Original Research Article

OUTCOME OF PERCUTANEOUS RELEASE OF THE COMMON EXTENSOR ORIGIN FOR TENNIS ELBOW

Abstract

Introduction

Tennis elbow occurs due to overexertion of the extremity with repetitive wrist extension and alternating forearm pronation/supination and occurs in 1 to 3% population. Surgical procedures are available like open, percutaneous and arthroscopic common extensor tendon release. Among them percutaneous release is a safe and simple surgical procedure with good-to-excellent results.

Material and methods

A prospective observational study was conducted in 50 patients at National Medical college and Teaching Hospital, Birganj, Nepal for one year duration among age 30 to 60 years with more than 6 months duration of pain and one dose previous steroid injection. Informed consent was taken before procedure. Percutaneous release was performed using 10ml of 2% lignocaine for local anesthesia and 18G needle for tenotomy in minor operation theatre. The patients were assessed by using quick DASH score.

Results

Out of 50 patients mean age was 43.50 ± 8.187 years, 31(62%) were female and right side 31(62%) was commonly affected. Mean duration of pain was 9.98 ± 4.359 months. All of the patients had taken treatment previously. The post operative outcome was excellent 48(96%) to good in 2(4%) patients. Mean quick DASH score Preoperative was 63.84 ± 4.87 (range 45.45 to 79.45), at 6 weeks follow up was 10.67 ± 7 .68 (range from 2.27 to 34.09) and at 6 months follow up was 5.86 ± 3.34 (range0.00 to 13.63). There was significant correlation between Quick DASH score at preoperative period and at six weeks follow up (r = .309, P = 0.03) and at six months follow up (r = .555, P < 0.000). No complication was reported. All the patients returned to their normal jobs and activities.

Conclusion: - The study concluded that percutaneous release of the common extensor origin for tennis elbow is effective treatment for tennis elbow with least complications.

Key Words: - Tennis Elbow, Percutaneous extensor tendon release, Quick DASH score

1. Introduction

Lateral epicondylitis, commonly known as ‘tennis elbow’, is an orthopedic condition affecting 1% to 3% of the general population, mostly over 40 years of age and with equal gender distribution.[1,2] It was first described in 1873 by Runge.[3]In his extensive study of lateral epicondylitis, Goldie attributed the onset of symptoms to overexertion of the extremity with repetitive wrist extension and alternating forearm pronation/supination.[4] Recent investigation identified as risk factors a history of manual labor with heavy tools and significant strain while performing repetitive tasks.[5]

Pathophysiology of lateral epicondylitis has no consensus, but the most common anatomic site of origin is known to be the Extensor carpi radialis brevis(ECRB), even though the annular ligament, lateral capsule, radial nerve, and extensor digitorum communis are associated as causative factors in lateral epicondylitis.[6] Degenerative tendinopathy is usually the outcome of microtrauma at the origin of the extensor tendon due to repetitive wrist extension and alternating forearm rotation by excessive use and stress. Tendon injuries in lateral epicondylitis share common histologic findings, characterized by ‘angiofibroblastic hyperplasia’, showing a disorganized mix of immature collagen fibers with fibroblastic and vascular components. [7] In addition, various microscopic studies on tissues of lateral epicondylitis have revealed that histologic features were a consequence of failure in reparative responses in Extensor carpi radialis brevis ECRB), rather than a result of an inflammatory process.[8]

The most frequent complaint described by patients with lateral epicondylitis is pain at the lateral aspect of elbow, often associated with radiating pain down the forearm.[9]

The pain is characteristically sharp and aggravated during wrist extension or forearm supination and pronation. Patients usually experience an insidious onset of pain at the anterior border of the lateral epicondyle, which may gradually develop into weakness; however, the symptoms in lateral epicondylitis vary from an occasional ache over the bony prominence of lateral epicondyle to recalcitrant debilitating sharp pain.[10]

On examination, pain may be exacerbated by resisted wrist extension in the pronated position. It is worse with the elbow at full extension. The range of motion of the wrist and elbow is usually complete.[11]

