BEND, DON'T BREAK:
Ergonomic solutions for dental career longevity

Ergonomics in dentistry is vital for the long-term health and efficiency of dental professionals. Repetitive movements, less-than-ideal postures, and prolonged static positions required during procedures can lead to musculoskeletal disorders (MSDs) such as back, neck, and wrist pain. Proper ergonomic practices, on the other hand, enhance productivity and extend career longevity. Additionally, ergonomic awareness improves focus and precision, ensuring higher quality patient care. Investing in ergonomic solutions such as adjustable seating, magnification loupes, and strategically designed workspaces fosters a safer, more comfortable environment, benefiting both the dental team and their patients.

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BEND, DON'T BREAK: ERGONOMIC SOLUTIONS FOR DENTAL CAREER LONGEVITY

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Exercise specialist Brianne Novaes realizes that dental professionals' pain is due to muscle imbalances. She recommends these exercises to help you overcome the pain.

BY BRIANNE NOVAES, CPT

BEND, DON'T BREAK: ERGONOMIC SOLUTIONS FOR DENTAL CAREER LONGEVITY

There's an old saying of "no pain, no gain." Whoever said this did not work in dentistry. In fact, it's quite the opposite for dental professionals. Instead of gaining, they lose—productivity, days of work, comfort, and years in their career. All of this is lost due to chronic pain from their practices. Chronic pain is the result of a muscle imbalance, but it can be fixed and prevented through a specialized exercise program.

WHAT IS A MUSCLE IMBALANCE?

A muscle imbalance is when opposing muscle groups are not of the same size and strength. One muscle is short and tight from overuse and the opposing muscle is long and weak from underuse. In dentistry, a common imbalance comes from leaning over a patient. This causes an imbalance between the anterior muscles of the chest and the posterior muscles of the back. Over time this leads to poor posture, including a forward head and rounded shoulders. This is also known as upper-crossed syndrome.

WHAT IS UPPER-CROSSED SYNDROME?

Upper-crossed syndrome is a disorder where the muscles of the neck, chest, and upper back are short and tight—the neck flexors, pectorals, and the upper trapezius. To the contrary, the muscles of the back are long and weak—the mid and lower trapezius, rhomboids, and serratus anterior. This results not only in poor posture but leads to pain in the neck and shoulders, which worsens over time if not properly addressed.

With the hope of alleviating their pain, many dental professionals regularly visit massage therapists, chiropractors, physical therapists, and acupuncturists. The problem is that all these providers fix the pain only temporarily. Therefore, regularly scheduled follow-up visits are required.

The reason for this is that muscles are like rubber bands. They can be stretched, and this will relieve tension temporarily, but muscles always revert to being tight unless the opposing, weak muscles are strengthened. The long-term solution for alleviating pain is through a specialized exercise program that strengthens the long, weak muscles.

EXERCISING FOR UPPER-CROSSED SYNDROME

When it comes to muscle imbalances, it is crucial to avoid certain exercises and incorporate others through strength training, also known as resistance training. Upper-crossed syndrome causes pectorals and upper trapezius muscles to tighten, so chest-focused exercises should be avoided. This includes pressing exercises such as bench press, chest press, and pushups. These exercises work the already tight muscles, so working the opposing muscles will help fix this imbalance and reduce pain. The muscles are already tight from overuse, so working the opposing muscles will help fix this imbalance and reduce pain.

Another reason to avoid these is because they are compound exercises, meaning they work multiple muscles at one time. In addition to working the pectorals, these exercises work the anterior deltoids, muscles that are extremely overworked by dental professionals.

More exercises to avoid are overhead shoulder presses and lateral raises. Like chest presses, these work the tight, overused muscles of dental professionals—the front and medial deltoids.

Exercises that should be included in programs for dental professionals are variations of both vertical pull (figure 1) and horizontal pull (figure 2), sometimes referred to as a row. These work the long and weak posterior muscles, including

the middle and lower trapezius, rhomboids, and rear deltoids. While strengthening these muscles is a key component in correcting posture and alleviating pain, following a program that uses progressive overload is required to build strength in these muscles.

WHAT IS PROGRESSIVE OVERLOAD?

Progressive overload is when the acute variables in an exercise program are adjusted over time. Examples of acute variables are repetitions, sets, weight, tempo, and rest time. This is adjusted to place additional stress on the muscles, which forces them to adapt to the increase in stimuli and work to become stronger. Without adjusting these variables, muscles will not gain size or strength; they will simply stay the same. In addition to progressive overload, it's important for corrective exercises to be included in a program for dental professionals.

WHAT ARE CORRECTIVE EXERCISES?

Corrective exercises address and fix movement compensations and muscular imbalances. Aside from standard strength or resistance training, the protocols are slightly different as they include a multistep process.

Take the following steps to fix an imbalance or faulty movement pattern.

First, the self-myofascial release must be performed on the overused muscles. This is followed by static stretching of the same overused muscles to lengthen them. Next, activation of the long and weak muscles is required to essentially "wake them up." This is done through isolated strengthening exercises. Last, the final step is to integrate dynamic movements to retrain the body's movement patterns. This is to build the muscle strength of the long and weak muscles so they can become of equal strength to the short and tight muscles.

This exercise properly aligns the body to correct posture, reduce pain, and avoid injury. With dental professionals prone to muscular imbalances, it is 100% essential to implement corrective exercises.

EXERCISE TO REDUCE PAIN AND INCREASE HEALTH

Dental professionals have some of the most physically demanding jobs, and this wreaks havoc on their bodies. It only makes sense that specialized exercises are required to combat the chronic pain that comes from poor posture and muscle imbalances. While patients need professional advice on proper oral health and home-care techniques, dental professionals need advice about proper exercise techniques. Just like a good oral health routine keeps teeth healthy, a good exercise routine keeps muscles healthy.

Brianne Novaes, CPT, has been a certified personal trainer for 10-plus years and has worked with thousands of clients of all ages. She's worked in multiple areas of fitness, including personal training, semiprivate training, group fitness, medical fitness, corporate wellness, and fitness center management. Her expertise is in strength training and building muscle to avoid pain and prevent injury. She also has knowledge in mobility, flexibility, and stability training. She is the founder of Built by Brianne, which provides specialized strength programs for dental professionals. Contact her at builtbybrianne@gmail.com or visit builtbybrianne.com.

CHRONIC PAIN FROM MUSCULAR IMBALANCES: HOW TO EXERCISE CORRECTLY TO AVOID PAIN (PART TWO)

Lower back pain is extremely common in dentistry, but there are ways to reduce pain and avoid surgery. Brianne Novaes, CPT, explains how to correct muscle imbalances with appropriate exercises.

