Nitrous oxide exposure in the operating room

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While investigating the levels of anesthetic gases to which operating room personnel are exposed, Piaziali concluded that "hot spots" exist where gas concentration peaks are 10 to 15 times the room average. In the present study, 185 pairs of gas samples were collected from inspired gas (10 cm behind the head at nose level) and end-tidal gas of persons administering anesthesia in three operating rooms.

Mean operating room N\textsubscript{2}O concentrations from 22 to 144 ppm were measured by gas chromatography. The measurements revealed large moment-to-moment variations in individual operating rooms. Mean end-tidal N\textsubscript{2}O concentrations from 50 to 114 ppm were observed. There were low correlations between inspired and end-tidal N\textsubscript{2}O concentrations, presumably because of spatial and temporal gradients of N\textsubscript{2}O in the operating rooms.

The temporal and spatial gradients in N\textsubscript{2}O concentrations are sufficiently large to invalidate estimation of exposure of anesthetic personnel to N\textsubscript{2}O from "spot" or "grab" samples collected in the breathing area. Levels of less than 25 ppm N\textsubscript{2}O concentration in the breathing area can be achieved. Because there is a poor correlation between inspired and end-tidal N\textsubscript{2}O concentration, the sampling site is important in defining N\textsubscript{2}O exposure of the personnel. The exposure to personnel can be measured only by continuous monitoring or by integrated personnel sampling of true inspired or expired gas (or both). This conclusion must be considered in establishing criteria for exposure of operating room personnel to trace anesthetic gases.

Bronchodilator therapy

D. C. Webb-Johnson and J. L. Andrews

A variety of therapy programs exist for bronchospasm because of the many new bronchodilatory drugs, preferences of physicians, and different responses by patients.

Asthma attacks, chronic bronchitis, asthmatic bronchitis, and emphysema may produce several abnormalities in the airways, including smooth muscle spasm, plugging with viscid mucus and obstruction from mucosal edema, basement-membrane thickening, infiltration with eosinophils and chronic inflammatory cells, and vascular and lymphatic engorgement. These result in an overdistended and hyperinflated lung.

As an asthmatic attack becomes increasingly severe, hypoxemia worsens and PaCO\textsubscript{2} rises. Acidosis, hypercarbia, and hypoxemia may cause potentially fatal cardiac arrhythmias, but the processes can be reversed with successful bronchodilator therapy.

The actions of epinephrine, isoproterenol, ephedrine, and other sympathomimetics and their side effects are discussed as are the uses of selective beta agents, including isoaetharine, metaproterenol, and terbutaline.

Selected pain states and the use of anesthesia in dentistry

Gary L. Racey

Certain pain disorders are difficult to diagnose because their symptoms are confusing or because they occur so infrequently that they are not commonly considered. Face and head pain can be classified into four groups: typical face pain, typical neuralgias, atypical neuralgias, and atypical face pain.

Typical face pains are produced by a variety of organic disorders affecting the tissues and organs of the face and head. Such pain may be of extracranial or intracranial origin. Generally, the typical face pains have a characteristic pattern and some determinable organic cause. However, the pattern may mimic that of other paid disorders. Typical face pains that may be difficult to diagnose include split-tooth syndrome, Eagle's syndrome, temporal arteritis, pain associated with cancer, trigeminal pain in multiple sclerosis, and pain of intracranial origin.

Typical neuralgias are characterized by severe, paroxysmal face pain following known nerve distributions. The pain is sharp, lancinating, stabbing, lasts for a few moments, is evoked by a trigger-point or specific action, and usually is incapacitating until the attack.

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subsides. The etiology usually is unknown. Of the typical neuralgias infrequently seen in the dental practice are glossopharyngeal neuralgia, geniculate neuralgia, and postherpetic neuralgia.

Pain associated with atypical neuralgias does not follow characteristic nerve distributions. Atypical neuralgias are generally considered to be expressions of painful dilation of terminal branches of the maxillary artery, of unknown etiology. Symptoms may include lacrimation, nasal discharge, sweating, nausea, or flushing. Infrequently seen are petrosal neuralgia, ciliary neuralgia, vidian neuralgia, and greater occipital-trigeminal neuralgia. Burning or aching usually begins deep within the midface behind or below the orbit and gradually radiates to cover the forehead, temporal area, and lower jaw. Attacks may be of 5 to 20 minutes duration or longer and may build in intensity with prolongation of repition of the episode. Usually there is no known or accessible trigger area, but there may be provoking events of an emotional or psychological nature.

Atypical face pain refers to certain pains in the lower half of the head, usually unilateral, that can be mistaken for dental pain, other typical face pain, or neuralgia. Characteristically, the pain is aching, burning, boring, knife-like, and steady, but not throbbing, and it usually is moderately severe. It is a poorly localized, deep, constant discomfort which overlaps anatomic nerve distributions. Atypical face pain should be considered in patients with known or apparent emotional or psychological problems.

