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COMPARATIVE STUDY BETWEEN PERCUTANEOUS SURGICAL RELEASE AND CONSERVATIVE TREATMENT OF LATERAL EPICONDYLITIS

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ABSTRACT

Lateral epicondylitis or tennis elbow is a painful syndrome of the elbow which affects a large portion of the adult population, it is generally self-limiting, but in some patients it may continue to cause persistent symptoms, which can be refractory to treatment. When the non-operative treatment of tennis elbow fails to improve the symptoms after six to twelve months a surgical procedure can be performed. Many different techniques are available. Despite the simplicity of the percutaneous release and its effectiveness in relieving pain with minimal scarring this procedure is still not widely accepted. **Objective:** To compare percutaneous release of common extensor tendon as a surgical method versus conservative management of lateral epicondylitis. **Patients and methods:** In this comparative study, 60 patients were included, 30 cases of them were treated surgically and the other 30 cases were treated conservatively. The patients were followed after each method of treatment for six months and data was obtained by physical examination and measurement of elbow range of motion by goniometer and the elbow function was assessed with the Verhaar et al. scoring system. **Results:** Our study showed that the surgically treated patients had better results according to the elbow range of motion and symptoms when compared to the conservatively treated patients in two, four and six months follow up visit. **Conclusion:** Percutaneous surgical release of common extensor tendon as a method of treatment of persistent lateral epicondylitis has better results than conservative treatment regarding relieves of symptoms and elbow range of motion. It's safe, simple and patient friendly method with no major consequences.

KEYWORDS: Lateral epicondylitis, Percutaneous release, Conservative treatment.

1. INTRODUCTION

The first description of Lateral Epicondylitis as "Writer's Cramp" by Runge in 1873,[1] and "Lawn Tennis Arm" by Henry Morris in 1882.[2] Tennis elbow or lateral epicondylitis refers to a myriad symptoms of pain centered over the common origin of the extensor muscles of the fingers and wrist at the lateral epicondyle, it usually affects non- athletic rather than athletic patients between 35 and 55 years of age with peak incidence at fifth decade.[3] The incidence of lateral epicondylitis in the population varies from 1 to 3%, with predilection for male who do heavy manual work.[4] **Etiology and pathogenesis:** the term epicondylitis is a misnomer as there is little evidence to suggest that there is an inflammatory process. Lateral epicondylitis may be caused by repeated micro trauma to the origin of extensor carpi radialis brevis (ECRB) and may also involve the origin of the extensor carpi radialis longus (ECRL) and extensor carpi ulnaris (ECU), but the precise etiology and pathology remains unclear.[5] The most widely held theory is that there are macroscopic or microscopic tears in the common extensor origin, as described by Cyriax and others,[6] with microscopic evaluation of this tissue shows angio-fibroblastic

hyperplasia and disorganized collagen fibers.[5] However; it has been shown histopathologically to have a paucity of inflammatory cells such as macrophages and neutrophils.[7] The condition is therefore now considered to be a tendinosis, which is defined as a degenerative process. The application of stress to a tendon normally leads to increased cross-linkage and collagen deposition. When the rate of stretching exceeds the tolerance of the tendon a micro-tear results, and the adaptation of the tendon to multiple micro-tears leads to tendinosis. There are several well-defined histological stages that result from such repetitive micro trauma.

Stage I: There is initially an acute inflammatory response, which can sometimes resolve completely during which time patients may seek medical help.

Stage II: If the insult is sustained, a concentration of fibroblasts, vascular hyperplasia and disorganized collagen, known collectively as angiofibroblastic hyperplasia, can be seen histologically. There is hyper cellularity in both an organized and disorganized fashion in relation to muscle fiber orientation. These factors combine to result in tendinosis. This is the most common stage at which patients present themselves for treatment.

Stage III: Continuous accumulation of pathological changes leads to structural failure of the tendon, with partial or complete rupture. Stage IV: The tendon exhibits feature of a stage II or III injury, with other associated changes such as fibrosis, soft matrix calcification within the disorganized loose collagen, and hard osseous calcification.[8]

Clinical features and Diagnosis: The diagnosis of lateral epicondylitis is made usually clinically by means of patient history and physical examination. The diagnosis is made by localizing discomfort to the origin of the extensor carpi radialis brevis, tenderness is present over the lateral epicondyle approximately 5 mm – 1 cm distal and anterior to the midpoint of the condyle. Pain usually is exacerbated by resisted wrist dorsiflexion and forearm supination and there is pain when grasping objects and decrease grip strength.[9]

Clinical test: Chair test Patient is asked to lift a chair with the shoulder adducted, the elbow extended, and the wrist pronated.[10] (Figure 1)

Lidocaine injection test: The patient should note pain relief following injection at the origin of the Extensor carpi radialis brevis (ECRB).[10]

Imaging studies

1- X- ray: Plain radiographs usually are negative; occasionally calcific tendinitis may be present in the ECRB origin.[9] (Figure 2)

2-Ultra-sonography

Ultrasound examination, also useful, the diagnosis made by noticing hypo echogenic areas in the common extensor tendon. This implies an area of tendon substance degeneration. Occasionally we can see focal areas of calcifications. It is also good to examine the contralateral pain free elbow to look for differences.[11] (Figure 3).

