

“Splitting the Headache”

By James P. Boyd, DDS



James P. Boyd, Developer of the NTI Therapeutic Protocol

Having suffered chronic, all-day headache pain and frequent migraine attacks for 12 years, Dr. Boyd was motivated to isolate the “missing link” in the traditional dental therapy that had failed to rid him of his pain. After four years of limiting his practice to the prevention of migraine pain and TM disorders at the Headache Prevention Institute in Bloomfield Hills, MI, he developed the NTI therapeutic protocol, which was later approved by the FDA for the prevention of medically diagnosed migraine pain. Dr. Boyd now has a private practice in Solana Beach, CA, and serves as Senior Clinical Instructor and Director of Research at the White Memorial Medical Center for Craniofacial Pain in Los Angeles, CA.

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Prologue

LIVING WITH A HEADACHE

Every day for twelve years I woke up with a headache. To someone who gets a headache maybe twice a month, a daily headache must seem pretty amazing, but if you're reading this book, it's probably because you can relate.

My headaches began during my senior year in high school. I was growing pretty fast and I had developed some tendonitis in my knees, so I frequently took aspirin. Since my knees hurt most of the time, my mom had strategically placed aspirin bottles in every bathroom and in the kitchen. Sometime during that year, my knees quit bothering me, but I still needed to take the aspirin. Every time I woke up in the morning, I had a slight headache, so I took a couple of aspirin. After school, another headache, so a couple more aspirin, and then maybe one before dinner.

Within a few years, I started my day with three aspirin and a Tylenol. The pain felt like a vise on my head, squeezing hardest on the temples. The base of my skull was very stiff and tender, so I'd stand in the shower with the water pounding the back of my neck, until I started to come around. By the time I was in graduate school, I started each day with four extra-strength Excedrin and an extra-long shower just to make the headache tolerable. By the end of each day, I had consumed ten to twelve Excedrin. Not many people realized my condition. Usually, I had taken so much pain reliever that I could behave normally, and those close to me rarely knew how often I was taking aspirin. I actually assumed that my headaches were somehow normal! I mean, wasn't there an entire aisle in the supermarket dedicated to headache remedies? Commercials for headache sufferers were on T.V. all the time, so I figured my condition was normal. Certainly, if I woke up with daily chest pain, somebody would want to cut me open to see what's wrong with me, but a throbbing head was somehow acceptable. Eventually, about once a month, I had the headache supreme. Sometimes the pain was on the right, sometimes on the left, or maybe the slam-dunk squeeze on both sides...and there was nothing I could do to stop it. Curled up in a dark room, yet close to a bathroom in case I had to throw-up from the pain, I learned to just ride it out. Nothing could stop it. I had tried different kinds of medications for this one, but nothing worked. Once I had it, I had it. Sort of like having the worst muscle cramp you can imagine, wrapped around your head.

A migraine is a headache that hurts so badly that it actually makes you nauseous and you need to curl up in a dark room. This is what I had and what the medical community calls a "common migraine". Common? Oh, great. I guess since lots of other people get these, too, and don't die either, I'm supposed to feel better. Turns out there's also a "classic migraine", which is identical to the common kind, but you need to see a weird aura and flashy

lights just before the migraine hits. Of all the migraine sufferers out there, 10% get the classic kind, for which there are preventive medications and special diets, but have limited effect on the common kind. During my education, I completed a rotation in myofascial dysfunction. Myo means muscle, and fascial refers to the connective tissue coating that wraps around muscles. Dysfunction is the wonder word of the 80's. Any time that something doesn't work right, it's dysfunctional. During my training, I treated many patients who were having the same symptoms that I was, but only half of them felt better from our state-of-the-art treatment. (I didn't feel any better, either.) Eventually, these patients were diagnosed with conditions that were unpreventable and barely treatable, like "atypical migraine", fibromyalgia, or myocytis (which means chronic muscle inflammation). Since the clinic couldn't seem to cure or prevent these patients' headaches, I think the doctors felt obligated to label them with a respectable condition. After graduation, I explored most of the usual methods for headache treatment. Chiropractic care felt good after the "adjustment," but I was right back to where I started a day later. Occasionally, I would sense a tremendous amount of pressure and pain in or behind my sinuses, so I went to a sinus specialist who said that my sinuses were normal. Physician friends of mine prescribed various headache medications, but nothing ever prevented my headaches and common migraines.

After three years in private practice, I gave up treating patients with severe myofascial dysfunction (or "atypical" migraine, fibromyalgia, or myocytis). I figured that if my headaches hadn't improved with the best treatment that money could buy (which I received for free), how could I charge somebody for a service that I questioned myself? In spite of my skepticism, I was convinced that my headaches were a result of some sort of muscular condition. My type of daily headache had been officially diagnosed as a muscle contraction headache, or tension-type headache (tension refers to the actual tightening or tensing that a muscle experiences, instead of emotional tension and/or stress). These daily headaches were thought to be separate from my occasional common migraines; however, I somehow felt that they were related. I believed that my migraines were somehow connected to my chronic tension headaches. Additionally, my headaches presented with the same symptoms that severely dysfunctional muscles did (pain and pressure, extreme soreness, tenderness, tightness and throbbing).

Although I was pleased to find out that I didn't have some kind of brain tumor (which I was convinced that I must have had), I felt frustrated when told I was simply suffering from "stress." I wasn't satisfied with the current treatment methods, medications and side-effects that are designed to provide relief from the headache pain, so my goal was to figure out how to prevent my headaches. My headaches began in 1977, and it was in the summer of 1989 that I figured it out. Over a period of several days, I designed and redesigned a comfortable method of treatment that I thought would, or should, prevent my headaches. When I was satisfied with the final version, I tried it out. The next morning I woke up without a headache. Ten years later (as of this 3rd writing), I still awake headache free, and have not had a common migraine since that summer. This entire book is dedicated to the process I went through and how the chronic headache sufferer may also find

relief. I can almost guarantee that if I told you now what the cause of these headaches and migraines was and how they are prevented, you wouldn't believe me. (Besides, how many books have only a prologue and that's it?) These first few chapters are necessary for you to understand the big headache picture. Then you will find the simple solution believable and logical. In fact, you may be puzzled as to why someone hadn't already thought of it! The first patient I treated with this new method was my girlfriend. She also awoke every day with a headache and also had regularly occurring common migraines (far more than I ever had). I hadn't been aware of it, but when she was younger, her parents had taken her to every headache specialist they could find. The neurologists confirmed she was having common migraines (such severe pain on one or both sides of the head that it causes sensitivity to light and nausea) and daily tension headaches. Her doctors couldn't help prevent her headaches, however, because "they were probably due to stress." As an adult, she was taken by friends to the emergency room for a shot of Demerol (a pain killing narcotic) on several occasions for her debilitating migraines. Of course, when I presented my hypothesis of headache cause and prevention to her, she politely told me that her headaches were different, that she had been to all the specialists, but thank you anyway. I told her that I really thought I had something that would help and wouldn't she just try it for two weeks? In hindsight, I suppose she was just humoring me, (we had just started dated, so she couldn't tell me I was a nut...yet), but she agreed. After two weeks, I asked her how she was doing. "Something is going on and I think it's good," she replied. "Let me try this a little while longer." Two weeks later, her morning headaches were practically gone, and she had ceased having migraines. She's not been to the hospital since. Two years later, we were married.

Eventually, word of this method of treatment and prevention spread. Several friends of mine who were attorneys insisted that I apply for a United States patent. I did, and my patent attorney warned me that a patent usually took a couple of years to get. Three months after the application was sent in, I received my first United States patent. (I've since received a two more patents, and an international patent). After I had treated several hundred patients, our local news channel aired a feature on what I was doing. That news segment was picked up by the network and shown nationally. I received calls from everywhere, with most of the calls reporting the same symptoms that I had been suffering. Unfortunately, a lot of people were disappointed when they that this type of treatment was not yet available in their town (that's no longer the case).

Wouldn't you think that if someone had come up with a logical hypothesis for the cause and prevention of recurring headaches, without medications, the world would come knocking? Not so at the beginning. Patients who had suffered for years with headaches (but who are now pain free) used to frequently ask, "How come everybody doesn't know about this? You've got to get it out there!" In the first two editions of this book, my response was, "I'm trying...", but as you will soon discover, it's getting more and more out there everyday.

I had lunch with a clinical psychologist several years ago who also doubles as a newspaper and book editor. He had just read my research manuscript and asked what my motivation was. "Well," I said, "I have a personal vendetta against headaches because I know how miserable they are. If someone out there is suffering as my wife or I did, I'd like to help." His response to me was, "If you want to get the word out to your fellow headache sufferers, you ought to write a book that they can relate to!" O.K. then, here goes....

"Most people don't realize how headaches limit and control your life. I used to get migraines that lasted for four days straight, every other week. Now, I get them maybe once a month, and I'm still progressing! Thank God for Dr. Boyd who had the insight, knowledge, and compassion to want to help people like me lead a richer, fuller life without headaches."

Sharon Koperwas, West Bloomfield, MI

Chapter 1

GETTING TO KNOW THE PLAYERS

Watching a basketball game is enjoyable when I know the players and their capabilities; however, what I really like is that element of surprise which comes from an unknown player performing 'like a Michael Jordan.' Wow! Did you see that guy? I didn't know he could do that!"

I'd like to familiarize you with some of the "players" in the chronic headache/migraine game. The most surprising players to us will be muscles. What we'll discover is that some muscles are capable of much more than we realize. Muscles are responsible for the majority of the aches and pains from which we all suffer. Without realizing it, most people have a general understanding of how muscles work, and we know through painful experience what happens when they don't work correctly or have worked too much.

