Occupational overuse syndrome and nitrile gloves: first order prevention in dental hygiene practice

By Professor Laurence J. Walsh

"OOS is usually associated with tasks that involve repetitive or forceful movements or both; and/or the maintenance of constrained or awkward postures..."

OOS is a collective term for a range of conditions characterized by discomfort or persistent pain in muscles, tendons and other soft tissues, with or without physical manifestations. Disorders included within the definition of OOS include carpal tunnel syndrome, myalgia, stenosing tenosynovitis crepitans (Trigger finger), tendonitis, ganglionic cyst, peritendinitis, tenosynovitis, vibration hand-arm syndrome and epicondylitis.

The prevalence of carpal tunnel syndrome among dental hygienists is estimated to be between 6 to 8.5 %. Among all occupations in the USA, dental hygiene has been ranked the highest by the Bureau of Labor Statistics in the number of carpal tunnel syndromes cases per 1,000 employees, which emphasizes the point that the pain associated with this disorder can dramatically affect working hours.

Work-related risk factors for carpal tunnel syndrome include repetitive forceful pinching and sustained non-neutral wrist positions. Periodontal scaling and root-planing require a high level of pinch force. As well, gaining access to some areas of the oral cavity may require the wrists to be held in awkward positions for prolonged periods.

Risk factors

OOS is usually associated with tasks that involve repetitive or forceful movements or both; and/or the maintenance of constrained or awkward postures. It is also termed repetitive strain injury (RSI), repetitive motion injury, cumulative trauma disorder and work related musculoskeletal disorder.

In dental practice, OOS can develop from highly repetitive work involving force (with or without vibration) in which there is an extreme wrist posture in combination with force. The problem is most likely to occur in dental hygienists who undertake long periods of scaling and root planning using hand instruments and because of this, OOS is a significant contributor to reduced working hours for dental hygienists.

OOS is more likely to occur in pregnant women, women beginning the use of birth control pills, women with premenstrual syndrome and menopausal middle-aged women. Medical risk factors for OOS include rheumatoid arthritis, diabetes mellitus, gout, amyloidosis, systemic lupus erythematosus, hypothyroidism, myxedema (advanced hypothyroidism), fluid retention and obesity. OOS

is more likely to occur when there are high levels of job stress, when there is high usage of tobacco, alcohol and caffeine and in those with poor overall physical fitness. Non-occupational factors that may contribute to OOS include knitting, tennis, typing, writing or other hobbies that utilize similar muscle groups to those being used constantly at the dental clinic.

OOS symptoms

The classical presentation of OOS in dental hygienists is carpal tunnel syndrome (CTS). This occurs following compression of the median nerve as it passes through the carpal canal formed by the wrist bones and the transverse carpal ligament. The major symptoms occur in the dominant hand and include pain, paraesthesia (tingling) and numbness along wrist and hand, particularly affecting the palmar surface of the thumb, index and middle fingers. Other symptoms of CTS include: weakness in grip, a perception of swelling of the fingers (when no swelling is present) and altered touch or temperature sensations. Loss of manual dexterity and loss of hand function can occur over time, leading to tenderness and a tendency to drop items. The symptoms tend to worsen at night (and on waking) and with repetitive activity.

General advice for prevention of OOS is given in Table 1.

Glove use

All dental hygienists wear gloves when working and in this regard it needs to be remembered that natural rubber latex (NRL) is an elastic material, which will resist the movements of the fingers and hands away from the original flat hand position used when the gloves were formed on a mould. When grasping an instrument, the muscular effort to resist this elastic recoil to the rest position results in muscle fatigue.

Scaling and root planing using curettes requires co-ordinated and controlled muscle activity of the wrist and fingers (especially of the dominant hand). However, the fingers have only limited capacity to sustain prolonged activity. Accumulation of metabolites from muscle activity can lead to discomfort and fatigue. Using hand instruments with small diameter shanks may contribute to inflammation of the synovial sheaths surrounding flexor tendons, leading to increased pressure in the carpal tunnel.

When using mirror vision, the precise location of the mirror using the non-dominant hand requires static muscle loading of the shoulder and elbow, leading to fatigue and discomfort in these areas.

Given the central role of gloves in OOS, selection of the correct gloves is paramount.

