

## Repetitive Strain Injuries

### What are Repetitive Strain Injuries?

Repetitive strain injuries (RSI) are injuries affecting tendons, tendon sheaths, muscles, nerves and joints. They cause persistent or recurring pains most commonly in the neck, shoulders, forearms, hands, wrists, elbows and lower limbs.

The term “repetitive strain” injury is misleading. Unlike other diseases, RSIs are not easily classified because they have a variety of causes and include injuries to different parts of the body. A number of terms are applied to such injuries including: repetitive injury, repetitive motion injury, repetitive trauma, overuse injury, cumulative trauma disorder, occupational musculoskeletal disorder and cervio-brachial disorder. The different terms indicate that such injuries involve repetition, and can also be caused by force, rapid movement, overuse, static loading, excessive strain, uncomfortable positioning of limbs or holding one’s posture in an unnatural, constrained or constricted position.

### Who is affected?

In the past, RSIs were most commonly attributed to people involved in sports, hence the names “tennis elbow” or “golfer’s elbow”. These injuries were generally not recognized amongst workers, although syndromes related to specific occupations such as “weaver’s cramp” and “threader’s wrist” were reported. However, RSIs are increasingly common among a variety of workers, from clerks to jackhammer operators and from maintenance workers to typists.

Many workers are unfamiliar with RSIs, so everyday aches and pains are overlooked and no connection is made between the injury and the workplace. Aches and pains warn that a serious injury may be developing. If the causes are not eliminated or the worker not moved from the job immediately, the damage can be permanent and irreversible. Sometimes the injury is crippling, leaving the worker in pain and possibly immobile for life.

Although the reports of RSIs are increasing, there are no regulations or standards covering them.

### RSI: The Causes

The causes of repetitive strain injuries can be classified in the following ways:

1. Rapid movement injuries, caused by repeated rapid movements
2. Forceful movement injuries, caused by exertion of muscle movement
3. Static loading injuries, caused by fixed positioning with unsupported limbs

Such injuries can be caused by either too little movement or excessive movement while handling either light or heavy loads.

Often, repetitive strain injuries have multiple causes. A maintenance worker using a screwdriver may get pains from repetitive use of force while working at an uncomfortable angle. Office workers may be

sitting in an uncomfortable position with no wrist support and using rapid finger movements on poorly designed keyboards. These workers may develop a number of serious injuries because of the effects on their musculoskeletal system.

Any work that forces a person into an “unnatural” position can lead to repetitive strain injuries. Regular work activities – such as the forceful twisting of screwdrivers, repetitive finger movements without rest, sitting in an uncomfortable position, bending the wrists for long periods, working with arms above shoulder length, gripping tools forcefully, etc. – strain tendons, ligaments and muscles, causing injury.

Repetitive strain injuries are linked to the type of work activity, the tools used and the design of the work station. For example, most tools are made for “the average man.” Sometimes grips are too wide or too slippery. Gloves may be too thick causing separation of fingers, or they may not be flexible enough, requiring a tight gripping and squeezing with overstretched hand muscles (The fact that standard hand tools are too large for many women helps explain why RSIs are more common among women). The workstation may be designed so that workers strain their bodies bending, stretching, reaching or twisting, etc.

Other factors contributing to RSI include excessive work rates, lack of job variation, increasing speed, poorly maintained equipment, constant or frequent vibration, stress, excessive overtime and inadequate training.

RSIs can be caused by overwork. Our bodies are simply not designed to work faster, more vigorously, endlessly or without rest. They break down, just like machines that are overworked. Rapid and repetitive motions with insufficient rest can cause RSIs. With overwork, the body is forced to work too much with not enough time to recover. This spiraling effect - coupled with stress (another contributor to RSIs) – can cause injuries that might never heal without a long-term break from their causes.

#### **What are the symptoms of Repetitive Strain Injuries?**

Description of how RSIs feel range from “a sense of discomfort” to “excruciating pain”. General symptoms include:

- numbness
- tingling and burning sensations
- pain or dull ache
- dry, shiny palms
- clumsiness of the hands (loss of ability to grasp items, impaired thumb and finger dexterity)
- swelling around the wrist and hand
- wasting of the muscles at the base of the thumb
- aches and pains which may be strongest at night

Pain in one area of the body may radiate to other connecting parts. Pain from the wrist can radiate to the forearm and the shoulder joint. If a worker has any of these symptoms, it should be reported immediately.

