Massage and Carpal Tunnel Syndrome Home Study Course

5 CE Credit Hours
Text and Study Guide

Presented by the:

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It is the responsibility of the practitioner to determine the appropriateness of the principles presented in terms within the scope of practice. This information is in no way meant to diagnose or treat medical conditions.

Instructions for the Massage and Carpal Tunnel Syndrome home study course

Thank you for investing in the Massage and Carpal Tunnel Syndrome home study course, a 5 CE credit hour course designed to further your knowledge on the subject of carpal tunnel syndrome and how it relates to the practice of massage therapy.

This guide will contain all of the instructions you will need to complete this course. This is a 5 CE hour course, so that means it should take you approximately 5 hours to read the text and complete the examination and course evaluation.

PLEASE READ THE FOLLOWING DIRECTIONS FOR COMPLETION OF THIS COURSE.

The following are steps to follow in completing this course:

1. **Read the instructions and review the text and exam.**

2. **Access the online examination in your account at www.massagetherapyceu.com.**

3. **Complete your examination and print your certificate. The exam is open book and there is no time limit for completion.**

You must pass the exam with an 80% or better to pass this home study course. You are allowed to access and take the exam up to 3 times if needed. There is no time limit when taking the exam. Feel free to review the text while taking the exam. There are no trick questions on the exam. All of the answers are clearly found in the text. The exam is also included at the end of the text for review before taking the exam.

It is advised to answer the exam questions in the study guide before testing online. That way, when you are testing you do not have go back and forth through the online exam and risk loosing your answered questions!

Good luck as you complete this course. If you have any questions please feel free to contact us at 866-784-5940, 712-490-8245 or info@massagetherapyceu.com. Most state boards require that you keep your "proof of completion" certificates for at least four years in case of audit. Thank you for taking our Massage and Carpal Tunnel Syndrome home study course.

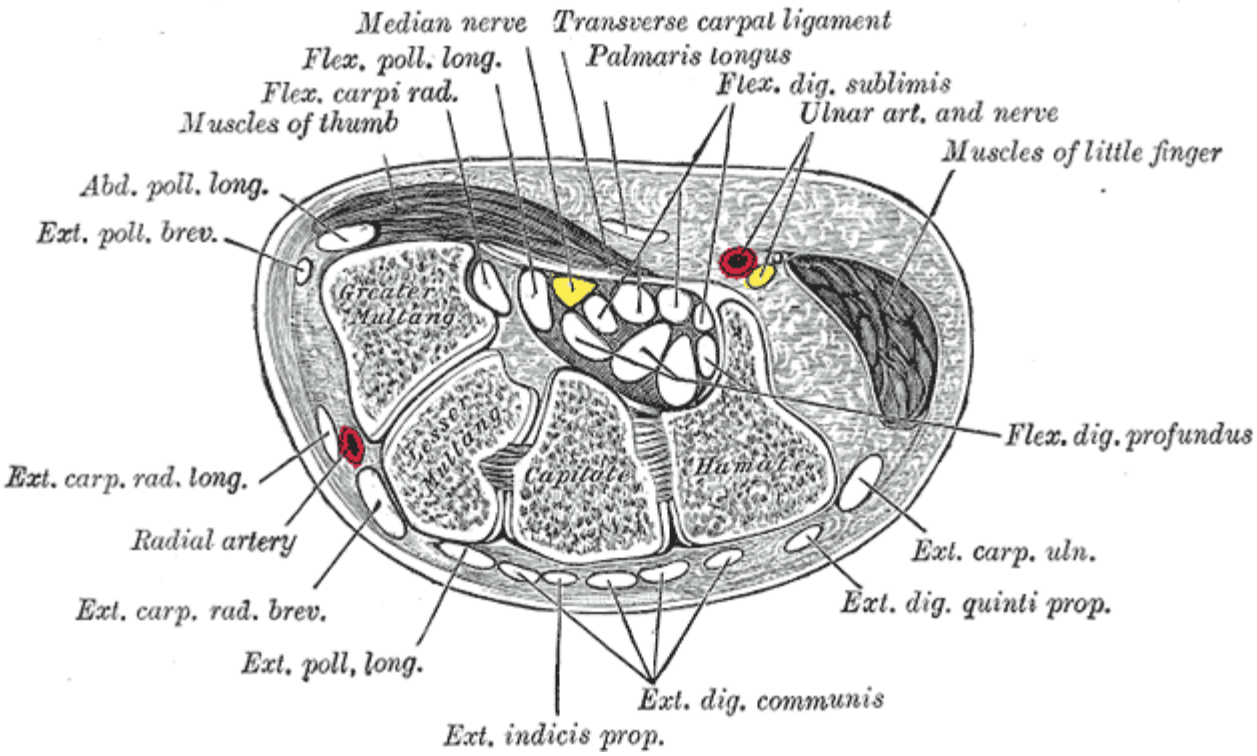
Massage and Carpal Tunnel Syndrome Text

What is carpal tunnel syndrome?
Carpal Tunnel Syndrome (CTS) has several names. It is also called median neuropathy at the wrist and median nerve entrapment. These other names identify exactly what the condition is. Carpal tunnel syndrome is a medical condition where the median nerve, which runs from the forearm into the hand, is compressed or squeezed or obstructed at the wrist.

The median nerve provides sensation to the palm side of the fingers (except the little finger) and the thumb. It also controls impulses to smaller muscles in the hand which allow the fingers and thumb to move.

The carpal tunnel gets its name from the eight bones in the wrist, four of which are shown below in diagram1, called the carpals. This tunnel is a narrow and rigid passageway formed by the carpal bones and the median nerve extends through it toward the hand. In addition to housing the median nerve, the carpal tunnel also houses tendons and ligaments. See diagram 1.