1. Glove size

A glove size should be chosen that does not resist the normal movements of the hands. Sized gloves should be used to ensure that there is sufficient freedom of motion in BOTH hands and to maximize comfort and fit. It may be necessary to wear a larger glove on one hand since hand size is not equal. Right handed individuals will have a larger right hand than on the left side, for instance.

2. Left and right handed gloves

Ambidextrous gloves are designed with the thumb in a neutral position, thus during any work the glove exerts a continuous, counteracting elastic force against the thumb. Because of this, the use of ambidextrous gloves for extended periods may result in muscle fatigue.

Table 1. Prevention of occupational overuse syndrome

- Limit the use of the fingers as much as possible.
- Alternate tasks and alternate treatment procedures.
- Take periodic breaks.
- Alternate difficult with easy patient appointments.
- When root planning:
  - Use lightweight (hollow) instruments with knurled shanks. The handles should be round and knurled to increase grip. Instrument handles should be large enough to distribute pressure over a larger area than directly over the carpal tunnel of the wrist.
  - Maintain a neutral wrist position, with the wrists in lines with the forearm.
  - Use a light grasp, with a gripping rather than a pinching action to hold instruments.
  - Move the entire hand, wrist and forearm as a unit.
  - Use a hard-tissue fulcrum close to the cutting edge of the instrument.
  - Use a slow, deliberate, applied force in a directed manner allowing relaxation between strokes.
  - Maintain sharp instruments, since these require fewer and less forceful motions.
  - Use an ultrasonic scaler where appropriate for gross debridement.
  - Alternate between scaling and polishing to provide variation and rest.
  - Fingers should not pinch or be used with the tip joints bent backward.
  - Fingers should be slightly flexed to avoid ligament stress.
  - Maintain the wrist in a neutral position as much as possible.
- At natural breaks in the appointment, stretch the fingers, and rotate wrist in small circles. Perform fist and finger extension exercises on a regular basis. Perform upper body stretching exercises and shoulder shrugs during breaks between patients.
- Rest the forearms as much as possible.
- Avoid using side-to-side motions.
- Avoid long periods of flexed/extended positions; adopt a “neutral” hand position where possible.
- Wherever practicable, adjust the patient position to ensure the best working posture for the operator. This is particularly important when working on different quadrants. Avoid prolonged static working postures by assuming the various “clock” positions during the one appointment.
- Check that cables and hoses which supply handpieces have adequate length and are sufficiently pliable or are equipped with a swivel action to permit rotation with minimal effort by the user.

3. Non-elastic glove material

It is worthwhile considering using nitrile gloves, as these release stress and adapt to the shape of the operator's hand as they warm to body temperature, creating a snug, comfortable fit. In dentistry, they are fast becoming more popular than latex because of their higher degree of flexibility. The material is heat-sensitive and adapts itself to the user's hand, making a snug fit. An extra advantage of this is that by fitting snugly, it is far easier to notice pinhole punctures in nitrile gloves, when they do occur. However, it should be noted that nitrile is less susceptible to puncture than latex. Nitrile is a stronger material than latex so it can be much thinner than latex and still be as puncture resistant.

There is conflicting evidence in the literature regarding whether nitrile gloves decrease dexterity in small hand motions. The few studies which found nitrile gloves caused a slight reduction in finger dexterity did not show any effect on dexterity in normal movements when using nitrile gloves over latex. Even if nitrile gloves impede smaller finger actions to a very small degree, this will not affect larger movements of the hands, wrists and forearms and there should be no appreciable loss of deftness and dexterity when undertaking debridement.

Nitrile gloves are easier to slide on than latex gloves and vinyl examination gloves due to their lower resistance to friction. Using nitrile will also prevent the development of allergic contact dermatitis to NRL proteins.

Further reading

- D Anton et al. Prevalence of musculoskeletal symptoms and carpal tunnel syndrome among dental hygienists. Am J Indust Med 42: 248-257, 2002.
- DR Strong & FH Lennartz. Carpal tunnel syndrome. J Calif Dent Assoc 20: 27-36, 1992.
- JL Visser & LM Straker. An investigation of discomfort experienced by dental therapists and assistants at work. Aust Dent J 39: 39-44, 1994.
- BJ Powell et al. Evaluating the fit of ambidextrous and fitted gloves: implications for hand discomfort. JADA 125: 1235-1240, 1994.

About the author

Professor Laurence J. Walsh is the technology editor of Australasian Dental Practice magazine. He is also a noted commentator on and user of new technologies and is the Head of The University of Queensland School of Dentistry.