We'll use an example to demonstrate typical muscle dysfunction and the resultant symptoms. Clench your fist as hard as you possibly can. Now, decrease your intensity to at least 50% of maximum and remain clenching for at least ten minutes. After three or four minutes, you may find that ten minutes is a bit longer than you realized, so try to go as long as you can. While you're doing this, use the opposite hand to feel your forearm. Your forearm should feel stiff and may start to burn and ache. Your fingernails may be digging into the palm of your hand. What does it feel like when you finally finish? Even if you didn't participate in the exercise, you probably know. Your fingers feel stiff and tend to remain curled. Your forearm is fatigued and perhaps sore. What would it feel like if you did that same ten minute exercise every two hours for the rest of the day? Tomorrow or the day after, your fingers would be stiff and curled, your forearm painful, stiff, and tender to the touch, even when your fist is not clenched. Additionally, normal use of your forearm may result in a spasm or cramping of the muscles, which is very painful. These are typical symptoms of a muscle in a dysfunctional state.

In order for a muscle to do its required job and not become dysfunctional, it must receive adequate oxygen for metabolism, adequate blood flow to transport waste products out of the metabolism site, and enough rest between contractions. And even more importantly, the muscle must not participate in activities that it's not designed to do. But first, what is a muscle's job? A muscle moves one bone closer to another bone by shortening itself (i.e., contraction). A muscle is attached at one end to a stationary bone and at the other end to a moveable bone or structure. Once a muscle has completed a given task (e.g., moving the bone), the muscle ends the contraction and relaxes.

During the contraction, de-oxygenated blood and waste products build up within the muscle while the oxygenated blood trying to flow into the muscle is restricted. Once the contraction has been completed, the muscle relaxes and oxygenated blood rushes in. During our fist-clenching exercise, the forearm muscles remain contracted, preventing an adequate supply of oxygen and allowing a buildup of waste products (which wouldn't be so bad if we did it only once or twice for a minute or two). Chronic and intense fist-clenching, however, is not an activity the forearm muscles are designed to do. As a result, the forearm muscles become dysfunctional (i.e., painful and stiff). When this condition is allowed to continue, the muscles may tend to cramp or spasm. Therefore, if someone had this peculiar habit of clenching their fist, discovering how their forearm became so painful and their hand so stiff would be easy...just watch them. Treatment would be easy, too. Just figure out a way to prevent them from clenching their fist (which may not be so easy after all).

The fist-clenching example demonstrates a situation in which the muscular contraction has no specific purpose. Usually, the fingers and forearm would be working together to hold an object for a particular task. Once the task is completed (e.g., setting the object down), the muscles relax and await the next task. Chronic and intense muscular contraction without specific purpose and the resultant symptoms can result in a condition known as myofascial pain dysfunction (myo means muscle and fascial refers to the connective tissue that wraps around muscles).

"I had been hospitalized for a week of observation and tests at a special institute, but they still couldn't help me. It's a blessing that something so simple has made my life so wonderful!" *Marvel Mayer, Troy, MI*

THE TENSION HEADACHE / COMMON MIGRAINE PUZZLE

Medical researchers estimate that at least 10% and as much as 20% of the population suffer from daily or weekly tension headache and common migraine. At one time, the medical community assumed that the muscles of the scalp somehow developed into a dysfunctional state which felt like a tight hatband around the head, with the most pressure at the temples. The medical community later realized that the scalp muscles didn't participate in the kind of strenuous activity that would normally result in muscle dysfunction (raising the eyebrows and wiggling the ears are hardly perpetual strenuous activities). Several studies demonstrated that the muscles of the scalp showed no increased activity during a headache, compared to the normal state. Researchers then concluded that either some dysfunction in the blood vessels or in nerve conduction to and from these muscles must be the cause of the intense muscle pain. Thus, researchers have concentrated their studies on blood vessel activity and nerve conduction.

Recently, neurological research has isolated the temporalis muscle as the primary center of tension headache pain and possibly common migraine pain. Although the temporalis muscle is located on the skull, it is technically a jaw muscle and not a scalp muscle, since its sole function is to close the jaw. Medical schools, therefore, leave the study of the temporalis muscle to the dental schools. Dental schools leave the study of headache to the medical schools, so the temporalis muscle and even more importantly, the nerve that services the temporalis, the Trigeminal, has been largely overlooked as a causative and/or perpetuating source of headache and migraine.

The temporalis muscle has a large fan shape that covers the entire side of your head, known as the temporal area, extending from above the ear to just behind the eye. The temporalis is actually much thicker than you might imagine, but it is not readily detectable because it resides in a deep indentation in the skull. That's why it's not very obvious. While the broad, fan-shaped end of the muscle covers the entire side of the skull, the other end tapers down and reaches under the cheekbone and attaches to a special projection of the lower jawbone.

The temporalis' sole function is to close the jaw during chewing. To demonstrate how it works, place a pencil between your molar teeth as far back as you can and bite down hard, repeatedly. If you rest your fingers along the temporalis muscle, you'll feel it bulge in and out. The temporalis is considered the strongest and most powerful muscle of the body, able to crush bones, crack hard nuts, and fracture teeth! Researchers haven't been able to determine whether the temporalis muscle itself is dysfunctional and, therefore, the cause of the headache, or if the blood vessels and nerves that service the temporalis are dysfunctional and cause pain to appear in the temporal region. If the temporalis muscle can be a source for all these headaches and migraines, how can it become so painful? (Perhaps, as well shall see later, there is one more component to the puzzle. . .)

There are basically two theories. The theory of those practicing in medicine (i.e., internists and neurologists) suggests a malfunction in the central

nervous system. Think of it as a computer malfunction. Medicine's view is that there is a problem with the software system (computer lingo). The pathways that carry information and data to and from the temporalis muscle have somehow been altered. This mis-information can result in headaches, usually in the temporal region. Various medications are then prescribed to cover up the problem. The other theory, the one proposed by physical therapists, orthopedists, dentists, and chiropractors, suggests a defect in the hardware, that is, a problem with the physical body that can be remedied by therapy, surgery, or chiropractic adjustment.

"I was a bi-monthly visitor to our local urgent-care facility for mega-shots of Demerol, Toredol, etc., for vicious migraines...no doctor, surgeon, dentist or other medical person I had dealt with for all those years had actually had the problem I did...except for Dr. Boyd. If I could turn back time, Dr. Boyd would have been there before things got so very bad for me...but to be headache-free after 10 years of pain and frustration is just wonderful!"

Dawn Alegre, Los Angeles, CA

Chapter 3

THE TMJ TRAP

Most headache sufferers go from doctor to doctor looking for some kind of answer. Each new physician or therapist 'knows' our problem and proceeds to treat us accordingly.

During our quest for pain relief, many of us have been told we have 'TMJ', a disorder of the jaw joint. So we visit a dentist who specializes in temporomandibular joint dysfunction (TMJ). 'Temporo' refers to the temple bone of the skull, mandibular refers to the lower jaw (i.e., the mandible), and the joint is where the two meet, just in front of the ear canal. The TMJ practitioner attempts to treat all the parts that control chewing: the teeth, the jaw joint, and the muscles.

In TMJ treatment, two particular theories attempt to explain why we have headaches. The first concerns the manner in which the upper and lower teeth meet, or 'bite', called the occlusion. Some TMJ practitioners feel that an improper bite is the cause of the headache pain. They believe that patients with a bad bite are constantly straining the jaw muscles (including the temporalis) to hold the lower jaw in such a position to create a proper bite. This strenuous activity results in myofascial (i.e. muscular) dysfunction, displayed as headaches. The TMJ practitioner's solution is to alter the teeth (by either orthodontics, crowns, grinding of the teeth, surgery, or some combination) to obtain the proper bite. The second theory assumes that the jaw joint itself is somehow damaged, which ultimately causes headache pain. The headache occurs when the muscles that surround the damaged joint assume a tightened (contracted) posture, in order to protect and support the damaged joint. If the joint is found to be irreversibly damaged, specialized therapy and surgery are recommended. Both theories utilize identical initial treatment. A special mouthpiece, called a splint, is fitted to the upper or lower teeth and covers the back molars and the edges of the front teeth.

The biting surface of the splint is polished smooth and flat, so that after you bite on it, your jaw can slide around. The design of this splint, often referred to as a 'flat plane' splint, serves two purposes. First, by preventing the opposing teeth from coming together in an improper bite, the jaw muscles can supposedly relax and allow the lower jaw to slide on the splint to the jaw's most optimal position. This would allow the muscles to 'heal'. Therefore, the splint should have eliminated the "bite" as a cause of the headache. Second, the splint prevents the jaw from closing all the way by keeping the opposing teeth separated by the thickness of the splint. Some practitioners believe that this will relieve pressure in the jaw joint. Therefore, those practitioners who diagnose jaw joint damage as the cause of the headaches believe that if pressure and strain are relieved from the joint, the joint will 'heal', which will allow the muscles to relax and resolve the headaches; but when using the traditional splint, that is a very questionable "if".

The lateral pterygoid muscle is what pulls the jaw from side-to-side and forwards, and is the muscle that experiences relief when splint therapy is successful.

Most patients who have mild to moderate headaches typically respond well to splint therapy; however, those who suffer with moderate to severe headaches don't do as well. As well over half of the patients with severe headache symptoms who are treated with TMJ splints, experience no relief or feel worse. Unfortunately, I was in this category, wearing a splint for five years with no relief.

There are situations in which TMJ therapy is indicated. Occasionally, in addition to their headaches, patients do have sore, tender, or painful jaw joints. Their jaws may move to the right or left or zigzag when opening and/or closing. Their jaw joints may make popping, clicking, or grinding sounds. Patients who experience these symptoms along with their headaches are often advised to try physical therapy, biofeedback, and chiropractic care in addition to their TMJ splints. If these methods are ineffective, patients may be referred to a counselor to help deal with life's stress. If these therapies and the splint wear have proven to be ineffective (i.e. the pain persists), surgery is often recommended. The most common TMJ surgical procedure simply 'rinses out' the joint space, flushing out the entrapped residue of inflammation and allowing the joint to heal, thereby allowing muscles to relax and curing the headache. Unfortunately, some patients' headaches return soon after surgery. These people typically learn to live with their pain with the help of prescribed medications. (If you're a TMJ patient, don't worry; this book is for you, too.)