Diagram 1

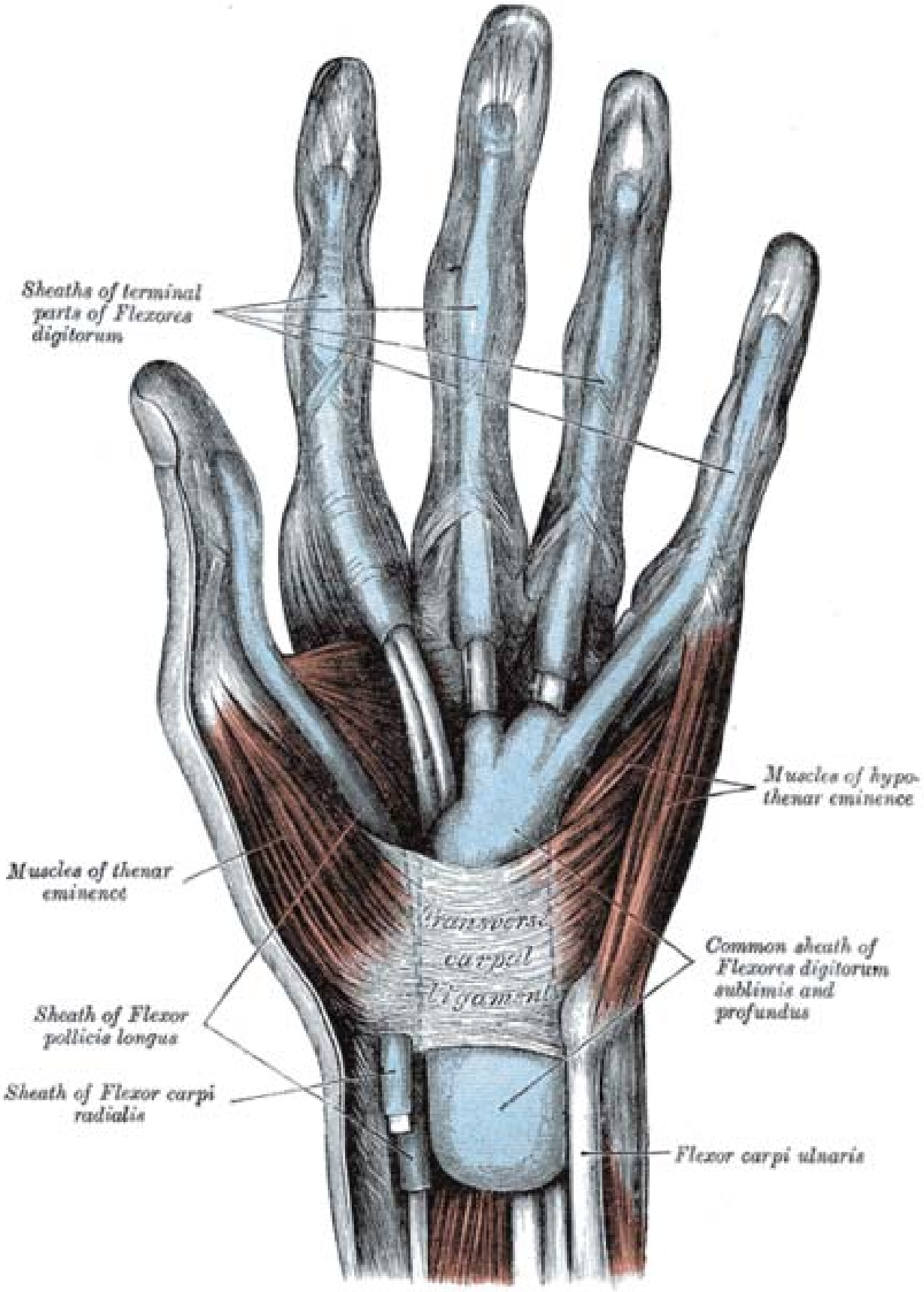


When the tendons become irritated causing thickening or there is other swelling in the narrow tunnel, the median nerve is compressed. This results in a pinched nerve, producing the symptoms of carpal tunnel syndrome. Causes of the swelling and irritation around the tendons will be discussed later on in this home study course.

CTS is the most common and widely known of the entrapment neuropathies in which the body's peripheral nerves are traumatized or compressed. Carpal tunnel syndrome is also considered a repetitive strain injury or repetitive stress injury (RSI) by some.

According to the National Institute for Occupational Safety and Health (NIOSH) and the Bureau of Labor and Statistics, over 8 million Americans are affected by carpal tunnel syndrome.

Diagram 2



What parts of anatomy are affected in carpal tunnel syndrome?

- The median nerve
- The carpal bones
- Transverse carpal ligament
- Nine flexor tendons of the hand
- The thenar eminence
- Flexor pollicis brevis muscle
- Adductor pollicis muscle
- Opponens pollicis muscle
- Abductor pollicis brevis muscle
- See diagrams 1 and 2

How are these parts of anatomy affected in CTS?
Refer to diagrams 1 and 2 for this discussion.

The carpal tunnel is created by bones on three sides and the transverse carpal ligament on the fourth side. Nine flexor tendons and one nerve of the hand pass through the tunnel. These include the four tendons of flexor digitorum profundus, four tendons of flexor digitorum superficialis, and the tendon of flexor pollicus longus. The median nerve is the nerve which travels through the carpal tunnel.

The median nerve is compressed anytime there is a decrease in the size of the canal, an increase in the size of the contents, or both. An example of decreasing the size of the canal is to simply bend the wrist 90 degrees. An example of an increase in size of the contents of the tunnel is the swelling of lubrication tissue around the flexor tendons.

Constant impingement of the median nerve causes weakness and wasting of the muscles of the thenar eminence. These muscles are the flexor pollicis brevis muscle, abductor pollicis brevis muscle, and opponens pollicis muscle. Lastly, compression causes some sensory loss in the first three fingers and thumb.

What are the signs and symptoms of carpal tunnel syndrome?
Signs and symptoms start gradually. They often first appear in one or both hands during the night, when people are sleeping with bent or flexed wrists. Clients will report a variety of signs and symptoms and these can include:

- Pain and numbness in the index and middle fingers
- Weakness of the thumb
- Paresthesias (burning and tingling sensations)
- Night symptoms
- Waking at night
- Numbness and muscle weakness in the hand
- Burning, tingling, or itching numbness in the palm of the hand and fingers, especially in the first three fingers and the thumb
- A feeling of uselessness in the fingers
- Reports of dropping things
- Fingers feel swollen, even though no little or no swelling is observed clinically
- Painful nighttime tingling in one or both hands disturbing sleep
- Wake up feeling the need to “shake out” the wrist or hand
- Daytime tingling in the hands
- Dominant hand usually affected first and produces the most severe pain
- Decreased grip strength causing decreased ability to squeeze things, grasp small objects, form a fist, or perform other simple manual tasks

- Hands feel like they are falling asleep
- Shooting pain from the hand up the arm and even up to the shoulder
- Loss of strength in the thenar muscles (muscles at the base of the thumb near the palm)
- In chronic or untreated cases, thenar muscle wasting
- In chronic or untreated cases, inability to tell between hot and cold by touch
- In chronic or untreated cases, weakness of palmar abduction of the thumb (difficulty bringing the thumb away from the hand)

What causes carpal tunnel syndrome?
Carpal tunnel syndrome is usually the result of a combination of factors that increase pressure on the median nerve and tendons in the carpal tunnel. It is rarely a problem with the nerve itself. Many cases of CTS are idiopathic, which means without known cause. Here is a list of causes from what is known.

Genetics Causes
Genetic predisposition is the most common cause. The carpal tunnel is simply smaller in some people than in others. Structurally and biologically there is less room or space in the tunnel leading to a potential compression of the median nerve.

Work and Job Related Causes
There seems to be great debate regarding the relationship between CTS and repetitive motions from work or activity. Occupational risk factors of repetitive tasks, repeated use of vibrating hand tools, assembly line work, excessive force, poor posture, and vibration are some of the activities in question.

The latest clinical data doesn't seem to support a relationship between these activities and the occurrence of CTS. The current literature shows little proof whether repetitive and forceful movements of the hand and wrist during work, or even leisure activities for that matter, cause CTS.

This relationship between work and CTS is also controversial because of workers compensation claims. In some places, workers diagnosed with carpal tunnel syndrome are entitled to time off and compensation. Carpal tunnel syndrome results in millions of dollars of workers compensation claims annually.

In 1998, an estimated three out of every 10,000 workers missed time from work due to carpal tunnel syndrome. About 50% of these workers lost more than 10 days of work. The average lifetime cost of carpal tunnel syndrome is estimated to be about $30,000 for each worker making compensation claims. This figure includes medical bills and lost time from work.

Repeated motions, like those performed in activities of daily living and under normal working conditions, are known to result in repetitive motion disorders like tendonitis and bursitis. They are not known to result in carpal tunnel syndrome.

Writer's cramp is another repeated motion activity that doesn't contribute to CTS. Writer's cramp is a condition brought on by repetitive activity. It consists of a lack of fine motor skill coordination, aches, and pressure in the fingers, wrist, or forearm. It is not a cause of carpal tunnel syndrome.

Psychosocial Causes
It is debatable whether stress is a cause of CTS. Studies show that psychological stress such as job demands, poor support from colleagues, and job dissatisfaction do correlate with increased pain at work. Since carpal tunnel syndrome tends to have numbness and tingling sensations rather than pain, it is questionable if stress is a true factor.

Disease Causes
There are many diseases associated with CTS. For example, carpal tunnel syndrome is often associated with diseases like multiple myeloma, trauma, amyloidosis, or mucopolysaccharidoses. Fluid retention during pregnancy, hypothyroidism, or menopause is another association of CTS.