Currently available treatment methods include acupuncture, ultrasonography, steroid injections, counterforce bracing, stretching exercises and cross frictional massaging. Most of these treatment modalities have no scientific basis. The most successful non-operative treatment consists of avoidance of overuse counterforce bracing to relieve the insertion of the extensor tendons, steroid injection into the affected area and stretching exercises. Operative treatment is reserved for those who experience chronic symptoms of more than several months duration.[12] Various operative techniques including open, percutaneous and arthroscopic techniques have been described.[13] One of them is percutaneous release of the common extensor origin at the elbow. Many authors have now published their results of releasing the common extensor origin percutaneously using either the surgical blade or the hypodermic needle under general anesthesia. [14,15,16] It is a simple operation with minimal morbidity and good-to-excellent results in most of the studies.

Nepal is an underdeveloped country where most of the population depends on agriculture for their daily living and Birganj being an industrial area, majority of people work here as labour or farmer. Most of the activities are done manually as people couldn't afford machineries because of their economic status. Repeated manual activities and stressful heavy lifting results in lateral epicondylitis or tennis elbow. Percutaneous common extensor release for tennis elbow is surgical procedure done in minor operation theatre as a day care surgery. There are few studies conducted in our setting to study outcome of this procedure. So, the aim of this study is to evaluate the outcome of percutaneous release of common extensor origin for the treatment of tennis elbow.

2. Materials and methods

A prospective observational study was conducted at National Medical college and Teaching Hospital, Birganj, Nepal from 7th January 2021 to 6th January 2022 for one year duration. This Hospital is a tertiary care institute, which is situated in Industrial area Birganj, where majority of population are labour and farmers and females are homemakers. Total 50 patients were enrolled in the study. Purposive sampling technique was used.

2.1 Inclusion Criteria

- Age above 30 years of age and less than 60 years of age
- Pain for six months duration not responding to medical treatment and one dose of steroid injection.
- Patients who were fit to undergo surgical procedure.
- Patients who gave consent for the study.

2.2 Exclusion criteria

- Age less than 30 years and more than 60 years of age.
- Acute pain.
- Calcification on lateral epicondyle on X-ray
- Patients who were not willing and medically unfit for surgery.

Ethical clearance was taken from the Institutional Review Committee of National Medical College and after obtaining the informed consent of the patient, prospective observational study was conducted. All the patients in the inclusion criteria were enrolled in this study. Patient's attendants were explained about the nature of disease and its possible complications and the need for surgery. Written informed consent was obtained before performing the procedure.

The diagnosis of tennis elbow was made on the consistent signs of tenderness directly over the lateral epicondyle, pain over the lateral epicondyle on an extension of the wrist against resistance and "handshake sign," where the patient with tennis elbow experiences pain in the lateral epicondyle on the handshake.

2.3 Technique

All the procedures were performed by the author in the orthopedics outpatient department minor procedure room. The technique for the procedure is described below:

1. With the patient seated comfortably on a chair and the forearm resting passively on an examination couch by the side, the elbow was flexed to 90 degrees and the wrist passively flexed to around 60 degrees.

2. After preparing the entire aspect of the lateral elbow with Betadine solution, 10 ml of two percent lignocaine (local anesthetic) was infiltrated by a 30 G needle around the entire common extensor origin.

3. After the local anesthetic had taken effect, an 18 G needle was introduced through the skin, and the bevel of the needle was used to divide the extensor origin at the site of maximum tenderness. The radial nerve was protected by staying within the extensor origin.

4.The needle puncture site was sealed using a Band-Aid, and a tennis elbow brace was applied. Postoperatively, 1 g of paracetamol tablet was given four times a day for few days. The tennis elbow brace was discarded after the pain resolved, and normal activity of the limb was resumed as quickly as possible.

