Ever-increasing treatment modalities are at the disposal of the dentist in managing the anxious or phobic patient.

A review of noninvasive therapies used to deal with anxiety and pain in the dental office

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Perhaps the most difficult problem facing the dental practitioner is convincing the public of the necessity for regular dental treatment. Even through extensive efforts on the part of the dentist, a recall success rate of 40% or less is not unusual. A recent study reports 11.7% of a random sample to have high dental fear, and an additional 17.5% to have moderate dental fear with approximately 50% of both groups being "dental avoiders," not having seen a dentist for more than a year. An even more alarming statistic, however, is the estimated 12% to 15% of the US population who totally avoid dental treatment as a result of severe dental anxiety or phobia. Some 10 to 12 million Americans have a dental phobia, and an additional 35 million experience extensive anxiety. It would seem, therefore, of the utmost importance to the modern clinician to have at his or her disposal a number of techniques and therapies that can be used to solicit and treat these more anxious patients. Before these techniques can be discussed with any amount of practical understanding, however, it is necessary to begin to look at the predisposing factors of dental anxiety and anxiety in general.

Anxiety—definition and possible antecedents

Anxiety can be defined as an unpleasant subjective bodily state that acts as an alerting reaction and coping mechanism to some impending event. Anxiety is not always negative or psychopathologic in the sense of hindering a person's function, but often is normal and necessary to help prepare for a crisis situation. Most abnormal anxiety, however, is non-traumatic. If this abnormal anxiety is unconscious, intense, and prolonged, it is a chronic anxiety state. When anxiety is so intense that it causes total avoidance of a stimulus, the patient is considered phobic.

In both acute and chronic responses, there is generally a large component of free-floating anxiety that will focus on a particular situation, such as the dental visit. Dental anxiety may stem from either a prior traumatic event or nontraumatic antecedents that may have a more complex psychologic origin. In general, fear of dental treatment may result from a number of causes including, but not limited to, personal negative or painful dental experiences, vicarious negative experiences (portrayed by family, friends, or mass media), generalization of anxiety related to aversive medical experiences, and personality traits and dynamics. The relationship of anxiety to pain is discussed in this paper.

Relationship of anxiety to pain

In terms of the effects of anxiety on the perception of pain, it can be said that anxiety acts concomitantly with pain; as anxiety increases, so does the likelihood of interpreting noxious stimuli as pain. For example, it is known that individuals who show general higher anxiety states in their daily lives (high trait anxiety) tend to be more sensitive and reactive to pain than their less anxious counterparts. In addition, during a situation of heightened...
Rationale for nonpharmacologic therapies

The use of pharmacologic analgesia and anesthesia should be an integral part of any practice, as pain is certainly one of the greatest (if not the single greatest) concerns of the anxious as well as "normal" patients. However, certain factors are related to the use and administering of pharmacotherapy when noninvasive therapies are preferable; for example, the indefiniteness of the oral route in terms of proper dosage and logistics. A dosage too large can be dangerous, whereas an amount too small may be ineffective; waiting for the effects of additional increments can be unduly time-consuming. Another factor is the potential for allergic or idiosyncratic drug reactions. Finally, it should be noted that when dealing with a fearful patient, both the means of administering drugs (for example, syringe) as well as the simple prospect of receiving drugs may further exacerbate the patient's already anxious state. For these reasons, as well as for that of attempting to maintain varied therapies, it seems incumbent on the practitioner to familiarize him- or herself with the various nonpharmacologic alternatives.¹⁴

Relaxation and distraction effects

The actual effects of the techniques on the patient are in one or more of three broad categories: relaxation, distraction, and analgesia. The last of these three is certainly among the most familiar to the dentist; however, the notions of relaxation and distraction may not be as well known or understood. The working principle behind relaxation is that of inhibiting anxiety. Therefore, any technique that succeeds in relaxing the body and mind will naturally help reduce anxiety and thus pain. Distraction, on the other hand, is thought to help relieve anxiety and pain by keeping the patient preoccupied. If the mind is attuned to a specific modality outside of the dental procedure, the patient seems better able to cope with a fair amount of pain.¹³ With both relaxation and distraction, patients often still report "feeling" the pain, but they are less bothered by it. In other words, relaxation and distraction techniques are generally nonanalgesic therapies that better enable the patient to ignore the painful stimulus. Many of the techniques discussed may act through more than one of these effects.

