

Review Article

Current Concepts for Evaluation and Management Strategies for Lateral Epicondylitis of the Elbow

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Abstract

Painful lateral elbow epicondylitis or tennis elbow can be a cause of significant disability and patient anxiety. The diagnosis is usually clinical and infrequently requires advanced imaging. While lateral epicondylitis is a self-limiting disease with most reporting complete resolution of symptoms by one year, patients frequently present to the physician in hopes that the physician can expedite healing. Common conservative modalities including physical therapy, non-steroidal anti-inflammatory drugs, and orthotics and corticosteroid injections are frequently implemented, although controversy exists about the true utility of these treatment strategies. Newer biologic therapies including autologous whole blood injections, platelet rich plasma injections, and stem cell therapy are currently being explored for improving patient symptoms. Operative intervention is typically reserved for the recalcitrant cases with frequent success and includes percutaneous, open, and arthroscopic procedures.

INTRODUCTION

Lateral epicondylitis of the elbow or “tennis elbow” is a common, painful degenerative musculotendinous disorder. It was first described by Runge in 1873 and subsequently coined “lawn-tennis arm” by Major in 1883 [1,2]. Tennis elbow reportedly affects 1-3% of adults each year with an annual incidence rate of 4 to 7 per 1000 individuals [3,4]. Only 10% of individuals affected by this disorder are active tennis players, although it has been estimated that 50% of racquet-sport players will experience a painful lateral elbow during their lifetime [5,6]. Males and females are equally affected with a peak incidence during the fourth and fifth decade of life [7]. Symptoms are more commonly seen in the dominant arm in those with manually intensive occupations, or in those who utilize vibratory tools. Symptoms usually occur with an insidious onset due to overexertion of the extremity with repetitive maneuvers involving wrist extension, and forearm pronation and supination [8]. Most commonly, repetitive eccentric contractions causing micro tearing of the extensor carpi radialis brevis (ECRB) origin is thought to be the underlying pathology [9].

The natural history of tennis elbow is widely regarded to be self-limiting, with a duration of symptoms of 6-24 months, and with approximately 90% of individuals exhibiting complete resolution of their symptoms at 1 year [10,11]. It has been reported that only 4-11% of patients will subsequently require surgical intervention. Regardless, lateral epicondylitis is a

common cause of upper extremity pain causing 5% of individuals to take sick leave from work, with an average duration of 29 sick days per year in those who take time off from work [12-14].

Anatomy

The lateral epicondyle is pyramidal shaped with an anterior face, posterior face, and summit ridge [15]. The posterior face is covered by the anconeus muscle. Proximal to the lateral epicondyle are the origins of the extensor carpi radialis longus (ECRL) and brachioradialis. Along the anterior face is where the origins of the extensor digitorum communis (EDC) and the ECRB arise. The lateral collateral ligament and annular ligament arise from the base of the summit of the lateral epicondyle, where surgical complications resulting in destabilization of the elbow can arise if the LCL is inadvertently resected [16]. Cadaveric studies have noted the unique relationship between the ECRL, ECRB, and EDC at the level of the elbow [17]. The entirely muscular ECRL overlies the proximal aspect of the entirely tendinous ECRB, and must be retracted in order to visualize the ECRB. The diamond shaped ECRB origin is located on the distal most aspect of the supracondylar ridge and is distinctly anterior to the origin of the EDC.

Pathology

The common diagnostic term “lateral epicondylitis” is actually a misnomer as the disease is better described as a tendinosis rather than a true tendonitis [18]. The pathologic process has

been studied numerous times and notably no inflammatory cells suggestive of either an acute or chronic inflammatory process have been identified on surgical specimens [15, 19-22]. The pathology is better classified as an overuse syndrome of the extensor muscles leading to a degenerative pathology of the involved tendons. Histologic studies have described findings of "angio fibroblastic hyperplasia" in which tendon collagen has been invaded by fibroblasts and vascular granulation tissue, with eventual apoptosis and extracellular matrix degradation of normal tissue [23-26].

