

# COMPLICATIONS OF SEDATION AND ANESTHESIA IN DENTISTRY

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**NOT FOR RESALE**

# Complications of Sedation and Anesthesia in Dentistry

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## PREFACE

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The relevance of a concept is always emphasized if related to actual clinical experience. Complications which have occurred in dental practice can be discussed in a constructive fashion and provide a valuable source of learning material. An unfortunate consequence of the malpractice climate is the inadequate reporting and discussion of complications that arise in the course of patient treatment related to dental sedation and anesthesia. The total reported experience noted in this book is an attempt to fill the need of a comprehensive overview of the problems that have arisen. An extensive search was made of the professional literature for incidents which have occurred in relation to dentistry together with a search of newspaper articles, reports in *The Citation*, and other medicolegal journals. The cases reported are the basis for the text, leading to a review and discussion of the events. To maintain the confidentiality of the parties involved, location and some details were omitted. Reports taken from scientific journals are referenced.

The authors have arbitrarily assigned the cases to the various sections primarily for the benefit of teaching a particular aspect of patient care, though they often illustrate several features.

The book has been divided into general areas wherein complications can occur. The index itemizes specific problems, such as hypoxia, as these problems can occur across the whole spectrum of dental practice, from local to inpatient hospital anesthesia.

All cases are presented in similar fashion. The topic is introduced, case reports follow and are commented upon, cross references are noted, references given, and the essential items are noted in a short epitome which alerts the dentist to potential complications.

Many case reports are brief and in some respects inadequate; however, they do have relevance in that they indicate that some problems are not unique. Frequently more than one case report is included in a particular section to emphasize that the complication may not be unusual.

Conclusions should not be drawn from the number of cases reported, as the series is not comprehensive, and only those which include sufficient useful data are reported. However, the number of unreported cases is great, as the majority of cases are settled out of court and thus not reported.<sup>1</sup> These data are available only in insurance company files and are not relayed to the dental boards. Only one actuarial report has been noted by the author, that by Berkowitz and Smith who report fatalities in dental anesthesia.<sup>2</sup> Collection of statistical data is incomplete as illustrated by the vital statistics of the US government.<sup>3</sup>

Dentistry patients are subject to the same hazards and complications that attend any surgical procedure. In some respects, the hazards may be greater if there is less than adequate preoperative evaluation and provided quality of the anesthetic or sedative services. Risks often increase because of the unique aspects of dentistry wherein the surgical field is shared by the operator and anesthetist. In addition, maintenance of the airway, together with supervision of sedation or anesthesia, may be a task undertaken by the operator. The airway assumes major importance in all dental procedures, and it would appear that many of the complications of dental sedation and anesthesia are a result of respiratory depression. Complications of all types can occur with the agents used in dentistry, due to the pharmacodynamic principle of biological variation. Thus, included in the text are cases which are not unique to dentistry, but which indicate an important aspect of patient care.

Some errors are unpredictable; others are systematic. The object of this book is to help reduce the incidence of predictable errors. Sedation or anesthesia are essential adjuncts to some dentistry procedures but offer no therapeutic benefit, and thus predictable errors are inexcusable. It is the hope of the authors

that this text be viewed as constructive criticism, and a useful aid to the prevention of complications.

The Jorgensen Memorial Library at Loma Linda University is an archival resource for the American Dental Society of Anesthesiology. The proceeds from this text will be devoted to the ongoing activities of the library. Case histories and memorabilia related to sedation and local or general anesthesia are welcomed by: Archivist, Jorgensen Memorial Library, Loma Linda, California 92350.

### **Acknowledgment**

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# Introduction



A major requirement of dentistry is the control of apprehension, fear, and pain in the diagnosis and treatment of oral problems. In the United States, conservative estimates are that 90 million people avoid dental treatment due to fear. Local anesthesia, no matter how skillfully administered, has no ameliorating effect on fear and anxiety. If anything, because the local has to be administered intraorally, the problems are intensified. Yet the safety of local anesthesia is evident; the mortality rate is minimal (1/1,500,000) although morbidity not infrequently follows injections into muscles and tendons. However, patients unable to endure treatment utilizing only local anesthesia are increasingly requesting alternative methods of pain control. The dentist must adapt and improve sedative management techniques. The management techniques range from sedation through hypnosis to general anesthesia, and all should be available for the dental patient.

