Lateral epicondylitis treatment by extensor carpi radialis fasciotomy and radial nerve decompression: Is outcome influenced by the occupational disease compensation aspect?

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\textbf{KEYWORDS}
Lateral epicondylitis; Tennis elbow; Radial tunnel syndrome; Fasciotomy; Occupational medicine

\textbf{Summary}

\textbf{Introduction}: The etiology, treatment, and patient management in cases of chronic epicondylitis, within the legislation on occupational disease, remain highly controversial.

\textbf{Hypothesis}: Recognition as an occupational disease has a negative influence on the functional result of epicondylitis treated with aponeurotomy and neurolysis of the motor branch of the radial nerve.

\textbf{Patients and methods}: Twenty-eight patients (30 cases of epicondylitis) were operated between January 2007 and January 2008. There were nine men and 19 women whose mean age was 46.1 years. A preoperative EMG found anomalies in the deep posterior interosseous nerve in all cases. Patients were divided into two groups: one group of patients recognized as having an occupational disease and a group of patients whose disease was not considered occupation-related.

\textbf{Results}: The patients were seen at follow-up at a mean 21.8 months. In the group of patients with occupational disease, there were six excellent, nine good, and five acceptable results; in the second group, there were six excellent, two good, and two acceptable results.

\textbf{Conclusion}: Recognition of epicondylitis as an occupational disease has a significant influence only on the time to pain relief and the result on strength.

\textbf{Level of evidence}: Level IV. Retrospective study.

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Introduction

Epicondylitis is a painful syndrome of the lateral side of the elbow expressed as pain in the origin of the extensor tendons of the wrist and fingers. Its incidence in the population is estimated at 1–2% [1]. Epicondylitis occurs particularly in two populations: in young patients consecutive to sports activity and in older patients consecutive to occupational activity.

The physiopathology of the epicondylians and its treatment have been the subject of considerable debate for more than a century. This tendinopathy is a disease of repetitive overuse of the extensor tendons of the wrist and fingers at their proximal insertion on the lateral epicondyle. Kraushaar and Nirschl [2] demonstrated that this was a degenerative process at the enthesis. With overuse, microtears are produced in the musculotendinous portion of the extensor radialis carpi brevis and to a lesser extent in the common extensor tendon of the fingers. This is a painful disease because of the contiguity of a number of nerve fibers stemming from the radial nerve. The microruptures in the extensor carpi radialis brevis tendon bring about stimulation of its nerve branches causing pain through the healing process. Local inflammatory phenomena of tendon microrupture healing can be responsible for neuropathy of the deep posterior interosseous nerve at the radial tunnel.

The objective of this study was to report the results of a surgical technique based on the hypothesis that insertion tendinopathy and neuropathy of the deep posterior interosseous nerve are interrelated. The secondary objective was to assess the impact of classifying this condition as an occupational disease on the result of surgical treatment.

Patients and methods

Thirty-five patients operated on by a single surgeon, between January 2007 and January 2008, were reviewed retrospectively for this study.

The series comprised 28 patients presenting 30 cases of epicondylitis, made up of 19 females and nine males whose mean age was 46.1 years (range, 29–57 years). The dominant side was involved in 19 patients. All the patients presented epicondylitis resistant to medical treatment applied for a mean 21 months (range, 6–60 months). The diagnosis of epicondylitis was based only on a clinical diagnosis; only preoperative X-rays had been taken, showing no abnormalities.

All the patients included in this study had had electromyographic exploration, showing neurogenic abnormalities of the deep branch of the radial nerve in all cases. This exploration was guided by poorly systematized symptoms of pain of the lateral side of the elbow with painful areas on the lateral epicondyle and the neck of the radius. All the patients presented both epicondylitis and neuropathy of the deep posterior interosseous nerve at the elbow.

The patients were separated into two groups so as to study the influence of the "occupational disease" variable on the function results. Group 1 comprised patients whose disease was not recognized as an occupational disease and group 2 included patients whose disease was considered occupational.

