers and 51.3% are housewife by occupation overall. In the operative group 7 patients (58.3%) are manual workers and 5 patients (41.7%) are housewife by occupation. In the non-operative group 7 patients are manual workers (41.2%) and 10 patients are (58.8%) housewife.

Table 3
Distribution of patients based on nirschl's stage

S. NO	NIRSCHL'S STAGE	OPERATIVE		NON OPERATIVE		TOTAL	
		N	%	N	%	N	%
1.	TYPE V	-	-	2	11.8	2	6.9%
2.	TYPE VI	3	25	6	35.3	9	31.1%
3.	TYPE VII	9	75	9	52.9	18	62%
TOTAL		12	100	17	100	29	100

Among the operated group, 3 patients (25%) were in Nirschl's stage VI and 9 patients (75%) were in stage VII. The non operative group has 2 patients (11.8%) in Nirschl's stage V, 6 patients (35.3%) in stage VI and 9 patients (52.9%) in stage VII. Nirschl's stage VII dominated in the operative and non operative group. The average time for conservative treatment is 6 months. Open extensor tendon release and thorough debridement of extensor tendon is done in 12 patients. Successful treatment of tennis elbow is defined as more than a 25% reduction in disabilities of the arm, shoulder and hand (DASH) score or visual analog scale without re-intervention after 1 year.³

Table 4
Comparison of dash score between operative and non-operative group before intervention

S. NO	VARIABLE	OPERATIVE (N=12)		NON OPERATIVE (N=17)		't' VALUE
		Mean	SD	mean	SD	
1.	DASH SCORE	72.5	8.82	69.5	11.34	0.455

The above table shows comparison between operative and non-operative group by 't' test which shows that it is statistically insignificant.

Table 5
Comparison of vas score between operative and non-operative group before intervention

S. NO	VARIABLE	OPERATIVE (N=12)		NON OPERATIVE (N=17)		't' VALUE
		Mean	SD	mean	SD	
1.	VAS SCORE	8.50	1.45	8.30	1.21	0.416

The above table shows comparison between operative and non-operative group by 't' test which shows that it is statistically insignificant.

Table 6
Comparison of outcome visual analog scale and dash score

SL NO	PREOP	FOLLOW UP	P VALUE
VISUAL ANALOG SCALE			
GROUP A	8.5 ± 1.45	1.92 ± 1.38	< 0.001 Significant
GROUP B	8.3 ± 1.21	2.4 ± 0.35	< 0.001 Significant
DASH SCORE			
GROUP A	72.5 ± 8.82	25.2 ± 17.13	< 0.001 Significant
GROUP B	69.5 ± 11.34	24.3 ± 14.98	< 0.001 Significant

In both group A and B Statistically significant amount of reduction in DASH score and VAS score when it is compared between initial presentation and latest follow up.

Table 7
Comparison of outcome vas score based on individual nirschl's stage

S. NO	NIRSCHL'S STAGE	VARIABLES	N	MEAN	SD	't' VALUE
1.	TYPE V	OPERATIVE	-	-	-	-
		NON OPERATIVE	2	1.00	1.40	
2.	TYPE V	OPERATIVE	3	2.00	1.00	0.840
		NON OPERATIVE	6	2.17	1.17	
3.	TYPE VII	OPERATIVE	9	1.89	1.54	0.186
		NON OPERATIVE	9	2.89	1.54	

Though outcome of Nirschl's stage VI and VII in operative group is better than non-operative group with respect to VAS Score, when compared it is statistically insignificant.

Table 8
Comparison of outcome dash score based on individual nirschl's stage

S. NO	NIRSCHL'S STAGE	VARIABLES	N	MEAN	SD	'p' VALUE
1.	TYPE V	OPERATIVE	-	-	-	-
		NON OPERATIVE	2	14.75	11.24	
2.	TYPE VI	OPERATIVE	3	26.5	19.58	0.486
		NON OPERATIVE	6	19.30	10.73	
3.	TYPE VII	OPERATIVE	9	24.74	17.51	0.521
		NON OPERATIVE	9	30.01	16.51	

Though Nirschl's stage VI is better in non operative group and Nirschl's stage VII is better in operative group with respect to DASH Score, when compared it is statistically insignificant.

Table 9
Complications

S. NO	COMPLICATIONS	GROUP A		GROUP B	
		N	%	N	%
1	Residual pain	3	25%	4	23.5%
2	Weakness of Wrist extension	1	8.3%	-	-

Extensor tendon release group - Three patients had residual pain (25%). One patient had weakness of wrist extension. No cases of infection. Autologous blood injection group - Four patients had residual pain (23.5%). For operative Group The mean preoperative DASH score is 72.5 whereas the mean postoperative DASH score at one year follow up is 25.2 which is statistically significant. The mean preoperative visual analog scale is 8.5 whereas the mean postoperative visual analog scale at one year follow up is 1.92 which is statistically significant. Preoperative Nirschl stage average 6.75 and postoperative Nirschl stage averages 2. For Non-Operative Group - The mean preoperative DASH score is 69.5 whereas the mean postoperative

DASH score at one year follow up is 24.3 which is statistically significant. The mean preoperative visual analog scale is 8.3 whereas the mean postoperative visual analog scale at one year follow up is 2.4 which is statistically significant. Preoperative Nirschl stage averages 6.4 and postoperative Nirschl stage averages 2.58. Pain relief was achieved in 9 patients (75%) in operative group. Three patients had residual pain (25%). One patient had weakness of wrist extension. No cases of postoperative infection. Pain relief was achieved in 13 patients (76.5%) in non-operative group. Four patients had residual pain (23.5%) for which repeat injections has been given twice in two patients, once in two patients 6 weeks after first injection.