3- Magnetic Resonance Imaging MRI shows tendon thickening with increased T1 and T2 signal intensity in the origin of ECRB.[12,13] (Figure 4)

Figure 1: Chair test for lateral epicondylitis.

Figure 2: X-ray finding for 47 years old female showing calcification of common extensor origin.

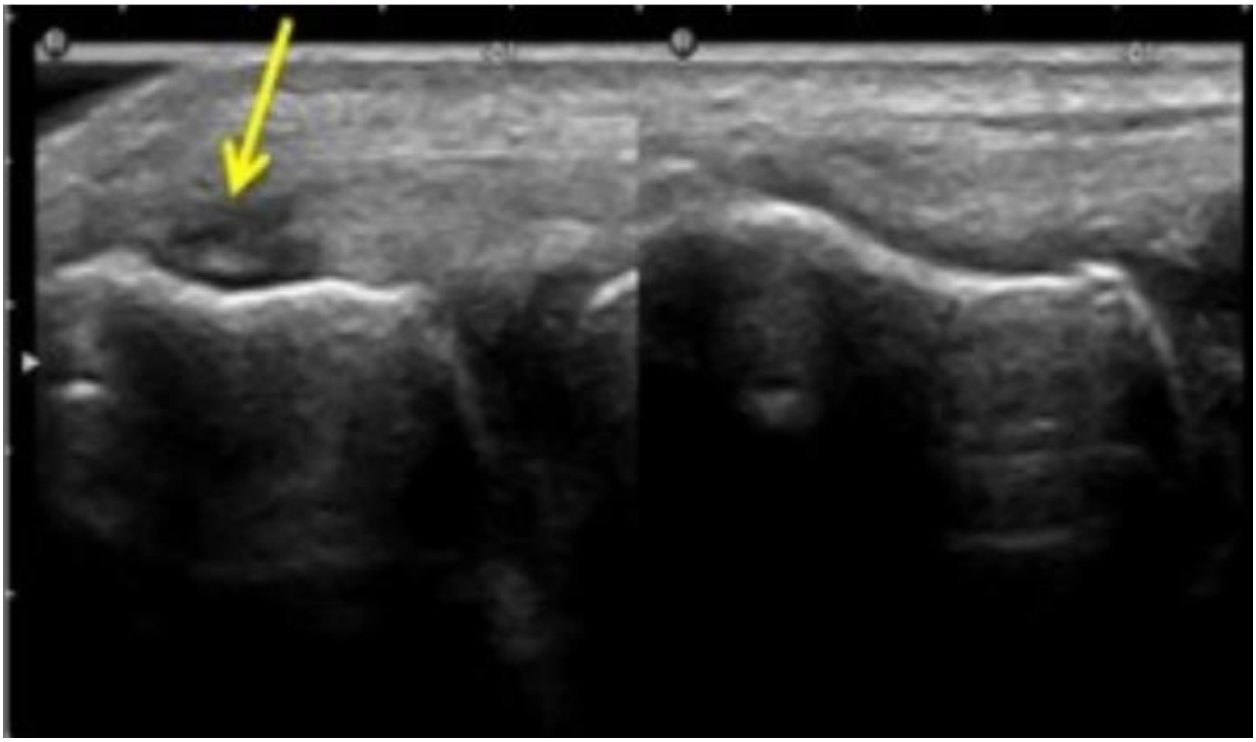

Figure 3: Ultrasound finding in 43 years old male with lateral epicondylitis.

Figure 4: MRI finding in 42 years old male with lateral epicondylitis.