Group 1 comprised nine patients who presented ten cases of epicondylalgia: six females and three males with a mean age of 46.1 years (range, 32–57 years). Another musculoskeletal problem was found clinically and on electromyographic examination in ten cases (carpal tunnel syndrome in ten cases, compression of the elbow's ulnar nerve in six cases, tendinitis of the rotator cuffs in four cases). In six cases, a surgical procedure was associated in the same surgical time (three decompression procedures for the median nerve of the wrist, two decompression procedures for the ulnar nerve of the elbow, and decompression of the median nerve of the wrist and of the ulnar nerve of the elbow).

Group 2 was made up of 19 patients who presented 20 cases of epicondylalgia: 13 females and six males, mean age, 46.2 years (range, 32–57 years). Another muscular or skeletal problem was found clinically and on electromyographic examination in 16 cases (80%) (carpal tunnel syndrome in 16 cases, compression of the ulnar nerve of the elbow in 13 cases, tendinitis of the rotator cuffs in eight cases). In 12 cases, a surgical procedure was associated during the same surgical time (four decompression procedures on the wrist's median nerve, three decompression procedures of the ulnar nerve of the elbow, and five decompression procedures of the median nerve of the wrist and the ulnar nerve of the elbow).

Surgical technique

The surgical technique used consisted in a fasciotomy of the extensor radialis carpi brevis and decompression of the deep branch of the radial nerve.

The intervention was performed under humeral block general anesthesia, with the patient positioned slightly forward, thus releasing the shoulder. A tourniquet was placed at the root of the limb.

The incision was made along a line drawn between the lateral epicondyle and the radial tubercle, beginning 1 cm under the epicondyle continuing downward for 8 cm.

The cutaneous edges were separated from the fascia, exposing the antebrachial fascia and the muscles.

A Thompson approach was used [3,4] (Fig. 1). The aponeurosis was incised between the common extensor of the fingers and the extensor radialis carpi brevis. The muscle mass of the extensor radialis carpi brevis was disinserted from the intermuscular wall, exposing the supinator muscle whose fibers are oriented forward and distally.

A fasciotomy of the common extensor of the fingers and the extensor radialis carpi brevis was performed, facilitating exposure of the deep posterior interosseous nerve to obtain zones of musculotendinous lengthening of approximately 1 cm.

The aponeurosis of the supinator was incised (Fig. 2) along the entire length of the axis of the deep posterior interosseous nerve, and the muscle fibers of the superficial head to obtain decompression of the posterior interosseous nerve (Fig. 3).

The wound was closed with aspiration drainage, suturing only the cutaneous and subcutaneous planes; the musculotendinous advancement zones were left to heal spontaneously.
The patients had no postoperative immobilization and were allowed to undertake all activities of daily life. Only carrying weight was not allowed for the first 6 weeks. Sports and occupational activities were authorized beginning in the first month for patients with light activity and after the second month for those with more intense activity of the upper limb.

The 28 patients were reviewed at a mean follow-up of 21.8 months (range, 15—36 months) by an independent operator. Residual pain was assessed on a visual analogue scale (VAS). The results were evaluated using the Roles and Maudsley [5] classification (Table 1). Wrist strength was measured using the Jamar dynamometer with three measurements taken with the elbow in flexion and extension.

Figure 1  Passage between the common extensor of the fingers and the extensor radialis carpi brevis, then the radial extensors are smoothed and reclined.

Figure 2  Opening of the superficial head of the supinator muscle to the emergence of the deep branch of the radial nerve, after fasciotomy of the extensor radialis carpi brevis and the common extensor of the fingers.

Figure 3  Decompression of the deep branch of the radial nerve.

The statistical analysis was done using SPSS® software. We used the Student t-test to compare variables because the groups contained fewer than 30 subjects. Statistical significance was set at $P < 0.05$.

Results

There were no intra- or postoperative complications in either of the two groups.

In group 1, symptoms were improved within 3 months (range, 1—4 months), and patients were able to return to work within 6.4 months (range, 2—16 months). Six patients had an excellent result (60%), two a good result (20%), and two an acceptable result (20%). Pain according to the VAS was 8.4/10 (range, 6—10).