BY BRIANNE NOVAES, CPT

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Chiropractors seem to be the be-all and end-all when it comes to low back pain (LBP). Well, that or surgery, of course. Many dental pros suffer from LBP due to the nature of their work. As a certified personal trainer, I have worked with hundreds of clients over the years who suffer from LBP, are post-back surgery, or even

have degenerative disk disease . . . and I can assure you there is another way. I am by no means a doctor, but often your LBP is stemming from somewhere else in the body. Pain is always the symptom, not the cause.

BACK PAIN

Dental professionals who suffer from LBP know how debilitating it can be. It's a fear that is constantly on the mind and impacts not only performance but also quality of life. LBP can be the result of muscular imbalances that alter both muscle length and strength of the surrounding muscles. For example, when most of the day is spent sitting in the operatory, the iliopsoas muscle, a muscle of the inner hip, becomes tight from being contracted and the glutes become long and weak from being disengaged or underused. In other words, this muscle imbalance is developed when certain muscles in front of the hip region become overactive while others, in the back of the hip region, become underactive. These are just some of the muscles that are included in a disorder referred to as lower crossed syndrome.

WHAT IS LOWER CROSSED SYNDROME?

Lower crossed syndrome is a musculoskeletal disorder that is related to postural imbalances and is commonly found in dental professionals. It is characterized by an anterior tilt of the pelvis, which leads to an arched low back, also known as swayback. "Crossed" refers to the crossing pattern of the overactive muscles, which tend to be tight and short, with the counter crossing of the underactive muscles, which tend to be long and weak. The short and tight muscles include the erector spinae and the muscles of the hip flexor complex, and the long and weak muscles include the abdominals and the glutes. While exercising with lower crossed syndrome is possible, there are certain protocols that must be followed to correct these postural imbalances and avoid making them worse.

TIPS FOR EXERCISING WITH LOWER CROSSED SYNDROME

There are a couple of key rules to follow when exercising with lower crossed syndrome. First, keeping the core engaged is going to ensure that exercises are performed safely and efficiently while protecting the lower back. This can also be practiced when seated on a saddle chair during procedures. Proper engagement of the core is done by tightening the stomach as if you expect to be on the receiving end of a knockout punch and keeping the rib cage down. This will not only protect the low back but will also provide stability for the spine.

Second, tucking the tailbone and keeping a flat back will add additional protection to the spine during exercise. Since the core includes the low back, it's important to focus on keeping the muscles engaged to take pressure off the lumbar spine. In lower crossed syndrome, the swayback is caused by the arching of the spine (**figure 1**). When weight is added during an exercise, the muscles should bear the weight, not the spine. Tucking the tailbone will reduce the swayback and keep the spine in a more neutral, safe position (**figure 2**).

Third, pay attention to breathing when exercising. When performing an exercise, inhale on the eccentric portion and exhale on the

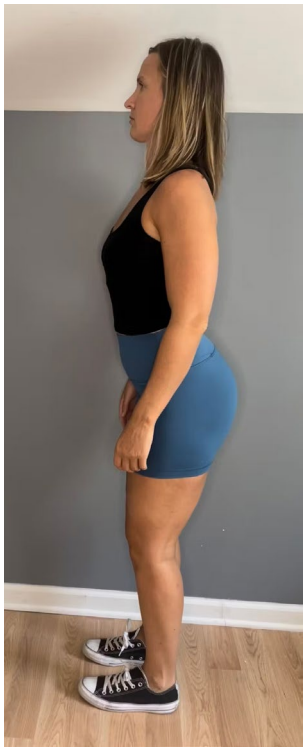

Figure 1: Core disengaged with swayback

Figure 2: Core engaged with tailbone tucked

concentric portion. To elaborate, in a squat, an individual would inhale on the lowering portion of the exercise, the eccentric, and exhale as they stand up, on the concentric portion of the exercise. This is important because when you exhale, you increase core engagement. Over time this becomes second nature.

STRENGTHENING TO REDUCE LBP

With muscle imbalances, following the proper protocol will help reduce pain and improve posture. This first starts with using a foam roller or lacrosse ball to reduce tension in the overactive muscle. Second, stretch the overactive muscles to lengthen them since they are short. Third, activate the underactive muscles to prepare them for exercise. The last step is to integrate strength exercises to improve the body's movement patterns. This will help the overactive and underactive muscles work together to correct this imbalance and reduce LBP.

In lower crossed syndrome, there are a few key muscle groups that need to be strengthened. One muscle group that requires strengthening is the abdominal complex. Performing core exercises will help strengthen the weak abdominal muscles and reduce or alleviate LBP. However, this does not include exercises such as crunches or sit-ups. Incorporating core exercises that work in different planes must be included to ensure all areas of the core are strengthened. Dead bugs, bird dogs, Pallof presses, and banded rotations are all great exercises.

The glutes are another group of muscles that are weak and require strengthening. The glutes are comprised of three muscles: gluteus maximus, gluteus medius, and gluteus minimus. It's important to incorporate exercises that strengthen all three of these muscles. Having strong glutes will help stabilize the pelvis and reduce LBP. Exercises such as glute bridges, hip thrusts, step-ups, and banded lateral walks are all great for strengthening.

The hamstrings are also a key muscle group to strengthen in lower crossed syndrome. Like the glutes, the hamstrings are a muscle group that is long and weak due to prolonged sitting. Since the glutes are connected to the hamstrings, they both work together to support the low back. Therefore, having strong glutes and hamstrings is extremely vital for avoiding LBP.

The hamstrings are comprised of multiple muscles including the semimembranosus, semitendinosus, and biceps femoris long and short

head. The good news is, there are many types of exercise that work the glutes and the hamstrings simultaneously. This includes exercises such as different deadlift variations and good mornings. These exercises tend to be more advanced, so it's best to regress or modify the exercise and then work to progress.

CONCLUSION

While LBP is extremely common in the dental industry, there are ways to reduce pain and even avoid surgery. While chiropractor visits may seem to help temporarily, there is another solution. Just like your teeth have memory, so does your body. Without strengthening the appropriate muscle groups, the body will revert to the poor posture that it is used to. Strengthening the long and weak muscles will fix muscle imbalances to correct posture and reduce LBP for the long haul.

Brianne Novaes, CPT, has been a certified personal trainer for 10-plus years and has worked with thousands of clients of all ages. She's worked in multiple areas of fitness, including personal training, semi-private training, group fitness, medical fitness, corporate wellness, and fitness center management. Her expertise is in strength training and building muscle to avoid pain and prevent injury. She also has knowledge in mobility, flexibility, and stability training. She is the founder of Built by Brianne, which provides specialized strength programs for dental professionals. Contact her at builtbybrianne@gmail.com or visit builtbybrianne.com.

GET THE UPPER HAND: ERGONOMIC STRATEGIES TO AVOID MUSCULOSKELETAL INJURIES

As hygienists get back to basics with hand scaling, paying attention to ergonomics is more important than ever. Registered dental hygienists Edie Gibson and Cindy Purdy offer some advice.

