Implant PRACTICE·US

Clinical

NuCalm™ – Eliminating dental anxiety one pocket of fear at a time

Dr. Paul J. Denemark and Jim Poole describe the physiology of dental anxiety and the benefits of a new system that creates deep relaxation without using narcotics or controlled substances, resulting in a profound anxiolytic experience

"I'm nervous." "Is this going to hurt?" "How long will the pain last?" "I don't like going to the dentist." "Nothing personal, but I don't like seeing you!" Sound familiar? That's the voice of anxiety, and it visits our offices every day. Anxiety is a normal human response to danger–real or perceived. As periodontists, we must be sensitive to our patients' fears and do our best to ensure that we provide the highest levels of care and the best possible clinical outcomes. The strategies and techniques available to us for managing dental anxiety are useful and effective, but they also increase risk and can compromise our patient's health and our ability to do our best work. This article explores a new technology that naturally eliminates anxiety without compromising our patient's health or the clinical procedure.

What is anxiety?

Anxiety is the physiological response to a perceived threat and plays an important role in relation to human survival. When confronted with unpleasant and potentially harmful stimuli, such as foul odors, physical endangerment, or a dental appointment, PET-scans show increased blood flow in the amygdala. The amygdala is an almond-shaped group of nuclei located in the center of the brain, above the hypothalamus. Using brain imaging technology and neurochemical techniques, scientists have discovered that the amygdala serves as the fear center and is responsible for activating the first response activities of the fight or flight system.[1]

What is the physiology of an anxious response?

When a stressor is perceived by the amygdala, it contacts an array of brain regions using neurotransmitters called corticotropin-releasing hormone (CRH). One set of nerve cells projecting from the amygdala reaches parts of the midbrain and brain stem. These structures control the autonomic nervous system, the network of nerve cells projecting to parts of the body that function involuntarily (heart rate, breathing, sweating, etc.). Half of the autonomic nervous system is the sympathetic nervous system (SNS), which mediates fight or flight. Once the amygdala is activated, the sympathetic nervous system directs the adrenal glands to secrete epinephrine via the HPA Axis. The HPA Axis is comprised of the hypothalamus communicating to the pituitary gland communicating to the adrenal gland. Epinephrine impacts the body's physiology, resulting in an increased heart rate, shallow breathing, and hypervigilant senses. Epinephrine mobilizes energy for muscles, increases cardiovascular tone so oxygen can travel more rapidly, and turns off nonessential activities like growth. Interestingly, the HPA Axis is a one-way communication channel. Therefore, once a person's fight-or-flight response is activated, there is no turning back. The body is now focused exclusively on fighting or fleeing from the stressor, and the mind cannot rationalize or self-regulate until after the threat is removed and time passes.[2]

Anxiety in the dental chair

The physiological state of anxiety is characterized by cognitive, somatic, emotional, and behavioral components that combine to create feelings of fear and apprehension. As we have all witnessed, anxiety is often accompanied by physical sensations such as: heart palpitations, nausea, stomach ache, muscle tension, dry mouth, sweating, inability to concentrate, irritability, or headache. An anxious dental patient is physically programmed to challenge the procedure as an act of survival. How many times have you tried to pacify or rationalize with a patient who seems to have a vacant stare and a rigid posture? The patient is having an anxious response and is unable to act on your advice because he/she is cognitively dissociated.

The impact of dental anxiety on the clinician

As one clinician points out, "It's a battle. When I'm working on anxious patients, I'm always on defense. I never get to play offense, and do my best clinical work." The bottom line is, these patients are not in control. Their bodies are consumed by their fight-or-flight systems, and they are simply trying to protect themselves. You must be able to manage their behaviors and at the same time provide a high level of clinical care. How can you do this if your patient cannot fully cooperate?

Neutralizing anxious patients with sedation techniques

Sedation techniques have become the most effective way to manage anxious patients. These include benzodiazepines (oral sedation), intravenous (IV) sedation typically using a combination of different drug classes, and nitrous oxide.