### **What parts of the body are affected?**

Bones and muscles make up what is known as the “musculoskeletal system.” This provides support and strength, keeps the body moving and protects internal organs. The bones, connected by joints, serve as levers for the muscles to act upon. Tendons anchor muscles to the bones, and ligaments connect two or more bones, cartilages or other structures. Any activity that wears away at this system may cause RSI.

Tendons are a common area of overuse injuries. They are tough tissues with very few nerve endings and little in the way of blood supply. They are often found where there are a large number of joints to move in a relatively small space (e.g., hands or wrists), tendons connect the body of the muscle to the bone which it is intended to move.

Certain repetitive movements or forceful exertions can cause the tendons to rub against adjacent bones and ligaments. This can cause friction which damages the tendons and lead to the constriction of the muscles they were designed to move. The various names for RSIs reflect the fact that different tendons, joints or muscles may become damaged depending on which movements are overdone.

### **RSIs include:**

- tendonitis
- peritendonitis
- trigger finger
- tenosynovitis
- de Quervain’s disease
- Carpal Tunnel Syndrome
- epicondylitis
- bursitis
- Dupuytren’s Contracture
- ganglion
- rotator cuff strain
- tension neck syndrome
- shoulder
- thoracic outlet syndrome
- digital neuritis
- radial nerve entrapment

This is a partial list of a wide range of related diseases that run up the entire hand, wrist, forearm, elbow, shoulder and neck.

### **Common Repetitive Strain Injuries**

#### **Tenosynovitis**

Rapid and repetitive movements such as keyboard work on typewriters or VDTs, and the repeated twisting of the forearm and hands with tools such as pliers can cause an injury known as tenosynovitis. While tendonitis is the inflammation of the tendons, tenosynovitis is the inflammation of the tendon sheaths, usually in the hand or wrist.

Tendons located at the wrist and ankle are enclosed in delicate synovial sheaths (you can feel the tendons and synovia move as you place a finger below the wrist crease and open and close your fist). The double walled sleeve of the sheath secretes synovial fluid which provides lubrication for the tendon so that damage and injury from rubbing, friction and pressure is prevented. Rest periods are needed to replenish the fluid.

With continuous movement, the lubrication protecting the tendons sheaths is depleted, or poor quality lubricant is produced. This causes friction which in turn stimulates increased production of lubricant. When the lubricant produced cannot meet the demand, the tendon and sheath rub against each other and can become inflamed. Movements become painful and can cause a creaking sound called crepitus.

In the early stages of tenosynovitis, the worker may experience numbness, tingling and pain during movement. If this happens, work should cease. Injury to the sheath can restrict hand or arm movement and weaken both muscle and grip. Symptoms of tenosynovitis include pain in the wrist and forearm which may travel up the elbow to the shoulder. Swelling and a clear cracking sound may occur. If recognized early enough, as with most such injuries, the condition will improve with rest, although the condition may flare up again. If work continues after the first symptoms appear, however, the tendon and tendon sheaths may scar, causing irreversible damage. The only reasonable way to deal with tenosynovitis is to prevent it.

#### **de Quervain's disease**

This is a type of tenosynovitis more commonly known as "trigger thumb." It affects the common sheath for the two tendons of the thumb just above the wrist. It is caused by repetitive trigger-like movements involving the wrist.

#### **Tendonitis**

Repeated and forceful movements strain the tendons, irritate them, and cause inflammation and thickening. The thickening tendon can eventually lock and restrict the movement of the associated muscles and bones. There are various forms of tendonitis. **Rotatorcuff tendonitis**, for example, affects the tendons which move the shoulders, rotating the arm inward and outward. **Peritendonitis** refers to the inflammation of the area surrounding the tendons and the muscle junction.

#### **Trigger finger**

It is a thickening of the finger tendons which makes it difficult to straighten the fingers after bending. Tasks requiring too wide a grip on a handle while squeezing can lead to this problem.

