Cumulative trauma disorders can be prevented and successfully treated with the right approach.

Much has been written about cumulative trauma disorders (CTD), yet these injuries continue to be problematic for dental hygiene professionals. With all of the information available on carpal tunnel syndrome (CTS) and neck, shoulder, and back pain, why do some dental hygienists choose to find an alternative to clinical practice because of these injuries? In some cases, despite costly and painful treatment, the pain and dysfunction return. CTD can affect daily life, from simple tasks like holding the phone to recreational activities like gardening or knitting. CTD affects everything that requires good hand dexterity and it can happen to any of us. The good news is that there are strategies to reduce the likelihood of CTD.

Table 1. Symptoms of CTD in the Upper Extremities.

- Pain in neck, upper or lower back, shoulders, and upper arms
- Tightness, pain, stiffness
- Feel need to massage area
- Pain/numbness wakens
- Hands/arms tingle/burn
- Weakness in hands, forearms
- Difficulty with small tasks
- Hands numb, cold
- Difficulty opening, closing hand
- Difficulty using hands
- Avoidance of hobbies, sports

Risk Factors
Risk factors for developing CTD can be changeable or unchangeable. Changeable risk factors in the work setting include prolonged, repetitive, forceful, and awkward hand movements; poor posture with any part of the body out of neutral position for extended periods of time; incorrect positioning of clinician and patient; poor instrument choice (design, type); dull instruments; moving radiographic and other heavy equipment with poor body mechanics; ill fitting chairs; a poorly designed operatory; the pressures of a heavy or fast-paced workload; and treatment of too many difficult cases one right after.

Unchangeable risk factors include age—the odds of developing CTD increase by 1.01 times for every year over middle age. Women are 1.6 times more likely than men to develop CTD. Poor circulation, untreated thyroid disease, arthritis, and women’s physical size compared to men may increase our risk. The number of hours practiced per day, the number of days practiced per week, the type of practice, and the number of years in practice all increase risk. Ten years or more of practice increases the risk of CTD 1.9 times and periodontal practice or a general practice treating patients with heavy deposits increases risk by 2.3 times. All these factors point to the cumulative effect of repetitive soft tissue injury as a major culprit—the longer you work, the higher the risk for developing CTD.

Symptom Checklist
Table 1 includes some common symptoms of CTD of the upper extremities. These should not be ignored because the symptoms may continue to worsen or in an attempt to limit one problem, the first problem could exacerbate another. For example, in an effort to decrease the work load on one symptomatic hand, a right handed clinician may work more with her left hand and then develop symptoms in that hand.

CTD can have serious repercussions. Cumulative trauma disorders include work-related musculoskeletal disorders, repetitive motion injury/disorders, and repetitive strain injuries. These injuries can affect the nerves, tendons, and neurovasculature of upper extremities and thus gravely impacting the ability to practice dental hygiene. Nerve disorders include carpal tunnel syndrome (CTS), ulnar nerve entrapment, and pronator syndrome. Tendon disorders include tendinitis of the wrist, tenosynovitis of the thumb (De Quervain’s Syndrome), and rotator cuff tendonitis. Neurovascular disorders include thoracic outlet syndrome and glove-induced injury. These are only examples of some CTDs and, unfortunately, is by no means a comprehensive list.

Nerve Response to Injury
Nerves respond to injury depending on the mechanism of injury and the pathophysiologic processes resulting from that mechanism. In all compression injuries, such as CTS, structural changes occur within the nerve itself and connective tissues within that nerve. Constant compression or pressure on an area also results in a complex interaction among nerves, muscles, and the vascular supply. When pressure on an area causes vascular obstruction, the nerves become hypoxic. In the early stages of nerve compression, motor skills are impaired but the injury is readily reversed.

Left untreated, permanent damage results as the hypoxia causes small veins and capillaries within the nerve to dilate, causing edema, which further increases compression on the nerve. In chronic stages of compression, nerve fibers are destroyed, leading to muscle atrophy and loss of strength and function.

Diagnosis and Treatment
The earlier a CTD is diagnosed and treated, the better the treatment outcome. Diagnosis, as well as treatment of CTD, depends on health care providers, ie, their level of experience, their knowledge of the latest diagnostic and treatment modalities, and their treatment philosophy. Perhaps more importantly, however, is how well they listen to your description of the problem. When you find a health care provider whom you are comfortable with, several tests will be done to document your sensory and motor function of the affected area(s).

Documentation of physical manifestations is critical to effectively diagnosing CTD or repetitive strain injuries. For example, a physical assessment for CTS may involve Tinsel’s sign, which is a sharp tapping over the suspected nerve that may elicit pain; a positive Phalen’s test, which involves holding the affected hand at a 90° angle to the wrist and may elicit pain and/or tingling and numbness; and identifying diminished sensation via pin pricks.

Instruments to measure pain and dysfunction must be reliable and valid,
but there are problems related to pain measurement. Because pain perception is subjective, pain measurement is a challenge. To measure physiologic pain, an instrument needs to measure the threshold for the stimulation of pain fibers as graded pain stimuli are applied. A common approach to physiologic pain evaluation is electrodiagnostic testing, where an electric current is run through the affected nerve or muscle to determine how long the current takes to travel the length of the nerve. Very fine acupuncture needles may also be inserted into affected muscles to measure electrical impulses. A less traumatic approach uses a Disk-Criminator®, which uses one and two point touch discrimination and two point movement perception. Another testing device is the Pressure-Specified Sensory Device™—a computer-assisted sensory testing device that can test any body surface. This device measures the earliest changes in touch sensibility and has normative values that differ with age. This is a nontraumatic test and, although not widely used, provides reliable and valid data.5-6

An important but often overlooked component of pain diagnosis is the psychological aspect. A questionnaire or visual analog can be used to measure the intensity of the perceived pain. Two useful tools for measuring psychological aspects of pain include the McGill Pain Questionnaire, which uses 78 adjectives. A numerical value from zero to five is assigned to the adjective and provides a reliable and valid method to describe the character and intensity of the pain experience.7 The Mensana Clinic Back Pain Test evaluates the effect of chronic pain on functional aspects of life and is a valid, reliable test for an organic basis for chronic pain, regardless of any underlying psychiatric problems.8 Depression is a major complication associated with chronic pain and quality of life.