Rheumatoid arthritis and other diseases can cause inflammation of the flexor tendons creating median nerve compression at the carpal tunnel. Endocrine problems like overactivity of the pituitary gland and hypothyroidism can be causes. Acromegaly, which is a disorder of growth hormones, compresses the median nerve because of the abnormally large growth of the bones in the hand and wrist.

Rarely benign tumors like a ganglion or a lipoma or a cyst can protrude into the carpal tunnel resulting in median nerve entrapment. Obese people are also more likely to be diagnosed with CTS than slender individuals.

Trauma Related Causes
Mechanical problems or injury in the wrist joint are a factor. Injury or trauma to the wrist that causes swelling is a problem. For instance, fractures such as a Colles' fracture are a particular cause of CTS. Dislocation of one of the carpal bones of the wrist can impinge the median nerve and cause CTS. Blunt trauma of the wrist and lower forearm incurred by using an arm to brace a fall or protect oneself from a heavy falling object is also a cause. A hematoma with its associated hemorrhaging inside the wrist can pinch the median nerve. Lastly, abnormal healing of old bone fractures can lead to deformities which can be a cause of CTS.

Summary of Causes
Overall, most cases of CTS are idiopathic. Genetic factors determine most of the problem. The role of arm and hand use, work/job related causes, and other environmental factors are widely disputed. Psychosocial causes are debatable. Disease and trauma related causes are certainly a factor in CTS, but remember, in some cases no cause can be identified.

How does carpal tunnel syndrome develop?
To recap, when the tendons become irritated causing thickening or there is other swelling in the narrow tunnel, the median nerve is compressed. This results in a pinched nerve, producing the symptoms of carpal tunnel syndrome.

Who is at risk for carpal tunnel syndrome?
- Those with a genetic predisposition (it is the most common risk factor)
- Women (three times more likely to have CTS than men)
- Pregnant women
- Women in menopause
- People with back, neck, and shoulder problems
- People with Lyme disease
- Slipped disc patients
- Broken collar bone or neck injury patients
- Those with thyroid problems
- Diabetics
- Other metabolic disorders
- Obese people
- Those with rheumatoid arthritis
- People between ages 40-60
- Users of caffeine
- Those who smoke or chew tobacco
- Those who drink alcohol

- Users of artificial sweeteners
- Cashiers
- Carpenters
- Gardeners
- Those who work all day at computers
- Mechanics
- Data entry personnel
- Those performing assembly line work including manufacturing, sewing, cleaning, finishing, and any poultry, fish, or meat packing

How can carpal tunnel syndrome be prevented?
Since there is a debate about whether CTS is caused strictly by genetics or by activity, there is a debate about whether or not CTS can be prevented. Some say the current best data suggests CTS is a structural disease determined by genetics. According to this group, it would seem that CTS is probably not preventable.

Those who favor activity as a cause of carpal tunnel syndrome say it is preventable and they support activity limits. The hope is that these limitations will decrease the risk of developing CTS. There is minimal clinical data to support this, but there are recommendations for preventing CTS nevertheless. They are as follows:

- Relax your grip and reduce your force. For instance, if you are a cashier, hit the keys softly. Many people use more force than needed to do tasks with their hands. For prolonged handwriting, use an oversized big pen with soft grip adapter and free flowing ink. This decreases pressing hard on the paper and gripping the pen too tightly.

- Computer keyboard users or users of browser based software programs that require excessive finger movements should take frequent breaks from this repetitive movement. Software programs exist to remind users to take breaks and stretch their wrists.

- Use good form. A relaxed middle position of the wrist is best. Avoid bending the wrist all the way up or all the way down. When using a keyboard, keep the wrist at elbow height or slightly lower.

- Use good posture. Poor posture causes your shoulders to roll or hunch forward. The neck and should muscles are shortened when in this position and nerves in the neck are compressed. This compression can affect your wrists, fingers and hands.

- Take frequent breaks at least every 15 to 20 minutes.

- Give your wrists and hands a break by gently bending and stretching them.

- Alternate your tasks when possible. When using vibrating equipment or equipment requiring excessive force, taking those breaks is even more important.

- Keep the hands warm. Hand pain and stiffness are more likely to develop in a cold work environment. Fingerless gloves are an option to keep the hands and wrists warm and flexible in cold work places.

- Workers can do on-the-job conditioning specific to their job and the repetitive motions they encounter.

- Perform stretching exercises at regular intervals is another suggestion.

- Wear splints to keep wrists straight and protected.

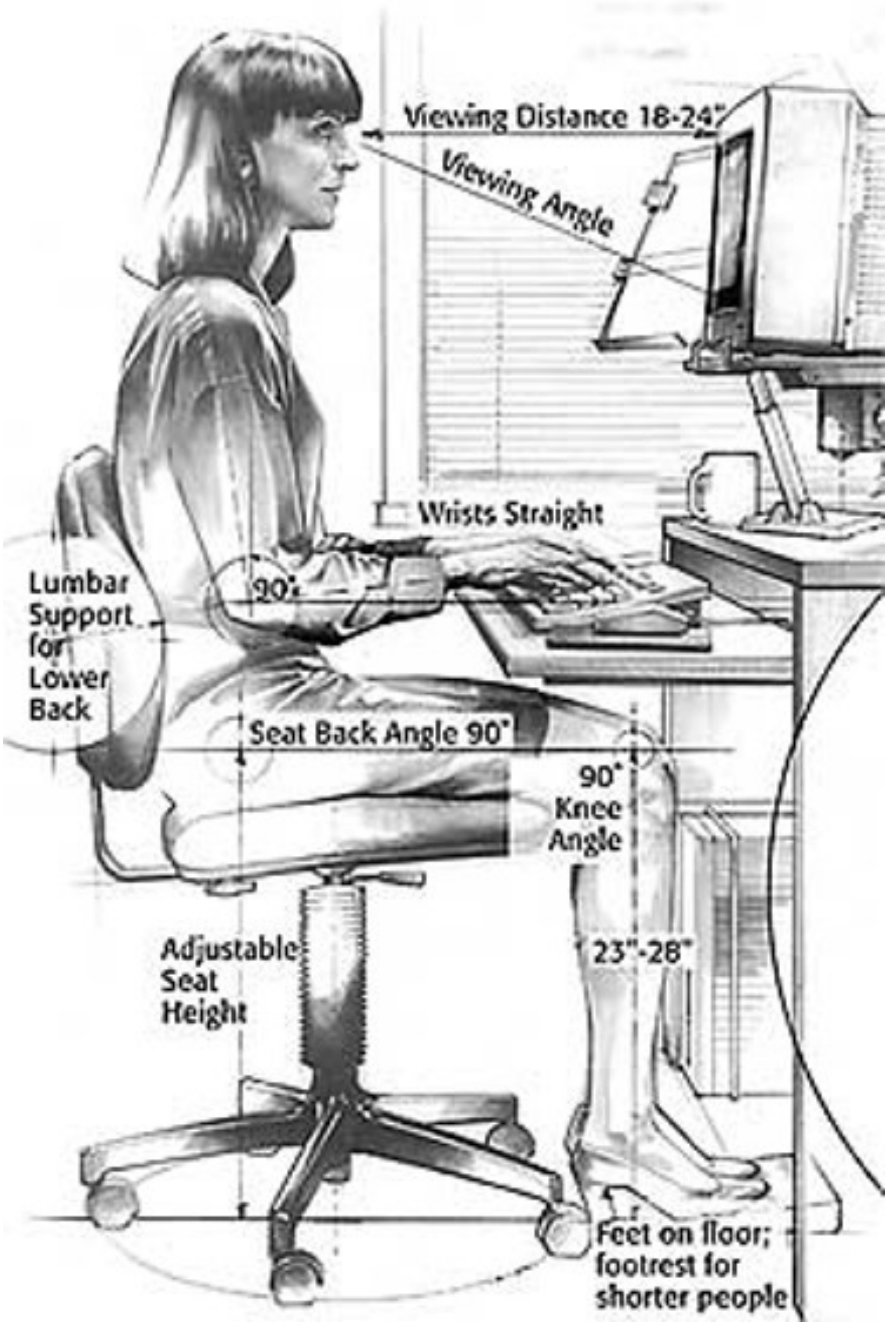
- Redesign workstations, tools and tool handles, and tasks to enable the worker's wrist to maintain a natural position during work.