Figure 1. Image showing painting and draping of the lateral epicondyle

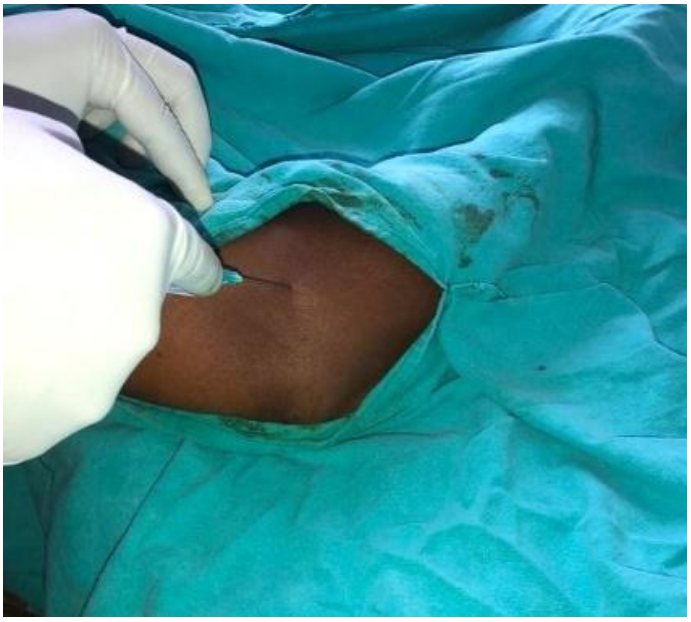

Figure 2. **10 ml of two percent lidocaine inserted over the lateral epicondyle at maximum tenderness**

Figure 3. **Percutaneous release with an 18 G needle**

Quick DASH scoring was used to assess the outcome of percutaneous release of common extensor origin for the treatment of tennis elbow. Quick DASH is shortened version of DASH questionnaire that uses it items to measure the degree of difficulty in performing various physical activities/disabilities due to shoulder, arm and hand pain. The Quick DASH is scored in two components: the disability/symptom section (11 items, scored 1-5) and the optional high-performance sport/music or work modules (4 items, scored 1-5). At least 10 of the 11 items must be completed for a score to be calculated. The assigned values for all completed responses are simply summed and

averaged, producing a score out of five. This value is then transformed to a score out of 100 by subtracting one and multiplying by 25. This transformation is done to make the score easier to compare to other measures scaled on a 0-100 scale. A higher score indicates greater disability. DASH is calculated by using formulae = [(sum of n responses/n)-1) *25], where n is equal to the number of completed responses.

The score of quick DASH was rated according to Philip et al. as excellent < 20 points, good 20 to 39 points, fair 40 to 60 points and poor > 60 points.[21]

Patient was followed up at 2nd week, 6th week ,3rd month and 6th month. All data were processed, analyzed, and disseminated by MS Office and Statistical package for social sciences (SPSS) version 25. Descriptive statistics (Frequency, Percentage, Mean, Standard Deviation) and inferential statistics (Correlation) was used.

3.Results

The age of the 50 patients ranged from 30 - 59 years. The mean age of the patients was 43.50 ± 8.187 years. Out of 50 patients, about two third 31(62%) were female and one third 19(38%) were male. Regarding educational level, equal number of patients 18(36%) were illiterate and were educated secondary and above, 17(34%) were educated up to secondary level and 6(12%) were educated up to primary level. Most of the participants 17(34%) were homemaker, 13(26%) were farmer, 9(18%) was labour followed by clerk 3(6%), teacher 3(6%), carpenter 2(4%) and others 3(6%). More than half 29(58%) of the patients resided in rural area and remaining 21(42%) resided in urban area.

Majority of the patient's dominant side that is right side 31(62%) was affected and left side tennis elbow was present in 18(36%) patients whereas in 1 patient (2%) bilateral involvement was found. Duration of pain ranged from 6 months to 36 months, mean duration was 9.98 ± 4.359 months. All of the patients had taken treatment previously.