So why do I consider TMJ a 'trap' for chronic headache sufferers? Two things have always puzzled me about the TMJ theories. First, dentists see people with absolutely lousy looking teeth and really terrible bites all the time; but as a group, these people don't necessarily have more headaches than those people with perfect teeth. In fact, published literature shows that the teeth and the bite are not factors in predicting who will have headaches. Splint therapy can be expensive, and 75% of patients with severe

headaches fail treatment, so something here just doesn't add up. Secondly, if a jaw joint can become damaged enough to cause a headache, treatment is directed at relieving the symptoms and repairing damage. Assuming there had been no traumatic event, how could the joint become so damaged in the first place?

"Most of the "TMJ specialists" in town had worked on me one way or another. All of my teeth had been capped--twice. My jaw had been surgically broken and reset. I had been given three separate "splints" without success (I actually got worse). I was accused of being alcoholic and in need of professional counseling to rid me of my terrible headaches. I was put on "display" in front of a TMJ symposium at a local hospital so that an auditorium of doctors could try to figure me out...nobody could. But now it seems so simple! One month after treatment with Dr. Boyd, I'm a new man!"
Dene Davidson, San Diego, CA

Chapter 4

MAINTAINING THE MEDICAL MYSTERY

So the question remains, what really causes tension headaches and common migraines? Officially, medicine says it's not yet completely understood. The International Headache Society lists dozens of classifications for headaches and migraines. No study exists to clearly indicate a simple cause of recurring tension headaches or common migraines, so medicine can't provide a means of prevention (just new drugs to treat the pain). In fact, IHS recently changed the name of "muscle-contraction" and "tension" headache to "tension-type headache. They point to research that shows no increased muscle activity during a headache compared to activity during a normal resting state; therefore, the term "tension-type" is used to describe a headache that seems to be like that of muscle contraction.

The practitioner's area of health care usually dictates what he or she believes. The neurologist believes that the central nervous system is somehow responsible. Several different medications are prescribed until an acceptable result is achieved (if ever). Treatment rarely "cures" the headaches, but rather relieves the pain soon after onset. The internist or neurologist may prescribe medications intended to prevent muscular spasm within blood vessel walls that are located within the skull or in the brain. The ear, nose and throat doctor (E.N.T.) may perform sinus surgery. The dentist makes a "splint". The chiropractor repeatedly adjusts the curvature of the neck vertebrae, hoping to prevent further attacks, only to have the patient return with a headache a week later or sooner.

Unfortunately for the daily headache and common migraine sufferer, no one has had an answer. We learn to accept and cope with headaches as a part of our normal daily life. We're told it's just stress, or our sinuses, or some lingering effect of an accident we had years ago. Ultimately, we no longer discuss our headaches. No one wants to hear about them anyway. Since we always seem to have a headache, we might as well gut it out and live with it.

In fact, most chronic headache sufferers soon learn to rationalize any discomfort they have above the neck, and must accept that a having head pain is somehow normal.. I performed a casual survey of chronic headache suffers on the alt.support.headaches.migraine group on the internet. Of the 32 respondents, 100% admitted that at least 3 times per week they awaken with some degree of headache (98% awaken with a headache more than half the time, and 60% awaken every day with some degree of headache).

NOT ME, NOT ANY MORE.

"I've had daily headaches all of my life. I've gone the route of neurologists, chiropractors, allergists, dentists, herbalists, acupuncture, physical therapy, bio-feedback and massage therapy with no lasting results. But now, no longer do I need to decline an invitation because I have a headache! It seems so strange to wake up headache free. I can get on with my life!"
Marilyn Wasemiller, Dearborn, MI

Chapter 5

SPLITTING THE HEADACHE

Let's go back to the fist clenching example again. Certainly, there are degrees of fist clenching. Simply curling your fingers is the slightest degree of fist clenching, and squeezing as hard as possible is the most severe degree of fist clenching. Assume that someone has developed a habit of clenching their fist during sleep and during periods of stress throughout the day and is completely unaware of it. Imagine we are the town specialists in forearm ache and an otherwise healthy 35-year-old female comes to us with a daily forearm ache. We suggest to the patient that perhaps she is a fist-clencher. Our patient confidently denies that she does any such thing because she's having a terrible forearm ache at that moment, and she's not making a fist. We know, however, that muscles can become very painful long after an exercise has been completed. How can we keep this patient from clenching her fist? How about giving our chronic fist clencher a billiard ball to hold on to? Would that make her forearm muscles relax? That probably depends on how severe a fist clencher she is. She may stop it at first, but then may get used to it and then clench the billiard ball anyway. How about using a tennis ball? Perhaps the rhythmic squeezing may keep her forearm from burning, but she'll still be fatigued, and her arm will still hurt. Our treatments, so far, have merely modified the fist clencher's ability to clench, but haven't prevented the clenching. But what if we were to tape her outstretched fingers to a ping-pong paddle? She couldn't make a fist or curl her fingers to begin with! Soon after our paddle treatment, our patient's forearm no longer hurts. We leave the ping-pong paddle on for a few weeks until our patient learns not to clench her fist. We've been allowing her to remove the paddle whenever she needs to use her hand, but she re-applies the paddle at all other times. Our patient now tells us that without the paddle, she is very much aware of her fist clenching and can catch herself before she can do any real damage. We recommend that she wear her paddle during times of particular intensity during the day (like a scary movie) and to

continue to wear the paddle during sleep, indefinitely. She readily agrees and tells us that whenever she has forgotten to wear her paddle to bed, she has awakened with a stiff and sore arm.

O.K., so now it's time to let you in on the little secret. Research has shown an association between intense chronic temporalis contraction and chronic headaches. When the temporalis contracts, it closes the jaw until the teeth touch (remember, the temporalis is really a jaw muscle, located on the scalp). Intense continual contraction of the temporalis (teeth touching or clenching) develops myofascial dysfunction of the temporalis, displayed as chronic headaches. It may surprise you to know that in the daytime, teeth should never be touching (i.e., temporalis contracting) except when eating! So here is where it gets interesting. Everybody, when asleep and dreaming, contracts their temporalis muscles from time to time. That is to say, it is normal to clench your teeth while asleep. What sets chronic headache patients apart from the pain-free crowd is not that they are teeth clenched (because everybody is), but rather they are more intense at it than others.

Doctors are trained to look for abnormalities. They will run a series of tests, looking for something abnormal to pop up. Once they find something wrong on your x-ray, MRI, blood work, etc., they can look in a book and find a description of the usual presentation of that abnormality. What I'm describing, however, is the opposite. Temporalis contraction is a normal function, but it's the presentation that is unusual. No wonder our doctors haven't found anything wrong with us. Here we've got all these wild symptoms and nothing to show for it. How is your physician supposed to know that a "normal" activity can result in such abnormal symptoms?

Now here is the most interesting part. Within every muscle, there exists tiny thread-like organs called "muscle spindles", or "spindle fibers". The spindles are believed to be stretch receptors, where upon being stretched, the spindle relays a message to the central nervous system, which is in turn relayed back to the "intrafusal fibers" of the spindle (meaning inside the spindle). The intrafusal fibers then contract, thereby encouraging the extrafusal (or outside the spindle) fibers to contract. The end result is a muscle which slightly shortens in response to be stretched. Now get this—research has now shown that in the chronic tension-type headache patient, those intrafusal fibers of the neck and scalp within are constantly in a state of tension, or contraction—without purpose (hey, that's dysfunctional!). Additionally, the division of the central nervous system which maintains the intrafusal fiber contraction is now strongly believed to be the sympathetic nervous system. You know the sympathetic nervous system. It's the one that controls the "fight or flight" response to stress or threat. So how does the tension-type headache patient respond to stress? They feel a headache coming on. Are their scalp muscles contracting? No. Are they getting increased input to the intrafusal fibers from the sympathetic nervous system? Yes. And what if the input was enough to make the chronically contracted spindle actually contort on itself? Yeow. That would be like a muscle cramp, wouldn't it? Let's see, intense and debilitating pain from somewhere from the neck up, perhaps intense enough that you become nauseous and sensitive to light, in the absence of any

identifiable disease. We've just described common migraine. Perhaps if the musculature hadn't experience such intense contractions during sleep, these spindle fibers wouldn't be so susceptible to spasm;but I'm getting ahead of myself.

And you're thinking, "Yeah, right. My headaches are due to sinuses , or red wine, or my neck vertebrae, etc..." Well, you're partially right (I'll be getting to those details later). Hundreds of patients who have experienced every possible treatment imaginable are now convinced that they were chronic, intense jaw clenched during sleep and had absolutely no awareness of it! Some of their comments appear throughout this book.

One method to determine if intense jaw clenching (i.e., chronic, intense temporalis contraction) is a source of your headaches is to firmly press on your temporalis muscle. Here's what you do. First, press on your forehead at the hairline, right in the middle. Don't be too gentle. You should be able to press pretty hard not feel much (or any) pain or soreness. This is your control so that you know what normal is supposed to feel like. Now you press on several spots throughout your temporal area, very firmly. When I do this to my patients, they advise me that it obviously hurts because I'm pressing so hard. Wrong. There should be no pain at all. It should feel the same as when you press on your forehead at the hairline. Ask somebody who never has headaches to do this on themselves...they'll barely hurt at all. If you can find some sore spots, good for you; keep reading!