BY CINDY M. PURDY, BSDH, RDH, CEAS AND EDIE GIBSON, MS, RDH

Dentistry has been presented with many long-standing lessons during the COVID-19 pandemic, but none more solid than the realization that to thrive as essential health-care professionals, we must be fluid, flexible, and continually open to evolving recommendations and regulations. This paradigm shift has forced us to

alter how we deliver optimal clinical care for the sake of our health and that of our patients. It is time to re-embrace hand scaling and call upon new prevention strategies to improve our musculoskeletal health and to reduce our risk of work-related injuries. As we get back to basics, it's more important than ever to observe and implement fundamental ergonomic principles for a healthy practice, which include incorporating instruments with science-based design into our armamentarium.

SCALE UP!

Our profession has stepped up to adopt changes for infection control to protect the health and safety of practitioners and patients, but shouldn't we also look at opportunities to improve our personal health and the overall patient experience? The American Dental Hygienists' Association (ADHA) supports Centers for Disease Control and Prevention (CDC) recommendations that state we should "balance the need to provide necessary services while minimizing risk to patients and health-care personnel."[1] It's well-known that dental practitioners are at an elevated risk of developing work-related musculoskeletal disorders (WMSDs) of the upper extremity.[2] According to certified occupational therapists, "One ergonomic component that may contribute to reducing the onset of WMSDs of the upper extremity in dental hygienists are ergonomically designed instruments; specifically, scalers."[3] With hand scaling and root planing accounting for approximately 31.3% of standard prophylactic procedures,[2] it is imperative that a hand scaler be ergonomically designed for the comfort of the operator and the patient alike. It's time to base our hand instrument selection on new and relevant science.

ERGONOMICS: WHAT'S IN IT FOR ME?

Focusing on ergonomics means finding the best possible match for the greatest number of people by adapting a product to fit the user rather than vice versa.[4] The worst problems developed by hygienists are often associated with repeated gripping and turning actions executed with the wrist in a deviated position. According to Hayes, et al., the hand and wrist regions were the most prevalent areas of pain for dental hygienists (60-69.5%)."[2]

Common shoulder, elbow, and hand disorders of dental hygienists:[3,5]

- De Quervain's tenosynovitis
- Carpal tunnel syndrome
- Trigger finger
- Osteoarthritis
- Thoracic outlet syndrome
- Lateral epicondylitis (tennis elbow, ulnar nerve entrapment)
- Ganglion cyst
- Trigger points

There is a misconception that the design of ergonomic products is intuitive, allowing users to rely on common sense in the evaluation and purchase of these products. In fact, the past definition of an ergonomically designed dental instrument was based heavily on assumptions instead of test data and empirical studies.

A SCIENTIFIC APPROACH TO ERGONOMICS

A leading-edge, innovative study compared

Harmony Ergonomic Scalers and Curettes from Hu-Friedy, now a part of HuFriedyGroup, to other scalers and curettes currently available. The study measured participants' resultant pinch force on a given handle while scaling and the associated scaling force applied to a tooth.[6]

To advance the understanding of ergonomics, HuFriedyGroup developed TrueFit Technology, a sensor-based system to identify key measures of ergonomics with dental instruments. The study collected 2,878,320 data points, which were analyzed by an unbiased analytics firm outside the dental industry.[6]

Results showed a significant improvement over the other brands tested. The Harmony Ergonomic Scalers and Curettes exhibited an average of 55% reduction in total pinch force of the thumb, middle, and index fingers and an average of 31% reduction in pressure applied to the tooth surface.[6]

HAND RELIEF DOWN TO A SCIENCE

Reducing the amount of pinch force dental hygienists apply to a scaler can go a long way toward preserving career longevity by helping to decrease the onset of muscle fatigue. Prolonged exposure to muscle fatigue can lead to inflammation, and this inflammation can cause hand disorders and injuries. Reducing pinch force removes a key component that can cause serious injuries which impact not only hygienists' careers, but personal lives as well.

Furthermore, improving the patient experience is something every hygienist strives to achieve. Reducing pressure applied to the tooth means increased comfort for patients during scaling procedures.

Image courtesy of HuFriedyGroup.

THE NEW STANDARD

Take a hand in improving your health and advancing the ADHA Standards for Clinical Dental Hygiene Practice. It is more crucial now than ever before to adhere to the Professional Responsibilities and Considerations:[7]

- Maintain awareness of changing trends in dental hygiene, health, and society that impact dental hygiene care.
- Access and utilize current, valid, and reliable evidence in clinical decision-making through analyzing and interpreting the literature and other resources.
- Prevent situations where patient safety and well-being could be potentially compromised.[7]

This HuFriedyGroup study is an in-depth exploration of the complexity of scaling, with attention to the hygienist's exertion and to the pinch force necessary to remove calculus from a tooth. Extensive testing demonstrated that an advanced ergonomic design delivers significant benefits for comfort without sacrificing effectiveness.[6] We now have a baseline

for comparing future ergonomically designed instruments.

Editor's note: *Both authors are key opinion leaders for HuFriedyGroup.*

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Cindy M. Purdy, BSDH, RDH, CEAS, has a passion for workplace wellness that has resulted in the creation of *THRIVE*, a dental-oriented wellness and therapeutic alternatives summit for dental professionals. *THRIVE* occurs three to four times annually at Glen Eyrie Castle in Colorado Springs, Colorado. Attendance information can be found at cindypurdy.com. In addition to multiple decades as a clinical dental hygienist, Cindy holds an ergonomic certification from Colorado State University, a certified ergonomic assessment specialist credential, and is certified in health-care ergonomics.

Edie Gibson, MS, RDH, has a mission to affect change. With over three decades of clinical and business expertise in dentistry, she opened About Face DH Spa in Crested Butte, Colorado, the first independent hygiene practice in Gunnison County. When spinal surgery ended her clinical career, she set out to empower other hygienists to *own* their profession and embrace proper ergonomic principles to help them avoid a similar fate. She is passionate about dentistry and inspiring other hygienists to take the leap into independent practice and public speaking.

HYGIENE INSTRUMENTATION, HAND HEALTH, AND ERGONOMIC HARMONY

If you are experiencing hand pain and/or considering whether your instruments and work habits are in line with keeping yourself healthy over the long term, I encourage you to learn more about these products that support hand health.