- Rotate repetitive motion jobs among workers.

- Employers can develop programs in ergonomics. Ergonomics is the process of adapting workplace conditions and job demands to the workers.

Again, the research doesn't conclusively show that these recommendations and workplace changes prevent the occurrence of carpal tunnel syndrome. Even though this may be true, the following diagram 3 suggests some of the proper angles and body positions for computer and keyboard users to implement at work and home.

Diagram 3



How is carpal tunnel syndrome diagnosed?
A physician, physician's assistant, or nurse practitioner diagnoses CTS based on clinical symptoms, routine laboratory tests, and X-rays. Their clinical assessment, which involves history taking and physical examination, supports the diagnosis of CTS.

Physical examination helps to rule out other painful conditions that mimic CTS. The diagnosis of CTS is often misapplied to patients with activity related arm pain. Early diagnosis and treatment of carpal tunnel syndrome are critical to avoid permanent damage to the compressed median nerve.

A routine physical examination of the hands, arms, shoulders, and neck is performed to determine if the patient's complaints are related to daily activities or to an underlying disorder. The wrist is examined physically for signs of warmth, tenderness, swelling, and discoloration. Sensation is tested in each finger. The thenar muscles, at the base of the hand, are examined for strength and signs of muscle wasting.

Doctors also use specific orthopedic tests to produce the signs and symptoms of carpal tunnel syndrome and diagnosis the condition. A few of these tests are listed below with some photos.

- The Tinel test or Tinel's sign – in this classic but less specific test, the physician presses or taps on the median nerve in the patient's wrist. In other words, they lightly tap over the area of the nerve to elicit a sensation of "pins and needles" or tingling. A positive test occurs when the patient reports tingling in the fingers or a shock-like sensation. It is a general way to detect irritated nerves. See picture 1 below.

Picture 1

- The Phalen or Phalen's Maneuver or wrist-flexion test – the doctor has the patient hold their forearms upright by pointing the fingers down and pressing the backs of the hands together. In other words, the maneuver is performed by flexing the wrist gently as far as possible, holding that position, and waiting for symptoms to occur. A positive test is feeling numbness or tingling within 1 minute in the fingers when holding the wrists in this acute flexion position. The quicker the numbness or tingling starts, the more advanced the condition. See picture 2 below.

Picture 2

- The Reverse Phalen test – Opposite of the Phalen test, the Reverse Phalen test is performed by having the patient hold the wrists and fingers in full extension. This position significantly increases pressure within the carpal tunnel. A positive finding elicits numbness, pain, and tingling along the median nerve. See picture 3 below.

Picture 3

- Movement tests – the physician asks the patients to repeat, create, or make the movements that bring on symptoms.

- The Durkan test or carpal compression test – the physician applies firm pressure of the palm over the median nerve for up to 30 seconds to elicit symptoms. A positive test occurs when symptoms are produced. See picture 4 below.

Picture 4

Routine laboratory tests and X-rays are helpful in the diagnosis of CTS because they can detect things like arthritis, diabetes, and fractures which are known to be associated with the disease. But really, the gold standard for the diagnosis of carpal tunnel syndrome is electrophysiological testing. If the patient's history and physical examination suggest CTS, patients are tested electrodiagnostically with nerve conduction studies and electromyography.

A patient can have intermittent numbness and a positive Phalen's and Durkan's test, but with a normal electrophysiological test, they have only very mild carpal tunnel syndrome. That shows just how important electrophysiological testing is in CTS diagnosis.

As a side note, the symptom of numbness is also very important in CTS diagnosis. When a patient has more pain than numbness, their problem is unlikely to be due to carpal tunnel syndrome no matter what the results of their electrophysiological testing.

As previously mentioned, the diagnosis of CTS is confirmed by the use of electrodiagnostic tests. An electrodiagnostic test is a nerve conduction study in which electrodes are placed on the hand and wrist. Small electric shocks are applied to the patient's wrist. The speed with which nerves transmit impulses is measured.

In another method called electromyography, a fine needle is inserted into a muscle. The electrical activity of the muscle is measured and viewed on a screen to determine the severity of damage to the median nerve.

Since other conditions are often misdiagnosed as carpal tunnel syndrome, the goal of electrodiagnostic testing is to compare the speed of conduction in the median nerve with speed of conduction in other nerves of the hand. In CTS the median nerve is compressed, so the nerve conducts more slowly than normal and more slowly than other nerves in the hand. Overall, there are many electrodiagnostic tests used to make a diagnosis of CTS, but the most sensitive, reliable, and specific test is the Combined Sensory Index (also known as Robinson index).

It's unclear whether magnetic resonance imaging (MRI) or ultrasound is helpful in the diagnosis of carpal tunnel syndrome. Ultrasound imaging possibly shows impaired movement of the median nerve. MRI shows the anatomy of the wrist, yet it doesn't seem to be especially helpful in diagnosing CTS.

How is carpal tunnel syndrome treated?
Treatments for CTS should begin as early as possible to prevent permanent damage to the median nerve. Underlying causes such as hypothyroidism, diabetes, or arthritis should be treated first under the care of a doctor. Treatment of these primary disorders often resolves CTS symptoms.

Generally, treatment includes resting the affected hand and wrist for at least 2 weeks, avoiding activities that worsen symptoms, immobilizing the wrist with splints to avoid further damage from bending or twisting, stretching and strengthening exercises, physical or occupational therapy, alternative treatments, pain and anti-inflammatory medicines, and surgery. If inflammation is present, application of cool packs may help decrease swelling.

There are two type of treatment. They are non-surgical, also called palliative treatments because they control symptoms, and surgical, also called disease modifying treatments. There is a lot of debate regarding what is the most effective treatment for CTS.

Non-Surgical Treatments or Palliative Treatments
Exercise – Stretching and strengthening exercises are effective for people whose symptoms have stopped. These exercises may be supervised by a physical therapist or an occupational therapist. Some of those exercises include tendon gliding exercises and isolated tendon gliding exercises.

A physical therapist is a person who is trained to use exercises to treat physical impairments. An occupational therapist is someone who is trained in evaluating people with physical impairments and helping them build skills to improve their health and overall well being.

Both physical therapists and occupational therapists may use any of the following treatment modalities to decrease pain and inflammation for patients with CTS:

- Ice or cool packs
- Hot packs
- Ultrasound
- Paraffin
- Contrast baths
- And many others

Physiotherapy or Physical Therapy – Physiotherapy offers a couple of ways to control and treat CTS. The physical therapy should be specific to the person's the pattern of pain, symptoms, and dysfunction. This is determined by the physical therapist. Treatment may include soft tissue massage, conservative stretches and exercises, and techniques to directly mobilize the nerve tissue. It can also include immobilizing braces.

If a patient presents with an inflamed, swollen hand and symptoms of pain, tingling, numbness, and a fear of using it because of the pain, a physiotherapist may focus on techniques to reduce the pain and inflammation. They may also use exercises to promote an increase in circulation.

Occupational Therapy – Mainly, occupational therapy offers ergonomic suggestions to prevent worsening of the signs and symptom of CTS. Occupational therapists also facilitate hand functions by teaching the patient functional activities. Additionally, they help people regain the movements necessary for the functional living with adaptive approaches.