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For example, biofeedback can act by means of relaxation, distraction, and analgesia, depending on its use by the clinician and the patient’s susceptibility.

Specific techniques

Auditory and visual programming

In recent years, different types of auditory and visual programming as methods of distraction have been widely studied in terms of reducing stress and lessening pain perception during the dental visit. Three different types of programming are discussed: "white" noise, musical programming, and video games. The discovery by Gardner and Licklider¹⁶ that intense auditory stimulation in the form of white noise was able to suppress pain produced in dental procedures was met with great enthusiasm by clinicians and researchers. A machine to produce the white noise was developed, and the patient could vary the intensity of the noise. The effects of this "audio analgesia" were often dramatic and enabled certain patients to have even extractions done without the need for any other analgesia.

The relative popularity of this technique, however, soon died out. Researchers such as Carlin and others¹⁷ failed to find any correlation between the use of white noise and increase in pain threshold. In addition, the technique proved impractical because of high cost of equipment in part, and to its inconsistent nature.

A possible theory for the sometimes successful results of white noise auditory analgesia was given by Melzack and others.¹⁸ They found, in a study linking auditory stimulation and suggestion, that when white noise was accompanied by suggestion there was a noticeable increase in pain tolerance. However, when audioanalgesia was given without specific suggestion as to its supposed effect, no significant increase in pain tolerance was obtained. Furthermore, subjects seemed to adapt some distracting strategy, while receiving the auditory stimulation, such as tapping their feet or adjusting the control knob. It would seem then, that whatever analgesic effect was obtained with white noise may have been solely an artifact of suggestion or distraction rather than a true intrinsic analgesic.

Another type of auditory stimulation that has been used to attempt to alleviate stress and possibly pain in the dental office is musical programming. Corah and others¹⁹ conducted a study comparing the effects of relaxation and musical programming on reduction of stress in the dental office. The relaxation condition consisted of tape-recorded relaxation instructions. There were two musical programming conditions, both of which gave subjects the choice of musical selection. In addition, the first was set at an invariable volume level; and the second condition provided the patient with the option of adjusting the volume level. The differences between relaxation and musical programming were not pertinent to the present discussion; however, the difference between the results of the two types of musical programming does shed some light on the effects of anxiety reduction through musical programming. Two reasons were cited for the significantly greater calming effect with the condition...
in which the subjects had control over the volume level than with the uncontrollable condition. First, a large element of distraction is involved in that subjects used the adjustment of volume control to distract themselves from the dental situation. The second and more plausible explanation is that by being able to adjust the volume level of music, subjects believed that they had some control over what was perhaps perceived as a threatening environment and, as such, they were able to alleviate some of their subjective anxiety and pain.

The last method of auditory and visual programming to be discussed, which perhaps best exemplifies the notion of stress reduction through distraction, is subject’s playing of video games during dental procedures. This type of visual programming is preferable in that it requires patients to make a conscious attention shift from the dental procedures to a different target. Corah and others used a video Ping-Pong game with controls mounted on the chair enabling the patient to reset after each game. Using the Corah Anxiety Scale and various physiologic measures, the investigators showed that visual programming did indeed seem to lessen stress and anxiety and make potentially painful dental procedures manageable.

**PROBLEMS WITH THE TECHNIQUE.** In general, one of the inherent problems with auditory and visual programming is uncertainty as to the origin of the effect. What may appear to be a distraction effect may be perceived control or relaxation effects. Another problem is that a great deal of distraction seems to relate so highly with individual personality characteristics that the particular effect will vary a great deal from patient to patient. Both of these drawbacks aside, the use of auditory and visual programming offers a pleasant, distracting, and somewhat controllable atmosphere and thus seems a good supplement, at least, to other well-chosen therapies.