Clinical Diagnosis

Patients will present with pain localized over the lateral elbow with some radiation down the forearm and made worse with activities involving an extended elbow. Patients do not usually remember a traumatic event and describe gradual onset of pain. They frequently will describe pain with every day activities such as lifting a gallon of milk, opening a door, turning a key, shaking hands, or carrying a bag.

On physical exam, the patient will be tender to palpation slightly anterior and distal to the lateral epicondyle at the origin of the ECRB and EDC muscles [7]. Range of motion of the elbow, wrist, and hand will be normal. Resisted wrist extension will increase pain. The chair test is performed by asking the patient to pick up a chair with an extended elbow and pronated hand and verifying if this reproduces symptoms [27].

Other diagnoses to consider include: cervical radiculopathy, osteochondral radiocapitellar lesions, intra articular loose bodies, postero lateral elbow plica, postero lateral elbow instability, and tumors. Additionally, radial tunnel syndrome, a compressive neuropathy of the posterior interosseous nerve, should be considered and may coexist in 5% of patients with lateral epicondylitis. Physical exam findings of pain 3-4 cm distal and anterior to the lateral epicondyle and pain with resisted thumb and index finger extension help differentiate this disorder from lateral epicondylitis [28]. Plain radiographs are often obtained to evaluate for any osseous pathology and should include standard antero posterior, lateral, and radio capitellar views [15]. Radiographic findings of calcifications of the common extensor tendons have been suggested to correlate with the need for eventual surgery in 20% of symptomatic patients [7]. Ultrasound can be utilized to detect tendon pathology including intra substance tears and thickening of the common extensor origin with a sensitivity of 64-88% and specificity of 36-100%, but is dependent on operator experience [29]. Advanced imaging including magnetic resonance imaging (MRI) is not routinely obtained, as positive findings of edema and thickening of the extensor origin have been found to be present in 14-54% of asymptomatic individuals, and furthermore provides no prognostic value in symptomatic individuals with respect to response to treatment [30-32].

Treatment

The natural course of lateral epicondylitis is self-limiting with nearly all studies suggesting 90% of all patients will have complete relief in 12 months. Various modalities have attempted to reliably shorten this symptom period, however to date no such treatment exists. Bracing, physical therapy, corticosteroid

injections, iontophoresis, botulinum toxin A injections, platelet rich plasma injections, extracorporeal shock wave therapy, and laser therapy have all been previously evaluated, yet no optimal treatment has been proven to be consistently superior to the natural history of the disease [33]. It has also been shown that symptom intensity and perceived disability from this disorder directly correlate with stress, distress, and ineffective coping strategies such as catastrophic thinking [34]. One study evaluated the probability of workers to present for evaluation of an upper extremity disorder, including lateral epicondylitis, and found it to be more predicted by psychological factors than by actual physical work demands [35]. It is therefore important to recognize that psychological factors can and do play a vital role in the treatment process, and to carefully work to align patient expectations with the notion that nearly all eventually heal without residual disability, and more importantly most non-operative modalities have no proven long-term benefit.

Physical therapy

Exercise therapy can be initiated with the goal of stimulating tendon remodeling and producing a muscular adaptive response. Therapy techniques have traditionally focused on increasing forearm strength, flexibility and endurance through isometric, isokinetic, and isotonic concentric and eccentric exercises. Numerous studies however, have shown non-superior, mixed results when comparing physical therapy versus a wait-and-see approach [33,36,37].

Bracing

Typical bracing recommendations include a compressive strap and a wrist extension brace. The common tennis elbow compressive strap or counterforce brace is thought to work by creating a more distal origin of the tendon and thereby decreasing the force on the bony origin of the ECRB [14]. The extension wrist splint is meant to inhibit contraction of the wrist extensors, thereby providing mechanical rest to the irritated extensor tendons and allowing for improved healing. One study reported no difference between the compressive strap versus the wrist splint in reducing pain, while another two studies suggested the extension splint was better at pain reduction versus the compressive strap [33,38,39]. However, other studies have shown no difference in the use of orthotics versus physical therapy alone [40].