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Figure 1: NuCalm™ patient relaxing before procedure

Figure 2: NuCalm™ components in the portable office case

Figure 3: NuCalm™ ready to go. Most offices have NuCalm™ systems in every operatory

Oral sedation

Benzodiazepines provide powerful relief from the symptoms of anxiety by slowing down the central nervous system (CNS). Benzodiazepines act mainly through the GABA-A receptor subtype by potentiating GABA (gamma aminobutyric acid) transmission. GABA is a ubiquitous neurotransmitter involved in the majority of inhibitory synapses in the brain. Thus, GABA suppresses neural firing, inhibiting or regulating other neurotransmitters including serotonin, norepinephrine, and dopamine. It accomplishes this by decreasing their turnover in limbic areas, i.e., amygdala, locus ceruleus, and raphe nuclei.

The use of benzodiazepines to sedate anxious dental patients is a popular form of treatment. Benzodiazepines help anxious patients relax throughout the procedure, but they force periodontists and their teams to act as part-time anesthesiologists. According to American Dental Association (ADA) guidelines, "because sedation is a continuum, it is not always possible to predict how an individual patient will respond. Hence, practitioners intending to produce a given level of sedation should be able to diagnose and manage the physiologic consequences (potential rescue) for patients whose level of sedation becomes deeper than intended. For all levels of sedation, the practitioner must have the training, skills, drugs, and equipment to identify and manage such an occurrence until either assistance arrives (emergency medical service) or the patient returns to the intended level of sedation without airway or cardiovascular complications."[3] The use of benzodiazepines can compromise patients' experiences and adds a level of complexity and risk for periodontists.

IV sedation

IV sedation refers to anti-anxiety medication that is delivered intravenously. This form of sedation requires special training or an anesthesiologist present. The medications used for IV sedation are typically benzodiazepines, but can vary widely depending on patient needs. The doctor adjusts the dose until the patient is nearly unconscious–patients should be able to respond to commands to open mouth, turn head, swallow, etc. Depending on the medication used, IV sedation often results in a powerful amnestic experience.

Nitrous oxide

Nitrous oxide (N_2O) is commonly used by periodontists to help sedate anxious and fearful patients. Nitrous oxide is a weak anesthetic agent when used alone. It is often used in combination with local anesthesia, as well as other sedative, hypnotic agents.[4]

Common complaints by periodontists regarding nitrous oxide include the investment costs, time required at the end of the procedure to oxygenate patients, inconvenience of the mask being in the way of periodontist's hands, and inconsistent patient experiences. Nitrous oxide results in loss of valuable chair time waiting for the patient to equilibrate their oxygen levels after the procedure, and usually requires additional staff for the recovery period.

Impact of using sedation techniques

Sedation techniques do provide a level of care that helps allay patient anxiety during a procedure. The challenge with using these techniques is the complexity, unpredictability, risk, and cost associated with these forms of patient care. See Table 1 for a summary of drawbacks of using sedation techniques.[5]

NuCalm™

NuCalm™ (Solace) is a patent-pending technology that mimics the body's natural experience of preparing for sleep (Figure 1). NuCalm™ is unique because it creates deep relaxation without using narcotics or controlled substances, causes no side effects, and requires no recuperative time or supervision. Unlike sedation techniques that use a "brute force" approach to suppress the CNS, NuCalm™ entrains the brain to pace at a frequency

Table 1

Patient experience	*Periodontist experience*
• Feeling nauseated, dizzy, light headed	• Expense for equipment
• Vomiting	• Expense for training
• Amnesia	• Steep learning curve
• Cognitive impairment, delayed reaction time, and forgetfulness	• Increased practice liability
• Xerostomia	• Permits required
• Feeling hungover or groggy (N_2O)	• Responsible for monitoring patient's vitals
• Gas equilibration for minimum 5 minutes with oxygen following the procedure (N_2O)	• Must diagnose and manage the physiologic consequences (potential rescue) for patients whose level of sedation becomes deeper than intended
• Inconsistent experiences	• Doctor must be present at all times
• Constrained feeling from mask placement (N_2O)	
• Unusual taste (N_2O)	
• Multiple relative contraindications (N_2O)	