Differential Diagnosis: Osteochondritis dissecans of the capitellum, lateral compartment arthrosis, varus instability and perhaps most commonly, radial tunnel syndrome. The pain of radial tunnel syndrome is located 3 to 4 cm distal to the lateral epicondyle and may be reproduced with long finger extension against resistance. We should keep in mind that true lateral epicondylitis and radial tunnel syndrome may coexist in 5% of patients.[9]

Management: Lateral epicondylitis is generally self-limiting, and most cases require no more than treatment with simple analgesia.[5,9]

Conservative Management

The initial treatment is conservative with rest, ice, modification of activity, physiotherapy and eccentric exercises, ultrasound, iontophoresis, electrical stimulation, manipulation, soft tissue mobilization, friction massage, stretching and strengthening exercises, counter-force elbow brace, and injections of corticosteroid.[9] Early studies were promising for extracorporeal shock wave therapy, but more recent studies have shown conflicting results. One study did not find a meaningful difference between treatment of lateral epicondylitis with extracorporeal shock wave therapy combined with forearm stretching and treatment with forearm stretching alone.[14] Autologous blood injection has been shown to be beneficial in certain patients, Edwards and Calandruccio[15] achieved 79% success in relieving pain in patients in whom all other non-operative treatments failed. More recently, platelet rich plasma (PRP) injections have been reported to be more effective than corticosteroid injections in relieving pain and improving function, although some studies found that autologous blood injections were more successful than PRP.[16,17] Autologous blood injections also have been reported to be more effective than corticosteroid injections and extracorporeal shock wave therapy.[18] Botulinum toxin injection, acupuncture and percutaneous radiofrequency thermal lesioning therapy also has been described in many researches as modules for non-surgical therapy of lateral epicondylitis.[19,20,21]

Surgical Management: In patients with prolonged (6 to 12 months) period of non-surgical treatment is ineffective, operative treatment may be considered; it is effective in 90% of properly selected patients.[22] Manipulation under anesthesia, especially in patients with concomitant flexion contractures, has been advocated. The technique involves sudden, forcible, full extension of the elbow with the wrist and fingers flexed and the forearm pronated to place the extensor carpi radialis brevis and extensors under tension, an audible, palpable snap frequently can be elicited, and the results can be excellent. We have no experience with this particular technique, but it seems to be a more aggressive form of the previously mentioned manipulative attempt at completion of the lesion.[23] Boyd and McLeod,[24] and Posch, Goldberg and Larrey[25] reported that up to 8% of all patients require surgery. Various surgical techniques have been described for the surgical treatment of tennis elbow such as, open or arthroscopic surgery for excision

of the proximal portion of the annular ligament, open release of the origin of the extensor muscles, excision of the bursa if present, excision of the synovial fringe which is often present, and decortication of the lateral epicondyle.[26,27] Another surgical option is percutaneous release of the common extensor origin,[28,29] the percutaneous release of the common extensor origin was first presented by Loose at a meeting in 1962.[30] More than ten years later Baumgard,[28] Yerger,[31] and Powell[32] reported their experience with modifications of percutaneous techniques. Despite the simplicity of the operation and its effectiveness in relieving pain with minimal scarring this procedure is still not widely accepted.

2. PATIENTS AND METHODS

A prospective comparative study has been conducted in the time period from 1st of September 2014 to 1st of January 2016 at Erbil teaching hospital. A Sample size of 60 patients has been collected randomly (every other patient) during the study period. In our study we have included all patients that exhibited typical lateral epicondylitis (Tennis Elbow) symptomatology such as pain about 1 cm down from bony area at the outside of the elbow (lateral Epicondyle), with difficulty doing simple tasks such as opening a door handle, shaking hands with someone or washing dishes and clothes manually, pain on the outside of the elbow when the hand is bent back (extended) at the wrist against resistance, pain on the outside of the elbow when trying to straighten the fingers against resistance and pain when pressing (palpating) just below the lateral epicondyle on the outside of the elbow. No previous surgery, fracture or major ligamentous injuries of the elbow were mentioned and there were no signs of compression neuropathy, which is known as the radial tunnel syndrome, or cervical spondylosis or posterior interosseous nerve compression syndrome. All patients with previous surgery, cervical spondylosis, compression neuropathy and pregnant patients have been excluded from the study. The diagnosis of the syndrome was based on the patient's medical history, the clinical examination and the imaging examination via X-ray. The initial examination and evaluation were performed preoperatively and then reevaluation was performed after one month, two months, four months and six months postoperatively. The patients were examined based on their subjective complaints and objective factors, such as local sensitivity, pain when moving the elbow and the wrist when spreading out the fingers against a given resistance. The study group has been divided into two groups, the 1st group (G1) consisted of 30 patients who were surgically treated, the 2nd group (G2) consisted of 30 patients treated conservatively. A goniometer was used for elbow range of motion (ROM) evaluation, for the elbow ROM evaluation the patients were asked to fully extend their elbows at a standing position and then bring their palms up towards their shoulders and bend their elbows as far as possible from a standing position (Figure 5).

Figure 5: Measuring elbow range of motion with goniometer.

For the forearm ROM evaluation, the patients were asked to bring their palms facing up at a standing position and then turn their palms facing down with the humerus slightly abducted and the elbow in a 900 flexion (Figure 6).

Figure 6: Measuring forearm range of motion with goniometer.