**Hypnosis: definition and misconceptions**

Hypnosis may be defined as an altered state of consciousness characterized by heightened suggestibility to produce desirable behavioral and even physiologic changes. Those clinicians who use hypnosis in their practices do not see it as being anything more or less than this definition suggests; however, there has been much debate over the years about the hypnotic state and its relative efficacy. Since its inception, hypnosis has had a history of controversy in professional and lay circles. Part of this controversy stems from the “magical” aspects of hypnosis purported by showpeople, who are supposedly able to induce trance states, causing total compliance by the subject to act in a fashion that may be against his or her will. Another reason for the lack of consistent faith in hypnotherapy by practitioners is the result of the theory that a number of the population are supposedly completely intractable to hypnosis. Regarding the first problem, only time and better understanding by the general public and clinicians will remedy this misconception. In almost all but the deepest trances, patients are fully aware of what is happening around them, and even with the deepest trance states, people cannot be made to do something they otherwise be convinced was wrong. The second complaint, that many people cannot be put into a trance state, is also erroneous. The literature reports that 95% of the general population can achieve a light hypnotic trance, 50% can achieve medium trance, and 10% can achieve deep trance. Only the remaining 5% are thought to be unreachable through hypnotherapy.

**USES, TECHNIQUES, AND EFFICACY.** After World War II, hypnosis slowly gained more acceptance and use in the health professions in general and in dentistry in particular. Case reports began to appear in the literature suggesting new uses of hypnosis in the dental practice. Hypnodontics can be used for reduction of anxiety, stress, and concomitantly for pain tolerance because of its relaxation effects. In addition to pain reduction through relaxation, in deeper states of hypnosis, true analgesic and anesthetic effects seem to be induced. This phenomenon is probably linked to physiologic changes effected by the hypnotic trance. As Craslineck and Hall state, “Alteration may be produced in physiological functions such as pain, that are usually inaccessible to psychological influence.” Hypnosis is unique from all other techniques discussed in this paper in that its effects span a variety of uses that are often uncontrollable by other means. One such use is in the control of chronic bleeding. Newman reported the successful handling of a patient with chronic bleeding during an extraction, who had previously bled for 8 hours during a similar procedure. With hypnotic treatment similar to that used with hemophiliac patients, the patient bled for only 1 minute. Some of the other effects of hypnodontics are reduction of gagging and salivation, reducing the resistance to local anesthesia, and assisting in the adaptation and acceptance of prosthetic and orthodontic appliances. Additionally, hypnosis is one of the most effective nonpharmacologic therapies that can be used with children for a number of different procedures.
Through biofeedback techniques, it has been shown that anxiety levels can be effectively reduced. In terms of analgesic effects produced by biofeedback, many accounts of dental pain have been said to be reduced without any other analgesia necessary. One of the more dramatic effects in reduction of dental pain through biofeedback has been seen in temporomandibular joint (TMJ) syndrome. Through biofeedback, subjects were able to relax the masseter, medial pterygoid, and temporalis muscles, and relief of pain associated with TMJ syndrome seems possible. One possible explanation for the effects of biofeedback may be the recognition and increased production of alpha waves. Alpha waves are one of four basic electroencephalogram wave types. Each of these wave types represents a particular state of arousal. Some investigators believe that alpha waves are responsible for the regulation of certain brain functions, possibly including pain control. Other investigators have disputed this hypothesis, doubting the importance of alpha waves to this process. One possible way to integrate these two conflicting theories is to state simply that biofeedback analgesia is brought about by the production of a low general state of physiologic arousal.

Biofeedback

Biofeedback and electromyographic (EMG) biofeedback are intriguing procedures as they completely rely on the patient's own ability to control the desired effects of anxiety and pain reduction. The process simply stated involves learning to become attuned to and to control psychologic bodily functions. During biofeedback, an individual observes one or more of his or her ongoing psychologic processes by means of electronic circuitry meters (usually in the form of a tone or light). The theory behind biofeedback is that through this monitoring, a person can gain at least some sort of voluntary control over processes that are usually thought to be totally involuntary. Biofeedback has been used to attempt to control a number of clinical problems ranging from the purely psychologic and anatomic to the psychologic and emotional. Uses of particular interest to the dental situation are the reduction of stress and pain.