Figure 4A: Case 1 preoperative radiograph. Teeth Nos. 19 and 20 with broken crowns and periapical abscesses had to be extracted

Figure 4B: Case 1 postoperative radiograph. Implants placed in sites No. 19 and 20 utilizing NuCalm™

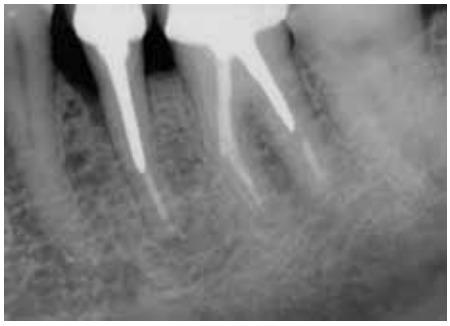

Figure 5A: Case 2 preoperative radiograph. Tooth No. 20 with vertical root fracture needed to be extracted

Figure 5B: Case 2 postoperative radiograph. Tooth No. 20 extracted and immediate implant placed with bone grafting utilizing NuCalm™

associated with deep relaxation. Patients using NuCalm™ are physically unable to have an anxious response.

With NuCalm™, the patient's brainwaves synchronize to frequencies that cause relaxation and calm. Beta brainwaves (13 Hz-30 Hz) are associated with day-to-day wakefulness–mental activity consisting of cognitive, sensory, and motor activities. High beta brainwaves (23 Hz-40 Hz) are associated with fear and anxiety. NuCalm™ brings the patient's brainwaves from beta or high beta to the alpha range (8 Hz-12 Hz). Alpha brainwaves are associated with deep relaxation, meditation, and idleness.[6] NuCalm™ uses applied neuropsychobiology and neurobioinformatics to entrain brainwave frequency to the alpha range, naturally creating homeostasis, neuromuscular release, and relaxation for the patient. NuCalm™ provides a safe, nonintrusive solution to eliminating anxiety in the dental chair.

The NuCalm™ protocol

NuCalm™ creates a profound anxiolytic experience by combining four sensory applications: chewable tablets (natural anxiolytic neurotransmitters); CES (Food & Drug Administration-cleared cranial electrotherapy stimulation), neuroacoustic binaural beat software, and black-out glasses. The NuCalm™ system is simple to administer (Figures 2 and 3). The four steps take less than 3 minutes, and most patients experience deep relaxation within 5 minutes of having NuCalm™ applied.

Orthomolecular chewable tablets

The NuCalm™ orthomolecular formula was developed over several years to maximize the body's natural relaxation response with NuCalm™. This proprietary formula includes structured nutrient-sourced building blocks that counteract adrenaline by rapidly entering the brain and converting to powerful messengers to suppress anxiety and create relaxation. The two primary ingredients in NuCalm's orthomolecular formula are GABA and L-theanine. Like benzodiazepines, NuCalm™ influences behavior at the GABA receptor site. The difference is, NuCalm™ provides GABA to the brain while benzodiazepines promote the production of GABA. L-theanine supports the formation of GABA and has been shown to induce a general calming effect.

Cranial electrotherapy stimulation (CES)

NuCalm's CES device is used to catalyze the effectiveness of the neurotransmitters provided by the NuCalm™ tablets. The CES device produces low levels of electrical current (similar to the cell's own electrical values–microcurrent is less than 1 millionth of an amp). This device has been cleared by the FDA for the treatment of anxiety, depression, and insomnia. Research over the past 50 years indicates an increase in the metabolism of neurotransmitters, evidenced by an increase in the metabolites of neurochemicals.[7] The low-level electrical current interacts with cell membranes that produce modifications in information transduction associated with classical second messenger pathways.[8] Electrical engineering studies found that a small fraction of CES current actually reaches the thalamic area of the brain, facilitating the release of neurotransmitters. Studies also showed reduced rigidity in the CNS stimulation process and enhanced activity of the alpha-rhythm generating systems.[9]

Combining CES with precursor neurotransmitters, such as those found in NuCalm™ chewable tablets, causes a profound state of relaxation and anxiolysis. But, at this point, the anxiolysis would not be sustainable.

