

Tennis elbow no more

Practical eccentric and concentric exercises to heal the pain

Hillel M. Finestone MDCM Deborah L. Rabinovitch MD

Lateral epicondylitis, commonly referred to as tennis elbow, affects 1% to 3% of the population.¹ It is thought to be an overuse injury, originating in the wrist extensor muscles, rather than an inflammatory problem. It is brought on by occupational activities and sports that involve a repetitive wrist motion or a power grip. The condition is most commonly associated with work-related activities,² such as cutting meat, plumbing, and working on cars, rather than with playing tennis.

The overuse causes microtears near the origin of the extensor carpi radialis brevis (ECRB) at the lateral epicondyle. This leads to the formation of fibrosis and granulation tissue. Infiltration of inflammatory cells takes place early on³ but is probably absent in more chronic cases.

There are various treatment options available, including local steroid injections, strapping, extracorporeal shock wave therapy, and acupuncture; however, many cases are difficult to treat successfully.⁴ Although exercise treatments are often recommended, the descriptions of these exercises lack sufficient detail.

The following article describes a muscle-strengthening program that involves progressive eccentric and concentric resistance exercises for treatment of lateral epicondylitis. The exercises can be done at home, and require only dumbbells, an instruction sheet, and the will to get better. Several of our patients who participated in this program have experienced long-term pain relief.

Muscle-strengthening program

The muscle-strengthening program was initially proposed by Dr Ernest W. Johnson (oral communication, October 2003), an American physiatrist from Ohio State University in Columbus. The program, described in **Table 1**, encompasses a 10-repetition maximum of eccentric and concentric movements of the wrist extensor muscles in 2 different positions: first with the elbow flexed to 90° (**Figure 1**), then with the elbow extended to 180° (**Figure 2**). The forearm is pronated in both positions. Slow full-wrist extensions are followed by slow full-wrist flexions; each full-wrist extension and full-wrist flexion should take 5 to 10 seconds. A "10-repetition maximum" means that it is difficult (or impossible) to do more than 10 repetitions with the given weight (handheld dumbbell).

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It is normal for pain to be present while performing the exercises. The weight is progressively increased when 10 repetitions can be completed without pain.

Typically, the pain of lateral epicondylitis decreases after 4 to 6 weeks of diligently performing the exercises once a day, 7 days a week.

Discussion

The rationale for the protocol of this regimen is that stressing the attachment of the ECRB through progressive eccentric and concentric resistance exercises results in the production of a dense collagenous scar in the area of attachment; thus, pain is eliminated. This idea is supported by the work of Curwin and Stanish,⁵ who wrote that the tension created through eccentric contractions allows the formation of new fibrous tissue

Table 1. Muscle-strengthening program to treat lateral epicondylitis: Patient instructions.*

1. Start with a 1- or 2-lb dumbbell (purchase at department, sports, or other specialty store).
2. Sit on a chair next to a table that has an edge or an overhang.
3. Bend the elbow to 90°; palm should be facing the floor. Slowly lower the weight, then slowly raise it toward the ceiling. Be aware that performing this exercise can be painful. Lower and raise the weight 10 times or until a) it becomes too painful or b) you just don't have the strength to move the dumbbell any further.
4. Rest a few minutes.
5. Fully straighten the elbow flat across a table (you might have to lean over the table or crouch next to it); palm should be facing the floor. Slowly lower and raise the weight 10 times, as described in step 3.
6. Once 10 repetitions have become easy to do, with hardly any pain, increase the weight by 1 or 2 lb.
7. Pain should start getting better by week 4 or 6. Continue the exercises once a day, 7 days a week, for about 3 months. Your doctor might need to make some adjustments to your program if there is no improvement after 6 weeks.

*Remember that it will hurt to do the exercises. "Good pain" occurs when it hurts while doing the exercise but the next day the pain is not worse. "Bad pain" is pain that increases the day after the treatment. If you experience "bad pain," you might have to cut back on the number of repetitions or the amount of weight used.

Modified with permission from Dr Ernest W. Johnson (Ohio State University in Columbus).

Figure 1. Flexion of the elbow to 90° (concentric contraction of wrist extensor muscles)



Figure 2. Extension of the elbow to 180° (eccentric contraction of wrist extensor muscles)



at the musculotendinous unit, making it more resistant to damage. Other possible explanations for the positive effects of eccentric training on tendonitis include “lengthening” of the muscle-tendon unit, which might result in less strain during elbow joint motion, or “loading” of the muscle-tendon unit, which might increase the tensile strength of the tendon and cause hypertrophy of the muscle belly.


Both eccentric and concentric contractions increase muscle strength, but the former improve muscle strength more than the latter.⁶ Curwin and Stanish⁵ postulated that only eccentric contractions sufficiently generate the tension necessary for forming fibrous tissue at the musculotendinous structure, allowing adaptation to increased tension. These powerful contractions often result in soreness and potential damage to the muscle itself.⁷ On the basis of these findings, Walmsley et al⁸ stated that the addition of concentric contractions decreases muscle tension during the training regimen, thus minimizing muscle soreness and damage.

In our program, the exercises are done with the elbow in 2 positions. The 90° flexed position likely isolates the ECRB as the extensor carpi radialis longus attaches above the lateral epicondyle (lateral supracondylar ridge

of the distal humerus). The 180° extended position is important because the extensor muscles, including the ECRB, are stretched further, creating more stress on the tendon during the exercises. The increase in tension generated from this extra stretch helps to build the collagenous scar in the area of attachment. This is the only program we know of that adopts both positions.

Croisier et al⁹ also showed benefits with a combined eccentric and concentric treatment; however, their program required the use of a specialized device that is not freely available in people's homes.

Conclusion

The eccentric and concentric treatment regimen that we describe is inexpensive, convenient, and, in our experience, effective. Patients must be compliant and have some tolerance for pain. They need to be counseled about the exacerbation of pain when performing the exercises. Patients should also be provided with a detailed instruction sheet to enable them to safely follow the protocol at home. 

Dr Finestone is an Associate Professor in the Division of Rehabilitation at the University of Ottawa and Medical Director of the Stroke Rehabilitation Program at the Élisabeth Bruyère Health Centre in Ottawa, Ont. **Dr Rabinovitch** is a resident in physical medicine and rehabilitation at the University of Toronto in Ontario. At the time of writing this article, she was a second-year medical student at the University of Ottawa.

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Competing interests

None declared

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