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RESEARCH ARTICLE

RESULTS OF AUTOLOGOUS BLOOD INJECTION AS AN OPTION OF TREATMENT IN TENNIS ELBOW

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ABSTRACT

Objectives: Tennis elbow (TE) or *lateral epicondylitis*, first described by Runge in 1873, is a common myotendinosis. Different modes of treatment are used in its management. This study was conducted to report the results of autologous blood injection (ABI) in the treatment of TE.

Materials and Methods: A prospective case study was performed to evaluate the results of ABI in the management of TE. Twenty three patients with tennis elbow were injected with 2 ml of autologous blood. The patients were evaluated under regular follow-up during which the satisfaction was assessed. The effectiveness of the procedure was assessed by Visual Analogue Scale (VAS) and Nirschl Phase Scale (NPS). If pain was not relieved entirely after 6 weeks a repeat injection was offered.

Results: Twenty-three patients with diagnosed TE were treated by ABI (12 males, 11 female) and were followed-up for an average period of 10 months (range 6-19). The mean age of the patients was 44 years. . After first autologous blood injection the average pain score (VAS) decreased from 8.2 to 2.5 and the average Nirschl phase scale (NPS) decreased from 6 to 2.0. The patients who opted for second injection after they were not completely relieved were evaluated further. And it was noted that both scores decreased thereafter earlier than what was achieved after first injection.

Conclusions: Given the acceptable outcomes, autologous blood injection can be considered a good treatment option for TE when traditional treatment has fails.

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INTRODUCTION

Tennis elbow (TE) or *lateral epicondylitis*, first described by Runge in 1873, is a common myotendinosis (Tcanale and James, 2008). It is a clinical diagnosis verified via ultrasonography and magnetic resonance imaging (Miller *et al*., 2002; Savnik *et al*., 2004). There has been a number of treatment modalities such as repetitive low-energy shock wave (Rompe *et al*., 2004), physical therapy (Waugh *et al*., 2004) and open surgical treatment (Isikan *et al*., 2005) for management of TE. However, no treatment method has shown to be superior to others. One of the common treatments is the injection of corticosteroid (Torp-Pedersen *et al*., 2008). The logic behind its use is based on the theory that the disease is inflammatory. Recent studies demonstrate that TE is a proliferative process and it is named angiofibroblastic degeneration or hyperplasia, indicating that the condition is basically a tendinosis rather than tendinitis.

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In 1993 Edwards and Calandruccio published their paper regarding use of autologous blood in treatment of TE even in those patients that were not cured by other methods (Edwards and Calandruccio, 2003). The reason being stated that blood contains humeral and cellular mediators that initiate an inflammatory process in the injured tissue and result in repair

MATERIALS AND METHODS

This study was conducted at our hospital. Forty-five consecutive patients reporting to our OPD (outpatient department) were evaluated for tennis elbow/lateral epicondylitIs. The treatment options, both surgical and non-surgical, were discussed with all the patients, which included non steroidal anti-inflammatory drugs, wrist splints, braces, local injections of either steroid or autologous blood injections or surgical release. Exclusion criteria were patients who were operated for lateral epicondylitIs, who have received autologous blood injections in the past and patients who had received steroid injection within three months before blood

injections. 27 patients opted for autologous blood injections. Out of 27, 4 patients did not reported back for the follow up. The remaining 23 patients were prospectively followed. 12 men with mean age 45.5 years (range 36-55 y) and 11 women with mean age 42.5 years (range 25-52y) had lateral epicondylitis involving 20 dominant and 3 nondominant extremities. Symptoms had persisted for at least for 3 months despite conservative treatment (physiotherapy, splints, NSAIDS, steroid injections). 6 patients had received steroid injection amongst which 5 patients had received one injection and 1 had received three injections. But the patients were not satisfied with the outcome.