Neuroacoustic software

NuCalm's proprietary neuroacoustic software uses a frequency-following response (FFR) that initiates a change in brainwave frequencies through entrainment. According to research, a scientifically validated neurophysiologic response is initiated when an auditory pacing signal is presented to the brain.[10] Solace, the maker of NuCalm™, has achieved significant advances in the design of binaural- and monaural-beat sound acoustics. NuCalm's binaural beat, FFR neuroacoustic software is overlaid with classical music and administered to patients using an MP3 player and noise-dampening headphones. The neuroacoustic software slows the patient's brainwave function from the high beta frequencies associated with anxiety (23 Hz-40 Hz per second) to brainwave frequency patterns consistent with the alpha stage of sleep (8 Hz-12 Hz per second). These alpha brainwaves are associated with deep relaxation and calmness and are maintained throughout the entire NuCalm™ experience.

Binaural beats are auditory brainstem responses, which originate in the superior olivary nucleus of each brain hemisphere.[11] They result from the interaction of two different auditory impulses, originating in opposite ears, registering below 1,000 Hz, that differ in frequency between 1 and 30 Hz. For example, if a pure tone of 500 Hz is presented to the right ear and a pure tone of 510 Hz is presented

Figure 5C: Dr. Denemark performing surgical extraction of No. 20 with patient using NuCalm™. This photo was taken during the procedure for NuCalm™ Case 2

Figure 6A: Case 3 preoperative radiograph. Tooth No. 18 with severe bone loss to the distal involving the periapical area

Figure 6B: Case 3 postoperative radiograph. Tooth No. 18 extracted with bone grafting utilizing NuCalm™

simultaneously to the left ear, an amplitude-modulated standing wave of 10 Hz, the difference between the two tones, is experienced as the two wave forms mesh within the superior olivary nuclei. This binaural beat can be used to entrain specific neural rhythms through the FFR, thus modulating the brainwave frequency.[12] In the case of NuCalm™, it is modulating the brainwave frequency between 8 Hz and 12 Hz. The neuroacoustic software is the most important aspect of the NuCalm™ system, and the patient will be relaxed until you stop the music.

Black-out glasses

NuCalm's black-out glasses (dark sunglasses) are used to block light from the optic nerve, resulting in an immediate 30% increase in alpha waves in the occipital cortex of the brain. This helps maintain deep relaxation.

Benefits of using NuCalm™

NuCalm™ has been used on more than 13,000 patients across the United States and United Kingdom. Some benefits of using NuCalm™ include:

- Safe, effective anxiolysis, where a relaxed state is induced and maintained for an entire healthcare procedure
- Patients can come and go on their own (no side effects, no recovery time or supervision required, and no impairments)
- Patient's body is more receptive to treatment (natural resistance mechanisms are dulled)
- Reduces patient's motor responses–minimizing risk to patient and clinician
- Patient is conscious and can respond to voice commands
- Promotes efficiencies for clinician because patient is relaxed and still (reduced startle response, salivary flow, and gag reflex)
- Less intrusive than sedation techniques–does not chemically compromise the CNS or cognitively impair the mind
- Patients experience feelings of rejuvenation and relief post-treatment (NuCalm™ promotes brain cellular homeostasis, providing a neuromuscular release of bodily tension)
- No vomiting
- No additional space or staff required for implementation or monitoring.

NuCalm™ case studies

All patients were provided written surveys the day of consultation. The survey questions were designed to rate their previous dental experiences on a scale of 1 to 4 with 1 being low anxiety and 4 being high anxiety. This data is included in the following case reports.

The following patients are examples of surgeries in which only NuCalm™ and local anesthetic were utilized.

NuCalm™ case 1

A 42–year-old Caucasion woman presented for evaluation prior to restorative treatment planning. She reported a 4 regarding her previous experiences with gum surgery and extractions. When asked by survey, "Would you go to the dentist more often if _____?" she responded, "If it didn't hurt." She rated her level of anxiety on a normal day as 3. She rated her "dental anxiety" as a 3.5. She reported that she had aborted dental appointments in the past due to anxiety. Her severe dental deterioration was the result of avoiding necessary treatment. She had experienced ineffective local anesthesia and tremors, racing heart, elevated blood pressure, and shortness of breath during treatment, especially following "novocaine" injections. She has been under my care since 2006 and could undergo treatment only with IV sedation with medperidine hydrochloride and midazolam.