#### **Carpal Tunnel Syndrome**

Repetitive finger movements, pinching and squeezing with fingertips, hand exertions with bent wrist, excessive use of the index finger, twisting of wrists, overly tight grip and uneven work movement can lead to a painful condition called carpal tunnel syndrome (CTS). The carpal tunnel is a narrow channel formed by carpal bones on three sides, with the thick, inelastic carpal ligament on the fourth. It runs through the inner side of the wrist. Tendons inside that tunnel run parallel the extremely fragile median nerve. This nerve passes from the shoulder and forearm to the hand, sending nerve signals to some fingers and the palm. Flexing causes the tendons inside the carpal tunnel to compress on the median

nerve (just as sitting for a long period with legs crossed compresses a nerve and causes numbness).

Simple CTS occurs when the presence of fluid or thickened tissues squeezes the median nerve. The more serious condition of secondary CTS occurs when inflamed tendon sheaths in the carpal tunnel (tenosynovitis) cause increased pressure on the median nerve. Workers performing light but frequent repetitive movements of the wrist and fingers are particularly likely to develop this injury.

The symptoms of carpal tunnel syndrome are numbness, tingling, burning sensations, pain in the wrist, wasting of the muscles at the base of the wrist, shiny palms, clumsiness of the hands, swelling of the wrist and hand, loss of the ability to grasp items, and impaired thumb and finger dexterity. In the early stages, there may be soreness in the wrist or forearm. In later stages, the pain can be acute, and the movement of wrist or fingers limited. There may be a grating sensation (crepitus) with movement. In the advanced stage, finger movements may be jerky, and in the final stage the thumb and fingers may become locked.

#### **Dupuytren's Contracture**

Sometimes repeated small movements of the palm (e.g. rubber stamping) can cause deposits of fibrous tissue on the tendon sheath of the palm and thumb. A progressive, painless thickening and tightening of the palm tissue beneath the skin takes place, causing the hand to close into a claw-like position. It becomes impossible to extend the finger, and the hand can become permanently bound. The first symptom of this condition is a small nodule appearing on the palm, followed by nodules appearing on the fingers.

#### **Ganglion**

Ganglion is an injury closely associated with repetitive strain injuries of the wrist and hands. Precise, repetitive hand movements may lead to the formation of round, hard swelling near a tendon, sheath or joint, usually in the back the hand or wrist.

#### **Writer's Cramp**

Cramping of the hand or forearm can result from the repetitive movement of handwriting or typing. Nerves are affected, causing uncontrolled finger movements.

#### **Epicondylitis**

Strain injuries of the muscle and tissues in the area of the elbow joint are known as **epicondylitis**. This is also commonly referred to as "tennis elbow" (lateral epicondylitis) or "golfer's elbow" (medial epicondylitis).

Muscles which bend the wrist and fingers forward and backward are attached at their upper ends to bone and ligament just above the elbow joint.

Common causes of epicondylitis include: repeated strain of the forearm (e.g. when hammering or laying bricks); bending of the wrist against a resisting force (e.g. when twisting a screwdriver or carrying a heavy load with arms extended); lifting objects with the hand held downward and with the forefinger in a grasping position.

There may be tenderness and swelling in or near the elbow and pain may radiate from the elbow. The pain may be especially acute if the hand is moved. **Lateral epicondylitis** (tennis elbow) is the inflammation of the tissue at the elbow end of the humerus bone (the largest bone of the upper arm). Symptoms are pain and tenderness when fingers are moved with the elbow held away from the body. The pain radiates from the elbow joint.

### **Bursitis**

Miner's elbow, weaver's elbow, housemaid's knee, hod-carrier's shoulders, dustman's shoulders, and miner's beat hand are common names for bursitis. It is an inflammation of the bursa, a fluid-filled fibrous sac often found in areas subject to friction, for example around joints or where a tendon passes over a bone. Excessive, prolonged and repeated pressures or jolts to joints can lead to bursitis, with symptoms of severe pain and restricted movements.

### **Shoulder and Neck Strain Injuries**

Repetitive lifting of your arms can lead to complications. Two tendons in the shoulder area can be strained because of repetitive work. One of the tendons passes over the top of the shoulder joint and lifts the arm away from the side. The other passes in front of the shoulder joint and assists forward and upward movement of the arm. Work requiring the arms to be moved or lifted away from the chest can cause muscle overload. **Humeral tendonitis** is one injury resulting from the continuous use of shoulder muscles and tendons.