Table 1  Roles and Maudsley classification.

<table>
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<th>Level</th>
<th>Description</th>
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<tr>
<td>Excellent</td>
<td>No pain spontaneously or on examination Complete pain-free function</td>
</tr>
<tr>
<td></td>
<td>Work and sports possible with no limitations and no discomfort</td>
</tr>
<tr>
<td>Good</td>
<td>Occasional minor discomfort after work and sport</td>
</tr>
<tr>
<td></td>
<td>Complete pain-free function</td>
</tr>
<tr>
<td></td>
<td>No pain on examination</td>
</tr>
<tr>
<td>Acceptable</td>
<td>Moderate discomfort requiring adjustments to work and sports</td>
</tr>
<tr>
<td></td>
<td>No pain at rest</td>
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<tr>
<td></td>
<td>Slight pain on examination</td>
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<tr>
<td></td>
<td>Improvement compared to preoperative condition</td>
</tr>
<tr>
<td>Failure</td>
<td>Persistent pain and discomfort, unchanged or worsened compared to preoperative condition</td>
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<tr>
<td></td>
<td>Discomfort during work and sports or these activities impossible</td>
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At the review, six patients had no pain and four presented pain with strenuous exercise. Strength as measured by the Jamar dynamometer with the elbow flexed was a mean 102% compared to the contralateral side (range, 82–150%) and strength with the elbow extended was 100% compared to the contralateral side (range, 78–180%).

In group 2, symptoms were improved within 5.6 months (range, 1–13 months) and work was resumed within a mean 7 months (range, 2–24 months). Six patients had an excellent result (30%), nine a good result (45%), and five an acceptable result (25%). Pain as measured on the VAS was 7.2/10 (range, 4–10).

At the review, seven patients experienced no pain, 12 presented pain during exercise, and one patient presented pain at night. Jamar dynamometric strength in flexion was 84% compared to the contralateral side (range, 40–183%) and strength in extension was 77% compared to the contralateral side (range, 37–113%).

There was no significant difference between the two groups at the 5% threshold according to the Roles and Maudsley classification (Chi-square test) nor on return to work (Student t-test). On the other hand, there was a significant difference on the subjective time to improvement in terms of pain as well as in the difference in strength between the two limbs.

Discussion

Most series report 75–90% good results with nonsurgical treatments. With these observations in hand, first-line nonsurgical treatment must always be proposed to a patient presenting epicondylitis for at least 6 months before turning to surgical treatment. Several types of treatment were proposed: modification of activity [6], use of nonsteroid anti-inflammatory drugs [7], brace wear [8], physical therapy [6–9], and injections of corticosteroids [10]. None of these techniques was superior to the others; only injections of corticosteroids provided improvement over the short-term, but the results at 1 year were identical to the results with the other techniques.

Surgical treatment is often recommended in chronic epicondylitis resistant to well-conducted medical treatment over 6–12 months, with substantial discomfort for the patient in carrying out occupational or sports activity. As with nonsurgical treatment, a variety of surgical techniques have been proposed. These treatments can be divided into three types: open surgical treatment, percutaneous surgery, and arthroscopic surgery.

Most open surgical techniques that have been published show good results; however, no randomized study has demonstrated the superiority of one technique over another. A number of open procedures have been described: the most frequently performed is the technique reported by Nirschl and Pettrone [11] described in 1979 and the techniques derived from this technique. The different surgical procedures can be done in isolation or in association: release of the extensor radialis carpi brevis tendon, denervation of the epicondyile, or decompression or release of the posterior interosseous nerve.

According to Nirschl and Pettrone [11], the causal lesion is a degenerative lesion of the extensor radialis carpi brevis tendon. In their technique, they perform an incision and proximal release of the extensor radialis carpi brevis tendon with excision of the macroscopically pathological tissue. They report 97.7% good results with functional improvement compared to preoperative function and 85.2% of the patients able to return to their activities. However, 82 of the 1213 patients did not respond to the surgical treatment.