Occupational therapy may suggest avoidance of any forceful and repetitive use of the hands and wrists that might cause upper extremity pain. They might recommend frequent rest breaks or multiple mini breaks in a person's work schedule to reduce symptoms. For instance, a person who works on a keyboard might take a 30 second pause every 3 to 5 minutes. The more severe the pain of CTS, the more often one should take this break.

More proactive ways to reduce hand and wrist stress, which will alleviate wrist pain and strain, involve adopting a more ergonomic work and life environment. An occupational therapist works with people to accomplish this.

For instance, they may teach a patient proper body alignment with the keyboard. This is accomplished by bending the elbows at a 90 degree angle and having the keyboard at the same height as the elbows. Also, position the computer monitor directly in front of the seat so the neck isn't twisted to either side when viewing the screen. Lastly, it is important not to put physical stress on the wrists. Examples of physical stress would be hanging the wrist on the edge of a desk or exposing the wrists to strong vibrations like when using a manual lawn mower.

Alternative Therapies - Acupuncture and chiropractic care have benefited some patients with carpal tunnel syndrome. More research needs to be done in both of these areas to demonstrate effectiveness of these treatments.

Yoga has been shown to reduce pain and improve grip strength among patients with carpal tunnel syndrome. It is also effective for decreasing stress which is sometimes present in cases of pain.

Massage therapy is surprisingly one of the most overlooked methods for treatment of the symptoms of CTS. The use of myofascial release and active stretch release can ease the pain, numbness, tingling, and burning in minutes. Following the massage with the stretches and exercises prescribed by a physical therapist lengthens the relief attained by these release techniques.

As far as nutritional supplement are concerned, studies demonstrate that vitamin B^6 (pyridoxine) supplements may ease the signs and symptoms of carpal tunnel syndrome. Vitamin B^{12} (methylcobalamin) is also helpful in many cases of CTS.

Immobilizing Braces or Splints – A splint keeps the wrist straight and immobilized. This helps limit numbness by limiting wrist flexion. The importance of wrist braces and splints in the CTS treatment is well known, but many people are unwilling to use braces.

Braces can be worn on one hand or both. The following are a few pictures of different kinds of braces that are available to carpal tunnel syndrome patients. See picture 5 and picture 6 below.

Picture 5

Picture 6

In 1993, The American Academy of Neurology started recommending splint use in the early treatment of CTS with light and moderate pathology. However, their current recommendations generally don't suggest immobilizing braces. They suggest activity modification and non-steroidal anti-inflammatory drugs as initial therapy, followed by more aggressive options, or specialist referral if symptoms do not improve.

Many health professionals suggest wearing braces at night. Night symptoms and waking at night can be managed effectively with night time wrist splinting in most patients. Also, night splinting helps patients to sleep. Health professionals also recommend, if possible, wearing splints or braces during the activity primarily causing stress on the wrists.

Drugs – Various drugs can ease the pain and swelling associated with carpal tunnel syndrome. The list includes the following:

Non-steroidal anti-inflammatory drugs over the counter drugs, such as aspirin, ibuprofen, naproxen, and other nonprescription pain relievers are the most commonly prescribed. They may ease and control symptoms that have been present for a short time or have been caused by strenuous activity. Only an anti-inflammatory will decrease the inflammation. Non-steroidal anti-inflammatory medications treat the swelling and the source of the pain problem. The most common problem with long term use of anti-inflammatory medications is bleeding and gastrointestinal irritation. Some anti-inflammatory medications have been linked to heart complications. Chronic anti-inflammatory medication use for long term pain should only be done with doctor supervision. The use of non-steroidal anti-inflammatory drugs may complicate asthma symptoms in patients with asthma or a history of asthma. In these cases, the use of steroids such as prednisone is the safer option for treating CTS.

Corticosteroids, such as prednisone, are injected directly into the wrist or taken orally to relieve pressure on the median nerve and provide temporary, immediate relief to patients with intermittent or mild symptoms of CTS. These steroid injections are quite effective to reduce swelling and nerve pressure within the carpal tunnel. They are a short term solution to be used while the patient creates a long term strategy that fits with their lifestyle for dealing with the CTS. This is considered an aggressive pharmaceutical option. People with diabetes and those predisposed to diabetes should note that prolonged corticosteroid use makes it difficult to control insulin levels. Corticosteroids shouldn't be started without a doctor's prescription or stopped without one either.

Lidocaine is also injected into the wrist for the same purpose as the corticosteroids. It provides temporary and immediate relief to patients with intermittent or mild symptoms of CTS.

Oral diuretics ("water pills") can decrease swelling. These require a physician's prescription.

Pain relievers like paracetamol mask the pain and aren't really a good treatment option.

What is the goal of these non-surgical or palliative treatments?

- To reduce inflammation
- To reduce pain
- Maintain normal movement of the flexor tendons through the carpal tunnel
- To prevent motor weakness of the median innervated thenar muscles
- To prevent sensory loss
- To prevent surgery

Surgical Treatments or Disease Modifying Treatments

In general, mild cases of carpal tunnel syndrome can be controlled for months to years. Severe cases with unrelenting symptoms are likely to require surgical treatment. Carpal tunnel release surgery is one of the most common surgical procedures in the US. If symptoms of CTS last for 6 or more months, it is generally recommended to have surgery. Surgery is also recommended when there is constant not just intermittent numbness, weakness of palmar abduction or atrophy, and when wearing a splint at nighttime no longer controls the intermittent symptoms. Many patients require surgery on both hands.

Carpal tunnel surgery is performed by hand surgeons, orthopedic surgeons, and plastic surgeons. In some cases, neurosurgeons and general surgeons also perform these procedures.

Carpal tunnel release surgery involves cutting the band of tissue around the wrist to reduce pressure on the median nerve. Surgery is done under local anesthesia. It is an out patient procedure and doesn't require an overnight hospital stay.

In carpal tunnel release surgery, the goal is to divide the transverse carpal ligament in two. The transverse carpal ligament is a wide ligament that runs across the hand, from the base of the thumb to the base of the fifth finger. See diagram 2. This ligament forms the top of the carpal tunnel. When the surgeon cuts across it, in a line with the middle finger, it no longer presses down on the median nerve inside, relieving the pressure.

While surgery to cut the transverse carpal ligament relieves symptoms and prevents further nerve damage, it doesn't help existing damage. The existing nerve dysfunctions such as constant numbness, atrophy, or weakness are usually permanent. These symptoms do not respond predictably to surgery.

Variations on carpal tunnel release surgery exist. Each surgeon has differences of preference based on their experience and beliefs. The common features of all the techniques include brief outpatient procedures, palm or wrist incisions, cutting of the transverse carpal ligament, rapid recovery profiles, and all usually leave a cosmetically insignificant scar.

There are two major types of carpal tunnel release surgery. They are *open release surgery or open hand surgery* and *endoscopic surgery*.

Open release surgery or open hand surgery – This is the traditional procedure used to correct carpal tunnel syndrome. It consists of making an incision up to 2 inches in the wrist and then cutting the carpal ligament to enlarge the carpal tunnel. Local anesthesia is used for the procedure on an outpatient basis, unless there are unusual medical considerations.

Endoscopic surgery – This procedure may allow faster functional recovery and less postoperative discomfort than the traditional open release or open hand surgery. It consist of making two incisions (about ½" each) in the wrist and palm, inserting a camera attached to a tube, observing the tissue on a screen, and cutting the carpal ligament. Local anesthesia is used for this two portal endoscopic surgery and it is effective for minimizing scarring and scar tenderness. One portal endoscopic surgery for carpal tunnel syndrome is also available.

