Functional outcome assessment after open tennis elbow release: what are the predictor parameters?

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ABSTRACT

Introduction: Open surgical release remains the gold standard for treatment of recalcitrant lateral epicondylitis (tennis elbow). We aimed to evaluate the potential impact of perioperative factors on outcome after open surgical release for tennis elbow.

Methods: All patients without elbow dislocation who underwent open surgical release for tennis elbow from January 2000 to June 2006 were included in the study. Comorbidities and associated pathologies of the upper limb as well as postoperative pain score, range of motion, evidence of instability, recurrence and other complications were noted.

Results: There were 37 female and 24 male patients aged 22–60 (44.95 +/− 7.34) years. Five (8.1 percent) patients had diabetes mellitus. The mean duration of symptoms before surgery was 16.8 +/− 15.3 (range 2–84) months. The average duration of follow-up was 23.0 +/− 34.5(range 0.4–206) months. Overall, 59 (96.7 percent) patients reported improvement of symptoms post surgery. Median grip strength on the operated and unoperated sides were 25.5 +/− 9.0 (range 10.5–44.0) KgN and 23.7 +/− 9.1 (range 9.3–41.5) KgN, respectively. Patients with diabetes mellitus had significantly higher pain scores (2.80 versus 0.36, p-value less than 0.01, 95 percent confidence interval [CI] 1.2–3.7), reduced grip strength (0.91 KgN versus 1.06 KgN, p-value is 0.038, 95 percent CI 0.29–0.01) and higher recurrence rates (40 percent versus 7.7 percent, p-value is 0.018).

Conclusion: Diabetes mellitus has a negative effect on surgical outcome in terms of pain scores, grip strength ratio and recurrence rate. This should be reiterated during preoperative counselling.

INTRODUCTION

Tennis elbow or tendinosis of the extensor carpi radialis brevis is a common musculoskeletal disorder. Most of these conditions improve with nonoperative measures, such as physical therapy, forearm bracing and local steroid injections. 80% of patients' symptoms improve over a period of one year of nonoperative treatment.[1,2] Less than 10% require surgical intervention.[3]

Despite numerous papers reporting good to excellent outcomes with various techniques,[4-8] there is a paucity of data to determine if there were any perioperative factors that adversely affect postoperative outcome other than the presence of a posterolateral plica.[9-12] The aim of our paper was to evaluate the potential impact of preoperative factors on postoperative outcome after open surgical release for tennis elbow.

METHODS

This was a retrospective study. We reviewed the case records of all patients who underwent open surgical debridement from January 2000 to June 2006. The inclusion criterion was all patients who underwent open surgical release for lateral epicondylitis after failing a trial of conservative treatment of analgesia, activity modification and a physiotherapy protocol. Specifically, we studied factors which could affect surgical outcome. Comorbidities such as diabetes mellitus, rheumatoid arthritis and associated pathologies of the upper limb were noted. Other factors such as chronicity of symptoms were also noted. The exclusion criterion was patients who had acute trauma to the elbow or a history of elbow subluxation/dislocations, as these patients may have some degree of potential ligamentous instability and may thus be managed differently.

We performed the standard tennis elbow release for the patients. The lateral epicondyle was located. A

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Table I. Patient demographics, precipitating causes and associated pathologies (n = 61).

Variable	No. (%)
Gender	
Female	37 (60.7)
Male	24 (39.3)
Mean age ± SD; range	44.95 ± 7.36; 22–60
Race	
Chinese	39 (63.9)
Indian	16 (26.2)
Malay	5 (8.2)
Others	1 (1.6)
Comorbidities	
Diabetes mellitus	5 (8.2)
Rheumatoid arthritis	1 (1.6)
Associated pathologies	
Bilateral tennis elbow	22 (36.1)
Finger pathologies	8 (13.1)
Shoulder pathologies	7 (11.5)
Wrist pathologies	6 (9.8)
Golfer's elbow	2 (3.3)

gently curved incision was made centred over the lateral epicondyle. The deep fascia was identified, incised and retracted. The origin of the extensor carpi radialis brevis was identified and the abnormal-appearing tendon was debrided. We did not suture back the remaining tendon. Postoperatively, the patients followed a standard rehabilitation protocol.