Local anesthetics may be administered to obtain diagnostic information about head and face pain. Typical face pain of extracranial origin usually will be relieved if the peripheral innervation of the organic source of pain is anesthetized. Radiating or referred pain usually will be relieved when the peripheral innervation of the organic source of pain is anesthetized. Typical face pain of intracranial origin will not be relieved by peripheral nerve anesthesia. Typical neuralgias usually will be relieved by topical anesthesia of the trigger area (if accessible) or by anesthesia of the peripheral nerve distribution of the neuralgia. Atypical neuralgias usually will not be relieved by topical anesthesia, but usually will be relieved by anesthesia of the peripheral innervation of the affected vessels and by injection of a vasoconstrictor solution. Atypical face pain may produce unexpected results. Local anesthesia, for instance, may or may not produce relief.

Failure of the popoff valve was encountered in two cases. In the first, the expiratory limb of the corrugated hose was accidently disconnected at the point of attachment to the CO₂ absorber and then accidentally reconnected to the exhaust side of the popoff valve. In the second accident, the scavenging hose was obstructed on the floor of the operating room by a wheel of the anesthesia machine. Both situations caused a gradual increase in pressure within the anesthesia circuit which could have resulted in pulmonary barotrauma.

In the first case, the complication could have been prevented if the exhaust hose had remained connected to the popoff valve at all times of if the diameter of the exhaust hoses from the scavenger had been greater or smaller than that of the breathing hoses. In the second, the problem would not have occurred if the exhaust hose were suspended above the anesthesia machine from the ceiling of the operating room, or if it were wrapped around the back of the machine.

**Pharmacotherapy I: non-narcotic analgesics**

*Sebastian G. Ciancio*


The major non-narcotic analgesics in use today include salicylates, aniline derivatives (acetaminophen and acetophenacacetin), propoxyphene, historical agents (ethoheptazine and mafenamic acid) and analgesic mixtures.

Aspirin is the most effect salicylate. It is thought that aspirin-like drugs inhibit the production of prostaglandins by blocking the microsomal prostaglandin synthetase enzyme system involved in the biosynthesis of prostaglandins from C-20 fatty acid precursors. In addition to their analgesic properties, these drugs are effective antipyretics and exert an anti-inflammatory effect. The most common adverse reaction to aspirin is gastrointestinal irritation. Aspirin also decreases prothrombin levels and alters platelet aggregation. Therefore, large daily doses of aspirin after dental surgery may result in bleeding problems.

Dental history forms should specify if the patient is allergic to aspirin. If so, ingestion of salicylates may result in death. Signs of overdose include tinnitus, vomiting, headache, nausea, and dimming of vision. In severe overdose, acidosis and electrolyte imbalance, as well as respiratory depression occur.

The analgesic and antipyretic properties of aniline derivatives are similar to those of aspirin. However, such drugs are not anti-inflammatory and do not alter blood coagulation, the cardiovascular system, respiration, acid-base balance, or uric acid excretion. They are nonirritating to mucosa and do not initiate gastric bleeding. The most serious side effects are renal tubular necrosis, hypoglycemic coma, and hepatic necrosis. Renal problems have been most often associated with the chronic use of phenacetin.

**Two hazards of gas scavenging**

*Mehrdad Tabakoli and Alfred Habeeb*

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The use of equipment to scavenge waste anesthesia gases presents a potential hazard for the patient in that scavenger valves fail to function safely if wall suction is applied directly to the exhaust port.
Propoxyphene is related structurally to methadone. Some recent studies have questioned the efficacy of this drug in comparison with salicylates. Analgesia is produced by a direct effect on the central nervous system. Some side effects are similar to those seen with codeine and are related to its central nervous system action. The drug has no antipyretic or anti-inflammatory properties. Toxic doses will produce central nervous system and respiratory depression of convulsions. Combinations of aspirin and propoxyphene or acetaminophen and propoxyphene can be effective as a combination of these analgesics with codeine. The practitioner can choose such combinations based on the nature of the patient, side effects expected, cost, and abuse liability.

Ethoheptazine's abuse potential is low, as is its analgesic efficacy. It is not widely used today because its analgesic effect may be less than that of aspirin or equivalent to a placebo.

Mefenamic acid has analgesic, antipyretic, and anti-inflammatory properties. However, it is not superior to aspirin and has many side effects.

In controlled tests, analgesic mixtures containing caffeine have not been found to be more effective than aspirin. Mixtures of analgesic antipyretics have been shown to offer no advantage over aspirin alone and have the same incidence of adverse effects as has aspirin. Combinations of a sedative and an analgesic or of a tranquilizer and an analgesic have been administered to provide the patient with relief from pain and sedation-relaxation. However, these drugs have not been shown to enhance the analgesic effect of the mixture of which they are a part.

Generally, the combination of aspirin or acetaminophen with codeine or other opioids offers more effective analgesia with fewer side effects compared with prescribing each agent alone at equivalent analgesic levels.

Differential diagnosis of orofacial pain

Alan J. Drinan


The successful diagnosis of orofacial pain depends on: an accurate and detailed history of the pain; a detailed clinical examination of the face and associated organs; and a thorough knowledge of those conditions which may produce facial pain. Dentists must not assume that orofacial pain is produced by a dental condition. Among those conditions resulting in orofacial pain which may be difficult to diagnose are: trigeminal neuralgia; maxillary sinusitis; "cluster" headaches; angina pectoris; facial pain and depression; and Von Munchausen syndrome.