Due to her dental deterioration from caries, she has had numerous extractions. In March 2006, she had a severe dentoalveolar abscess, was admitted to the emergency room, and needed to be hospitalized for 3 days. She was placed on a course of IV clindamycin and then teeth Nos. 19 and 20 were extracted under IV sedation (Figure 4A). In 2007, tooth No. 29 was extracted, and placement of a dental implant was performed under IV sedation. In 2010, she had tooth No. 31 extracted, electing to try NuCalm™. She was apprehensive and skeptical, but her experience with NuCalm™ was extremely positive, and she stated she was ready to proceed with implant reconstruction for teeth Nos. 19 and 20. She underwent surgical placement of two dental implants with NuCalm™ (Figure 4B). Post-surgically she stated, "Dr. Denemark, you are a rock star! Thank you!"

NuCalm™ case 2

A 48-year-old Hispanic woman presented for a recurring 6-mm pocket on the mesial of tooth

No. 20. She reported the reason she did not like going to the dentist, giving a rating of 4 for gum (periodontal) surgery. She reported numerous terrifying dental experiences as a child. She required pocket-elimination surgery for tooth No. 20 and decided to use NuCalm™. Tooth No. 20 revealed a vertical root fracture clinically and was scheduled for extraction (Figure 5A). She reported the NuCalm™ experience to be "wonderful." She stated, "I have not had such a relaxing experience ever before in the dental office." She was apprehensive regarding pending surgical extraction of tooth No. 20, but stated, "I want to have the NuCalm™ relaxation technique again." She proceeded with the extraction and implant placement with NuCalm™ within 6 weeks (Figures 5B and 5C).

NuCalm™ case 3

A 42-year-old Caucasian man had tooth No. 18 evaluated. He had been aware of an issue with the tooth for the past 2 years but failed to have treatment, citing he had "no real excuse and was just too busy." Radiographically, tooth No. 18 demonstrated a large radiolucency apically extending from the mesial to the distal (Figure 6A). Clinically, the tooth had 12 mm of pocketing distally and lingually, and 9 mm mesially. A Hamp class 3 furcation defect and a Miller's mobility of 3 were noted. He reported a 3 when asked to rate his level of anxiety on a normal day. He reported he would more likely undergo all dental treatment needed if he were "sleepy and relaxed, but remained partially awake." After discussing his options, he decided on extraction and bone grafting with NuCalm™. Tooth No. 18 was extracted with bone grafting for a future dental implant (Figure 6B). Post-surgically, he reported, "A very relaxing experience," and "it was like a dental cleaning."

Clinical observations

I have been using NuCalm™ in my practice since December 2009. Implementation of NuCalm™ is easy and inexpensive. My assistants were trained within 10 minutes to provide NuCalm™ without supervision.

NuCalm™ has allowed me to eliminate the need for IV sedation. It's nice to provide comfort to our patients without the need of an escort or post-sedation instructions. Because of the relaxed state of the surgical experience for patients, they are less irritated during surgery and are healing better with less postoperative pain and swelling. NuCalm™ also has allowed us to eliminate extra postoperative visits. My staff and I are also less stressed during surgery because of the efficacy of NuCalm™.

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NuCalm™

Making every patient the ideal patient.

Some patients are just a pleasure to work on. You know, the rare ones who show up for appointments, remain calm during procedures, and have total confidence in your expertise. The good news is, ideal patients aren't always born that way—they can be cultivated too!

Introduce the NuCalm™ system into your practice and you'll see an immediate change in your patients' attitudes. It's a revolutionary technology proven to safely and naturally relax the body within minutes, providing a rejuvenating dental experience. NuCalm eliminates stress and anxiety, allowing you to complete your work in less time while leaving your patients feeling refreshed.

Call 1-877-6NuCalm to ask about our 30-day trial, or visit **NuCalm.com** to learn more about this life-changing innovation in dentistry.