Nsaids

Lateral epicondylitis is a non-inflammatory condition, therefore the utility of NSAID's in providing pain relief is thought to be secondary to a reduction in associated synovitis or acute inflammation in the surrounding tissues [7,14]. A recent study did not support the routine use of NSAID's given the risk for gastrointestinal side effects, and with only minimal improvements in pain and no effect on grip strength or functional ability versus placebo [41].

Corticosteroid injections

The injection of corticosteroids into the area of the lateral epicondyle and ECRB origin has been a common treatment for lateral epicondylitis. As our understanding of the histopathology of the disorder has improved, the validity of corticosteroid usage

has been called into question. Corticosteroids work by inhibiting the inflammatory cascade and decreasing the local immune response to pain [42]. Given the lack of inflammatory cells in lateral epicondylitis some have suggested it is rather through a reduction in pain generator substance-P (neureleukin-1) that allows corticosteroids to provide pain relief [43].

Most recent studies suggest that corticosteroid injections only provide short-term relief with concerns for potential long-term increased pain and loss of function. Recent comparative studies of corticosteroid injections, physical therapy, and a wait and see approach have found a significant improvement at 6 weeks with corticosteroid injections, however longer follow-up approaching one year showed no difference between treatment modalities [44,45]. Additionally, at one year those who had been injected with corticosteroid had more pain and dysfunction versus non-injected groups. Similarly, other studies have noted a 34-72% recurrence rate at one year in those treated with steroid injections, compared to 9% recurrence rate to those treated with a wait and see approach [46,47]. Furthermore, Kachooei et al., determined that while a corticosteroid injection delayed time to surgery for lateral epicondylitis, it actually was associated with an increased rate of surgery versus those patients who did not receive an injection [48].

Commonly reported side effects of corticosteroid usage include skin depigmentation and fat atrophy at the site of injection, and a temporary elevation of blood sugar in diabetics [5]. Additional reports have also cited the complication of extensor tendon rupture, which is thought to be secondary to corticosteroids impairing the natural healing inflammatory response, thereby leading to decreased tissue formation, collagen growth, and tendon healing.

Biologic Injections

The field of biologics, including autologous whole blood injections (ABI's), platelet rich plasma (PRP) injections, and stem cell therapy has gained recent popularity in the management of tendinopathy conditions, especially in the field of sports medicine, and specifically with regards to rotator cuff tendinopathy, patellar tendinopathy, and Achilles tendinopathy [49].

Similarly, it has been hypothesized that applying biologic therapy to tennis elbow may result in improved symptom management with enhanced tendon healing. The rationale for biologic therapy lies with providing functional cells to the site of injury to overcome the apoptotic process of tendinopathies in hopes of restoring tendon structure and function [50]. Autologous whole blood injections (ABIs) require the withdrawal of blood and then re-injecting the contents into the area of injury or tendinopathy. The contents of whole blood and growth factors are thought to then lead to an inflammatory response with eventual tendon repair [51]. Edwards et al injected 28 patients with ABI and noted 79% reported complete relief of pain at 1 year, however this study had a small population and no control group [52]. Conversely, Wolf et al conducted a multicenter randomized control trial of 30 patients (9 ABI, 9 steroids, 10 lidocaine) and found no significant differences in pain or function at 6 months follow-up between the 3 groups [53]. PRP is an autologous concentrate of platelets in a small volume of plasma, separated by