Consider the person who, instead of a painful forearm, feels pain and pressure on the side or sides of the head. Could it be that the temporalis muscle is painful (i.e., headache) because intense due to intense contraction during sleep? During the daytime, even the slightest touching of the teeth requires contraction of the temporalis muscles (just like raising your arm requires contraction of the shoulder muscle). I used to think that since teeth seem to fit together pretty well, they should be together, right? Wrong. Although it seems harmless enough, daytime teeth clenching (usually during stressful events) acts as an irritation to pre-existing dysfunctional temporalis muscles (caused by the nighttime clenching). Remember, when your hand is at rest, it should not be gripping an object; and when you're not chewing food, your jaw should be at rest, so your teeth should not be touching. Simply allowing the teeth to touch requires a continual contraction of the temporalis muscle. Once the teeth are in contact, any degree of intensity of temporalis contraction and resultant clenching is likely to occur, without that person's awareness. The episodic and often severe continual contraction of the temporalis muscle during sleep results in its dysfunctional state, which may not be painful until a later time. This is one reason why some medical studies find no increase in muscle activity during a headache. Another example of this delayed muscle pain occurs in the weekend athlete who plays a hard game of football on Saturday, and whose muscles are sore and painful on Monday.

What can we do for these intense nighttime jaw clenched? What if we placed the hard, acrylic, flat-plane TMJ splint in their mouths? Would that make their temporalis muscles relax? The answer probably depends on the intensity of their jaw clenching habit compared to their teeth grinding habit. They

are entirely two different things. Certainly, teeth are protected from severe grinding, but jaw clenching is another story. These patients may lessen the intensity of their clenching at first, but once they get used to the splint, they clench into it anyway, sometimes harder! That's how TMJ treatment gets a bad reputation...clenching patients sometimes get worse. Some doctors will try to make a splint out of a soft plastic, but that simply allows these patients to chew into the splint, thus maintaining their muscular fatigue and headache.

Just as the remedy for the fist clencher was to create a situation in which her fingers couldn't curl, the remedy for the jaw clencher is to prevent the back teeth from touching each other or from touching objects that are sandwiched between them (like the splint). Essentially, an 'air-space' should exist between the upper and lower teeth when not chewing. Remember how to feel for the temporalis muscle? It is difficult to sense the bulging in and out of the temporalis without biting down on something with the back molars (like the pencil). Now place the pencil between your front teeth (so it sticks straight out) and bite on it while feeling your temporalis. Does it bulge out less, or at all? The contraction is minimal when your back teeth are kept apart and not biting something! What if you could figure out a way to keep the pencil attached to your front teeth while you were asleep and dreaming and during stressful events during the day? Even though you would look ridiculous, your temporalis muscles would have time to relax, allowing their dysfunctional state to subside and headaches to resolve.

This is, essentially, the thought process that I went through. I had been wearing a TMJ (flat-plane) splint for five years, with no resolution of my headaches. I was making other people wear one, so I felt guilty if I didn't, too. At this point I realized that I was wasting my time and my patients' money on the traditional TMJ splint. My goal was to design an appliance that would significantly decrease muscle activity enough to rid me of my headaches. Finally, in the summer of 1989, I designed what is now known as the Nociceptive Trigeminal Inhibition Tension Suppression System. The NTI-tss consists of two mouthpieces, one for day, and one for night.

The NTI-tss appliances keep the teeth discluded ('disclude' means to separate, while the term 'occlude' means to meet or bring together) while sleeping and during stressful daytime events. Dentistry has been trying to influence muscle activity by controlling the occlusion (the bite). **The occluding of the teeth, however, is already a dysfunctional act when not chewing.** The NTI tension suppress system keeps the teeth from touching each other, which prevents temporalis muscle over activity and the resultant headaches! The first morning after wearing the NTI-tss appliance, I awoke with a strange sensation that something was definitely different. Within a week, my headaches were dramatically diminished. One month later, I was waking without headaches!

I soon realized that as I performed general dentistry all day long, I was constantly setting my teeth together. Before using the NTI-tss at night, I never would have noticed. Even though I had woke up without a headache (a result of using the NTI-tss at night), I usually developed one as the afternoon wore on. The simple act of setting one's teeth together throughout the day really doesn't cause anything. But I still wasn't out of the woods.

I still had a "pre-existing" condition; I was still clenching during my sleep, and even though the intensity was reduced (by the NTI-tss), the frequency and duration of the events remained the same. Those years of off-the-map nighttime clenching intensity with the on going frequency and duration of activity still allowed even the seemingly harmless "teeth touching" during the day to trigger headache pain. So the daytime NTI-tss was born. For the first four to six weeks of using the nighttime NTI-tss, the daytime is used to prevent those "harmless" jaw clenching events that irritate the fatigued temporalis and trigger a headache. Once the nighttime jaw clenching intensity has been suppressed over several weeks, the typical chronic headache patient has less of a "pre-existing" condition to irritate, so the use of the daytime NTI-tss can be reduced or eliminated.

Although daytime teeth-touching/jaw-clenching can trigger a headache, it isn't as significant as the sympathetic nervous system's input to the spindle fibers. Without my teeth touching, I could still sense the tightening and tensing of my scalp in response to stress (or whatever the "trigger" might have been). As the weeks went by, those circumstances (triggers) which always seemed to bring on (worse) headaches just didn't have the effect that they used to. Why? Because the spindles were no longer residing within such dysfunctional musculature!

The first NTI-tss "anti-clenching" appliance I made was very bulky and awkward. I wore it only at night. I was single, so it didn't matter if I had a Frisbee in my mouth, as long as I didn't have a headache. What I had designed was anti-dentistry. All of my training had been focused on the extreme importance of 'the bite' and how it affected everything else. I was now suggesting not only that the bite was not so important, but also that biting was not normal to begin with (when not chewing). I kept this idea pretty much to myself, thinking that the 'dental god' might strike me down for such sacrilege. Soon after, I began dating Kathleen (who is now my wife). Like the rest of us headache sufferers, she put on a pretty good act for a while. Little did I know that most of the time, just before our dates, she would take all the pain medications she could stand (not because I wasn't good looking or anything...). The first time I met one of her brothers, he asked her, quite casually, "Hey Kath, how's the headaches?" "Oh, I'm doing fine...." I could almost see it written on her face, "Shut up, you idiot, do you want him to know?!" I don't think a girl wants a guy to know that she has a headache before they get married! Later, after extensive questioning, I discovered her long history of migraines. While growing up, it was not unusual for her to miss a family function due to one of her headaches. It had become part of her, and her family practically expected it. She told me that the only thing which helped a little bit was a drug called Fiorinal. When I looked it up, I found that "Fiorinal is indicated for the relief of the symptom complex of tension (or muscle contraction) headache." Hey! Tension headache! I thought maybe I could help her. More than anyone else, I think my wife is responsible for the comfortable, current NTI-tss design. I had been satisfied with my original bulky (yet effective) version, but Kathleen wanted something comfortable to wear at night that would prevent her headaches, and at the same time, something she could wear in public during stressful daytime occasions without embarrassment. Eventually, with

her encouragement, I came up with two designs that were just right: a daytime appliance that was hidden from view and didn't make speech difficult, and a nighttime appliance that was comfortable to wear and prevented her headaches...maybe that's why she married me.

"My husband had been out of work for six months because of his migraines. We had seen everyone who was supposed to be "the best" in the south, but with no luck. I read about Dr. Boyd and contacted him. Now, thanks to the NTI-tss system, my husband comes home from work smiling and plays with the kids...without a headache!"

Kim Reid, Selma, AL

Chapter 6

HOW DOES IT WORK?

The Nociceptive Trigeminal Inhibition Tension Suppression System (NTI-tss) takes advantage of a protective reflex which suppresses the temporalis muscles from contracting with their fullest intensity. Here are a couple of examples of this protective reflex. Let's say you've just taken a candy bar out of the freezer. How do you know if it's too hard to eat? Easy, you bite on it with your front teeth. If it's so hard that your lower front teeth can barely make a dent in it without hurting, you know it needs to thaw out a bit. But what if you're really hungry and just can't wait any longer? Simple, just use your back molars and start crushing away! How about when you're eating carrots? You can nibble on the skinny ones with your front teeth, but the big fat ones need to go between your back teeth in order to break off a piece because it would hurt to use your front teeth. Or imagine you're having a bowl of thick'n'chunky beef stew. If you accidentally bite the spoon with your lower front teeth...yeow!...You instantly open your mouth. What if there is a piece of bone in the stew? Unfortunately, you may discover it by chewing on it with your back teeth and splitting a molar in half!

Here's what's happening. Your lower front teeth (called incisors) are designed to warn you that what you're about to eat may be too hard to chew on. Whenever the lower incisors are put under moderate to severe pressure, they signal the temporalis muscles to relax before pain and damage can happen to them. This is called the jaw-opening-reflex. It is designed to prevent you from putting something too hard into your mouth that may be damaging to your back molar teeth. The back molars, on the other hand, do practically the opposite. Whenever something comes in contact with them (like frozen-solid Snickers Bars, a piece of bone, or TMJ splints), the back molars signal the jaw-closing muscles to bite down hard because they figure, since there's something between them; it must be time to chew!

The NTI-tss device takes advantage of the jaw-opening reflex by only allowing contact to be made on only one or two of the lower front teeth (incisors), and never allowing any of the back teeth (or canine teeth) to

touch. (The prevention of allowing canine and posterior teeth from contacting is probably just as important as the lone contact on the incisors. The research shows that the contacting of either the canine or posterior teeth instantly allows a significant increase in temporalis contraction.) Thus, when the mouth is being closed, a lower incisor will touch the NTI-tss appliance, suppressing the temporalis muscles' ability to contract! Of course, the NTI-tss appliance cannot be worn when actual eating and chewing are taking place.