Most surgeons perform the open surgery. It is widely considered to be the gold standard. However, as endoscopic procedures are becoming more common, many surgeons are now using the endoscopic techniques. The main differences are simple. The traditional open hand surgery involves a one or two inch incision somewhere on the palm. Through incision, the ligament is directly visualized and divided. Endoscopic procedures involve one or two smaller half inch incisions. Instruments are introduced via these incisions. These instruments include probes, knives, and the scope used to visualize the operative field.

How effective is surgical or disease modifying treatment?
Surgery has a high success rate in correcting carpal tunnel syndrome especially using the endoscopic surgery techniques. Around 90% of people who have the surgery are able to return to their same jobs. Generally, traditional open carpal surgeries and endoscopic techniques are equally effective. A faster recovery time is noted with the endoscopic procedures. The down side to the endoscopic procedures is that they have a higher complication rate than traditional surgeries.

Success is highest in people with the most common typical symptoms. An incorrect diagnosis is the most common cause of failure. This is because surgery will only fix carpal tunnel syndrome. It won't relieve symptoms with other causes.

After surgery, recurrence of carpal tunnel syndrome is rare. If there is recurrence, it usually results from a misdiagnosis of another problem. Serious complications are infrequent to rare.

Full recovery from carpal tunnel surgery takes months. Some symptoms may be relieved immediately after surgery. A few patients can have infection, nerve damage, stiffness, and pain at the incision site or scar. Once in awhile, the wrist loses strength because the transverse carpal ligament is cut into two. Usually, patients

undergo physical therapy after surgery to gain back their wrist strength. A few people need to change jobs after recovery from their surgery. Some patients get by with just adjusting their job duties.

What does long term recovery look like for those with carpal tunnel syndrome?
Those who find relief from their carpal tunnel symptoms with conservative or surgical management find minimal lasting nerve damage. Chronic carpal tunnel syndrome, usually seen in the elderly patients, can result in permanent nerve damage. This means continual symptoms of numbness, muscle wasting and weakness.

Overall, outcomes are generally good, but certain factors do contribute to poor results. These factors include mental status parameters and alcohol use. People with these things have much poorer overall results of treatment. These factors have little to do with nerves, anatomy, or surgery type.

Mild carpal tunnel syndrome sufferers often try to find a conservative non-surgical treatment approach. They look for something that allows them to return to full activity without hand pain or numbness and without waking them up at night.

This can be either a change of hand use pattern or posture at work. It can also be adjusting repetitive movements, the frequency with which the movements are done, and the amount of rest time between periods of performing the movements. Others simply prioritize activities and avoid certain hand activities so they minimize pain and perform essential tasks.

While recurrence of carpal tunnel syndrome after surgery is a possibility, it is rare. The majority of patients recover completely. Fortunately true recurrences are uncommon to rare. If there is a recurrence, it can be due to non-CTS hand pain. This hand pain may have existed prior to the surgery, which is another reason it is very important to get a proper and correct diagnosis the first time.

How can massage therapy help carpal tunnel syndrome clients?
In general, massage is known to ease pain, boost energy, support healing, reduce recovery time after an injury, enhance relaxation, improve mood, and improve sense of well-being. In addition to these benefits for carpal tunnel syndrome patients, studies have shown that CTS symptoms decrease following massage therapy. When massage therapy is used for CTS clients, the massage may lead to a dramatic reduction in symptoms and pain, as well as improved grip strength. Massage therapy also relieves pain from muscles in the arm or shoulder that may mimic carpal tunnel syndrome.

Studies have shown both general massage and carpal tunnel syndrome targeted massage treatment programs ease and reduce the symptoms of carpal tunnel syndrome. Studies also show that carpal tunnel syndrome targeted massage therapy programs increase grip strength.

Typically, the most effective massage routines include moderate pressure strokes from the fingertips to the elbow. Another simple, self-performed massage technique called “wrist-wringing” may also help to decrease congestion in the wrist and increase fluid movement in the joints. To perform this method, clasp one wrist with the other hand and massage the sore or affected wrist in a circular movement. Of course, during massage people should avoid movements that are painful. Exercising the hands and arms gently to stretch them helps make the massage more effective.

Other professional massage therapy techniques, such as myofascial release (MFR) and neuromuscular therapy (NMT), decrease pressure on the median nerve from irritated and inflamed tendons within the carpal tunnel. They also reduce excessive fluid in the wrist area which helps ease irritation on the nerve.

Overall, keep in mind that massage therapy eases the symptoms of carpal tunnel syndrome and increases grip strength. It can be very effective with carpal tunnel syndrome clients.

What types of massage can be used with CTS clients?
Massage therapy techniques such as effleurage and lymphatic drainage may be useful in decreasing the edema and pain associated with carpal tunnel syndrome. The effleurage and lymph drainage techniques increase venous return and lymph drainage of the upper arm. This helps move fluid out of the upper extremity. Effleurage massage also reduces carbon dioxide, lactic acid, and other fluids.

Lymphatic Massage – Lymphatic massage is a massage technique which requires specialized instruction to learn. This specialized massage technique is used to enhance lymphatic flow and helps to rid the body of toxins and edema to promote health. Lymphatic massage is characterized by a gentle pumping technique. This gentle pumping is used to stimulate the lymph system's ability to drain away areas of water retention and trapped toxins.

As mentioned, lymph drainage requires advanced training and skills. Knowledge of the lymphatic system and the anatomy associated with the lymphatic system, especially the lymph nodes, is needed to perform it correctly. This technique was pioneered in Europe. It is becoming quite popular around the world and in the US.

Lymphatic massage is performed on all areas of the body in leisure settings, spas, or therapeutic environments. Lymph massage of the upper extremity may decrease symptoms associated with carpal tunnel syndrome by helping to stimulate lymphatic circulation. Stimulating lymph circulation increases the body's ability to eliminate waste and absorb nutrients. Lymphatic massage also decreases pain associated with CTS.

Effleurage Massage – Effleurage massage uses long horizontal, gliding strokes applied with the fingers, hand, or forearm. Usually, this gliding stroke follows the direction of the muscle fibers which are being massaged. Effleurage massage is usually associated with Swedish massage and can be combined with other massage techniques. It is performed on the arm with symptoms before and after the massage treatment to the affected area or areas.

Are there any special considerations when using massage with carpal tunnel syndrome clients?
Yes, there are several special considerations to note when using massage for CTS. Understand that direct manipulation of the damaged median nerve is highly detrimental and will easily cause other problems. Direct pressure on the carpal tunnel region is rarely applied. Always massage with great caution.

There are other specific techniques to keep in mind with CTS clients. In addition to focusing on the wrist flexors or the carpal tunnel region, massage therapy should address all the regions of the upper extremity and the neck when treating CTS. There may be median nerve compression in a number of other locations in the upper extremity, which could further irritate the nerve at the carpal tunnel. Therefore, a complete CTS massage treatment includes the entire upper extremity.

Generally, massage is considered relatively safe. Pain or other rare negative side effects are usually only caused by an extremely vigorous massage. Overall, massage is safe for CTS clients.

Are there any contraindications to using massage therapy with carpal tunnel syndrome clients?
As mentioned, the major contraindication when using massage with CTS patients is direct pressure and manipulation of the damaged median nerve. Another potential contraindication would be for people with rheumatoid arthritis or skin lesions, such as eczema. They should not receive massage therapy during acute flare ups. Since CTS is associated with rheumatoid arthritis, make sure to ask clients about this.

Other general contraindications for massage therapy with CTS patients include those who might have cancer. It is not an absolute contraindication; it is just that the patient and/or massage therapist should check with the oncologist before considering massage because a treatment can further damage tissue already subjected to chemotherapy or radiation treatments. Other times a CTS patient might want to avoid massage would be in

cases of osteoporosis, high fever, low white blood cells, low blood platelets, mental impairment, or recovering from certain types of surgery.