“No sort of exercise is so healthful or harmless that it does not cause serious disorders, that is, when overdone.”

—Bernardino Ramazzini
From Diseases of Workers published in 1731

Anatomy May Be Destiny
Hand function requires integration of both sensory and motor function. Even when performing skills requiring precision, much of what the hand does is almost effortless. However, the rigid boundaries of carpal bones on the dorsum of the wrist and flexor retinaculum on the palmer side where the flexor tendons and median nerve pass through the carpal tunnel present an anatomy problem waiting to happen. The structure of the wrist is rigid and any edema resulting from hormonal fluctuations or repetitive strain injuries causes pain as the tendons swell, reducing the dimension of the carpal tunnel and compressing the median nerve. Anatomy may be destiny as well. A square rather than rectangular wrist may predispose an individual to CTS and women are more likely than men to have this anatomic feature.9,10

Disability Insurance
The chance of illness or injury causing loss of income and/or reduced work hours is substantially greater than the chance of dying for those in the workforce.11,12 A 40 year old’s chances of becoming ill or disabled for more than 90 days are triple the chances of death.11,12 The likelihood of disability continuing 5 more years when someone has been disabled for 1 to 2 years increases from 39% to 49 % at age 32 and to 53% to 60% at age 52.11,12

Disability insurance may not be high on your list of financial priorities. But insuring your livelihood may be just as important as insuring your car. Here are some questions to ask when shopping for a disability policy.
1. Are benefits paid if you are unable to work in your profession?
2. Can I cancel the policy and is it guaranteed renewable?
3. Are you insured for disability for your own vs any occupation?
4. Can you choose a “residual disability” benefit?
5. Can you choose the longest elimination period—90 days?
6. Is there a cola rider?

Disability policies provide benefits to the typical retirement age of 65. Purchasing the most coverage allowed, usually replacement of 2/3 of your income, is advisable. The Medical Insurance Bureau reports all medical visits and their diagnoses. You can purchase coverage if you have a CTD like CTS, but a rider that excludes the condition or disability for a period of time will be attached to your policy. If surgery is involved and you are released from the surgeon’s care, a policy can be purchased if there are no claims or treatment for that condition for a certain period of time and you are
practicing in your profession.

**Prevention**
Following are strategies that may help you avoid surgery and disability:

- Take a hands-on ergonomics course.
- Fit your operatory to you, not the other way around. This means not only your chair, but the patient chair. A patient chair with a back that cannot recline so it is horizontal to the floor or with a back that is too wide is a prescription for early retirement or chronic pain.
- Do not raise the patient chair to get your legs under the chair. This often places the patient at a level that requires stress on your shoulder, neck, and back.
- Face your body toward the surface being worked on, rather than sitting in the same place for the entire procedure.
- Learn about the latest in power scaling. Newer tips and techniques are invaluable hand savers. Some of the tips now come with a swivel that makes for easier adaptation.
- Short breaks are essential. No one should work in the same position longer than 60 minutes. Stop and take a stretch break—even a minute or two provides respite for stressed muscles.
- If the practice is primarily periodontal, schedule recalls between the heavy initial preparation patients.
- Patients can be trained to help you help them. They can move their heads right and left, up and down. They are in the chair an hour at most—we are at the chair 8-10 hours a day.
- Teach yourself to use a neutral wrist position, where the wrist is aligned with the long axis of the lower arm (a wrist brace can be a helpful training tool). The little finger side of the palm should be rotated slightly downward with the fingers rounded/curved and the palm open and relaxed, like when you are sitting in a relaxed position with your hands resting on your thighs.
- Make an effort to keep all parts of the body in neutral position. Determine ways to work while remaining in neutral position only briefly deviating from neutral when there is no other way.
- Keep the operatory at a comfortable temperature—too warm and your hands may swell, too cool and circulation may be diminished.
- Maintain the best lighting possible. Poor lighting may cause you to compromise your positioning.
- Instrument design has come a long way since the pencil thin handled instruments I learned to use in school. The thicker the handle, the better. Thin is NOT in. The thinner the handle, the more pinch force we need to roll the instrument and control it. Larger handled pens and pencils are also essentials in a busy practice if you don’t have a voice-activated recording system.
- Sharp instruments are a must. There are excellent continuing education courses available on instrument sharpening techniques.
- Use magnification. You will sit up straighter, thus lessening neck and shoulder strain. Magnification for hygiene procedures should be 2.0 x to 2.5 x; much greater and the depth of field is decreased. The manufacturer should warrant the magnification as described.
- Wear paired gloves in your size. Ambidextrous, limited sized gloves can contribute to CTS. These gloves are manufactured on flat hand formers rather than naturally shaped hand formers, resulting in pain and muscle fatigue at the base of the thumb due to the constant pulling force from the glove, which may constrict the vascular supply as well.

Much of CTD can be attributed to detrimental habits. Learning ergonomically correct body positioning and instrumentation modalities is much easier and smarter than suffering injury and altering long-standing hazardous habits once injury occurs. Habits alter brain patterns and require less effort/thought to access existing memory patterns than to change habits. It takes 21 days to change a habit. Making the effort may seem too annoying or problematic but surgery and disability are only more so.

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