We tension headache and common migraine sufferers have developed a habit of pressing some or all of our teeth together when we are concentrating on something. We may squeeze our teeth together just a little bit or go for a full-on clench. Our jaw may be lined up in the middle, or we may hold it off to the side a bit, and we have no idea we're doing it. By definition, we usually have *absolutely no awareness* of our habit. No one else is aware that we're doing anything abnormal because our clenching (whatever the degree) is a silent and motionless act (especially when sleeping, unlike "grinding" of teeth).

There are two versions of the NTI-tss appliance, one for sleeping, and one for when awake. Daytime clenching activity by itself really *doesn't cause anything*, but acts as an *irritant to pre-existing condition*...one that was developed while asleep. Wearing the daytime appliance for a month or so (except when chewing) allows us to have a more intimate awareness of our habit and most importantly, frequently allows the signal to be sent to suppress the musculature (every time you "tap" on the device). Although clenching activity during sleep is impossible to stop, the nighttime NTI-tss device allows for a suppressed, or reduced intensity of muscle contraction (which may also be a function of not allowing for canine and posterior teeth to touch). It's important to point out that in the muscular parafunction world, *it's the intensity of contraction* that creates and perpetuates the symptoms. I find myself biting on my nighttime appliance when I wake up, however, I don't have a headache because the NTI-tss reduces the intensity of clenching, thus preventing the headache.

It's during certain stressful parts of the day (like during scary movies, driving, balancing your checkbook, when the sympathetic nervous system makes its presence felt.) and especially at night, when high intensity temporalis contraction occurs that the NTI-tss appliance is worn. Essentially, the NTI-tss appliance is a simple habit-breaking device for daytime, and prevents the sleep disorder of intense temporalis contraction at night.

During the research and development of the NTI-tss, we did an electro-myography (EMG) study of the temporalis muscle. An EMG records the intensity of a muscle contraction by measuring the electrical activity through the muscle during the contraction. We wanted to know how the maximum clenching intensity of the temporalis would be affected by the NTI-tss appliance as compared to using a traditional "TMJ" appliance. Twenty-two patients who woke up with headaches were selected. Maximum clenching activity of the temporalis was recorded on each patient by placing the EMG electrode pads on the patient's temporalis muscle and having the patient clench his/her teeth as hard as he/she could. All of the patients

were then fitted with a NTI-tss appliance and asked to clench into it as hard as they could. On average, the patient's muscle contraction was reduced to one-third (33%) of maximum. Each patient was then fitted with the TMJ flat-plane splint and asked to clench into the splint as hard as possible. On average, patients were able to clench at 104% of maximum! This means headache patients who have myofascial pain dysfunction of the temporalis can actually intensify their condition when using the traditional TMJ splint! (Our studies were to confirm previous studies.)

What if you believe that your headaches are different and are caused by a sinus condition or some food allergy and are not somehow associated with muscle contraction?...KEEP READING.

"At 82 years old, I'd been having constant headaches and migraines for more years than I'd like to remember. It was absolutely marvelous to find relief after just two weeks of using the NTI Tension Suppression System. I promised myself I'd give Dr. Boyd a big hug when I saw him, but since I already paid him, I figured we're even!"

Edith Pratt, Escondido, CA

Chapter 7

THE SYNDROME

There appears to be a particular similarity of symptoms in the patients I treated during the development of the NTI-tss protocol which we like to call Chronic Clenching Syndrome (CCS). A syndrome is a group of symptoms (complaints) which, when taken individually, don't tell you much, but as a group can help to diagnose a certain condition.

Typically, CCS patients wake up with a headache. Most of the time the headache is focused in the temporal region and often extends to the forehead. Occasionally, the headache comes from the back of the neck, at the base of the skull (some patients get only this kind, which I'll explain later). They may have visited a chiropractor several times, with limited improvement. In addition to their headaches, CCS patients typically suffer from other symptoms. Their teeth are sensitive to cold and they occasionally experience 'phantom' toothaches (their dentist cannot find a reason for the pain). Many have experienced episodes at a dental office in which a tooth wouldn't get numb after several injections. Their necks are stiff and sore. Their ears sometimes itch, tingle, ring, or feel stuffy, plugged, or clogged. Some patients are constantly trying to clean their ears, or at least they're sticking something into their ears, just to scratch. Their jaws may be stiff and sore, and fatigue easily after a chewy meal. Some patients have recurring

'sinus' headaches, although their physicians have assured them that their sinuses are within normal limits.

TOOTHACHES AND SENSITIVITY

When I was in dental school, students practiced doing novocaine injections on each other. Unlike most everybody else, I never seemed to get very numb when I was the target for the lower molar teeth. In fact, I've had only one filling done on a lower back molar as an adult, and that was performed by a fellow dental student. I remember being able to sense the drilling, even though I was not supposed to. I thought, "Well, no wonder people get the creeps when you drill on them, if it feels like this!" The typical chronic headache patient may have few fond memories of dental treatment.

One of the more frequent ways Chronic Clenching Syndrome can be diagnosed is when a patient goes to their dentist with a toothache. Typically, the tooth is very sensitive to cold; however, the patient cannot always pinpoint the exact tooth. Instead, the patient will point through their cheek, instead of directly on a specific tooth. The patient is convinced there are 'cavities' due to several toothaches, usually on the same side, some on top, some on the bottom. An x-ray rarely shows any need for fillings or crowns, and the teeth look normal. I'm afraid to guess how many fillings, crowns, and root canals have been done unnecessarily by dentists because the patient requested something be done, even though no reason for the pain could be found. My mother-in-law is a good example. Before I knew her, she had been complaining for over a year of a toothache located in an upper, back molar. First, a filling was done. Later, a crown (sometimes called a cap) was placed over the tooth. When she still had a toothache, a root canal was done. Her tooth actually hurt more after the root canal was done, so the tooth was extracted. Guess what? When I met her, she told me of this weird toothache she was still having. (Ever notice that you tell a dentist your worst dental nightmare when you first meet him?) We were in her living room at the time, so I asked her to open up and let me peek. I said to her, "Hey, there's no tooth in there!" Then she told me her horror story and she concluded that some part of the tooth must have been left behind after the extraction. I announced that I'd like to do a little test on her. I put my finger on the side of her face and gently pushed under her cheekbone. She hit the roof. All that time, it had been a painful jaw muscle (the one I had just pushed on) giving her all the problems, a result of clenching!

What's going on? Teeth are not designed to be temperature sensors. If they were, nobody would ever get a pizza burn on the roof of their mouth! The teeth would touch the hot cheese and warn you to stop. Teeth do sense temperature when they are in distress, however. For example, if decay is deep enough into a tooth, the nerve can easily sense temperatures and acidic foods while eating. The dentist easily detects this type of decay. Although I never had any tooth decay, I used to have to drink icy drinks out of a straw and keep my cheeks sucked in a little to protect my teeth from hurting from the cold. So why do they hurt? Here's the deal. The intense pressure and compaction that an individual tooth experiences from clenching is tremendous. The root of each tooth is coated with a shock-absorbing nerve and ligament liner that becomes strained and bruised. This is very distressing to the teeth and they respond by being temperature sensitive. They are trying to tell you something is

wrong, even though an x-ray of that tooth will look normal. To demonstrate, imagine grabbing a molar with a pair of pliers and twisting the tooth from side to side for a few minutes. Hours later, that tooth would still be aching and sensitive to cold. This is exactly what happens when intense clenching occurs. Instead of the pliers applying the pressure, an opposing tooth is applying the pressure. Of course, it's the muscle that is really supplying the force. This is why many patients feel that they have two toothaches. It takes a lower tooth to push on an upper tooth, so sometimes both hurt. Typically, these patients have been having headaches, simultaneously, with their toothaches, but never make the connection.

STIFF AND SORE NECK

What does clenching have to do with a stiff and sore neck? Muscles generally work in teams. It's difficult to have one muscle (like the temporalis) tighten up without having muscles from the supporting 'team' tighten also. When a patient's jaws are squeezed together, the neck muscles that support the entire skull assume a tightened posture at the same time. These muscles are primarily located in the back of the neck; therefore, the habitual intense jaw-clencher practically always experiences a stiff and sore neck.

HEADACHE AT THE BACK OF THE NECK

Some patients' headaches originate primarily from the back of their necks. There is a certain type of jaw-clenching activity that particularly involves and engages these neck muscles. Instead of pressing the back teeth together, patients with these symptoms will have their lower jaw positioned slightly forward, pressing the lower front teeth into the backside of the upper front teeth. This type of activity doesn't fatigue the temporalis as much because the back teeth are not squeezed together as efficiently, yet still puts a tremendous strain on the neck muscles. Why? The neck muscles are trying to pull the head back to keep it erect because the forward jaw-thrusting makes the head want to tilt forward. The constant strain on the neck muscles results in the headache felt at the back of the neck radiating up the back of the skull.

UNSUCCESSFUL CHIROPRACTIC CARE

The clenching patient with chronic temporal tension headaches or back of the neck headaches is the chiropractor's worst nightmare. My chiropractor assured me that he could get rid of my headaches. He had shown me an x-ray of my neck and pointed out how my neck bones were lining up to form a straight line, instead of the curve that they were supposed to be in. Through chiropractic adjustments, he attempted to realign my neck bones to regain the proper curve. This should, I was told, relieve me of my headaches. Since I was actually there to have him fix my lower back (which I periodically mess up), I figured what the heck, as long as I'm coming here, go ahead and take a crack at it (sorry). After a few visits, my back was good as new, but my headaches hadn't changed. I went twice a week, and each time I needed the same adjustment as before, as though nothing had been accomplished. Maybe by now you've figured out what was happening. I'd go home from my visit feeling pretty good, but during the night, I'd clench my jaws together, which would re-establish my headache. This would tighten my neck muscles and pull my neck bones back into a straight line. My clenching habit kept goofing up everything the chiropractor had just done!