Shoulder and neck strain muscles are related. Neck muscles control head posture and lift and brace the shoulders. Like shoulder muscles, they are in constant use. Symptoms of injury include pain in both areas during rest, stiffness in the neck and headaches arising from the neck, muscle tightness and tender spots in the muscles.

Physicians may be confused about the source of pain since it may be "referred" to other parts of the body. Nerves in the shoulders travel down the arm to the hands, and any injuries involving shoulders may cause pain elsewhere.

### **The danger of multiple problems**

Workers with a repetitive strain injury in one part of the body may develop problems in other areas at the same time. When feeling discomfort or pain from doing work in one particular way, they may try and compensate through movements that cause other strain injuries. Thus, pain in wrists or hands can be followed by pains in the forearms and shoulders.

An additional problem is that workers may try to "work through the pain." Since they do not relate their pain to the workplace, they try to keep up productivity and don't stop their work. As a result, inflammation continues and worsens, leading to even greater injury.

### **Other concerns**

Getting RSIs diagnosed is a major concern. The pain can be persistent, but because there are no open signs of injury or damage aside from occasional swelling, workers are accused of being neurotic or

malingers. Often the victim is blamed and told that the pain is “all in their mind.”

While the worker finds that doing the job may lead to a painful condition, the pain usually goes away with rest. When returning to work the pain reappears. Other workers may see this person as a chronic complainer because they fail to make the connection between the unseen injury and work.

Some physicians have called such problems “women’s complaints” saying that women are more prone to RSIs. However, it’s more likely that many women receive such injuries because they are employed in large numbers where such injuries are common (e.g. typing, keyboard work), or because the tools they must use are designed for the “average male,” not for the smaller grip many women have. Again, because the injury is not plainly visible, women workers are accused of “hysteria.”

### What can be done about RSI?

Because RSIs have numerous causes affecting a variety of areas, eliminating them demands a comprehensive prevention program. The cornerstone of such a program must be to make the job fit the person rather than make the person fit the job.

1. An education program outlining the source and prevention of repetitive strain injuries should be provided. Workers should be informed of the symptoms of such injuries so that they can be identified before any serious injury occurs.
2. A reporting system to ensure early symptoms are dealt with seriously and immediately. Workers should not put up with the pain.
3. A provision for regular rest and time-off work should be established. If the cause of the repetitive motion, trauma, etc. is eliminated a healing process can begin. Too often the worker will return to work as soon as pain disappears. This extends the problem, possibly causing a worsening of the condition. Surgery to deal with serious injury is always the last resort, especially in the case of RSIs. Job rotation, job enlargement (variety?) and repeated rest breaks should be used to break up the series of repetitive motion that can lead to injury. Jobs can be redesigned to eliminate de-skilling and monotonous and repetitive tasks. Job rotation can be used to vary the muscles used in the work process.
4. A program to investigate and document all complaints of pain related to the workplace should be developed. A careful analysis of the workplace should be conducted to detect potential causes of RSIs. A full scale ergonomics study can look at the force, speed and direction of movements, frequency of movements, work posture, rate of worker (??) and stress.
5. Redesign tools to fit the individual or specific task. For example, some tools can be designed with smaller grips that require less power to manipulate, squeeze or press, so that hands and wrists are in the same posture as when they are hanging relaxed at one’s side. Badly fitting components should be eliminated, and machinery should be well maintained. Sometimes tools may be redesigned, but any improvement can be offset by a consequent increase in the work rate (workload?). A mix of both tool or workplace redesign and rest breaks would be the most effective.

**Kommentar [JC1]:** Is this the same as workload? This may need explanation or re-wording, but I’m not sure what it is.

6. Recognition of repetitive strain injuries as serious occupational injuries is yet to be fully recognized. Each province has different coverage under the Workers' Compensation Board. Some jurisdictions do not even recognize RSIs while others deal with the problem case by case. Workers must demand legislation that covers all rRSIs and which recognizes the direct relationship between their injuries and the workplace.
7. Proper training for new workers should be provided if their jobs involve repetitive motion.