In terms of reduction of anxiety, it has already been stated that relaxation is of the utmost importance in reducing anxiety and furthermore that one way to accomplish relaxation is through hypnosis. Other suggested methods are respiratory feedback and EMG biofeedback. The patients were instructed to concentrate on relaxing the frontalis muscle as it usually contracts during agitation, tension, and anxiety and thus is thought to have an intrinsic relationship with these states. Good listening skills are a sine qua non in promoting an empathic and conducive environment to effective treatment.

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little insight for the modern clinician in terms of theories of pain perception and control.

Another reason for the difficulty in trying to find a theoretic basis for acupuncture has to do with the many possible confounding forces such as distraction, coping strategies, suggestion, and placebo effects. An additional reason for its effects may stem from the bias of the Chinese and others who, through their belief in acupuncture, may unknowingly cause analgesic effects. The main problem stems from the complex neurophysiologic and biochemical systems of the central nervous system (CNS) that make it extremely difficult to isolate one system as the basis for acupuncture effects. Two of the most plausible theories are sensory interaction in the CNS and the production of endogenous opiates.

The first of these theories postulates that the extra-fenniscal system (including the reticular formation and the centralmedullary nucleus of the thalamus) is the area responsible for pain inhibition arising from acupuncture. Stimulation of needles causes the stretch receptors to send afferent volleys over large and medium fibers. The inhibition of pain that occurs through this process has been explained through the "gate-theory" of Melzack and Wall. Stimulation must be sufficiently above the threshold of medium-sized fibers. Too strong a stimulus however will activate the fine C fibers and thus intensify pain. It has been found that electrical stimulation is superior to needle twisting for bringing about this effect. The hypothesis that one kind of "pain producing" sensory input can relieve another is within everyday empirical findings such as fist-clenching or muscle tightening during intense pain, which seems to lessen subjective pain experience.

A second theory proposed to explain the analgesic effects of acupuncture relates to neuropharmacology. In this theory, acupuncture stimulation is seen as working through the increased release of certain neurotransmitters, specifically acetylcholine, serotonin, and other endorphins. Further evidence to prove this theory is that endorphin antagonists such as norepinephrine, dopamine, and naloxone counteract the effects of acupuncture. Acupuncture has also been reported to have relieved symptoms of withdrawal from opium addiction, hypothetically as a result of the body's own production of endogenous opiates.

DENTAL USES, EFFICACY, AND PLACEBO EFFECTS. Acupuncture in the dental setting has been used for a variety of purposes including operative dentistry and endodontics. When used correctly, dental acupuncture has been shown to be an extremely effective analgesic. Although the success of acupuncture is well documented, a provocative study by Taub and others pointed to a different reason for the success of acupuncture than other than a technique-specific efficacy. Using a double-blind paradigm, the investigators found that both acupuncture and placebo effect were 100% effective for analgesia in operative dentistry. The placebo effect in this case consisted of needle insertion into a plastic tip as opposed to skin. This study suggests the possibility that the success of acupuncture may be totally the result of placebo effect. This statement is indeed significant in that placebo effects could hypothetically be called on to account for virtually all analgesic effects, at least nonpharmacologic ones. Even with drug therapy, placebo effects have certainly been obtained, as, for example, in a review by Guran and Shub, it is reported that Lesagna and others found that about 50% of a postoperative population received placebo relief. Regardless of whether placebo effects do exist to a large extent with various forms of analgesia, it would certainly be a non sequitur to state that because of placebo effects, true analgesic states do not exist with therapies such as acupuncture. All that can be surmised is that in the absence of a salient external mechanisms for bringing about relief from pain, internal mechanisms can be elicited to take over the function of supposed analgesias.

A humanistic treatment approach

The apprehensive patient views the dental experience as an aggressive act that violates a private sector of his or her body—the mouth. In conjunction with those feelings, he or she looks on the practitioner with distrust and hostile feelings. This negative transference is the result of not only past experiences, but social and cultural attitudes present in our society. It is therefore essential to establish a trusting relationship with the patient, for if the practitioner fails to do so, it will prove almost impossible for the patient to submit to even a proper examination. To initiate a more positive interpersonal relationship with the patient, it is necessary to attempt to understand his or her feelings in relation to the dental visit. Such acknowledgement should minimally include an attitude of kindness, patience, and tolerance. Open communication should begin with a detailed discussion of previous experiences that should focus not only on the dental components, but also on other health problems that may in some way be related to a previous traumatic event.