SENSITIVE OR RINGING EARS

I remember going to the ear doctor during the time when I was having amazing headaches. I was concerned that there was blood on the Q-tip after I had cleaned my ears. "A-ha!" I figured. "This must have something to do with my headaches!" The ear doctor looked into my ear and asked me, "What are you doing in there? There's a scab deep in your ear canal!" I told him that something had been bugging me deep in my ear, and I had been trying to clean it out. He announced that I had rubbed right through the skin.

O.k., so how come our ears feel so weird? Put your little finger in your ear while opening and closing your mouth. Now move your jaw from side to side. You can feel a lot of action in there! The over-activity of your jaw makes your ear canal somewhat sensitive. In many cases excess wax is produced, as if some little bug were in your ear canal, and your body was trying to protect itself.

There are two other muscles associated with jaw function (that is, muscles innervated by the mandibular division of the trigeminal nerve) called the tensor tympani (it attaches to the ear drum, and stabilizes it from the excess vibration caused by loud sounds) and the tensor veli palatini (it attaches to the eustachian tube, and helps to open and close the tube, thereby equalizing pressure within the inner ear...it is what "unplugs" your ears as you chew gum in an airplane). Over activity of these muscles can sometimes cause a ringing sensation, called tinnitus. It is not unusual for the patient with CCS to complain of ringing in their ears, or vertigo. The tensor tympani and tensor veli palatini are tensed whenever the jaw-closing muscles are tensed, i.e., whenever the jaw is clenched. Although at first they might seem unrelated, you can now see how chronic jaw-clenchers often times complain of tinnitus.

JAW JOINT PAIN

The lateral pterygoid muscle attaches at the top of the jaw bone, just in front of the ear canal, and inserts at a wall of the sinuses (the pterygoid plate). The lateral pterygoid can become dysfunctional by pulling the jaw to one side (while your teeth are together), too much and/or too hard. Clenching your teeth on only one side requires the temporalis and lateral pterygoid to work at the same time. The temporalis is closing your jaw enough so that your teeth can touch, while one of the lateral pterygoids is pulling your jaw to the side. This is called a unilateral or one-sided clench. When clenching occurs from side-to-side-to-side, it is called grinding (or bruxing). As the lateral pterygoid becomes dysfunctional from all this over-activity, the pressure and strain that is created is focused in the jaw joint space. The jaw joint is designed to deal with the forces and strains that are put upon it *during normal chewing*; however, the intense strain put on the jaw joint during unilateral clenching is very damaging. Given enough time, the strain from unilateral clenching can cause such damage that even constant rest can not reverse. For the most part though, most people with a jaw joint problem who use an NTI-tss appliance for a couple of weeks (daytime included) experience a significant improvement. For the patient whose jaw joint(s) have not shown significant improvement (less painful and considerably less tender) are usually referred to an oral surgeon to have their jaw joints evaluated. This occurs in about 5% of cases.

CLENCHING VS. GRINDING

If you simply had your teeth pressed together, and neither lateral pterygoid

was working, you'd be clenching your teeth; but, if your mouth was closed just enough so that your teeth could touch (a function of the temporalis), and each lateral pterygoid started working, alternately pulling your jaw to the left and then to the right, you'd be grinding your teeth (a right and left motion while the teeth are touching). Clenching the teeth and grinding the teeth are two separate activities. People whom exclusively grind their teeth (and don't clench), rarely get headaches. In order to grind your teeth, the temporalis must relax enough to let the jaw move around so that the teeth aren't locked together, but must contract slightly to keep the teeth touching. The temporalis is relaxed enough to keep it from hurting, but it still becomes fatigued (which is important to remember for later in the book). Some people do a little of both. After a clenching episode, they'll have a headache. If they've been grinding only, however, they won't have a headache.

Unfortunately, dentistry seems to combine the terms 'clenching' and 'grinding', as though they were interchangeable. They're not. If a patient reports that she is having headaches, and a dentist sees that the patient has tell-tale wear facets on their teeth, the dentist may mistakenly assume that *grinding* has caused the headaches (which it hasn't, that's clenching). Then he attempts to protect the teeth from the grinding with the traditional splint, believing that the headaches will be relieved. This gets him nowhere because it's the clenching that causes the headaches (remember, some people can clench harder with a splint).

Medicine and dentistry have yet to fully acknowledge that grinding is a dynamic form of clenching and that addressing grinding alone may serve to accentuate clenching. I'm convinced that this lack of acknowledgement has kept headache and jaw dysfunction prevention research at a standstill. Treating and preventing grinding of the teeth is a piece of cake, but it has little to do with headaches and jaw joint strain and damage. Suppressing clenching intensity is a whole different matter, requiring a totally different approach (which is what we're addressing).

The NTI Tension Suppression System simply provides an 'air space' between the teeth and keeps them from touching when they're not supposed to be touching. In other words, the NTI-tss prevents the temporalis and lateral pterygoid muscles from contracting with intensity when they're not supposed to be. By doing so, the myofascial dysfunction of the temporalis' and lateral pterygoids and strain on the jaw joint is prevented, thereby preventing headaches, toothaches, neck pain, ear conditions, and jaw pain.

No wonder headache sufferers are accused of being hypochondriacs! They visit neurologists for headaches, dentists for tooth and jaw aches, chiropractors and P.T.'s for their stiff and sore necks, and E.N.T.'s for their ringing, itchy ears. But you've got sinus headaches? No problem, let's talk about that in the next chapter.

"Today I am free of throbbing head pain, and a painfully stiff neck (I can now turn my head, not my body, while backing my vehicle out of the garage). No more Imitrex shots in the wee hours of the morning. My eyes are not at half-mast (due to pain and medication). I now have energy, I can exercise, and I feel like a new person!"

SOLVING THE SINUSES

Well, now that we've talked about the lateral pterygoid, I might as well give you the rest of its story. Some might think this is complicated stuff, but I hope to make it as simple as it really is. Ready? Remember, we said that one end of the lateral pterygoid attaches to the top end of the jawbone. The other end attaches to the walls of the nasal passages. I've mentioned earlier that the lateral pterygoid moves your jaw from side to side. Actually, you have two lateral pterygoids: a right one, and a left one. The lateral pterygoid on the right pulls your jaw to the left, and the one on the left pulls your jaw to the right. How's that again? Remember, all a muscle can do is contract, that is, get shorter. One end of a muscle is attached at a stable bone, called the origin. The other end is attached on the bone to be moved, called the insertion. The right lateral pterygoid, for example, is anchored deep behind your nose and above your upper molars, on a potato chip thin plate of bone. It then extends backward and outward, attaching to the top end of your jawbone (the condyle), right in front of your ear canal. So when the lateral pterygoid contracts, it pulls the condyle forward. Since the jaw is like a horseshoe (and if the left lateral pterygoid isn't doing anything), the net effect of a contraction of the right lateral is that your entire jaw shifts to the left. If both lateral pterygoids are contracting, the entire jaw is pulled forward and/or opened. When you can't seem to open your mouth without your jaw shifting to one side or the other, it is usually because one of the lateral pterygoids is highly fatigued, and can't coordinate well with the other.

When your temporalis closes your mouth enough so that your teeth can touch, and then you move your jaw over to the left a bit and hold it there, you'd be using the right lateral pterygoid to do so. Essentially, you'd be clenching your teeth on the left side. If you were to hold that position long enough, guess what? The right lateral pterygoid becomes dysfunctional. Where, then would it hurt? At one or both ends of the muscle, where it attaches at the jaw joint (the condyle), or at the other end, along the nasal passages. Frequently, when a lateral pterygoid muscle becomes dysfunctional, it will cause pressure and pain in and around the nasal passages and sinuses, and can be called a sinus headache. Not only does the patient feel pain and pressure from the sinuses, but also a dysfunctional lateral pterygoid will cause the sinuses to produce a discharge (a runny or stuffy nose). This patient is in a real fix. A visit to the sinus specialist for a special x-ray reveals nothing particularly wrong with their sinuses. Antibiotic therapy rarely resolves the condition. The patient is convinced, however, that there is definitely a problem with the sinuses. The patient maintains this conviction by observing that they do get some relief from sinus headache medications. What's in sinus headache remedies? High dosages of analgesic (pain medication) for muscle pain and decongestants for a stuffy, runny nose... the two symptoms that result from a dysfunctional lateral pterygoid!

In order for a lateral pterygoid to become dysfunctional, it needs resistance for it to contract against. The resistance is provided by the temporalis' efforts of pressing the teeth together (making it difficult to move the jaw sideways). So by suppressing temporalis intensity, the NTI-tss also inhibits the intense activity of the lateral pterygoid muscles, thereby relieving sinus symptoms and jaw joint strain.

Chapter 9

SETTING IT OFF

"TRIGGERS"

So red wine gives you a headache? Or is it chocolate? Perhaps it's a combination of things. Most of us have tried to figure out just what it was that caused our last headache. Maybe you've been advised to keep a log of what you eat and drink to help you figure out what it is that gives you headaches.

Now let's look at it a different way. Perhaps there are certain things that initiate a sympathetic response. The sympathetic nervous system responds to any kind of threat, or insult. It doesn't have to be some outrageous stressful event, it could be a glass of wine (too much alcohol is deadly, and your body knows it), or the preservatives in certain foods, or the cultures in aged cheeses. Everybody responds, but not everybody has spindle fibers that reside within highly dysfunctional musculature. And those who do have dysfunctional musculature don't have the same degree of dysfunction in the same musculature from one day to the next. So here comes a sympathetic response to an irritant, otherwise known as a "trigger". Depending on the posture of the spindle, and the particular muscle it resides in, for example, it could be in one or both temporalis' (headache on the side(s) of the head), lateral pterygoids' (face), trapezius (neck/shoulders), or the sphenomandibularis, (which attaches just behind the eye, i.e., "ocular" migraine). You begin to feel that familiar "tension" about your scalp and/or neck—that's the intrafusal fiber of one or more spindles tensing up. What headache you already had begins to get worse. Ultimately, the worst may happen. If the intrafusal fiber contorts or spasms, you would find yourself in exquisite pain and possibly nauseous (humm, that's the definition of migraine). It may seem to originate from one or both sides of the head (the temporalis), or behind the eyes or sinuses (lateral pterygoid), or from the back of the neck (trapezius), or behind your eye (sphenomandibularis).