BY JULIE WHITELEY, BS, RDH

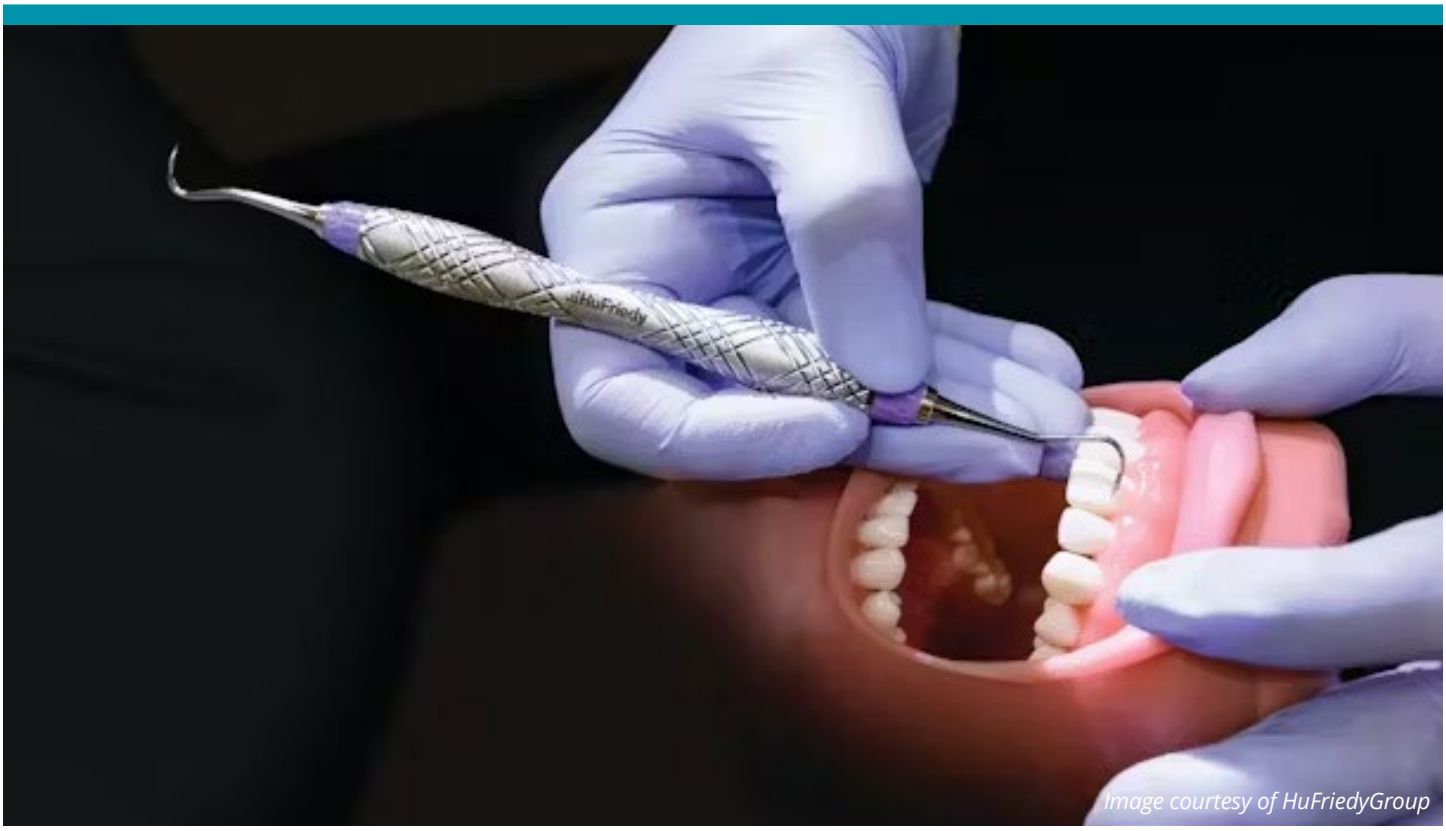

Image courtesy of HuFriedyGroup

After practicing clinical dental hygiene for 14 years, I considered myself very fortunate that, despite some occasional work-related aches and pains, I never experienced any serious symptoms of musculoskeletal disorders (MSDs), particularly with my hands and wrists. Unbeknownst to me, the years of "making do" with many instruments that were either not ergonomically designed or past their prime were slowly taking an irreversible toll on my hand health.

BEND, DON'T BREAK: ERGONOMIC SOLUTIONS FOR DENTAL CAREER LONGEVITY

Further adding to this was not having instruments that held their sharpness longer, and reserving sharpening for when I had time, which was not frequently enough to protect my hands. I was successful with removal, and was not experiencing any issues, so I incorrectly assumed that I would continue to remain healthy.

Although this damage was likely years in the making, the pain came on suddenly and relentlessly, affecting me physically, emotionally, and financially. My injury not only had an effect on my career, but also on my life outside of work as I dealt with chronic pain. As a clinical instructor, a role I held for many years, I had expanded knowledge of instrumentation but had no idea how a few compromises would so greatly impact my clinical career and my life.

SOME STATISTICS ON PAIN

Unfortunately, I am sure that many reading this article have experienced hand pain related to practice. Research has indicated that the hand and wrist are the most prevalent regions for dental hygienists to experience MSDs.[1] A study published in the *Journal of Dental Hygiene* in 2001 reported that the highest rate of diseases of the hand and wrist in the field of dentistry were among dental hygienists. Of 5,000 Army dental professionals surveyed, 75% of the dental hygienists reported hand problems. Those who spent more than 50% of their time working with patients with heavy deposits were 2.3 times more likely, and those who had been practicing greater than 10 years were 1.9 times more likely, to develop hand problems.[2]

A 2016 study similarly reported that when compared to other dental professionals, dental hygienists may be at an increased risk of MSDs based on repetitive strain and cumulative trauma that can result from the nature of our work. The one-year prevalence rate of MSDs among dental hygienists ranged from 60% to 96%, with pain reported in the neck, shoulder, wrist, hand, and back. Without proper knowledge, preventive and/or coping methods, hygienists may be forced to endure daily pain. Allowing injuries to progress without intervention may force some to leave clinical practice.[3]

WHAT CAN WE DO?

What does this mean for us, particularly with the increased use of hand scaling over recent months as we navigate practicing within the constraints of a novel virus? It means that we have to stay informed about best practices, equipment, and products designed to protect our health and the longevity of our clinical careers. Sparked by my own injury, I have researched, written, and presented material to help colleagues identify potential problems proactively, while I share solutions and strategies to protect the hand health of my peers. I am always interested in exploring ideas and products. That, combined with a decade and a half of clinical teaching, taught me that not all instruments are created equally.

THE PROBLEM WITH PINCH FORCE

With regard to hand injuries, an important risk factor in dental practice is forceful pinching between the thumb and index finger, which occurs during dental scaling. “The use of unnecessary force in a pinch grip is the greatest contributing risk factor in the development of injury among dental hygienists.”[4] My own

hand issues can be attributed to increased pinch force that can occur with instruments that are too thin, those that are not properly balanced, those that are dull, having a weak fulcrum, improper finger position/hyperextended joints, and the design of the instrument handle. Ergonomic instrument design can greatly reduce the need for excessive pinch force, thereby aiding in the protection of hand health and may reduce the prevalence of MSDs among dental practitioners.[1,5]

HARMONY ERGONOMIC SCALERS AND CURETTES

Recently, I had the opportunity to experience the new line of Harmony ergonomic scalers and curettes from Hu-Friedy, now a member of HuFriedyGroup, which are designed using TrueFit Technology. When evaluating an instrument, I look for factors that will allow me to comfortably reduce my pinch force and promote efficiency to decrease the pressure and number of strokes to get the job done.