DISCUSSION

Lateral epicondylitis is due to chronic overuse which leads to multiple micro-traumatic events that cause disruption of the internal architecture of the tendon and degeneration of the cells and matrix, which fail to mature into normal tendon. It's a misnomer. Rather tendinosis, not tendonitis, appears to be a degenerative process that is characterized by the presence of dense populations of fibroblasts, vascular hyperplasia and disorganized collagen. Introducing autologous blood in a relatively atraumatic manner may initiate the inflammatory cascade and promote healing in an otherwise degenerative process. This inflammatory response has resulted from local tissue irritation during the metabolism of the blood or from cell-mediated factors within the blood. Edwards SG, Calandruccio JH et al achieved 79% success with autologous blood injection. It provides necessary humoral and cellular mediators to promote healing.⁶ In our study series (17 patients) non surgical group of patients in resistant tennis elbow 13 patients had good to excellent relief of pain. 4 patients had persistent pain (25%). Our study group results are comparable with Edwards et al study outcome. One third of the patients had multiple steroid injections in our study. One fourth of the patients in our study required repeat injections had been treated previously with at least 2 steroid injections. Despite this challenge 4 out of 17 patients (25%) who had more than one autologous blood injection were relieved entirely of their symptoms. Nirschl stated that pain is improved when minor trauma was inflicted in an area of tendinosis at the lateral epicondyle. Baumgard and Schwartz reported excellent results in 32 of 35 patients with percutaneous release of the extensor carpi radialis brevis tendon. These practices have been abandoned because increased risk for harmful sequelae such as fracture, neurovascular injury and ligament rupture or laceration. Resistant cases of lateral epicondylitis are subjected to surgical line of management. Surgery can be either open or percutaneous procedures that release the extensor origin from the lateral epicondyle. Degenerated tissue is removed from the lateral epicondyle and the ECRB origin is released or repaired, intra-articular procedures, de-nerivation of the lateral epicondyle and arthroscopic debridement or release of the ECRB origin. Recently published long-term follow up studies of both arthroscopic and open methods of tennis elbow release have demonstrated similar outcomes. It appears that either surgical technique is acceptable, as long as the pathological tissue is accurately identified and adequately resected and no technique appeared superior to another technique.⁷ Dunn et al reported the results after the open procedure is good to excellent in 84% of patients.⁸ Baker reported the long-term results of arthroscopic tennis elbow release. Forty patients (42 elbows) with resistant lateral epicondylitis were treated with arthroscopic resection of pathological tissue. 30 of these patients (30 elbows) were contacted for extended follow-up of which 23 patients (77%) stated they were

'much better'.⁹ Retrospective comparative study between open and arthroscopic procedures was performed by Peart et al. At 6 months no significant difference was seen, but earlier return to work after arthroscopic lateral release has been reported.¹⁰ Szabo et al performed a retrospective evaluation of three methods of operative treatment (open, arthroscopic and percutaneous cases) and found no difference in preoperative parameters such as age, gender, dominance, cortisone injections and conservative measures used. No significant differences were found at follow-up (minimum of 2 years) in complications, failures, recurrences, VAS scores for pain. Therefore all three methods are effective way to treat lateral epicondylitis.¹¹ Lo and Safran published an excellent systematic review in 2007 on the surgical treatment of lateral epicondylitis. They compared studies of arthroscopic, percutaneous and open release of the extensor tendon from the lateral epicondyle, for important factors such as time to return to work, strength and overall function after surgical treatment. They claimed that arthroscopic or percutaneous surgery leads to a more rapid recovery.¹² Outcomes after open release or debridement are generally good to excellent in 70% to 97% of patients. However, a prolonged recovery and unsatisfactory results can be seen in 15% to 20% of cases. Percutaneous release of the common extensor origin from the lateral epicondyle has been described using a small incision. Reported success rates are 70% to 91%. In our series of cases reported success rate is 75% in extensor tendon release patients which is comparable and equivalent to various studies. One fourth of patients had persistent pain which is also similar to other study results. Autologous blood injection group, repeat injections were encouraged in patients who had suboptimal relief of symptoms after the initial injection. The protocol for this study allowed 6 weeks before repeat injection. The optimal interval between injections is controversial because some patients required up to 8 weeks to achieve maximal benefit from a single injection. Interestingly the time required to reach maximal benefit after the repeat injection was shorter on average (1-2 wk) than after the initial injection possibly because the healing cascade was already on progress. Based on our observations, blood injections provided relief to patients who had failed multiple steroid injection attempts. The injection of autologous blood for other forms of tendinosis such as medial epicondylitis and plantar fasciitis has been used in various centres with good results. Despite the early favourable results of lateral epicondylitis treatment longer-term follow-up evaluation are required before conclude our results.

Limitations

- Our study is limited by less number of patients and not randomized.
- Our sample size is small.
- The mean follow up period is short.
- Surgery is done by different surgeons and the observer is not blinded.

CONCLUSION

- Both autologous blood injection and extensor tendon release groups offer encouraging results.
- Statistically no significant difference between two groups of patients based on follow up DASH score and Visual Analog pain scale.
- Autologous blood injection provides similar clinical outcome and relief of pain as in extensor tendon release patients. Repeat injections up to maximum three injections can be given at 6 weeks interval.
- Thorough debridement of degenerated tendinous tissue is necessary for better relief of pain. Release of entire common extensor origin is not necessary, release and debridement of involved tendon alone

will improve the clinical outcome and avoids weakness of wrist extension.

- In resistant tennis elbow biological treatment accelerating the repair process (use of Autologous blood injection) should be considered before performing surgery.
- Our study group follow up is short term. Long term follow up is necessary before concluding the outcome.

CONFLICT OF INTEREST

Conflicts of interest declared none.

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