Two mL of venous blood was drawn from the ipsilateral upper-limb. It was then injected into the lateral epicondyle starting proximally and going along the supracondylar ridge up to the under surface of ECRB. No anaesthetic agent was used. Arm sling was used for a week. Patients were advised to follow up regularly. The procedure was done by one of the authors. After blood injections patients were placed in a removable arm sling (no specialized cock up splints were used). (Fig. 1a)

Figure 1. Autologous blood being injected

For the first 3 weeks patients were restricted from other modalities such as braces, straps physiotherapy. At three weeks patients began an interval wrist motion program consisiting of stretching the musculature about the wrist and elbow especially extensor compartment. The patients were released to activities as tolerated at 6 weeks after injection.

The effectiveness of the procedure was assessed by Visual Analogue Scale (VAS) and Nirschl Phase Scale (NPS) (Table 1) which was monitored before the procedure, at first week, monthly for first three months, then 3 monthly for first year, then six monthly for next 1 year. If pain was not relieved entirely after 6 weeks a repeat injection was given. This six week cycle was repeated until patient was fully satisfied or the patient declined the injection.

Table 1. Nirschl phase scale (NPS) for tennis elbow

Phase 1	Mild pain with exercise; which resolves in 24 hours
Phase2	Pain with exercise; exceeds 48 hours
Phase3	Pain with exercise; does not alter activity
Phase4	Pain with exercise; alters activity
Phase5	Pain with heavy activities of daily living
Phase6	Pain with light activities of daily living; intermittent pain at rest
Phase7	Constant pain at rest; disrupts sleep

RESULTS

The 23 patients were followed-up for an average time of about 10 months (range 6-19) months) The average pain score was 8.2 (range 7-10) before autologous injections and the Nirschl stage was 6 (range 5-7). After first autologous blood injection the average pain score decreased from 8.2 to 2.5. The average Nirschl phase scale decreased from 6 to 2.0. The maximal benefit was reached at an average of 2.8 weeks (range 1-8). The patients who were not completely relieved were offered second/further injections according to our six week cycle policy. And the patients who accepted were given further injections.

Table 2. Autologous blood injection in tennis elbow

			Preinjection		After first injection		Maximal benefit (wk)	After second injection		Maximal benefit (wk)	After third injection		Maximal benefit (wk)
Patient	Age	Sex	Pain	Nirschl	Pain	Nirschl		Pain	Nirschl		Pain	Nirschl	
1	55	M	8	6	0	0	1	-	-	-	-	-	-
2	48	M	8	5	2	1	2	-	-	-	-	-	-
3	35	F	7	5	0	0	2	-	-	-	-	-	-
4	42	F	10	6	5	4	3	1	1	2	-	-	-
5	45	M	10	7	9	6	8	-	-	-	-	-	-
6	52	F	8	6	0	0	2	-	-	-	-	-	-
7	51	M	7	5	0	0	1	-	-	-	-	-	-
8	25	F	9	6	5	4	2	1	1	3	-	-	-
9	42	M	8	6	1	1	3	-	-	-	-	-	-
10	40	F	8	7	4	4	3	0	0	3	-	-	-
11	45	M	10	7	6	5	2	3	2	1	0	0	1
12	52	F	8	6	3	2	1	-	-	-	-	-	-
13	48	M	9	5	5	3	1	-	-	-	-	-	-
14	50	F	7	5	2	2	2	1	1	2	-	-	-
15	36	M	8	7	5	3	2	-	-	-	-	-	-
16	51	F	9	7	0	0	5	1	1	1	-	-	-
17	45	M	7	7	0	0	3		-	-	-	-	-
18	37	F	8	6	3	3	3	0	0	1	-	-	-
19	44	M	8	7	0	0	2	-	-	-	-	-	-
20	36	F	7	5	0	0	5	-	-	-	-	-	-
21	51	M	9	7	4	4	2	0	0	3	-	-	-
22	47	F	7	5	0	0	4	-	-	-	-	-	-
23	37	M	9	5	3	3	5	0	0	1	-	-	-
Mean	44	M=12 F=11	8.2	6	2.5	2	2.8	0.8	0.66	1.9	0	0	1

In such patients it was observed that the maximal benefit time reached was earlier than the previous injection. All data is summarized in Table 2.