BALANCE

One of the first things I look for in any new instrument is balance. Balance refers to the working ends being centered along the long access of the handle. Balanced instruments allow the finger pressure to be transferred more effectively to the working end. This results in a decrease in the pinch strength necessary, thereby reducing muscle stress and the potential for injury.[5] The precision manufacturing process used for Harmony produces perfectly balanced handles, which may reduce fatigue.[1,2,6,7]

HANDLE SHAPE

What I noticed immediately when I grasped the instruments was the way the ergonomically designed handle rested easily, naturally, and comfortably in my modified pen grasp. The wide, rounded and tapered shape of the Harmony Scaler handle allowed for easy adaptation of my grasp without compromise.

The benefits of the wide handle with a tapered shape have been supported by evidence. It has been shown that instrument handles with a round and tapered shape and a diameter of at least 10 mm require less force while those that are thinner are associated with cramping.[8-10] A 2007 piece published in *Applied Ergonomics* found that tapered handles reduced the average median pinch force by 11% compared to nontapered handles.[9] "Tapered shaped handles can allow for improved coupling of the finger pads to the handle during the high force pulling motions required for scaling."[9] I could observe this directly when practicing with the Harmony instruments.

The Harmony Scaler handle shape also allowed my index finger and thumb to rest comfortably on the handle with a space between them, both when at rest and when activating and rolling the instrument. This optimized shape of the Harmony Scaler handle is designed to promote a secure grasp that allows for ease of finger movement as the instrument is navigated around the tooth.

When the index finger and thumb are too close—or worse, overlapping—it makes rolling the instrument more difficult, which can affect proper adaptation. This can decrease optimal engagement of the cutting edge to the tooth. When a compromise is made here, fingers often split and/or additional force and strokes are needed for effective removal. This

increases the likelihood of pain, cramping, and cumulative damage to the hand.

Additionally, the smooth transition from the handle to the functional shank allows for easy adaption to all hand sizes, as evidenced when I had three colleagues also try the instruments. Despite the differences in our hand sizes and preferences, our reactions were very similar in that we found the Harmony Scaler was noticeably more comfortable to grasp and maneuver.

KNURLING PATTERN

Another obvious feature I noticed in the handle design was the unusual knurling pattern. Knurling is the texture of the instrument handle. The way I often describe this to students is by using an analogy. Compare the feeling of walking on a marble floor with smooth bottomed shoes to that of walking across the same floor with running shoes. Clearly the running shoes provide better traction and stability.

Now picture walking across the same floor with hiking boots. The boots will provide the best traction and stability as the bottoms are the most textured. The same can be said for knurling patterns on instrument handles. The more ergonomic the texture, the greater the friction of the fingers on the handle, thereby decreasing the pressure/pinch force needed to securely hold the instrument without slipping, even in a wet environment.[11]

The decrease in pinch force that is created with prominent knurling, as evidenced on the Harmony Scaler handle, can alleviate hand fatigue and reduce injury risk due to repetitive motion.[1,2,6,7] The recessed double-helix knurling pattern of the Harmony Scaler handle has been the most textured I have personally experienced to date. Studies show the optimized shape and double-helix patterned grip of the Harmony Scaler handle reduces pinch force up to 65% compared to other leading designs.[12] Further, I noticed that the silicone grip between the handle and functional shank is longer than others I have used, which made a noticeable difference in the ability to comfortably and securely grasp the instrument with less pressure.[12]

EVEREDGE 2.0 WORKING ENDS

When adapting the Harmony Scaler designed with TrueFit Technology to the tooth, I could feel the cutting edge easily and securely engage with the tooth surface with no slipping. The result was an effective removal stroke without the need for excessive pinch force or lateral pressure.

The design incorporates EverEdge 2.0 Technology into the working ends. This technology yields a blade that is 72% sharper than the next leading competitor and is a result of the combination of the properties of the metals, heat treatment, and cryogenics used in the manufacturing process.[12]

Working with dull instruments has been shown to force the wrist out of a neutral position, which is a risk factor for developing MSDs. Additionally, the force needed to work with a dull instrument increases the likelihood of pain and cumulative trauma to the hand and increases the risk of losing control of the stroke, which can result in injury to the patient and/or clinician.

Lastly, dull cutting edges can burnish calculus. This can make removal more time consuming and difficult, impacting both the comfort level of the patient and the clinician.[5]

EverEdge 2.0 Working Ends are not only sharper but stay sharper longer. This can result in a less frequent need for sharpening, an increase in patient and clinician comfort, a decrease in the hand fatigue and injury that can be caused by the use of dull instruments, and in instruments that can last longer before needing to be replaced.[12]

COMBINED BENEFITS

The features of the Harmony Scaler handle design combined with the EverEdge 2.0 sharpness of the cutting edge work in perfect "harmony" together to decrease lateral pressure against the tooth, decrease pinch force against the handle, promote a more ergonomic grasp, and allow clinicians to effectively and efficiently remove calculus. Less pressure is needed to do the same amount of work. According to the results of over 2.8 million data points collected, the Harmony Ergonomic Scalers and Curettes can decrease pressure applied to the tooth by up to 37% compared to other leading scaler handle designs.[12] Further, the design considerations that allow for decreased pressure against the tooth when scaling not only positively impact clinician time, comfort, and hand health, but patient comfort as well.[5]

CHOICES

Lastly, the Harmony Scaler and Curette handles come in a wide variety of tip designs to match clinicians' preferences and to customize the instruments to the tasks at hand. For example, there are universals, area-specific curettes, and sickle scalers. The handles are available in more than 30 different working end designs. Additionally, there is a rigid shank option for the 11/12 and 13/14 Graceys. A rigid shank has less flexion in the instrument and is excellent to have when faced with heavier or more stubborn deposits, particularly during this time where more hand scaling may be occurring in an effort to reduce aerosol-generating procedures.

CONCLUSION

As a long-term clinical instructor and a hygienist with a passion for sharing information to help protect the hand health of my peers, I can confidently say that I am impressed with the Harmony Scalers and Curettes; they checked all the boxes of my "must haves" with regard to evidence, comfort, quality, efficiency, and ergonomic considerations.

If you are finding yourself in a situation where you are experiencing hand pain and/or you are considering if your instruments and work habits are in line with keeping yourself healthy over the long term, I encourage you to learn more and align yourself with products that will support your hand health.