Table 1. Distribution of Comorbidities among Patients

n=50

Comorbidities	Frequency	Percentage
No comorbidities	34	68
Diabetes Mellitus	8	16
Hypothyroidism	3	6
Hypertension	3	6

Rheumatoid Arthritis	2	4
Total	50	100

The range of Intraoperative duration was 3 to 5 minutes with mean 4.12 ± .799 minutes. Blood loss was found to be minimal i.e., 1 to 3 ml. Out of 50 patients, only one patient developed hematoma.

The score of quick DASH was rated according to Philip et al as excellent < 20 points, good 20 to 39 points, fair 40 to 60 points and poor > 60 points. Quick DASH score at preoperative period was poor in majority 46(92%) patients and fair in 4(8%) patients. The score at 6 months follow up was excellent 48(96%) to good in 2(4%) patients.

Table 2. Distribution of Patients According to Quick DASH Score at Preoperative Period, at Six Weeks and at Six Months. (n=50)

	Rating	Frequency	Percentage
Quick DASH score at preoperative period	Excellent	0	0
	Good	0	0
	Fair	4	8
	Poor	46	92
Quick DASH score at six weeks	Excellent	46	92
	Good	4	8
	Fair	0	0
	Poor	0	0
Quick DASH score at six months	Excellent	48	96
	Good	2	4
	Fair	0	0
	Poor	0	0

Mean of Preoperative quick DASH score was 63.84 ± 4.87 with range from 45.45 to 79.45. Mean value of quick DASH scoring done at 6 weeks follow up was 10.67 ± 7.68 and score ranged from 2.27 to 34.09. The quick DASH scoring done at 6 months follow up was 5.86 ± 3.34 and score ranged from 0.00 to 13.63.

Table 3. Correlation of Quick DASH Score at Preoperative Period and Follow up at Six Weeks and Six Months

n=50

	Mean ± S.D.	r value	*P* value
Quick Dash at preoperative period	63.84 ± 4.87		
Quick Dash at 6 weeks	10.67 ± 7.68	.309	0.029
Quick Dash at 6 months	5.86 ± 3.34	.555	0.000

P value significant < 0.05

There was significant correlation between Quick DASH score at preoperative period and at six weeks follow up (r = .309, *P* = 0.03) and at six months follow up (r = .555, *P* < 0.000).

Discussion

Biomechanically Tennis elbow is result from overuse of the extensor carpi radialis brevis (ECRB) muscle by repetitive microtrauma resulting in a primary tendinosis of the ECRB, with or without involvement of the extensor digitorum communis (EDC). In tennis, the predominant activity of the wrist extensors in all strokes (serve, forehand and one- and two-handed backhand) might be one explanation for predisposition to the condition. It is believed that tennis players using a twohanded backhand rarely develop tennis elbow as the nondominant arm appears to absorb more energy, which changes the mechanics of the swing. Electromyographic studies (EMG) showed reduced amplitudes in the extensor muscles during a two-handed backhand stroke. In addition, the decreased incidence of tennis elbow in players using a two-handed backhand might not only be caused by decreased extensor activity, but also by factors associated with faulty stroke mechanics, which are more often seen with the one-handed technique.[22]

According to the current literature, tennis elbow is treated successfully by non-operative measures in more than 90% of cases and in resistant cases a surgical treatment is available [23]. Several surgical options are available. Nirschl suggests that 85 to 90% of cases can have symptomatic relief following any of a number of surgical options.[24]

Percutaneous release of the origin of the common extensor tendons was proposed by Loose in 1962 at the Hawkeye Sport Medicine Symposium, Iowa.[25] No articles were published following this presentation. Baumgard reported 35 cases of percutaneous release of tennis elbow in which an excellent result was achieved in 32 cases, while 3 cases were unsatisfactory.[16] The surgical technique that was proposed is similar to our surgical technique.