Get the idea? So you figure you must be allergic to red wine. Or was it the chocolate? Perhaps it's too much sugar. Chinese food. Spicy things. Dairy products. Too much sleep. Not enough sleep. You name it, because it doesn't matter, does it? (You didn't really think that wine, cheese, glare, etc. was painful, did you?)

So as you can see from this explanation, I'm not saying that the intensity of intense jaw clenching directly causes migraine pain. But just as hot, humid air is required for a tornado, chronic intense muscular contraction may be one of the foundational requirements to perpetuate chronic migraine pain.

Once you understand what kind of condition your musculature (and their resident spindle fibers are in), the way they react to "triggers" are not such a mystery. Now that my temporalis is not overly fatigued, I'm able to eat and drink whatever I want, and I don't get a headache

MENSTRUATION

Why do you suppose something as natural as menstruation or ovulation "triggers" a headache? Many women, who generally don't get headaches through the month, have headaches and/or migraines before, during, or after menstruation and/or ovulation. They're told it's hormones, a menstrual migraine, so hang in there. And if these headaches appear during pregnancy? "No pain medication for you, you're pregnant."

Rapid changes in blood hormone levels is certainly a physiologically stressful event, causing sleep pattern changes, mood swings, etc. Sure seems like an ideal scenario for the sympathetic nervous system to react to. And who is it that responds? Well, if the musculature is already dysfunctional, those spindle fibers are at risk. Although it takes several cycles to observe significant relief, about two thirds of "menstrual migraine" sufferers respond favorably to the NTI-tss.

ACCIDENTS AND TRAUMA

Sometimes, physical trauma to the neck can cause jaw clenching to initiate, or to intensify. The cervical sympathetic ganglia (a group neurons from the sympathetic nervous system within the neck) has been shown to cause and maintain jaw muscle contraction. If injured, parafunctional jaw muscle activity may result, or pre-existing parafunction may intensify. It may take days to weeks before the symptoms are realized from this enhanced activity, which usually complicates the diagnosis. Did the accident really cause these chronic headaches? If the accident was weeks ago, you can see how some patients may be accused of "faking it", due to a pending lawsuit? Let's look an automobile accident, for example. Let's say two people are sitting in a car and get hit from behind, and it's not very hard, either. It's just enough for the car to need a little body work. The passenger is perfectly fine, while the driver starts getting terrible headaches. What's the difference? Perhaps the driver rarely or never had headaches before; but, by looking at her teeth, you see the tell-tale wear marks that she has had a history of grinding her teeth. Another possibility is that her teeth may look perfectly normal, but she has had a history of occasional headaches, prior to the accident. But not like now. Now she has intense headaches, all the time. The wear marks on her teeth (grinding), or her history of headaches (clenching), confirm a propensity for jaw muscle parafunction. All it took was some traumatic event to set off a sympathetic response to intensify her pre-existing parafunction. Her passenger, who has no previous grinding or clenching habit, seems to be doing just fine. Unfortunately for the driver, she may develop and continue to experience headaches for years to come. She may be told she has had some kind of semi permanent brain or neck injury. If her clenching intensity isn't suppressed, her headaches may continue indefinitely. Of course she starts believing that maybe she really did have some sort of terrible injury. She will go through endless doctor visits, physical therapy, chiropractic visits, and possibly surgery with little relief. Patients like these are told they

will now have to endure their conditions and learn to live with them. Take your settlements and be on your way.

Be aware, that it is possible for injury to occur to the jaw joint (TMJ). Entire textbooks have been written on the treatment of such instances. Rarely will any type of mouth splint, by itself, cure the pain and headache from true TMJ injury. Most patients with a jaw joint injury require specialized physical therapy and, occasionally, surgery.

Occasionally I'll see a patient who has been in an accident and has been through months of various treatments for headaches and jaw joint conditions. All of the treatment had been directed at the jaw joint, the doctors assuming that the jaw joint was damaged and the cause of the headaches. They'll have tried physical therapy, mouth splints, chiropractic care, and medications, but nothing to suppress the intensity of the clenching, the perpetuating cause of the headaches. Some patients have even undergone jaw joint surgery because the doctors had assumed that a TMJ injury must have been the cause of the headaches, since nothing else was working. Right after the surgery, the headaches stop, but four to six weeks later, the headaches come back. This makes sense...would you clench your teeth just after jaw joint surgery? Not me, ouch! I'd wait until my surgery healed a bit.

Typically, these patients' symptoms will reduce significantly within days to weeks of using the NTI-tss. Ideally, they'll continue with their physical therapy and chiropractic care. As the NTI-tss suppress the intense muscle activity, the remaining symptoms (injured neck and shoulders, for example) can be successfully treated by the physical therapist and chiropractor.

WEEKENDS AND HOLIDAYS

My wife recalled that her headaches were actually worse on weekends and on holidays. Boy, was I relieved that I wasn't the only one with such symptoms! One doctor suggested that she was probably pulling the covers up over her eyes to avoid the light when she tried to sleep in on weekends. He said this created a build-up of carbon dioxide in the air she was breathing, which intensified her headache. She assured me that that couldn't be the case because she always slept in a room with black-out shades, so she never could tell if the sun was up or not. My wife and I shared another curious feature of our headache histories. A nap in the middle of the day seemed to help our headaches, but sleeping all night always made them worse, especially when we'd sleep in.

Actually, the explanation for this is simple. Sleep is comprised of several different stages. Of particular interest are the several hours just before waking, as you are transitioning from deeper to lighter sleep.. This is when teeth grinding and clenching commonly occur. Headache sufferers are clenching their teeth during their dreams. When they awake, the temporalis muscles are fatigued and painful...morning headache. If they decide to stay in bed longer, they lengthen their total clenching time and, therefore, the headache is worse.

Taking a nap during the middle of the day for some seems to relieve the headache. A nap provides continuous muscle relaxation, with little or no clenching time, therefore, the headache sometimes subsides. However, the longer

the nap, the more likely clenching will occur with the accompanying headache!

The medical community is aware that some type of activity during sleep is causing morning headaches, but their remedy is to medicate the pain. When I attended an orofacial pain (jaw and face pain) conference in February of 1994, a question was asked of a prominent headache specialist on what should be done for chronic morning headache sufferers. His reply? Have your patients set their alarms earlier and earlier, until they determine when they can awaken themselves before the headache starts. Once they've done that, take lots of aspirin and go back to bed!

"I have had migraines for thirty years. I have gone to many "experts" and tried all the recommended drugs. Sometimes the side effects were worse than the migraines. The thought of having headaches the rest of my life was despairing. Since using the NTI-tss, I had not had a migraine. I feel like a new person. Thank you for my miracle!" Sharon Goralewski, Rochester Hills, MI

Chapter 10

WRAPPING IT UP

We've discussed headache and migraine pain from an angle that is unfamiliar to most health care providers. I suppose that's one of the biggest reason's I've written this all down...to at least introduce the hypothesis to the health care field.

This is the fourth edition of this booklet, and since the first time I wrote it, a lot has happened. Originally, when I wrote the first edition, I was a doing general dentistry in San Diego, with emphasis on jaw muscle related disorders. Then in 1995, I founded the Headache Prevention Institute in Bloomfield Hills, Michigan. (What's this you say? San Diego to Michigan?) I wanted to focus my career on headache prevention, and it was necessary to start a completely new practice. Since my wife's family were all in Michigan, it seemed like the right place to go—and it was! Our entire emphasis was to refine the NTI-tss treatment protocol. During those four years (1995-98, we moved back to San Diego in 1999), I learned a great more about chronic headache; what it is, and just as important, what it is not. The world's third largest dental supply company, Heraeus Kulzer, recognized the potential of the NTI-tss, and assisted me in doing pre-market testing. In July of 1998, the FDA gave marketing approval to the NTI-tss "for the prevention of temporomandibular disorders resulting for high intensity jaw clenching". With Heraeus Kulzer's assistance (who helped in setting up a separate company for the NTI-tss, NTI-TSS, Inc.), my original goal had been accomplished; to make the NTI-tss device and method available to all patients through their local dentist. I soon found myself lecturing all over the country to dentists about this new "breakthrough" product and method

(that I had been using for 10 years and that dentistry had been aware of forever, but never thought to use it in this capacity). Some of the slide presentations I use and detailed information about the NTI-tss are on my website.

As of this writing, the FDA has not yet approved the NTI-tss to be marketed as a headache and/or migraine prevention device (although that is exactly what many doctors are now using it for), but clinical trials are now underway. Right now, the NTI-tss is available to every headache or TMD sufferer, through their dentist. If your dentist is not interested, there's probably one close by who is currently treating patients with the NTI-tss (refer to the NTI-tss website).

"As a registered pharmacist, I figured I had seen every specialist there was to see, or taken every medication possible. The NTI-tss made so much sense, I'm sure it will one day soon be available everywhere, because it works for me!"

Alan Medoff, R.PH., Ramona, CA

Chapter 11

ANY QUESTIONS?

"What is the success rate?"

That depends on what the presentation of the patient. Dentist who are using the NTI-tss exclusively for TMD patients are getting very, very good results. Based on the reports I've been receiving, even those patients who seem to not respond to any TMD treatment do quite well with the NTI-tss (testimonials). Migraine patients are different. Unlike the protocol for the TMD patient, the dentist can not miss a trick when providing an NTI-tss to a migraineur. While at the Headache Prevention Institute, 75% of migraineurs had a significant or their frequency and/or intensity of their migraine episodes. In the trials that are underway right now, comparing the NTI-tss to a control device, will have more reliable numbers and is expected to be published in the summer of 2000.