As I think back on all that I have experienced since developing an MSD of my dominant hand, I regret being less proactive and allowing myself to make compromises that ultimately limited my ability to practice. Remember that MSDs are cumulative and that you may not feel the damage today that could be career limiting tomorrow.

Prevention is more successful than disease management, so it is critical that we arm ourselves with information, work habits, and equipment that can protect us over the long term of a career that can be so demanding on our bodies. Following through on the information we learn can promote healthier outcomes

that can allow us to practice our profession with increased comfort, less work-related disease, and less interruption to income. Knowledge can also empower us to confidently ask for what we need and/or secure it ourselves. Put your future in good hands—your own.

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IT'S ALL ABOUT THE ANGLES: A BIOMECHANICAL EXPLANATION OF WORKPLACE BODY PAIN

If you're still in pain despite trying ergonomic methods in your dental hygiene practice, here are some subtle changes you can make that will help.

BY KATRINA KLEIN, RDH, CEAS, CPT

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The angles that are used (or not) to achieve neutral body posture during clinical practice are deeply rooted in geometry, biomechanics, and ergonomic practices. Biomechanics is the understanding of the fundamental principles of human motion.[1] It considers the components of the musculoskeletal system and all the forces,

torques, pressures, and stresses to understand the mechanical aspects of biological processes. In other words, it's how we use our bodies.

The number one reported area in studies about dental hygiene body pain is the neck at 66%–68%, followed by the lower back at 61%–68%.[2] Everything in the body is connected, from the hands to the neck. When we lunge our head out in front of the body, we begin a cycle of cellular death from a lack of oxygen, innervation, and nutrients to the cells in the area.

We compound these effects when we add another out-of-neutral angle and pivot our face down to see into the oral cavity. With each angled body part that is held out of neutral, we further compound the damage while expediting the symptoms of that damage. Here I'll address the biggest pain—the neck.

THE DIFFERENCES IN TWO PRACTICING HYGIENISTS

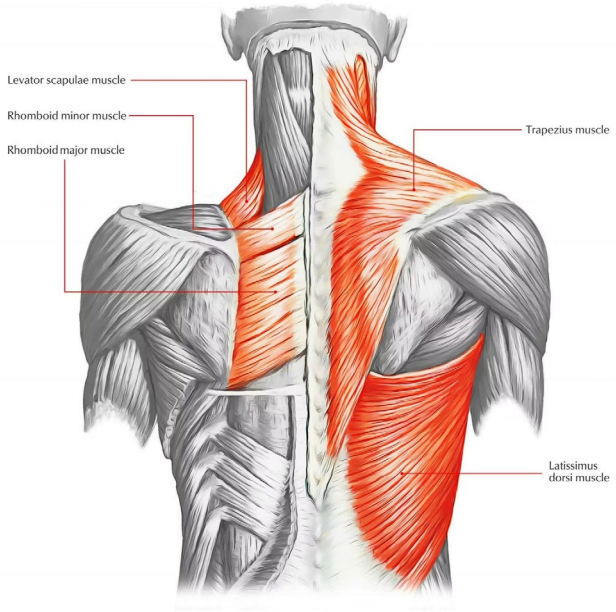
I'll feature two hygienists named Heidi and Helga in my example. Heidi practices with her head forward and down by 60 degrees, and she rarely has her arms out to the side (abducted). Helga practices with her head forward and down by 60 degrees, and she routinely abducts her arms and leans forward at the hip. The pain-free career longevity for Helga is significantly less due to her holding multiple out-of-neutral body angles. Helga will likely feel pain sooner.

Since people have their own preferences, we must think about different equipment use. Continuing with the example, Heidi uses reading glasses to practice and therefore maintains a 60-degree forward head flexion. Helga tries to fix her pain with a pair of traditional TTL loupes that place her head at a 20-degree forward head flexion. If Helga makes no other changes, she's likely to slow, but not eliminate, her momentum toward pain. It may still come sooner than Heidi's because she has multiple angle issues, as many people who use traditional loupes have discovered.

THE PROBLEM WITH LOUPES

As an ergonomics assessment specialist, I'm often asked during ergonomic training, "Why aren't my loupes working?" Despite the use of traditional loupes, up to 93% of hygienists still report body pain.[3] Why is this? The 20-degree forward head flexion found in traditional loupes is a biomechanical error. It's better than 60 degrees, but still not neutral. It's the perio equivalent of a 5 mm pocket.

The fact is that 20 degrees of cervical spine flexion is equivalent to approximately 20 pounds of pressure on the vertebral discs in the neck. This may have been considered safe when that's all that was offered, but we have



Back muscle anatomy.

true safety now with prismatic ergo loupes that put zero pounds of pressure on our spine due to a 0-degree forward head flexion.

In our example, let's add Henry RDH. Henry uses prismatic loupes that hold his head perfectly neutral, he keeps his arms down, and he practices in neutral body angles. As a result, he can expect to have very little body pain unless he works too many days and hours without rest, which is also an ergonomic no-no.

THE BODY'S MUSCLES

There are chains of muscles in the body that work together. As a personal trainer who specializes in posture correction, I see these chains in constant threat of neuromuscular patterns that cause damage, sometimes permanently. A chain example is the posterior chain. This includes the deep cervical muscles of the neck, the levator scapulae that interact with the shoulders, the spinal erectors and upper trapezius that begin at the back of the neck and go down to the lumbar vertebrae, and the glutes that begin at the hips and end at the back of the thigh where the hamstrings go to the back of the knee. Following are the calf muscles, and last but not least, the muscles of the ankles and feet.

The muscles in the chain are a group of muscles that are highly supportive of one another. When the head goes forward, the neck muscles engage, which signals the other muscles in the chain for support. Everything in the body works together to support the entire system, even to its own detriment. If multiple areas of muscle are heavily used, those muscles fatigue and fail with an eventual result of pain and loss of function.

But wait. There's more.

How we interact with the oral cavity is also angle dependent. When looking at the maxillary linguals on our nondominant side, it's necessary to have indirect vision and have the patient turn away to avoid angling the head to see directly. Seeing the mandibular lingual molars on our dominant side is also aided by indirect vision and the patient turning their head toward you. Don't compensate the angles in your neck to avoid asking a patient to turn their head for a moment. Both of your comfort levels depend on it, but only you know where the patient needs to move.

Try not to twist and bend during practice.

Standing in neutral position.

HOW TO KEEP YOUR ANGLES NEUTRAL

1. Reduce the biomechanical angles of the body while practicing—arms down, shoulders even, hips even, feet flat, wrists straight.
2. Use equipment that helps you work with your entire body in neutral—prismatic loupes, saddle stools, and a dual articulating head rest on the patient chair that is in supine.
3. Move the patient's head. Say "turn to the right/left" or "look up." Avoid saying "a little."
4. Use and master indirect vision. This is nonnegotiable.
5. The more you practice, the better you will perform a skill. This includes being kind to yourself as you learn a new skill.