Pain arising from trigeminal neuralgia is frequently sharp and of short duration and often simulates a toothache. Presently there is no real understanding as to the nature of the condition. However, occasionally pain experienced in the trigeminal area may arise secondary to some other condition such as a tumor of the cerebellar-pontine angle. The pain usually is unilateral, and remains localized to one division of the trigeminal nerve, with the ophthalmic division being the least often involved. The pain may be described as stabbing and lasts for only a few seconds, sometimes followed by a vague aching or burning. The patient typically experiences a series of attacks followed by symptom-free episodes. Most patients report that presence of "trigger zones." The dentist should always keep this condition in mind when a patient describes a dental pain for which no obvious dental pathology can be found.

Maxillary sinusitis is frequently diagnosed erroneously as hayfever or chronic allergic rhinitis. The symptoms are usually a stuffy feeling in the nose and a feeling of "fullness" over the involved sinus. The patient may complain of a postnasal drip and of headache. The dental symptoms are usually those of tenderness of the maxillary teeth on the involved side with some increased sensitivity to percussion. The dentist should consider this condition when diagnosing some vague discomfort of the maxillary teeth.

In "cluster" headaches, the painful episodes are separated by periods of remission. The pain, which is thought to be vascular in origin, is usually unilateral and is associated with some nasal stuffiness and mucous secretion. The pain is of a boring nature and often comes daily for several weeks. It is more usually experienced in the upper part of the face than in the mandibular area. The pain often recurs at the same hour of the day.

Atherosclerosis of the coronary arteries can lead to a diminution in the blood supply to the cardiac muscle. The resulting muscle ischemia may give rise to angina pectoris. The pain, which typically radiates from the chest, may be present in the neck and jaws. Therefore, it may be thought due to some dental or jaw pathology.

When the pain is vague, difficult for the patient to localize or describe, or burning or nagging in character, the dentist should consider atypical facial pain. Such pain is seldom confined to any anatomic sensory nerve boundary. It is often constant and lasts for hours or days. The areas involved are frequently those supplied by the 5th and 9th cranial nerves or the 2nd and 3rd cervical nerves. Depression may account for the onset of atypical facial pain. If no organic cause is found, a careful search should be made for symptoms of an associated depressive illness.

Von Munchausen syndrome has been used to refer to those people with the most involved, elaborate, and convincing symptoms, who go to numerous practitioners and hospitals seeking help. The condition may be thought of as the imitation or production of an illness for a particular purpose — be it the need for food and shelter available in a hospital to masochistic tendencies. The possibility of this syndrome should be considered when confronted with a perplexing pain that
seems to have no organic cause, especially if the symptoms of the pain do not appear to be anatomically or physiologically appropriate.

If the dentist is uncertain to the cause of the pain, he should not hesitate to refer the patient for evaluation rather than perform irreversible dental procedures.

**Psychological components of pain perception**

**Barry J. Wepman**


Pain is a psychological, as well as a physiological, event. Psychological components of pain perception include cognitive, emotional, and symbolic factors which interact and influence each other. In treating patients, the dentist must be aware of these components.

Cognitive factors can reduce or augment the result of the stimulus event in the dental office. Some of these factors influence how patients categorize the sensations transmitted from free end receptors; thus describing a set of ambiguous sensations as “pain” can induce a patient to interpret them as pain and to feel “hurt.” Other factors help determine where a patient focuses attention: on intraoral discomforts, on auditory or visual stimulation, or on suggested imagining. The patient’s perception of helplessness may increase his feelings of anxiety. The dentist should lead the patient to a perception that he does maintain some control over what is happening to him.

Anxiety is the major emotional factor related to pain perception. As anxiety increases so does the likelihood of interpreting noxious stimuli as pain. Therefore, any procedure that reduces anxiety will help patients tolerate pain effectively.

Most patients in the dental chair are in a state of vigilance. Because they believe that pain may come at any time, they are more reactive to stimuli. There are certain moments, however, of relaxation, such as the quieting of the handpiece. By giving patients accurate information about when pain may occur, the dentist may be able to extend these periods of relaxation. Special relaxation techniques, such as biofeedback or hypnosis also may be used.

Extensive tissue damage is generally associated with severe pain. However, if that pain causes the patient to be relieved of a different painful stimulus, the message to the patient will be one of relief. For instance, soldiers injured in battle are often unaware of pain resulting from their injuries, as they are preoccupied will feelings of relief upon being away from the battle.

Pain may be used by patients for various psychological purposes. Some patients may develop psychosomatic pains and some may perceive that they are in pain in order to evoke the sympathy of others. Although studies cannot confirm that culture helps to determine pain responsiveness, differences in pain perception should be considered in treating patients of various ethnic derivation.

The dentist can influence a patient’s anxiety by: treating each patient as an individual; describing accurately what will be experienced during a procedure; giving patients a feeling of having some control; establishing a relaxed environment; and paying attention to what the patient is communicating, either verbally or nonverbally.