"What do teeth have to do with headaches and migraine pain?"

Actually, teeth have nothing to do with headaches and migraine pain. Let's not forget the simple definition of migraine: a debilitating headache accompanied by nausea and/or sensitivity to light and/or sound. **It doesn't matter what kind of teeth you have, or where your teeth are located, but it does matter what you do with the muscles that control your teeth (like clench).**

Medical science has not yet figured out how to prevent common migraines, just how to medicate the attack. I don't believe the medical community understands how intensely headache/migraine sufferers use their temporalis muscles! Maybe it took someone who had tension headaches and common migraines, and had a background in muscle physiology and jaw dynamics, to figure it out.

Here's an example. I was visiting a clinical psychologist who specialized in biofeedback for patients who have tension headaches and common migraines. I was curious to know what my maximum clenching reading would be on his EMG

(electro-myograph) machine. These machines are used to tell how tense a muscle is; that is, how much a muscle is contracting. My request was somewhat strange because bio-feedback is supposed to teach you to achieve the most relaxed state. After gluing the electrode pads to my temporalis muscle, I clenched as hard as I could, and the reading went off the scale. The doctor recalibrated his machine. I clenched as hard as I could, and again, off the scale. This happened once more before he could calibrate the machine to accurately measure my clenching intensity. I asked the therapist if he suffered from chronic headaches and migraines. He didn't. Just for fun, I suggested we wire him up to see what his temporalis muscles were capable of. We left the machine at my last calibration setting for his first trial at maximum clenching. He couldn't get a reading! We recalibrated the machine to its original setting. This time we were able to record his maximal reading. We discovered that my temporalis muscles were three times more powerful than his. I was the Arnold Schwarzenegger of clenching! Here was a headache specialist who had no idea of what a headache patient's temporalis was capable of!

Here's another example. A research group set out to see if normal clenching could cause common migraines. Migraine patients were instructed to clench their teeth at one third of their maximum ability for thirty minutes. The researchers assumed that this should be more than adequate to cause a migraine (if it were possible) because previous studies had shown that clenching activity was less than one third of maximum during migraines. Therefore, they figured that one third of maximum would be more than enough to cause a migraine. I've been suggesting that clenching occurs well before the migraine and is far more intense than one third of maximum. The researchers advised the subjects that they would be allowed to take a break every ten minutes for a rest. To the researchers' surprise, most of the subjects breezed through the experiment, without stopping to rest, and no one got a migraine. What the researchers hadn't realized was that the subjects had been in 'training' for years! These were the All-Stars of clenching, and one third of maximum didn't even tire them. What the researchers did prove then, was that migraines can be prevented by limiting the intensity clenching!

"Can the NTI-tss appliance stabilize the jaw joint and is it good for TMD patients?"

Mouthpieces for TMD patients are supposed to do three things: protect teeth from grinding, decrease strain and pressure in the joint during clenching and grinding, and reduce muscle parafunction. The NTI-tss prevents teeth grinding by providing an air space between the teeth. Second, jaw joint strain occurs only when clenching or grinding occurs on the side opposite the joint. The NTI-tss design provides for the least amount of joint strain possible by not allowing clenching or grinding on either side. Finally, the NTI-tss design decreases maximum temporalis muscle activity by 66 to 82 percent while the traditional TMD splint can actually increase muscle activity in some patients; thus a NTI-tss appliance is an ideal splint for TMD patients.

"Do the teeth move?" (Can the back teeth "supraerupt")

No. The way dentists and orthodontists move teeth is by applying a slow, constant pressure to the teeth, and the teeth then move away from the pressure source. The protective jaw muscle relaxing reflexes that the NTI-tss activates prevents the amount of force necessary to move the lower front teeth when they

contact the appliance.

Back molars, to maintain their positions, require regular chewing stimulation. For example, if a lower molar has been extracted, there is nothing for the upper molar to contact against during chewing, thus eliminating its normal regular stimulation. The upper molar, over several months, slowly drops down a little, or 'supra-erupts', looking for the lower opposing molar (which is gone) to chew against. Some dentists might quickly assume that supra-eruption of the back molars is possible with the NTI-tss. However, since it is impossible to use the NTI-tss while eating, the back teeth receive daily stimulation during normal chewing, **so they never have a chance to supra-erupt** (I've worn mine nightly for 11 years, and no supraeruption yet).

However, there are situations where it seems as though teeth have moved following months of NTI-tss use. A small percentage of patients have report that as their headaches begin to taper off, they notice that their teeth don't meet the same way they used to. Their 'bite' has changed, and they naturally assume that their teeth must have moved. Here's what really happens. First, it is important to understand that the jaw bone is like a big, flexible horse-shoe that is merely suspended from your skull by a 'sling' of muscles. Similar to a garage door whose springs swing and pull the door closed, the jaw muscles swing and pull the jaw closed. These muscles are particularly powerful, and when they are in a dysfunctional state they are capable of 'bending' your jaw-bone ever so slightly, and are capable of holding the jaw bone within it's joint space in an unnatural position (which complicates headaches and TMD). In this condition, the patient develops a familiar "bite". Once the muscles are allowed to relax and become comfortable, the jaw-bone 'unbends', and/or the way the jaw-bone is suspended from your skull changes slightly, allowing the jaw to seat better into the joint space. The lower jaw actually assumes its natural and optimal shape and orientation, and its arc of closure changes. Just as the fit of the closed garage door changes when the tension of the springs changes, so does the fit of the teeth change when the tension of the muscles changes. The arc of closure is the path on which the muscles take the jaw during closure. Since the muscle tension is different, the path is different, and therefore, so is the final point of closure. Patients then notice changes in the way their teeth fit together. It is important to remember that for the musculature and joint, this is an improvement over the original condition and is a desired effect. In traditional TMD therapy and in NTI-tss therapy, once the patient's TMD symptoms or headaches are gone, the dentist and/or the patient may want to modify the teeth so they fit to the patient's comfort.

"Why is it that I can feel a headache coming on and I'm certain that my teeth aren't touching?"

Remember pushing on your temporalis muscle and finding some spots that were more painful than others? Those painful spots are called trigger points. Here's how they are created: Within every muscle there are specialized muscle cell bundles called spindle fibers which extend the full length of the muscle. Spindle fibers are like individual rubber bands which your sympathetic nervous system has special control over. The sympathetic nervous system controls the reactions to fear and threat, like hair standing on end, pupils dilating, muscles tightening, cold sweat, etc. The sympathetic nervous system adjusts the tension of the spindle fibers that sets the overall 'tone' of the muscle. When the spindle

fibers are tightened, the overall length of the muscle is shortened. When the spindle fibers are relaxed, the muscle is more easily stretched and lengthened.

In some patients, the sympathetic nervous system works overtime and maintains several of the spindle fibers of the temporalis in a contracted state (reference). Over a period of time, these fibers themselves become painful, and are called trigger points. When a stressful event occurs, the sympathetic nervous system over-reacts and begins to tighten the already fatigued and sore spindle fibers of the temporalis (or another muscle, like the lateral pterygoid, trapezius, or sphenomandibularis). The patient becomes aware of a general tightness over the scalp, followed by a headache. Ex-migraine patients who are now headache-free after wearing the NTI-tss often wonder why their injectable drug, Imitrex, stopped their migraines. One possibility is that the Imitrex interrupts the sympathetically controlled spasming of the spindle fibers.

This is where the daytime version of the NTI-tss comes in handy. Even though the back teeth aren't clenched, the lower front teeth will still tap on the appliance and activate the jaw opening reflex. This causes the musculature to relax and counteracts the tightening of the spindle fibers!

By the way, it is also the presence of trigger points within the lateral pterygoid muscles (the muscles responsible for moving your jaw from side to side) that chronically bends the jaw bone. When the trigger points resolve, and the spindle fibers relax, the jaw bone 'unbends'. In addition, it is the trigger points within the lateral pterygoid muscle which present with 'sinus' pain.

"My mother had taken me to every specialist in Oklahoma...but when we booked a flight to see Dr. Boyd, I knew she was desperate (she'd never been on a plane before)! We arrived on a Friday afternoon and left Sunday morning...without a headache! Words cannot express my gratitude."

Anita Clark, Tulsa, OK

"Dr. Boyd's analysis of the causes of persistent headaches is the most logical and complete formulation I have seen. The use of the NTI-tss to break the cycle of muscle spasm and subsequent pain is a simple, safe and effective way to alleviate often intractable headaches. While there are certainly other factors operative in the causation of headaches, the use of the appliance would appear to be an excellent first choice in their treatment. Other approaches such as drugs, manipulation and acupuncture are time consuming, expensive and/or may have significant side effects, while not addressing the basic problem. Use of the NTI-tss appliance with adjunctive therapy of other modalities as needed would seem to be the ideal way to approach patients with chronic headaches."

Carl Muchnick, M.D., Los Angeles, CA

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Dr. Okeson describes the NTI-tss concept in his textbook.

Wesley E. Shankland, II, D.D.S., M.S., Ph.D.

Director, TMJ & Facial Pain Center, Columbus, Ohio

President, American Academy of Head, Neck and Facial Pain, 1997-99

Without Dr. Shankland's influence, the NTI-tss probably wouldn't be the growing success it is today. Having experimented with the NTI-tss himself (and achieving outstanding results), Dr. Shankland took a personal and professional risk and arranged for me to make my first public presentation to the AAHNF in July of 1998 and is now one of the most experienced clinicians using the NTI-tss.

Bob Weber

Vice President of NTI-TSS, Inc.

Through Mr. Weber's sole efforts, the NTI-tss is now a readily available option to any headache and/or TMD sufferer. His belief and commitment to the concept have made it all possible. Thanks, Bob.