Another general caution with massage and CTS would be on women receiving full body massages during pregnancy. Pregnant women should consult a therapist specifically trained to perform massages on pregnant women.

Additionally, as the massage therapist, one should ask about any medications the client is taking. Massage may influence the absorption or activity of both oral and topical medications. A good history and intake form takes care of this.

How to release carpal tunnel syndrome using massage therapy
First, realize and understand that the goal for carpal tunnel syndrome is to relieve pressure on the median nerve at the wrist. Next, use thorough and frequent massage of the hand and anterior musculature, the wrist, and the forearm flexors. Also, combine these massage treatments by a therapist with self-massage between treatments and proper use of splints and braces.

This combination brings a variety of solutions to decrease pain and injury. The patient should experience reduction of pain in a few weeks. They can expect clinical restoration of function within a few months.

As mentioned, it is possible the median nerve is constricted where it leaves the spinal area or in other spots in the upper extremity. Again, it is helpful to include the shoulder area, the neck, and upper back in the massage treatment. Use long strokes up the flexors of the forearm.

Give special attention to the tendons where they pass through the flexor retinaculum. Also, using gentle and passive range of motion exercises of the wrist is helpful to decrease symptoms. It is also important to stretch the forearm flexors by extending the fingers, hand, wrist, and elbow. Use gliding strokes distal to proximal on the flexors.

When is it appropriate to refer clients?
If symptoms persist or become worse, refer the client to their physician immediately, as further damage may occur to the median nerve. Prolonged median nerve compression with signs of muscle wasting may become irreversible. This can result in permanent damage to the critical hand muscles.

What resources are available for clients with carpal tunnel syndrome?
For more information, CTS clients can contact the any of the following organizations:

American Chronic Pain Association (ACPA)
P.O. Box 850
Rocklin, CA 95677-0850
ACPA@pacbell.net
http://www.theacpa.org
Tel: 916-632-0922 or 800-533-3231
Fax: 916-652-8190

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
National Institutes of Health, DHHS
31 Center Dr., Rm. 4C02 MSC 2350
Bethesda, MD 20892-2350
NIAMSinfo@mail.nih.gov
http://www.niams.nih.gov
Tel: 301-496-8190 or 877-226-4267

Centers for Disease Control and Prevention (CDCP)
U.S. Department of Health and Human Services
1600 Clifton Road, N.E.
Atlanta, GA 30333
inquiry@cdc.gov
http://www.cdc.gov

Occupational Safety & Health Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210
http://www.osha.gov

Tel: 800-311-3435 or 404-639-3311 or 404-639-3543

Tel: 800-321-6742

American Academy of Orthopedic Surgeons/
American Association of Orthopedic Surgeons
6300 North River Road
Rosemont, IL 60018
hackett@aaos.org
http://www.aaos.org
Tel: 847-823-7186
Fax: 847-823-8125

American Society for Surgery of the Hand
6300 North River Road
Suite 600
Rosemont, Il 60018-4256
info@assh.org
http://www.assh.org
Tel: 847-384-8300
Fax: 847-384-1435

For more information on neurological disorders funded by the National Institute of Neurological Disorders and Stroke, contact the National Institute's Brain Resources and Information Network (BRAIN) at:

BRAIN
P.O. Box 5801
Bethesda, MD 20824
(800) 352-9424
http://www.ninds.nih.gov

As a massage therapist, what can you do to prevent carpal tunnel syndrome?
Since there is a debate about whether CTS is caused strictly by genetics or by activity, there is a debate about whether or not a massage therapist can prevent CTS. Some believe the current research data that suggests CTS is a structural disease determined by genetics and CTS is probably not preventable. Some believe that activity is a cause of carpal tunnel syndrome and it is preventable.

With that in mind, massage therapists may be at risk for developing carpal tunnel syndrome as a result of repetitive activity and overuse of the hands. Overuse often leads to tenosynovitis. As the tenosynovium surrounding the tendons becomes irritated and inflamed the space within the carpal tunnel decreases. This of course compresses the median nerve and producing symptoms.

Those who believe activity is a cause of CTS support activity limits for prevention of the disease. You can apply these activity limits as a working massage therapist. The hope is that these limitations will decrease your risk of developing CTS. Here are some general recommendations for massage therapists to prevent CTS:

- If you use a computer keyboard in your massage business, take frequent breaks from repetitive movement. Software programs exist to remind you to take breaks and stretch your wrists.
- Use good body position and mechanics at all times. A relaxed middle position of the wrist is best. Avoid bending the wrist all the way up or all the way down. When using a keyboard, keep the wrist at elbow height or slightly lower.
- Take frequent breaks.
- Give your wrists and hands a break by gently bending and stretching them.
- Alternate your tasks when possible. An example would be, one hour of massage, one hour of computer work.

- Use good posture. Poor posture causes your shoulders to roll or hunch forward. The neck and should muscles are shortened when in this position and nerves in the neck are compressed. This compression can affect your wrists, fingers and hands.

- Keep the hands warm. Hand pain and stiffness are more likely to develop in a cold work environment. Fingerless gloves are an option to keep the hands and wrists warm and flexible in cold work places.

- Perform stretching exercises at regular intervals is another suggestion.

- Wear splints to keep wrists straight and protected.

Again, the research doesn't conclusively show that these recommendations and workplace changes prevent the occurrence of carpal tunnel syndrome. Also, it may be difficult to implement some of these recommendations while massaging clients. For instance, wearing a protective brace or splint is not practical when giving someone deep tissue massage.

As a massage therapist, what can you do if you develop carpal tunnel syndrome?
If you experience signs or symptoms of CTS like those listed earlier in this text, consult your own personal primary care physician immediately. Early and correct diagnosis of the problem is critical for the best outcome in all cases. Don't wait for the symptoms to go away. Get checked out early. As a massage therapist, your fingers, hands, and wrists are your livelihood.

References:
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Medline Plus, http://www.nlm.nih.gov/medlineplus/carpaltunnelsyndrome.html

National Institute of Neurological Disorders & Stroke,
http://www.ninds.nih.gov/disorders/carpal_tunnel/detail_carpal_tunnel.htm

Wikipedia, http://en.wikipedia.org/wiki/Carpal_tunnel_syndrome

WikiHow, http://www.wikihow.com/Release-Carpal-Tunnel-Syndrome-With-Massage-Therapy

Massage and Carpal Tunnel Syndrome Exam

1. Which nerve is compressed in carpal tunnel syndrome?
    A. Median
    B. Brachial
    C. Ulnar
    D. Radial

2. The carpal tunnel gets its name from:
    A. Eight bones in the wrist
    B. Nine tendons in the wrist
    C. One nerve in the wrist
    D. Two arteries in the wrist

3. According to NIOSH and the Bureau of Labor & Statistics, how many people are affected by CTS?
    A. 2 million
    B. 4 million
    C. 6 million
    D. 8 million

4. Which of the following anatomy is usually not involved in CTS?
    A. The flexor tendons of the hand
    B. The radial artery
    C. The thenar eminence
    D. The median nerve

5. Muscles of the thenar eminence include:
    A. flexor pollicis brevis muscle
    B. abductor pollicis brevis muscle
    C. opponens pollicis muscle
    D. All of the above

6. CTS can cause sensory loss in which part of the hand?
    A. The thumb only
    B. The fingers only
    C. The first 3 fingers and the thumb
    D. The last 3 fingers and the thumb

7. When do symptoms of CTS appear?
    A. In the daytime only
    B. With a quick onset only
    C. With a gradual onset and at nighttime
    D. With a quick onset and in the daytime