centrifugation. PRP contains 3-10 times higher concentration of platelets compared to whole blood [42]. Upon activation, platelets release a number of growth factors like platelet-derived growth factor (PDGF), transforming growth factor (TGF- β), platelet factor 4 (PF4), interleukin-1 (IL-1), platelet-derived angiogenesis factor (PDAF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), epithelial cell growth factor (ECGF), platelet-derived endothelial growth factor (PDEGF), insulin like growth factor (IGF), and fibroblast growth factor (FGF) which are known to play critical roles in cell proliferation, chemotaxis, cell differentiation, and angiogenesis [54]. Additional studies have also suggested that PRP promotes the differentiation of tendon stem cells into tenocytes to aid in the reparative process [55]. Peerbooms et al., conducted a randomized control trial comparing PRP versus corticosteroid injections in 100 patients and found a significant difference in pain reduction, and improved functional outcome at 1 year in the PRP group [56]. Conversely, Krogh et al., found no significant difference in their randomized control trial of PRP versus corticosteroid, but was limited to 3 months follow up [57]. Other studies have compared PRP to ABI and have found no significant difference in pain or functional results between the 2 groups at one year, although both groups showed improvement of their symptoms overall [51,58,59]. One problem with these studies is the lack of a true control group without any intervention, therefore making it difficult to determine the true benefit of these modalities versus the natural course of the disease [49].

Emerging stem cell technologies are also being evaluated for the treatment of lateral epicondylitis. Multipotent stem cells, skin fibroblasts, and autologous tenocytes are being studied for their ability to improve tendon healing and remodeling [42]. Currently only low population, case series pilot studies have been conducted with promising results. However, additional randomized control trials are needed [50,60,61].

Surgery

Operative intervention is reserved for those patients who have failed non-operative therapy for 6-12 months. Common procedures performed include percutaneous, arthroscopic, and open procedures. The percutaneous procedure involves placing a small incision directly over the lateral epicondyle and releasing the common extensor origin. No extensive debridement is undertaken, and recovery is quick. Open procedures involve a larger curvilinear incision centered on the lateral epicondyle and carrying the dissection between the interval of the ECRL and ECRB/EDC. The EDC is then released from its bony origin allowing visualization of the pathologic ECRB tendon, which is then debrided and the underlying epicondyle is frequently decorticated. The arthroscopic procedure is performed via small portals and involves a release of the capsule and debridement of the ECRB with frequent decortication of the lateral epicondyle. The arthroscopic technique also allows for enhanced visualization of any intraarticular loose bodies, chondral flaps, or arthritis. Overall operative complication rates are approximately 3.3% (4.3% open, 1.9% percutaneous and 1.1% arthroscopic) [16]. Most complications are classified as neurological (36.3%- paresthesias, neuritis), wound related (30%-drainage, seroma), infectious (14.2%), or loss of range of

motion (14.2%). Most operative studies report well to excellent results in the management of recalcitrant lateral epicondylitis [7]. However, Rosenberg et al noted that 60% of high-level athletes and 15% of manual laborers had residual symptoms following open debridement [62]. In arthroscopic outcome studies it was noted that 20-38% of patients, although improved, had residual symptoms [63,64]. In comparison studies no significant difference was reported in outcomes between percutaneous versus arthroscopic, or open versus arthroscopic techniques [65,66]. Although these procedures are commonly performed with frequent improvement for the patient, a recent Cochrane Database systematic review noted insufficient evidence to support or refute the effectiveness of surgery for lateral elbow pain versus continued conservative management [67].

CONCLUSION

Lateral epicondylitis is a common painful elbow disorder affecting middle aged individuals. The diagnosis is commonly made through history and physical exam alone and infrequently requires advanced imaging. It is a self-limited disorder caused by tendon degeneration with the overwhelmingly majority of individuals having complete resolution of symptoms by one year. Commonly employed conservative modalities including physical therapy and bracing have shown no true effect on decreasing the duration of pain. Corticosteroid injections may improve pain in the short term, but have shown no long-term benefit with some concern for increasing recurrence of symptoms. The future of biologics including autologous whole blood injections, platelet rich plasma injections and stem cell therapy looks promising, but requires additional well-designed long-term prospective randomized control trials. Operative intervention for recalcitrant cases has proven beneficial, however residual symptoms are common, and true comparative studies versus allowing the disease to progress through its natural course are lacking.

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