How we hold our bodies during practice is what ultimately determines injury, pain levels, and longevity as dental hygienists.

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PAIN FROM DENTAL HYGIENE: A NUISANCE, DISTRESSING, OR DEBILITATING?

Many of the tasks dental professionals are required to perform can result in musculoskeletal disorders or injury to the central nervous system. Cindy Purdy, BSDH, RDH, says attention to diagnosis and treatment needs to be immediate.

BY CINDY M. PURDY, BSDH, RDH, CEAS

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We are all familiar with what often happens when a dental patient calls the office with a complaint of pain, right? Routinely, the patient is immediately added to the dentist's schedule for therapeutic treatment. Most dental professionals would agree that this is not the time for preventive procedures, such as a fluoride application or a change in toothbrush technique.

As dental professionals, why do we treat ourselves with less regard for our own health and career longevity? It is now well documented that dental careers are subject to the possibility of many musculoskeletal disorders (MSDs),

defined as an injury of the muscles, ligaments, nerves, cartilage, bones, or blood vessels in the arms, legs, neck, or back. The pain of an MSD for a dental professional is no less debilitating than that of our dental patients' pain. Attention to its diagnosis and treatment needs to be just as immediate.

SIGNS VERSUS SYMPTOMS

Let's take some of the diagnostic concepts that we were taught in school and apply them to our own health. A sign is any abnormality indicative of disease, discoverable on examination of a patient; it is an objective indication of disease, in contrast to a symptom that is a subjective indication of disease.[1] A symptom is any morbid departure from normal in structure or function experienced by the patient and indicative of disease.[2] A sign is *verifiable*. It is the definite indication of the occurrence of a specific disease. A symptom, on the other hand, is a vague report by a patient; something the patient feels or experiences. Pain is the most common symptom of injury and disease, and descriptions can range in intensity from a mere ache to unbearable agony.[3] Signs of an injury are present long before symptoms, such as pain, occur.

MUSCULOSKELETAL PAIN

Musculoskeletal pain can affect bones, joints, ligaments, muscles, tendons, bursas, or any combination, though injury is the most common cause.[4,5] The pain can be acute, meaning it is sudden and severe, or it can be chronic (long-lasting). It can be localized pain (in one area of the body) or it may affect the entire body.[4] Symptoms of musculoskeletal pain include aching and stiffness, burning sensations in the muscles, fatigue, muscle twitches, pain that worsens with movement, and sleep disturbances.[4] In addition, it can include weakness, joint noises, inflammation, and decreased range of motion.[5]

Tests used in diagnosis of musculoskeletal pain can begin with x-rays and rheumatoid factor and antinuclear antibody blood tests, used to help diagnose common causes of arthritis. Further testing can include magnetic resonance imaging (MRI) for the identification of abnormalities of soft tissues or a computed tomography (CT) scan to obtain more detail about a bone problem.[5]

Pain management of milder MSD pain can be relieved with over-the-counter medications, such as NSAIDs or acetaminophen; hot and cold therapies; strengthening, conditioning, and stretch exercises; and stress-reduction techniques.[4] Treatment of an MSD will be more specific depending upon the underlying cause, but common treatments include pain relievers, acupuncture, chiropractic adjustment, occupational therapy, physical therapy, splints, steroid injections, and therapeutic massage.[4,5]

NEUROPATHIC PAIN

Pain can be deceptive. Its source is not always the location where it is manifested. Damaged nerve fibers can send incorrect signals to other pain centers within the body.[6,7] Neuropathic pain is defined by the International Association for the Study of Pain (IASP) as "pain initiated or caused by a primary lesion or dysfunction of the nervous system."[8] Neuropathic pain is due to nerve compression or entrapment neuropathies, such as ruptured disk or carpal tunnel syndrome, nerve damage due to a chronic

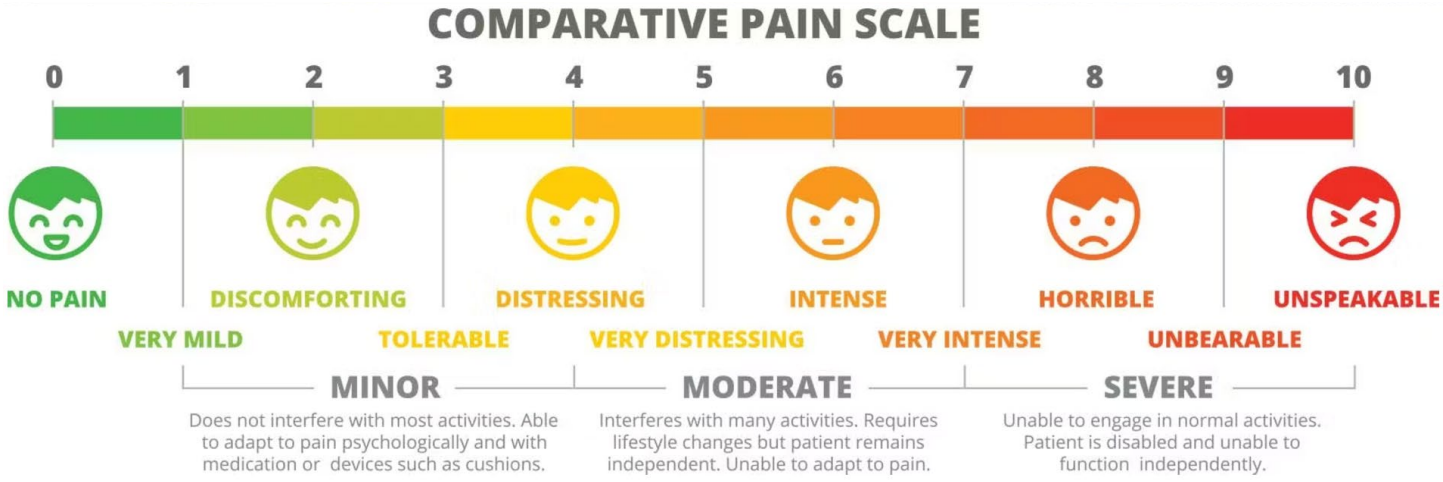

Figure 1: Visual analog scale

and progressive disease, or an injury resulting in the abnormal or disrupted processing of pain signals by the brain or spinal cord.[9,10] Neuropathic pain may be constant or intermittent. It does not usually begin suddenly nor is it alleviated instantly. Symptoms of neuropathic pain are a persistent numbness or a loss of sensation, shooting, stabbing, burning, or tingling, and may be deep and aching. It may result in an inability to sleep or rest.[6,7,9,10]

Identification of the source of neuropathic pain can be challenging because it is based upon the patient's subjective words and descriptions. Most often, a visual analog scale (VAS) is used throughout the process of treatment and as a comparison during recovery (**figure 1**).[10] The most accepted diagnostic tool to evaluate neuropathic pain is a nerve conduction study with electromyography (EMG). The purpose of an EMG is to determine any loss of function using touch, temperature, and vibration.[9] Additional imaging studies and blood work may be needed.