The initial evaluation was performed before the beginning of the treatment and the patients were reevaluated after one month, two months, four months and six months. The Verhaar et al. scoring system was used for the evaluation of the results of the treatment (Table 1) at one month, two months, four months and six months after the beginning of the treatment.[33] All participants were informed in detail about the purpose and the procedures of the study and they provided verbal consent.

Table 1: Scoring system for the results of the treatment based on Verhaar et al. (1993).

Excellent	In the absence of any pain, complete mobility of the elbow, no clinical inferences, good grip, return to work and satisfaction on the part of the patient.
Good	When a slight pain was experienced or noticed after heavy work, the patient was satisfied with the results and there was a small decrease, or none, in the power of the grip.
Fair	When the epicondylitis was still felt but to a lesser degree than before the surgery, a minor or moderate decrease in the power of the grip, the patient was on the whole satisfied with the results and the clinical areas of epicondylitis produced only minimal pain.
Poor	When the pain was not diminished in the epicondylar apophysis, the patient was pleased with the result, there was a definite loss of power and the clinical areas of the epicondylitis caused severe pain.

Surgical Technique: The lateral elbow was infiltrated with 5mls 1% lidocaine, all patients had their operations performed by the senior author. The percutaneous release of the common extensor origin was performed in the operating theatre under local anesthesia. The positioning for the procedure was supine, no tourniquet was used, and a number 11 blade was inserted perpendicular to the skin anterior to the lateral epicondyle (Figure 7).

Figure 7: Skin infiltration with lidocaine and skin incision.

A skin incision one centimeter long was made by moving the tip of the blade anteriorly and inferiorly from the lateral epicondyle a complete release of the common extensor origin was performed. A further displacement more distally of the common extensor tendon was then achieved by performing the Mill's manipulation. This manipulation consisted of a forcible, full extension of the elbow with the forearm fully pronated and the wrist and fingers held in flexion. A gap of one centimeter, on average, was easily palpable between the lateral epicondyle and the retracted tendons at the end of the procedure (Figure 8).

Figure 8: Mill's manipulation of the forearm.

Skin closure was achieved with a single Steris trip, a soft dressing was applied and early mobilization was commenced, no wrist or elbow splints were recommended.[34]

Conservative Treatment: Conservative care started with immediate temporary termination of offending activities. Ice therapy for 15-20 minutes three times per day was suggested to the patients. Total immobilization was not suggested in order to avoid muscular atrophy which could have inhibited the rehabilitation. Counterforce bracing was applied and oral Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) were prescribed for five to seven days provided that the patient had no medical contra-indications. Then a guided rehabilitation program with physiotherapy was recommended. It consisted of three treatment courses per week, lasted for six weeks and it was constituted of massages and a progressive exercise program. In addition, patients were given one to three local corticosteroid injections according to their response to the injection.[35]

Statistical Analysis: All analyses were carried out with the SPSS statistical package, the paired t-test was used to compare the reevaluation tests. All tests were two-sided and the statistical significance was set at $p< 0.05$.

3. RESULTS.

In study sample of 60 patients, 30 cases (50%) have been treated by surgical method (G1), while (G2) consisted of 30 cases (50%) were treated conservatively (Table 2). The age class prevalence between the two groups shown in (Figure 9).

Regarding G1, 24 (80%) of the patients were males and six (20%) were females, the age range in G1 was 42.433 ((±)) 8.236 years. Our study revealed that in G1, 22 (73.33%) cases were hard workers, while only eight (26.67 %) cases were light workers, four (13.33%) of the cases in G1 were related to sports that involve repetitive elbow motion.

Table 2: Details of the study patient's groups.

	Surgically treated patients G1		Conservatively treated patients G2	
	Number of patients	**Percentage**	**Number of patients**	**Percentage**
Number of patients	30	50%	30	50%
Gender: Male	24	80%	22	73.34%
Gender: Female	6	20%	8	26.66%
Hard worker	22	73.33%	18	60%
Light worker	8	26.67 %	12	40%
Relation to sport	4	13.33%	5	16.66%
Age Average	42.43 years		73.56 years	