Good listening skills are a sine qua non in promoting an environment that is both empathic and conducive to effective dental treatment. Through listening, underlying causes and trigger zones of specific anxiety states can perhaps be discovered. In general, by allowing the patient to vent his or her fears and past experiences, a clearer picture of the concerns can be understood. The clinician must also take into account the loss of power the patient experiences during any dental procedure and the necessity to relinquish some measure of this power through experiential learning and self-knowledge. The need for control is validated through a higher degree of awareness that can result from this integration of emotional and intellectual development. Through this experiential process, the anxious patient is allowed to identify, analyze, and generalize feelings, behavior, and learning. These experiences can suggest new insights for the future and can also increase the range of alternative behavior patterns from each new and positive experience in the dental office.

Assessment

The therapies discussed are useful tools for decreasing anxiety and pain, yet without careful consideration of the patient's psychological state, any treatment may be difficult or ineffective. To effect a more holistic approach with the fear-ridden patient, it is of vital importance to
assess the psychologic and emotional states before beginning even minimal dental treatment. Assessment can be defined as the compilation and interpretation of information concerning the patient's behavioral problems.42

At the onset, it should be noted that the area of psychologic assessment is one that has unfortunately been often overlooked in the dental setting. Two reasons for this are procedural time constraints and reluctance on the part of the practitioner to delve into an area of limited knowledge or experience. Despite the inherent difficulties with assessment, it is a necessary and achievable aspect of treatment.

Although it is probably not possible to develop a universal parametric scale of dental phobia, this type of objective measure is probably not essential. What is essential is to effect a detailed history that includes not only both actual and vicarious negative dental experiences, but also aversive medical experiences and phobic responses outside of the dental setting. Within this framework, specific components such as fear of the drill or needle, fear of not being able to breathe, claustrophobic feelings, perceived loss of control, and invasion of privacy must be isolated and removed.

An anxiety scale such as proposed by Corah and others,43 or even a detailed questionnaire certainly has some use. However, the most important aspect of the assessment process must involve a detailed, client-centered, one-to-one interview to ascertain the specific ramifications of the patient's anxiety state. The actual interview process will additionally facilitate the establishment of the therapeutic rapport.

Conclusion

The techniques described in this paper can be used by any dentist interested in providing a number of different nonpharmacologic procedures for the patient who may be experiencing a great deal of stress, anxiety, and even pain. Each technique is based on the patient's inherent ability to understand at some level (either conscious or unconscious) the workings of the mind and body and to use this 'knowledge' to effect positive changes in the psychological state. The ability to understand and consequently choose between these and other procedures is of enormous benefit to the practitioner who desires to have the background to effect the optimum treatment plan for anxious as well as "normal" patients.

It is most significant to consider the interactions of these various noninvasive therapies and how they can be integrated with more conventional approaches such as local anesthesia and nitrous oxide relative analgesia. For practitioners truly concerned and empathic with their dental patients, a working knowledge of the various modalities of anxiety and pain reducers must be formulated. Most of these techniques potentiate each other into a holistic approach. Relaxation training goes hand in hand with biofeedback and hypnosis. Relative analgesia with nitrous oxide both facilitates and potentiates relaxation and hypnosis. The effects of these approaches are mutually synergistic. They also facilitate the acceptance of local anesthetics and make local anesthesia more effective by lessening the anxiety often associated with it.

The possible permutations of combining modalities are extensive, but the best approach to use is that which is patient-sensitive. When one approach is not effective for a specific patient, another approach or combination of approaches should be substituted. Starting from a trusting relationship with the patient, the dentist can institute true treatment planning in terms not only of the dentistry to be performed but also of the method of performing the dentistry. Enlightened practitioners using all the resources at their disposal can help even the patient who has a true dental phobia. Large numbers of dentists using these principles can help to effect a major change in the outlook of dealing with the current unmet dental needs of the public.

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