

Repetitive Stress Injuries In Computer Users: Overview and Treatment

Kendall Wills Sterling, ELS

Repetitive stress injuries (RSIs), also called *cumulative trauma disorders*, currently account for more than 50% of all occupational illness in the United States.^{1,2} They affect 15% to 20% of Americans, and their incidence is increasing.³ Although they are often referred to as tendinitis injuries, in most cases they are actually degenerative lesions.⁴

RSIs are quite costly both economically and socially. Costs in 1995 for carpal tunnel surgery alone exceeded \$2 billion,⁵ and one estimate has placed treatment and related expenses for all RSIs at more than \$20 billion annually.⁶ By the year 2000, more than 50 cents of every dollar spent on occupational injury was expected to go toward treatment of RSIs.²

The toll exacted by RSIs is not limited to health care expenses. The most common RSI, carpal tunnel syndrome, requires the longest recuperation of all injuries resulting in lost workdays, with a median of 30 days away from work.⁷ Individuals affected by an RSI frequently experience considerable pain and functional impairment that may necessitate physical therapy, surgery, or, in extreme cases, a change in occupation.⁸

Examples of RSIs include upper extremity tendinitis, carpal tunnel syndrome, tennis elbow, tension neck syndrome, and various other neuropathies and musculoskeletal disorders. A disorder known as computer vision syndrome, a complex of eye and vision problems characterized by visual symptoms resulting from computer use, can also occur. (Computer vision syndrome and its treatment and prevention will be covered in a later article.)

MUSCULOSKELETAL DISORDERS

Pathology and Etiology

Much of the pathology and etiology of RSIs remains unclear. Heavy repeated forces cause degenerative changes that can be documented radiographically, but repeated light loading, such as occurs in computer keyboard use, often cannot be adequately evaluated with current imaging and clinical techniques.⁹ Although some studies have shown a causal relationship between repetitive, forceful work and the development of musculoskeletal disorders in the hand/wrist or shoulder,^{10,11} others have been unable to consistently demonstrate conclusive evidence that repetitive mechanical loading is a major etiologic factor in RSIs.^{12,13} What is known is that workers who use a computer 4 or more hours per day typically report significantly more symptoms than those who do not use a computer for prolonged periods.¹⁴

RSIs have been consistently correlated with age and decreased tendon vascularity, but the importance of these factors in etiology has not been determined.¹² Increased hand forces and greater frequency of finger movements are commonly associated with RSIs, but ergonomic (eg, wrist postures) and gender- and disease-related factors also appear to play a role. Neck and upper limb disorders are associated with work performed with a flexed neck and elevated and abducted arms.¹⁰ Females appear to be more prone to RSIs than males, possibly due to the influence of pregnancy-associated factors on gene expression in tendons.³ Individuals with diabetes, hypothyroidism, rheumatoid arthritis, and lupus erythematosus have a higher risk for some RSIs, such as carpal tunnel syndrome. Obese persons are more than three times as likely as nonobese persons to have impaired nerve conduction,¹⁵ which can result in an RSI, but nerve conduction does not necessarily correlate with severity of symptoms; symptoms may be severe without significant conduction deficits, and vice versa.

Finally, stress and tension (eg, both work that is perceived as stressful as well as personal stressors) also increase the likelihood that a person will experience an RSI.^{13,14,16}

Symptoms

A common precursor to an RSI is a stiff or aching neck or shoulders. This is generally followed by tendinitis, the earliest recognizable manifestation of overuse injury.¹⁷ Symptoms may include muscle pain and tenderness, usually in the neck/shoulder area or the forearm/hand musculature; numbness, tingling (a "pins-and-needles" sensation), or burning in the wrist, hands, or fingers; and loss of hand, arm, or shoulder strength. Pain and numbness often occur at night, disturbing normal sleep patterns. Advanced symptoms may include weakness of the hands, difficulty manipulating small objects, and loss of hot/cold sensation. Recurrent or persistent symptoms require a thorough examination by a medical professional. If the overuse continues, partial tears or complete ruptures may follow.