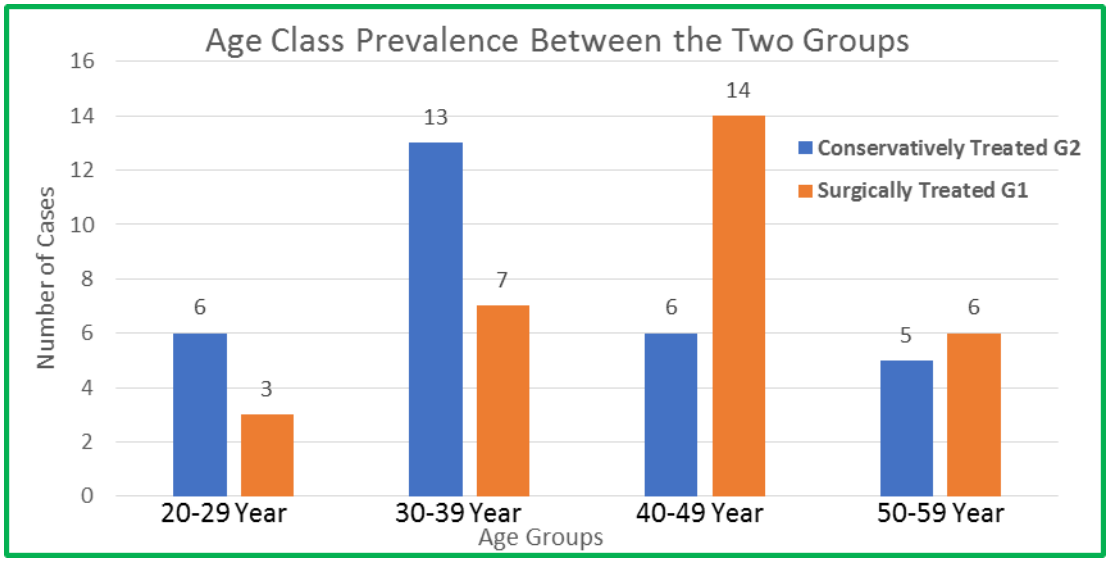

Figure 9: Age class prevalence between the two groups.

Our study showed that 26 (86.66%) cases have had excellent and good results at two months period of follow up 28 (93.34%) of the cases have excellent and good results at 4 months period after surgery, at six months follow up 27 (90%) of the cases treated surgically have had excellent and good results (Table 3). Regarding elbow range of motion, all patients showed improvement at two, four and six months of treatment post operatively. No major complication occurred after surgery. More specifically, there were no cases of complex regional pain syndrome or restriction in the range of motion of the elbow. Two patients (6.66%) developed a mild to moderate hematoma on the lateral and dorsal aspect of the elbow. There was no need for treatment and it resulted in no infection or restriction in range of movement. One patient (3.33%) in the surgically treated patient developed infection post operatively and was treated by oral antibiotic (Co-Amoxiclav tab 1gm twice daily) for one week and recovered without any further consequences. All patients had a full range of motion at the elbow and all patients with excellent or good results returned to their former activities without any restriction. The scar was barely visible in most patients with no reports of loss of sensation or neuroma type pain around the scar.

Table 3: Patients with excellent and good result in G1 during follow-up.

	Time duration	Number of patients with excellent and good results	Percentage of patients with excellent and good results
Surgically treated patients G1	2 Months	26	86.667 %
	4 Months	28	93.334 %
	6 Months	27	90 %

Regarding G2, 22 (73.34%) cases were males and eight (26.66%) cases were females, the age range was 73.566 (± 9.936) years. Our results showed 18 (60%) of the cases were hard workers, while 12 (40%) of them in G2 were light workers. Five (16.66%) of the cases in G2 were related to sports and games that involve repetitive elbow movement. In G2 our results shows that 20 (66.67%) of the patients have had excellent and good results at two months which rose to 26 (86.66%) at four months, at six months follow up 25 (83.33%) of the patients have had excellent and good results (Table 4).

Table 4: Patients with excellent and good result in G2 during follow-up.

Conservatively treated patients G2	**Time duration**	**Number of patients with excellent and good results**	**Percentage of patients with excellent and good results**
	2 Months	20	66.667 %
	4 Months	26	86.667 %
	6 Months	25	83.334 %

There was a statistically significant difference (p=0.0324) regarding the elbow extension between the two groups only at the six-month reevaluation when the G1 group exhibited better elbow extension. Statistically significant changes were observed within each group after the four-month reevaluation onwards. The G1 group exhibited a statistically significant improvement at the four-month reevaluation (p=0.0186) compared to two-month reevaluation and at the six-month reevaluation (p=0.0114) compared to the four-month reevaluation (Table 5).

Table 5: Elbow ROM in full flexion and full extension and forearm ROM in supination and pronation for both groups. Average measurements and typical deviation.