In our study, majority of the patient's dominant side that is right side 31(62%) was affected and left side tennis elbow was present in 18(36%) patients whereas 1 patient (2%) bilateral involvement was found. Similar results were seen in study done in Turkey by Seyhmus Yigit in which twenty-six right elbows and fifteen left elbows were treated surgically. Dominate elbow rate was 74%. [26] Similarly, study results from Panthi et al showed the right side was involved in 37 patients (74%) and the left side in 13 patients (26%).[17] The study findings revealed that the duration of pain ranged from 6 months to 36 months, mean duration was 9.98 ± 4.359 months. In contrast, study by Solheim et al reported that increased duration of symptoms i.e., the median duration of symptoms was 13 months (range, 6 – 72 months). [21]

Study findings reported out of 50 patients, complication was found in one patient who had hematoma. Similar type of complications was observed in study by Solheim et al in which superficial wound problem/ infection was seen in three patients, and a postoperative hematoma was evacuated in one patient.[21] The study findings by Nazar et al revealed that one patient developed a wide hematoma on the lateral and dorsal aspect of the elbow, which extended into the proximal forearm. There was no need for treatment and it resulted in no infection or restriction in range of movement.[18]

The study findings showed mean of preoperative quick DASH score was 63.84 ± 4.87 which was slightly higher than study findings by Solheim et al in which score at preoperative period was 61 ± 16.[21] Mean value of quick DASH scoring done at 6 weeks follow up was 10.67 ± 7.68, which was slightly higher than study by Nazar et al in which the mean post-op DASH score was 8.47 (range 0 to 42.9).[18] There was significant correlation between Quick DASH score at preoperative period and at six weeks follow up (r = .309, $P = 0.03$) and at six months follow up (r = .555, $P < 0.000$) similar results were found in study by Solheim et al in which a moderate correlation between the short-term and the medium-term results for the quick DASH (r = 0.691; P \ 0.001) and study results showed a weak correlation between the quick DASH at the final follow-up (a high value denotes residual symptoms) and baseline quick DASH (r = 0.388; P \ 0.001).[21]

Conclusion:

The study concluded that percutaneous release of the common extensor origin for tennis elbow is effective treatment for tennis elbow with least complications. The post operative outcome was good to excellent in most of the patients.

Ethical approval and consent:

Ethical clearance was obtained from Institutional review committee of National medical college and teaching hospital, Birgunj, Nepal. Ethical approval was obtained on 11th

January 2021(Ref. F-NMC/513/077-078). Written consent was obtained from all the patients after explaining the detail of entire research protocol.