In addition to the physical discomfort produced by an RSI, persons experiencing these injuries have elevated levels of anxiety, depression, anger, confusion, and fatigue, likely as a result of chronic pain.¹⁵

Treatment

Successful resolution of an RSI depends on early diagnosis and appropriate treatment.⁸ The longer the injury is left untreated, the greater the chance that symptoms will become permanent. Diagnosis involves identifying not only the affected tendinous unit, but also the underlying predisposing condition(s).¹⁷

Conventional treatment is aimed at elimination or correction of the conditions underlying the RSI, control of inflammation, and use of modalities designed to restore the structural and functional integrity of the tendon.¹⁷ It can take several forms, including injection of local anesthetics and steroids¹; use of anti-inflammatories (eg, nonsteroidal anti-inflammatories); physical therapy (eg, flexibility and strength training and splinting); and, in cases refractory to conservative methods, surgery. So-called alternative treatments may reduce stress and thereby provide relief for patients.

Conventional Treatment

Cortisone injections have produced mixed results, with complete resolution of symptoms occurring in some cases but not in others.^{1,12} Higher doses and more frequent administration can lead to serious side effects such as weight gain, elevated blood pressure, and osteoporosis.¹⁸

Anti-inflammatories resulted in some pain relief in 5 of 9 placebo-controlled studies summarized by Almekinders and Temple,¹² but are generally considered ineffective. Vitamin B₆ (50 to 500 mg/day for 3 months) has also been prescribed to reduce swelling in the synovial membranes that lubricate tendons, but should be used with caution, as chronic B₆ overdose can lead to neuropathy.

Physical therapy modalities such as ice packs, electrical stimulation, ultrasound, and deep tissue massage can be helpful, but heat should be avoided. Splinting is effective in as many as two-thirds of cases,¹⁵ and joint manipulation to correct biomechanics, which should be performed by a chiropractor, can also be beneficial. Stretching exercises for the hands, wrist, upper extremity, or shoulder/back may serve to increase mobility and help lengthen contracted nerves, as well as strengthen the involved joint. However, these conservative measures generally require 12 to 20 weeks to be effective.

Surgery to correct the disorder, while effective, may not be possible in all cases. In carpal tunnel release surgery, the most common RSI-related surgical procedure, the transverse ligament is cut, which often provides immediate relief; recovery time is 4 to 8 weeks. However, a small but significant percentage of patients experience relapse and may require a second surgical procedure.¹⁹

Alternative Treatments

Yoga, an ancient practice that uses stretching and improves strength, has demonstrated benefit for many types of arthritis.²⁰ A limited study of yoga in patients with carpal tunnel syndrome, published in the *Journal of the American Medical Association*,²¹ indicated that yoga may also relieve the symptoms of carpal tunnel, based on an 8-week program in which patients with carpal tunnel syndrome were assigned to participate in a yoga program or were given a wrist splint and no exercise. Yoga resulted in a significant decrease in pain and an increase in grip strength; non-yoga participants did not experience these improvements. The importance of posture, muscle strength, and flexibility in preventing RSIs make yoga a good choice both for development of these characteristics and for relief of the stress that is associated with RSIs.

Other relaxation techniques may also ease muscle tension and reduce fatigue. These include chi gong (or chi kung) stances and meditation to relieve pain and promote healing, and ba duan jin exercises to improve strength and stimulate blood circulation.

SUMMARY

RSIs are the leading occupational illness in the United States and result in high health care costs and significant disability in those affected. Although their pathology and

etiology remain unclear, certain factors—age, reduced tendon vascularity, female sex, ergonomic factors, and stress—are known to play a role. Treatment may consist of both conventional methods (eg, physical therapy and surgery) and alternative methods (eg, yoga). However, at least one study has suggested that current treatment methods may not significantly affect the natural history of the disease.¹² Because postinjury therapy often is not effective, prevention remains the best treatment for RSIs in the workplace.² The next article in this series will discuss prevention measures to reduce the incidence of RSIs. Readers desiring more detailed information can find links to online consumer documents detailing common occupation-related hand/wrist/arm problems, medical diagnosis, and treatment, rehabilitation, and prevention can be found at <http://www.nlm.nih.gov/medlineplus/handwristarminjuriesanddisorders.html>

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