Pannier and Masquelet [12] also reported a study of proximal release of the extensor radialis carpi brevis. In their surgical technique, they associated deep aponeurotomy of the superficial head of the supinator; certain patients also underwent aponeurotomy of the common extensor of the fingers. They reported 78% excellent and good results.

Some authors believe that most treatments are effective because of local denervation. Wilhelm [13] described innervation of the elbow region by certain branches of the radial nerve. In his study, the patients underwent a test through local injection of a local anesthetic. Patients whose pain was reduced underwent denervation of the collateral nerve of the radial nerve at the lateral intermuscular level. In his study, 39 patients had isolated denervation: 92% had excellent or good results.

Leppilaiti et al. [14] compared the percutaneous technique with the reference open technique in 2004. They compared a group of 22 patients who underwent the open technique and 23 patients who had the percutaneous technique. They found better results in the percutaneous group, with a better DASH score. Patients returned to work after 2 weeks in the percutaneous group versus 15 weeks in the open surgery group. Patient satisfaction was better in the group of percutaneously treated patients.

Baker et al. [15] described an arthroscopic technique in 1998, a technique consisting in an excision of the lateral joint capsule, debridement of the pathological extensor radialis carpi brevis tendon tissue, and decortication of the lateral epicondyile. They reported 37 patients with excellent and good results of the 39 patients who underwent this technique; furthermore, patients returned to work within a mean 2.2 weeks. This technique had the advantage of exploring the joint cavity during which Baker et al. found 69% joint lesions.

Peart et al. [16] compared the arthroscopic release technique and the open technique. In their study, 54 patients underwent open release of the extensor radialis carpi brevis tendon and 33 patients were operated arthroscopically. Of the 75 patients reviewed, there was no significant difference in the functional results between the two groups. However, the patients in the arthroscopic group were able to return to work earlier and had fewer associated postoperative treatments.

Two broad currents are contrasted in the physiopathogenesis of epicondylalgia: the defenders of insertion tendinopathy [11–17] and the partisans of neuropathy of the posterior interosseous nerve [4,18–20]. The contribution of the deep interosseous nerve in the etiology of epicondylalgia is still being debated. In the randomized study conducted by Leppilaiti et al. [14] comparing two groups of 14 patients treated with decompression of the posterior interosseous nerve or release of the extensor radialis carpi brevis tendon, a significant difference in favor of decompression was demonstrated.
Lateral epicondylitis treatment by extensor carpi radialis fasciotomy

The difference between epicondylitis and radial tunnel syndrome is easy to discern in terms of symptoms and the clinical examination. Pain in epicondylitis focuses on the epicondyle or behind it, which is clearly described by and localized by the patient with no real irradiation. The symptoms of radial tunnel syndrome are different: chronic, heavy, spontaneous pain located under the epicondyle on the lateral side of the forearm in the muscle mass of the extensors, with irradiation along the radial nerve, most often descending toward the back of the wrist.

However, after a long painful history of epicondylitis the distinction in the signs of these two entities is more difficult to make. In 1979, Werner [21] wrote that less than 10% of epicondylitis cases included irritation of the radial nerve. This association can be explained by a locoregional inflammatory reaction that can lead to a reaction on the radial nerve.

Our surgical technique works on both components of this pathological association: both the pain of enthesopathy through aponeurotomy of the extensors of the wrists and fingers and radial nerve irritation through decompression of the posterior branch of the radial nerve. Isolated release of the radial nerve will not resolve the causal disease responsible for this local pathological association and the patient risks clinical failure. Nor will isolated aponeurotomy have a constant effect on the symptoms related to radial nerve irritation.

This was a continuous, single-operator series that shows valuable results in this complex pathology. Its recognition as an occupational disease does not disturb the functional result of this surgical technique.

However, this study has certain limitations, being a retrospective study, and it could be advantageous to conduct a study randomizing the treatment of epicondylalgia with or without decompression of the deep branch of the radial nerve.

Conflict of interest statement

None.

References