Group	Duration	Full Flexion (Degrees)	Full Extension (Degrees)	Supination (Degrees)	Pronation (Degrees)
Surgically treated patients G1	Pre-Operative	127 ± 4.9	10.2 ± 8.3	72.3 ± 9.7	85.1 ± 3.8
	1 Month Post operation	121.9 ± 8.3	8.1 ± 7.7	76.4 ± 10	87.8 ± 2.1
	2 Months Post operation	131.3 ± 5.6	6.8 ± 7.2	85.1 ± 3.8	88.5 ± 1.6
	4 Months Post operation	133.1 ± 2.5	3 ± 4.7	87.8 ± 2.1	88.8 ± 0.8
	6 Months Post operation	133.2 ± 2.3	0.6 ± 1.8	88.5 ± 1.6	88.9 ± 0.5
Conservatively treated patients G2	Pre-Treatment	127.7 ± 5.4	10 ± 8.4	72.4 ± 9.2	79.9 ± 7.1
	1 Month post treatment	121.6 ± 8.7	9.4 ± 8.4	75.9 ± 10	85.2 ± 3.6
	2 Months post treatment	131 ± 6	7.2 ± 7.3	79.9 ± 7.1	86.7 ± 3.1
	4 Months post treatment	132.9 ± 3	3.9 ± 4.8	85.2 ± 3.6	88 ± 1.8
	6 Months post treatment	133.3 ± 2	2 ± 3	86.7 ± 1	88.7 ± 1

Similarly, the G2 group presented a smaller than the G1 group but statistically significant improvement at the four-month reevaluation (p=0.0430) compared to the two-month reevaluation but at the six-month reevaluation (p=0.071) compared to the four-month reevaluation which was statistically not significant.

The G2 group presented statistically much better values of the ROM regarding supination from the two, month reevaluation onwards. More specifically, the G1 group presented statistically better ROM than the G2 group at the two months reevaluation (p=0.0001), the four month reevaluation (p=0.001) and the six month reevaluation (p=0.0012).

Within each group, the G1 group exhibited a statistically significant improvement (p=0.0065) even from the two month reevaluation compared to the one month reevaluation and this improvement continued to the next reevaluations.

On the contrary, the G2 group exhibited a statistically significant improvement only at the four month reevaluation (p=0.043) compared to the two month reevaluation, although this improvement was not statistically significant to the next reevaluations. Finally, the G1 group had much better results in the forearm ROM regarding pronation compared to the G2 group in all reevaluations. Initially, the G1 group exhibited statistically a much better ROM both at the one-month postoperative reevaluation (p=0.0012) and the two-month reevaluation (p=0.0065) compared to the G2 group. Although this difference decreased, it remained statistically significant and the G1 group exhibited a statistically significant improvement (p=0.03) at the four-month reevaluation compared to the G2 group, however, there was no statistically significant difference between the two groups at the six-month reevaluation. Within each group, the only statistically significant improvement in the ROM (p=0.0012) in the G1 group was observed at the one month reevaluation compared to the preoperative reevaluation, however, the G2 group exhibited statistically significant improvements at the one month reevaluation (p=0.0006) compared to pre-treatment evaluation, at the two month reevaluation (p=0.01) compared to the one month reevaluation, at the four month reevaluation (p=0.05) compared to the two month reevaluation and at the six-month reevaluation (p=0.0014) compared to the four month reevaluation. Our study revealed that five (8.333%) out of 60 patients demonstrated x-ray positive findings for lateral epicondylitis.

4. DISCUSSION

Lateral Epicondylitis is a syndrome which is characterized by localized pain on the lateral side of the elbow, sometimes pain can reflex down to the wrist. It affects mostly middle-aged men rather than women. “Tennis elbow” management is an issue which has greatly interested researchers and surgeons as to which treatment is the most effective. This study examined the percutaneous technique as a surgical treatment compared to the conservative treatment. Our study reveals that most of our patients that were affected by lateral epicondylitis were males. In the (G1) there were 24(80%) males, where as in (G2) there were 22 (73.34%) males, this goes in line with the studies conducted by Noteboom, Cruver R, Keller J, Kellogg B, Nitz AJ[36] that suggested that males compared to females do heavier manual work. Our study shows that in surgically treated patients G1, most of our patients fall in the age range of 42.433(± 8.23) years, where as in conservatively treated patients G2, the average age was 37.566(± 9.936) years. This revealed that most of our patients fall in the 5th decade of their life which goes with the study conducted by Dunkow PD[3] and Brattberg[37] respectively. Regarding G1, 22(73.33%) patients were hard worker and 8(26.67%) were light workers. Where as in G2, 18 (60%) of patients were hard worker, while 12 (40%) were light workers. This revealed that lateral epicondylitis or tennis elbow mostly affect patients who are doing heavy manual work this goes with the study conducted by Kivi.[38] Our study shows that 5 (8.33%) of the 60 patients were having x-ray findings suggestive of lateral epicondylitis, this agrees with the study conducted by Konstantine B.[39] According to Verhaar scoring system,[33] in G1 the result of the surgical procedure were excellent - good in 27(90%) of our patients at six months follow up period, where as in G2 the good to excellent result were obtained in 25(83.333%) of the patients at six months follow up, this

goes in line with the study conducted by Konstantine B[39] and Nazar M et al.[34]