Common medicinal treatments range from nonsteroidal anti-inflammatory drugs, to a lidocaine patch, to tricyclic antidepressants (e.g., amitriptyline, nortriptyline, or desipramine), to selective serotonin reuptake inhibitors (e.g., paroxetine and citalopram), to antiseizure medications (e.g., carbamazepine, phenytoin, gabapentin, or lamotrigine).[6-10] Additional treatments include acupuncture, epidural or perineural nerve blocks, electrical impulse-emitting implant devices, and lifestyle treatments such as relaxation and massage therapy.

Many of the tasks dental professionals are required to perform can result in the development of musculoskeletal disorders or injury to the central nervous system. Long-term, chronic pain can negatively affect the ability to maintain an enjoyable workplace environment and a high-quality lifestyle.

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PAIN: PREVENTION, MANAGEMENT, OR THERAPY?

The first step to successful pain relief begins with an honest determination of your expected outcome. Is the search for injury prevention, pain management, or therapeutic relief of existing pain?

BY CINDY M. PURDY, BSDH, RDH, CEAS

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One of the primary functions of pain is to alert the body to potential danger. Pain is a warning mechanism that protects an organism by influencing it to withdraw from harmful stimuli; it is primarily associated with injury or the threat of injury.[1] Logic might imply that the threat of injury should be enough to tell the body to automatically pull away from the harmful stimuli, right?

Unfortunately, chronic pain does not elicit that same kind of "hand on a hot stove" reaction. Chronic pain is more complex. It is more

than a sensation or the physical awareness of pain; it also includes perception and the subjective interpretation of the discomfort.[2]

PAIN RECEPTION VERSUS PAIN TOLERANCE

Perception and response to pain vary dramatically from person to person. The context of pain and the meaning it has for each sufferer determine how pain is perceived.[1] A pain reception threshold is defined as the point at which a stimulus begins to become painful. A pain tolerance threshold is the point at which pain becomes unbearable.[1]

Studies have determined that gender, ethnicity, childhood experiences, and cultural attitudes are factors that can contribute to the development of individual perceptions and tolerances of pain.[1] A higher tolerance of pain may be perceived as stoic or brave for some individuals due to cultural attitudes, while others falsely tolerate higher pain levels due to fear of financial loss or the disruption of a balanced family dynamic.

PREVENT, MINIMIZE, OR TREAT

Call it disengaging, retreating, or even retiring, but the first step to successful pain relief begins with an honest determination of your expected outcome. Is the search for injury prevention, pain management, or therapeutic relief of existing pain? Is it to improve function and increase quality of life, or is it just to get through a few more years of employment at all costs? While a portion of the solution may be similar or overlapping, the actual pathway to achieve each of these outcomes is significantly different.

Injury prevention involves modifications to work practices, work space, and equipment, and adoption of daily strength training and muscle stretching. Products and systems are preventive, but they will not actually treat existing disorders or physical damage. In some circumstances, the use of various products may provide some pain relief, but pain is a sign that a disorder or damage is present. A medical diagnosis and intervention are still needed. A systematic literature review by Lietz, Ulusoy, and Nienhaus concluded that the most effective preventive ergonomic interventions are ergonomic stools, magnification loupes, prismatic spectacles, selection of dental instruments, and a training course in ergonomics (**figure 1**).[3]

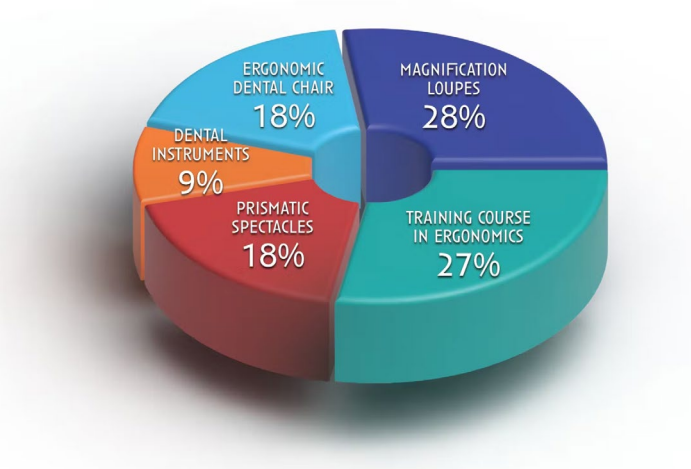

Figure 1: Preventive ergonomic interventions

Additional preventive products or equipment to assist in the maintenance of neutral posture can include an intraoral camera, high-definition mirror, cordless handpiece, hands-free periodontal charting, ultrasonic scalers, accessories that are designed with a contra-angle, patient chairs with a narrow back and a double-articulating headrest, and

a delivery system with straight, lightweight handpiece cords.

While pain management may include some the preventive products and systems, it is much more complex and involves medical intervention, preferably with the assistance of medical professionals at a pain management clinic. Alternative treatment includes acupressure, acupuncture, massage therapy, hydrotherapy, dry needling, chiropractic therapy, and/or relaxation techniques such as yoga, hypnosis, and meditation—along with a healthy diet and routine exercise.[2] Additional interventional pain management options include trigger-point injections, root block injections, radiofrequency ablation, facet and sacroiliac joint injections, or platelet-rich plasma therapy.[4] The stimulation of additional peripheral nerve endings by a transcutaneous electrical nerve stimulation (TENS) unit sometimes has an inhibitory effect on the nerve fibers generating the pain. It is thought that this is the same mechanism of action for acupuncture, compresses, and heat treatment.[5]

Treatments to reduce anxiety can result in a decreased need for a higher level of prescription pain medications.[5] Persistent chronic pain management presents the greatest challenge in pain management. The source of such pain may not be obvious. Because chronic pain can cause psychological complications such as depression, sleep disturbance, loss of appetite, and feelings of hopelessness, its treatment is usually multidisciplinary.[5]

Surgical methods are usually only used if drug therapy and local anesthesia wane in effectiveness or prove to be completely unsuccessful. Surgical severing of the nerve can result in severe side effects such as numbness, motor loss, or relocalization of pain.[2,5] One surgical alternative is to implant a pump beneath the skin to deliver pain medication directly to the spinal cord. An additional surgical alternative is to implant a spinal cord stimulation electrical device to disrupt the nerve, which inhibits the transmission of pain signals.[2,5] Positive surgical outcomes have increased due to improved anesthetic techniques and minimally invasive surgical procedures utilizing the laparoscope.[5]

Pain due to work-related musculoskeletal disorders/injury is generally preventable, treatable, and successfully resolvable if the cause of the pain is accurately determined. Early medical intervention and clear communication for the expected outcome lead to the most successful resolution.

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