Nine patients had more than one injections. The maximal benefit after second injection was observed after an average of 2 weeks. Nine of 23 patients were relieved completely of the pain after first injection. Six out othe remaining 14 patients were relieved after 2 injections. One patient received third injection for complete relief. The maximal benefit was maintained through out the follow-up.

There were no infection, reflex sympathetic dystrophy, elbow flexion contracture or any untoward effects. The pain after injection was comparable to the steroid injection.

DISCUSSION

Lateral epicondylitIs like other chronic overuse injuries are the result of multiple microtraumatic events that cause disruption of the internal structure of the tendon and degeneration of the cells and matrix which fail to mature to normal tendon (Nirschl, 1992). Histopathological studies have shown that the specimens of the tendon obtained from areas of overuse do not contain large number of inflammatory cells (Nirschl, 1992; Józsa and Kannus, 1997; Leadbetter, 1992; Rathbun and Macnab, 1970). Rather tendinosis not tendinitis appear to be a degenerative process that is characterized by the presence of dense population of fibroblasts, vascular hyperplasia and disorganized collagen. This constellation of findings has been termed as *angiofibroblastic hyperplasia*. Nirschl (Nirschl, 1992; Nirschl, 1988; Nirschl, 1995; Nirschl, 1990) and Nirschl and Sobel (1996) have investigated extensively the pathology of the lateral epicondylitIs. The vascular channels described by them may have potential to promote healing activated by some mechanism (Rathbun and Macnab, 1970; Nirschl, 1995). Historically when minor trauma was inflicted in an area of the tendinitis at the lateral epicondyle the outcomes were improved, as was shown by Wandsworth by doing close manipulations (Balasubramaniam and Prathap, 1972; Baumgard and Schwartz, 1982; Wadsworth, 1972). Introduction of autologous blood in a relatively a traumatic manner may initiate inflammatory cascade and promote healing in an otherwise degenerative process. Mitogens such as *platelet-derived growth factor β* (PDGF β) cause fibroblast mitosis and chemotactic polypeptides such as *transforming growth factor β* (TGF β) cause fibroblasts to migrate and have been shown to cause an angiogenesis (Gelberman *et al*., 1988).

The such role of mitomorphogenetic factors of blood in the healing of degenerated tendon lead to the advent of autologous blood injection therapy for tennis elbow. Edwards and Calandruccio summarized the advantages of autologous blood injection for the treatment of refractory lateral epicondylitis in their excellent work on the subject (Edwards and Calandruccio, 2003; Nirschl, 1988; ul Gani *et al.,* 2006; Connell *et al.,* 2006; Kazeim *et al.,* 2010). Its application being minimally traumatic, reduced risk of immune mediated rejection, simple to acquire and prepare and inexpensive are the other advantages. Although local steroid injection treatment for lateral epicondylitis is well documented (Tonks *et al.,* 2007; Assendelft *et al.,* 1996). Its advantage over autologous blood is debatable (Nirschl, 1988; Kazeim *et al.,* 2010). Varying results are published by the studies on long term follow up (Assendelft *et al.,* 1996; Bunata *et al.,* 2007; Calfee *et al.,* 2008). Comparative studies are few but have shown the better long term results with ABI (Nirschl, 1988; Kazeim *et al.,* 2010). PRP has been shown to give good results and few studies have shown it to be better than ABI on long term follow up (Mishra and Pavelko, 2006; Thanasas *et al.,* 2011).

The theoretical reasons explained for the use of autologous injection to heal, rather than weakening, encouraged using repeat injections although only after acquiring patients consent. This study does not prove exclusively whether the blood itself induced the healing cascade or the injury inflicted by the injection was responsible which lead to the better outcomes. Nonetheless, the study provide encouraging results of an alternative treatment which, albeit theoretically, address the pathophysiology of the tennis elbow. Further clinical studies may prompt the investigators for the further refinements which can lead to healing of tennis elbow/lateral epicondylitIs and other disabling tendinoses.

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