8. Which of the following is not a symptom of CTS?
    A. Weakness of the elbow
    B. Paresthesias (burning and tingling sensations)
    C. Weakness of the thumb
    D. Pain and numbness in the index and middle fingers

9. In chronic or untreated cases of CTS, which of the following can happen?
    A. Thenar muscle wasting
    B. Weakness of palmar abduction of the thumb
    C. The inability to tell between hot and cold by touch
    D. All of the above

10. What is the most common cause of carpal tunnel syndrome?
    A. Disease
    B. Work
    C. Trauma
    D. Genetics

11. It is estimated that a worker who has CTS files how much in worker's compensation claims?
    A. $30,000
    B. $40,000
    C. $50,000
    D. $60,000

12. Which of the following diseases is CTS associated with?
    A. Mucopolysaccharidoses
    B. Amyloidosis
    C. Myeloma
    D. All of the above

13. Which of the following fractures is associated with CTS?
    A. Robinson fracture
    B. Colles' fracture
    C. Dusty's fracture
    D. There are no fractures associated with CTS

14. CTS can be, but is rarely associated with which of the following benign tumors?
    A. Ganglion
    B. Cyst
    C. Lipoma
    D. All of the above

15. Who has the lowest risk for CTS?
    A. Men
    B. Women
    C. People with diabetes
    D. People with rheumatioid arthritis

16. Who is at risk for CTS?
    A. People with heart problems
    B. People with gastrointestinal problems
    C. People with thyroid problems
    D. People with liver problems

17. According to the text list, which of the following professions may have an increased risk for CTS?
    A. Health care personnel
    B. Data entry personnel
    C. Sales people
    D. Postal worker

18. Ergonomics suggests people using keyboards should position their elbows at what degree angle?
    A. 30 degree angle
    B. 45 degree angle
    C. 75 degree angle
    D. 90 degree angle

19. Who can diagnose carpal tunnel syndrome?
    A. A physician
    B. A physician's assistant
    C. A nurse practitioner
    D. All of the above

20. When screening for CTS, a complete physical examination should include:
    A. The head, neck, and shoulder
    B. The neck, shoulder, and elbow
    C. The neck, shoulder, arm, hand, and wrist
    D. The hand and wrist only

21. A positive Tinel's test occurs with:
    A. A feeling of tingling in the fingers
    B. A feeling of tingling in the toes
    C. A feeling of pain in the toes
    D. A feeling of pain in the fingers

22. A positive Phalen's test occurs with finger numbness and tingling in how many minutes?
    A. 2 minutes
    B. 1 minute
    C. 3 minutes
    D. 4 minutes

23. In a positive Durkan test, firm palm pressure over the nerve elicits symptoms in how many seconds?
    A. 60 seconds
    B. 50 seconds
    C. 40 seconds
    D. 30 seconds

24. The gold standard for the diagnosis of carpal tunnel syndrome is:
    A. X-rays
    B. Electrophysiological testing
    C. Lab work
    D. Ultrasound

25. In electrophysiological testing what is measured?
    A. The width nerves transmit impulses
    B. The distance nerves transmit impulses
    C. The speed with which nerves transmit impulses
    D. The force with which nerves transmit impulses

26. Why is early treatment critical in CTS?
    A. To prevent damage to the ulnar nerve
    B. To prevent damage to the radial nerve
    C. To prevent damage to the median nerve
    D. To prevent damage to the brachial nerve

27. Treatment of what primary disorders may resolve symptoms of CTS?
    A. Diabetes
    B. Hypothyroidism
    C. Arthritis
    D. All of the above

28. Another name for the surgical treatment of carpal tunnel syndrome is:
    A. Disease modifying treatment
    B. Palliative treatment
    C. Conservative treatment
    D. Disease lingering treatment

29. Physical therapists and occupational therapists may use which of the following treatments for CTS?
    A. Hot packs
    B. Cold packs
    C. Ultrasound
    D. All of the above

30. Which of the following alternative therapies can be helpful for CTS clients?
    A. Yoga only
    B. Acupuncture, Chiropractics, and Yoga
    C. Acupuncture only
    D. Chiropractics only

31. What is one of the most overlooked alternative therapies for CTS?
    A. Physical therapy
    B. Occupational therapy
    C. Massage
    D. Exercise

32. Which of the following nutritional supplement is helpful for carpal tunnel syndrome?
    A. Vitamin A
    B. Vitamin D
    C. Vitamin B^{12}
    D. Vitamin C

33. Since many people don't want to wear braces, what do health care professional recommend?
    A. Wearing the brace at home
    B. Wearing the brace in the nighttime
    C. Wearing the brace at work
    D. Wearing the brace in the daytime

34. Which of the following are non-steroidal anti-inflammatory drugs?
    A. Aspirin
    B. Ibuprofen
    C. Naproxen
    D. All of the above

35. All of the following can be side effects of non-steroidal anti-inflammatory drugs except:
    A. Headaches
    B. Bleeding
    C. Gastrointestinal irritation
    D. Worsening of asthma symptoms

36. What drug can be injected to the wrist to control CTS symptoms?
    A. Corticosteroid
    B. Diuretic
    C. Aspirin
    D. Vitamin C

37. What is the goal with palliative treatment of CTS?
    A. To prevent motor weakness of median innervate thenar muscles
    B. To prevent sensory loss
    C. To prevent surgery
    D. All of the above

38. Surgical treatment is recommended for carpal tunnel syndrome if symptoms last longer than:
    A. 3 months
    B. 6 months
    C. 2 months
    D. 4 months

39. What are the two major kinds of surgical treatment for CTS?
    A. Reach release and endoscopic
    B. Closed release and endoscopic
    C. Open release and endoscopic
    D. Stretch release and endoscopic

40. What percentage of people are able to return to their same jobs after surgery?
    A. About 90%
    B. About 70%
    C. About 50%
    D. About 40%

41. How does massage therapy help clients with CTS?
    A. By reducing symptoms, increasing pain, and decreasing grip strength
    B. By decreasing symptoms, decreasing pain, and decreasing grip strength
    C. By increasing symptoms, increasing pain, and increasing grip strength
    D. By reducing symptoms , decreasing pain, and increasing grip strength

42. A typical massage treatment for carpal tunnel syndrome would most likely include:
    A. Weak pressure strokes from fingers to elbow
    B. Moderate pressure strokes from fingers to elbow
    C. Heavy and intense pressure strokes from fingers to elbow
    D. None of the above

43. Effleurage massage:
    A. Reduces carbon dioxide
    B. Reduces lactic acid
    C. Improves venous return
    D. All of the above

44. Lymphatic massage may help CTS clients because it:
    A. Stimulates lymph circulation
    B. Inhibits lymph circulation
    C. Decreases venous return
    D. Doesn't affect venous return

45. In massage for CTS clients, what is contraindicated?
    A. Indirect manipulation of the ulnar nerve
    B. Direct manipulation of the damaged median nerve
    C. Direct manipulation of the hand muscles
    D. Indirect manipulation of the hand muscles

46. CTS patients might want to avoid massage therapy in cases of:
    A. High fever
    B. Low white blood cells
    C. Mental impairment
    D. All of the above

47. To release carpal tunnel syndrome using massage therapy, the therapist should:
    A. massage the foot and anterior musculature, the ankle, and the leg flexors
    B. massage the hand and anterior musculature, the wrist, and the forearm flexors
    C. massage of the hand and posterior musculature, the elbow, and the forearm flexors
    D. massage of the hand and posterior musculature, the wrist, and the upper arm flexors

48. When is it appropriate for massage therapists to refer their clients?
    A. If symptoms decrease or improve
    B. If symptoms resolve or improve
    C. If symptoms persist or worsen
    D. If symptoms stop altogether

This completes the Massage and Carpal Tunnel Syndrome exam.