Patients were recalled for assessment after surgery. The parameters assessed were pain score (based on the visual analogue scale), sagittal range of motion of the elbow, evidence of posterolateral instability (PLRI) based on the symptomatology of clicking, and clinical assessment using the elbow Lachman and pivot shift tests. Other complications of surgery were also noted.

Grip strengths of both the operated and unoperated hands were measured on a hand-held dynamometer (Jamar™, Bolingbrook, IL, USA), and the ratio of grip strength of the operated arm against the unoperated side was calculated. Grip strength was measured with the elbow at 90 degrees flexion and the forearm in mid-prone position. The patient was asked to grip the dynamometer and exert maximal strength when the reading was taken. Readings were taken three times and the average grip strength was taken. Recurrence was defined as pain of similar magnitude before surgery and clinical signs of pain on resistance to wrist extension in pronation and middle finger extension.

The Statistical Package for the Social Sciences version 11 (SPSS Inc, Chicago, IL, USA) was used for statistical analysis. The chi-square test was used to analyse recurrence, and the *t*-test was used to analyse differences in the grip strength against preoperative and surgical factors.

RESULTS

A total of 61 patients were studied, out of which 37 were female and 24 were male. The mean age of the patients was 44.95 ± 7.34 (range 22–60) years. Five (8.2%) patients had diabetes mellitus and one (1.6%) had rheumatoid arthritis. 36 (59.0%) patients had undergone operations of the dominant hand. The mean duration of symptoms prior to surgery was 16.8 ± 15.3 (range 2–84) months. 55 (88.2%) patients had symptoms for six months or more prior to surgery. Table I summarises the patient's demographics and associated pathologies.

The average duration of postoperative follow-up was 23.0 ± 34.5 (range 0.4–206) months. Overall, 59 (96.7%) patients reported improvement of symptoms post surgery and two (3.3%) reported no change in symptoms. In terms of pain scores on daily activities, 50 (82.0%) patients had a score of 0, while four (6.6%) had a score ≥ 5. The median grip strengths on the operated and unoperated sides were 25.5 ± 9.0 (range 10.5–44.0) KgN and 23.7 ± 9.1 (range 9.3–41.5) KgN, respectively. There were two cases each of infection (3.3%) and haematoma formation (3.3%), both of which did not require surgical intervention. Six (9.8%) cases of recurrence of tennis elbow and no cases of posterolateral instability were noted.

Patients with diabetes mellitus had significantly higher pain scores, with a mean pain score of 2.80, while patients without diabetes mellitus had a mean score of 0.36 ($p < 0.01$, Diff = 2.4, 95% confidence interval [CI] 1.2–3.7). One out of the five diabetic patients (20%) did not express any improvement of symptoms postoperatively, while 55 of the remaining 56 non-diabetic patients (98.2%) reported an improvement of symptoms postoperatively ($p < 0.01$). There was, however, no significant difference in the duration of postoperative pain among diabetic patients (0.7 months in diabetic patients vs. 0.8 months in non-diabetic patients).

Grip strength ratios were significantly reduced in patients with diabetes mellitus. They had a grip strength ratio of 0.91 (i.e. 91% of the unaffected side), while patients without diabetes mellitus had a grip strength ratio of 1.06 ($p = 0.038$, Diff = 0.15, 95% CI 0.29–0.01). Patients with diabetes mellitus did not have increased postoperative stiffness as compared to non-diabetic patients. They also had a significantly increased risk of recurrence ($p = 0.018$). Two out of the five patients with diabetes mellitus (40%) had recurrence when compared to four out of 52 non-diabetic patients (7.7%).

There was only one patient with rheumatoid arthritis, and thus a reasonable conclusion cannot be made. Patients with ipsilateral shoulder pathologies had a tendency to

Table II. Comparison of average pain and grip strength ratio.