References

1. Pierce TP, Issa K, Gilbert BT, et al. A systematic review of tennis elbow surgery: open versus arthroscopic versus percutaneous release of the common extensor origin. Arthroscopy. 2017;33(6):1260-8. doi: 10.1016/j.arthro.2017.01.042.
2. Riff AJ, Saltzman BM, Cvetanovich. G, Frank JM, Hemu MR, Wysocki RW. Open vs percutaneous vs arthroscopic surgical treatment of lateral epicondylitis: an updated systematic review. Am J Orthop (Belle Mead NJ). 2018;47(6). doi: 10.12788/ajo.2018.0043.
3. Wittenberg RH, Schaal S, Muhr G: Surgical treatment of persistent elbow epicondylitis. Clin Orthop Relat Res. 1992, 278:73–80
4. Goldie I: Epicondylitis lateralis humeri (epicondylalgia or tennis elbow): A pathogenetical study. Acta Chir Scand Suppl 1964;57(suppl 339):1+.
5. Haahr JP, Andersen JH: Physical and psychosocial risk factors for lateral epicondylitis: A population based case-referent study. Occup Environ Med. 2003;60:322-329
6. Savoie FH 3rd, O'Brien MJ. Arthroscopic tennis elbow release. Instr Course Lect. 2015;64:225-30.
7. Burn MB, Mitchell RJ, Liberman SR, Lintner DM, Harris JD, McCulloch PC. Open, arthroscopic, and percutaneous surgical treatment of lateral epicondylitis: a systematic review. Hand. 2018 May;13(3):264-74.
8. Chen J, Wang A, Xu J, Zheng M. In chronic lateral epicondylitis, apoptosis and autophagic cell death occur in the extensor carpi radialis brevis tendon. J Shoulder Elbow Surg. 2010;19(3):355-62. doi: 10.1016/j.jse.2009.07.064
9. Brummel J, Baker CL 3rd, Hopkins R, Baker CL Jr. Epicondylitis: lateral. Sports Med Arthrosc Rev. 2014;22(3)1-6. doi: 10.1097/JSA.0000000000000024.
10. Dong W, Goost H, Lin XB, et al. Injection therapies for lateral epicondylalgia: a systematic review and Bayesian network meta-analysis. Br J Sports Med. 2016;50(15):900-8. doi: 10.1136/bjsports-2014-094387
11. Nirschl RP, Pettrone FA: Tennis elbow. The surgical treatment of lateral epicondylitis . J Bone Joint Surg Am. 1979, 61(6A):832–9
12. Boyd HB, McLeod AC Jr. Tennis elbow. J Bone Joint Surg Am 1973; 55(6): 1183-7
13. Lo MY, Safran MR: Surgical treatment of lateral epicondylitis: a systematic review. Clin Orthop Relat Res 2007;463:98-106.
14. Dunkow PD, Jatti M, Muddu BN: A comparison of open and percutaneous techniques in the surgical treatment of tennis elbow. J Bone Surg (Br). 2004;86:701-4. 10.1302/0301- 620X.86B5.14469
15. Yerger B, Turner T: Percutaneous extensor tenotomy for chronic tennis elbow: an office procedure. Orthopaedics. 1985,8:1261-3.
16. Baumgard SH, Schwartz DR: Percutaneous release of the epicondylar muscles for humeral epicondylitis. Am J Sports Med. 1982;10:233-6.

17. Panthi S, Khatri K, Kharel K, et al.Outcome of Percutaneous Release of Tennis Elbow: A Non-Randomized Controlled Trial Study. Cureus 2017;Jan;9(1): e952. DOI 10.7759/cureus.95.
18. M.A. Nazar, S. Lipscombe, S. Morapudi, G. Tuvo, R. Kebrle, W. Marlow and M. Waseem Percutaneous Tennis Elbow Release Under Local Anaesthesia the Open Orthopaedics Journal, 2012; 6: 129-132.
19. Verhaar J, Walenkamp G, Kester A, van Mameren H, van der Linden T. Lateral extensor release for tennis elbow. A prospective long-term follow-up study. J Bone Joint Surg Am. 1993 Jul;75(7):1034-43. doi: 10.2106/00004623-199307000-00010. PMID: 8335663.
20. Solheim E, Hegna J, Oyen J. Extensor tendon release in tennis elbow: results and prognostic factors in 80 elbows. Knee Surg Sports Traumatol Arthrosc. 2011 Jun;19(6):1023-7. doi: 10.1007/s00167-011-1477-1.
21. Phillips NJ, Ali A, Stanley D.Treatment of primary degenerative arthritis of the elbow by ulnohumeral arthroplasty. A long-term follow-up. J Bone Joint Surg Br 2003; 85:347–350
22. De Smedt T, de Jong A, Van Lemur W, Lieven D, Van Gabbed F. Lateral epicondylitis in tennis: update on aetiologia, biomechanics, and treatment. Br J Sports Med. 2007; 41:816–819.
23. Coonrad RW, Hooper WR. Tennis elbows its course natural history conservative and surgical management. J Bone Joint Surg Am. 1973;55(6):1177–82.
24. Nirschl RP. Muscle and tendon trauma: Tennis elbow. In: Morrey BF, editor. The elbow and its disorders. Philadelphia: WB Saunders; 1985. pp. 481–96.
25. Loose R. Tennis elbow: Twenty years experience. Presented at the Hawkeye Sports Medicine Symposium Iowa City Iowa. 1984. pp. 5–7.
26. Seyhmus Yigit. Medium-term results after treatment of percutaneous tennis elbow release under local anaesthesia Acta Biomed 2020;91(2):305-309.