Regarding range of motion of the elbow there was a significant difference regarding the elbow extension between the two groups only at the six-month reevaluation when the G1 group exhibited better elbow extension. Statistically significant changes were observed within each group after the four-month re-evaluation onwards. The G1 group exhibited a significant improvement at the four-month re-evaluation compared to the two months reevaluation and at the six-month re-evaluation compared to the four months reevaluation. Similarly, the G2 group presented a smaller than the G1 group but statistically significant improvement in every re-evaluation period compared to the previous visit at two; four and six months follow up. The G1 group presented statistically much better values of the range of motion regarding supination from the two-month re-evaluation onwards. More specifically, the G1 group presented statistically better ROM than the G2 group at the two-month re-evaluation, the four-month re-evaluation and the six-month re-evaluation. Within each group, the G1 group exhibited a statistically significant improvement even from the two-month re-evaluation compared to the one-month re-evaluation and this improvement continued to the next re-evaluations. On the contrary, the G2 group exhibited a significant improvement only at the four-month reevaluation. The G1 group had much better results in the forearm range of motion regarding pronation compared to the G2 group in all re- valuations visits at two, four and six months, although this difference decreased over each visit, but it remained statistically significant, however, there was no statistically significant difference between the two groups at the six month re-evaluation, these results agree the study conducted by Konstantine B.[39] Two patients (6.66%) developed hematoma on the lateral and dorsal aspect of the elbow which need nothing but follow up and recovered without any consequence. This agrees with the study conducted by Nazar M et al.[34] Finally one patient (3.333%) in the surgical group developed infection which was treated by oral antibiotic for one week and recovered without any further consequences. This rate of infection has not been observed in the study conducted by Konstantine B.[39] where there was no post-operative infection, which may be due to poor sterilization technique.

5. CONCLUSION

The excellent and good results according to Verhaar scoring system and elbow range of motion in conservatively treated patient G2 was obtained in 20 (66.67%) patients, while in surgically treated patient G1, the excellent and good result was obtained in 26 (86.66%) patients which indicate that surgery have a superior result over conservative treatment with no major consequences.

Recommendation

Most patients with lateral epicondylitis respond to conservative treatment. In resistant cases, percutaneous release of the common extensor origin can provide very good results. It is safe, simple and patient friendly method with no major complications.

REFERENCES

1. Runge F. Zur genese und behandlung des schreibe kranfes, Bed Klin Worchenschr, 1873; 10: 245–8.
2. Morris H. The rider's sprain. Lancet, 1882; 2:133–4.
3. Dunkow PD, Jatti M, Muddu BN. A comparison of open and percutaneous techniques in the surgical treatment of tennis elbow. J Bone Joint Surg Br, 2004; 86(5): 701-4.
4. Wittenberg RH, Schaal S, Muhr G. Surgical treatment of persistent elbow epicondylitis. Clin Orthop, 1992; 278: 73-80.
5. Matthew D M, Hart J, Miller M. Sport Medicine. In: Miller M, Thompson S, Hart J, ed. by. Review of orthopedics. 6th ed. Philadelphia: Saunders, 2012; 335.
6. Coonrad RW, Hooper WR. Tennis elbow: its course, natural history, conservative and surgical management. J Bone Joint Surg. Am, 1973; 55: 1177-82.
7. Doran A, Gresham GA, Rushton N, Watson C. Tennis elbow: a clinicopathologic study of 22 cases followed for 2 years. Acta Orthop Scand, 1990; 61: 535–8.
8. 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.
9. Miller III R, Azar F, Throckmorton T. Shoulder and elbow injuries. In: CANALE S, BEATY J, ed. by. Campbell's operative orthopedics. 12th ed. Philadelphia: Mosby, 2013; 224: 1-5.
10. Wheelessonline.com. Tennis Elbow - Lateral Epicondylitis - Wheeless' Textbook of Orthopaedics [Internet]. 2016 [cited 19 January 2016]. Available from: http://www.wheelessonline.com/ortho/tennis_elbow_lateral_epicondylitis
11. Clarke AW, Ahmad M, Curtis M, Connell DA. Lateral elbow tendinopathy: correlation of ultrasound findings with pain and functional disability. Am J Sports Med., 2010; 38: 1209.
12. Coel M, Yamada CY, Ko J. MR imaging of patients with lateral epicondylitis of the elbow (tennis elbow): importance of increased signal of the anconeus muscle. Am J Roentgenol, 1993; 161: 1019–21.
13. Miller TT, Shapiro MA, Schultz E, Kalish PE. Comparison of sonography and MRI for diagnosing epicondylitis. J Clin Ultrasound, 2002; 30: 193–202.
14. Chung B, Wiley JP. Effectiveness of extracorporeal shock wave therapy in the treatment of previously untreated lateral epicondylitis: a randomized controlled trial. Am J Sports Med, 2005; 33: 461.