Outcome parameter/variable	Mean score	p-value
Pain		
Gender		0.52
Male	0.71	
Female	0.46	
Diabetes mellitus		< 0.01
Yes	2.80	
No	0.36	
Shoulder pathology		0.05
Yes	1.57	
No	0.43	
Golfer's elbow		0.59
Yes	0	
No	0.58	
Wrist pathology		0.33
Yes	0	
No	0.62	
Finger pathology		0.71
Yes	0.38	
No	0.58	
Grip strength ratio		
Gender		0.62
Male	1.01	
Female	1.04	
Diabetes mellitus		0.038
Yes	0.91	
No	1.06	
Type of surgery		0.26
Simple release	1.04	
Bosworth procedure	0.96	

experience increased postoperative pain, with a mean pain score of 1.57, whereas patients without shoulder pathology had a mean score of 0.43 (p = 0.05, Diff = 1.2, 95% CI 0.01–2.3). However, there was no difference in grip strength, stiffness or recurrence in patients with ipsilateral shoulder pathologies. Pathologies of the wrist or fingers did not have any effect on the outcome parameters measured. Table II summarises the mean pain scores and grip strength ratios in patients of the different subgroups analysed.

DISCUSSION

According to the National Health Survey conducted in 2004, the prevalence of diabetes mellitus in Singapore is 8.2%, which is very similar to the prevalence of diabetes mellitus in our study population. The most significant finding of this paper is that diabetic patients do not fare as well as non-diabetic patients after open surgical release for lateral epicondylitis. This is the first paper, to our knowledge, to report this clinical correlation.

Diabetic patients have increased pain postoperatively, and a disproportionate number of them expressed no improvement of symptoms after surgery. Diabetic patients also have an increased risk of recurrence and a decreased

grip strength ratio (a difference of about 15% compared to non-diabetic patients). This may be due to poor tissue healing in these patients. Diabetic rat tendonitis models have shown that the number of accumulated neutrophils, macrophages and proliferative cells is decreased, as is the new vessel formation in the paratenon and core tendon of rats induced with diabetes mellitus.[13] This may result in poorer healing of the tendonitis even after debridement and release, and may result in persistence of symptoms or subsequent recurrence. Patients with diabetes mellitus may also have pre-existing neuropathy, which may result in poorer outcomes in this group of patients. Radial tunnel syndrome occasionally accompanies lateral epicondylitis, and although it usually causes numbness, pain may also be another manifestation of neuropathy.[14]

Patients with diabetes mellitus may need a longer trial of activity modification, physical therapy or symptomatic treatment before considering surgery. Prior to surgery, diabetic patients should be educated about the higher risk of postoperative pain, decreased grip strength and recurrence. There may be a potential role for arthroscopic surgery in patients with diabetes mellitus, as it causes less tissue damage compared to open surgery. However, this has to be validated through further studies.

Patients with ipsilateral shoulder pathologies, such as rotator cuff tendonitis, also have a tendency for increased postoperative pain. Patients with tennis elbow should be closely evaluated preoperatively so as to rule out shoulder pathologies. There was, however, no significant correlation between postoperative pain and other common upper limb pathologies, such as carpal tunnel syndrome or trigger fingers.

Overall, we have found open release of tennis elbow to be an effective operation that provides good pain relief, with more than 95% of our patients reporting an improvement of symptoms postoperatively. Open release is a safe operation; in our study, only four (6.6%) cases of minor complications of haematoma formation and infection were noted, both of which were easily treated with nonsurgical measures. The main limitation is the retrospective nature of this study. Another limitation is the small number of patients with diabetes mellitus compared to the large number of non-diabetic patients. A prospective study involving an equal number of diabetic and non-diabetic patients should be conducted in the future.

Open release of tennis elbow provides reliable symptomatic relief with no appreciable weakness or instability. Diabetes mellitus appears to have a negative effect on surgical outcome in terms of pain scores and grip strength ratio, and these issues should be reiterated

during preoperative counselling. Patients with lateral epicondylitis with ipsilateral shoulder pathologies should be properly worked up prior to surgery.

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