15. Edwards SG, Calandruccio JH: Autologous blood injections for refractory lateral epicondylitis. J Hand Surg, 2003; 28: 272.
16. Ahmad Z, Howard D, Brooks RA. The role of platelet rich plasma in musculoskeletal science. JRSM Short Rep., 2012; 3: 40.
17. Gosens T, Peerbooms JC, van Laar W, den Oudsten BL: Ongoing positive effect of platelet-rich plasma versus corticosteroid injection in lateral epicondylitis: a double-blind randomized controlled trial with 2- year follow-up. Am J Sports Med, 2011; 39: 1200.
18. 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, randomize. controlled multicenter study. J Hand Surg Am, 2011; 36: 1269–72.
19. Trinh KV, Phillips SD, Ho E, Damsma K. Acupuncture for the alleviation of lateral epicondyle pain: a systematic review. Rheumatology, 2004; 43: 1085–90.
20. Wong SM, Hui AC, Tong PY. Treatment of lateral epicondylitis with botulinum toxin: a randomized, double-blind, placebo controlled trial. Ann Intern Med, 2005; 143: 793–97.
21. Lin CL, Lee JS, Su WR. Clinical and ultrasonographic results of ultrasonographically guided percutaneous radiofrequency lesioning in the treatment of recalcitrant lateral epicondylitis. Am J Sports Med, 2011; 39: 2429–35.
22. Buchbinder R, Johnston RV, Barnsley L, Assendelft WJ, Bell SN, Smidt N. Surgery for lateral elbow pain. Cochrane Database Syst Rev., 2011; (3): CD003525.
23. Araghi A, Celli A, Adams R, Morrey B. The outcome of examination (manipulation) under anesthesia on the stiff elbow after surgical contracture release. J Shoulder Elbow Surg, 2010; 19: 202.
24. Boyd HB, McLeod AC. Tennis elbow. J Bone Joint Surg Am, 1973; 55: 1183-7.
25. Posch JN, Goldberg VM, Larrey R. Extensor fasciotomy for tennis elbow: a longterm follow-up study. Clin Orthop, 1978; 135: 179-82.
26. Owens BD, Murphy KP, Kuklo TR. Arthroscopic release for lateral epicondylitis. Arthroscopy, 2001; 17: 582–587.
27. Darlis NA, Kaufmann RW, Sotereanos DG. Open surgical treatment of posttraumatic elbow contractures in adolescent patients. J Shoulder Elbow Surg, 2006; 15: 709.
28. Baumgard SH, Schwartz DR. Percutaneous release of the epicondylar muscles for humeral epicondylitis. Am J Sports Med, 1982; 10: 233-6.
29. Ahmad Z, Siddiqui N, Malik SS, Abdus-Samee M, Tytherleigh-Strong G. Instructional review: shoulder and elbow lateral epicondylitis. Bone Joint J., 2013; 95: 1158-64.
30. Coonrad RW, Hooper WR. Tennis elbow: its course, natural history, conservative and surgical management. J Bone Joint Surg Am, 1973; 55: 1177-82.
31. Yerger B, Turner T. Percutaneous extensor tenotomy for lateral epicondylitis. An office procedure. Orthopedics, 1985; 10: 1261-63.
32. Powell SG. Burke AL. Surgical and therapeutic management of tennis elbow: An update. J Hand Ther, 1991; 4: 64-8.
33. Verhaar J, Walenkamp G, Kester A. Lateral extensor release for tennis elbow. J Bone Joint Surg Am 1993; 75: 1034–43.
34. Nazar M, Lipscombe S, Morapudi S, Tuvo G, Kebrle R, Marlow W et al. Percutaneous tennis elbow release under local anaesthesia. Open Orthop J., 2012; 6: 129–32.
35. Bisset L, Smidt N, Van der Windt DA, Bouter LM, Jull G, Brooks P, Vicenzino B. Conservative treatments for tennis elbow-do subgroups of patients respond differently?. Rheumatology (Oxford), 2007; 46: 1601-5.
36. Noteboom, Cruver R, Keller J, Kellogg B, Nitz AJ. Tennis Elbow: A Review. J Orthop Sports Phys Ther, 1994; 19: 357-66.
37. Brattberg G. Acupuncture therapy for tennis elbow. Pain, 1983; 16: 285-8.
38. Kivi P. The etiology and conservative treatment of humeral epicondylitis. Scand J Rehabil Med, 1983; 15: 37-41.
39. Konstantine B. Percutaneous surgical technique for persistent tennis elbow: a comparative study. J Surg, 2013; 1(1): 6.