A problem that dentistry faces, however, is that the development of sedation, and local and general anesthesia for the control of pain and anxiety has continued in an isolated environment with little input from medical anesthesiology. In such an environment inappropriate guidelines for outpatient sedation and general anesthesia may be issued by agencies not knowledgeable of the concerns of anesthesiology. The published requirement for an intravenous line in all cases of ambulatory general anesthesia or deep sedation is an example.<sup>1</sup> Techniques which are clinically successful have not been subjected to critical evaluation. Much of the change has resulted from medicolegal concerns, and this must be deemed an unfortunate attitude. To leave improvements to the stimulus from legislation is never really successful. Perhaps this is best illustrated

by the attempts of the Academy of Plastic and Reconstructive Surgery to reform cosmetic surgery mills. Successful malpractice suits have had little effect on these facilities. The isolated practice of the dentist prevents his participation in regular mortality and morbidity conferences as in the hospital practice. The benefit of these conferences is that problems are soon highlighted and criticism is accepted as an endeavor to inform and improve. Thus the potential advantages of an open discussion of the problems in dental sedation and anesthesia are evident. Because the dentist is a dental surgeon, the rules of law applicable to care owed by physicians and surgeons apply to him, and thus his need to carefully review those hazards that occur.

There is evidence that adequate remuneration for those who provide control of pain and apprehension for dental patients is not available yet. In the best interest of the patient, this is essential. It would seem that the time is right for an attempt to be made for adequate funding of pain control in dentistry by insurers and the government. In 1986, the National Institute of Health provided \$12,570,708 to improve the 20 million general anesthetics administered for hospital practice, but only \$446,497 for the 5 million dental general anesthetics plus the innumerable local anesthetics administered for dentistry.

The assessment of analgesic and anesthetic practice has been difficult due to inadequate reporting and use of varied criteria for mortality and morbidity reports. The published data on morbidity for outpatient anesthesia for oral surgery are so minimal as to indicate incomplete reporting. The Los Angeles County medical examiner's office reports one death from dental office operations every 6 to 8 weeks. Comparison from facilities which have firm control of data collection demonstrates this problem.

Lack of interest in voluntary reporting by component societies of the American Society of Oral Surgery in 1977 is indicated by the fact that of 52 societies polled for mortality and morbidity from intravenous anesthesia, only 31 replied. Data on morbidity and mortality of nonmembers of the component societies appear to be completely absent.

Reliable data from the United Kingdom in 1982 show a

mortality rate of 1/331,000 for general anesthesia in dentistry. With separate anesthetists, the mortality rate was 1/367,000, and with a dental anesthetist, 1/598,000.

Adverse reactions are rarely reported and no central organization for reporting such is available. Hence no deaths from local anesthesia were reported to the Council on Dental Therapeutics of the American Dental Association, yet the Bureau on Drugs of the Food and Drug Administration noted four fatalities with mepivacaine.

Intravenous sedation has been scientifically demonstrated to be safe, as has nitrous oxide-oxygen sedation. Other techniques which have been euphemistically called sedation and scientifically demonstrated to be unsafe must be controlled by the profession. However, this control should not decrease the availability of some form of parenteral sedation when needed for dentistry patients. The administration of inhalation sedation and intravenous sedation by dental assistants and hygienists may significantly increase the patient's exposure to risk of an adverse result. The care provided by a doctor involved in patient care with knowledge of the physiology as well as the pharmacology of these drugs can provide safety. Even the most advanced training and knowledge will not prevent some accidents, but if those occurring due to human error are eliminated, it would be a valuable contribution to the health professions.

Semantic problems still remain however, despite attempts to reach a consensus in regard to definitions. The use of terms to either avoid regulation, to ensure insurance payment, or reduce malpractice insurance premiums is an ongoing problem.

Case 1      Preop — A 4-year-old male, 16 kg. BP 100/60, pulse 90, respiratory rate 22, presented for restorative dentistry. The anesthesia record indicated the patient was NPO. However, the consent and evaluation form noted that the patient had eaten.

Intraop — Sixty percent nitrous oxide-oxygen given and an IV infusion of D5/LR was begun. The nurse anesthetist then administered atropine 0.1 mg, fentanyl 12.5 µg and diazepam 1 mg IV, followed ten minutes later by additional fentanyl

12.5 µg. A local anesthetic with 2% lidocaine with 1/100,000 epinephrine 3.85 mL (80 mg) was then administered. Five minutes later the patient continued to respond to commands and 15 minutes after local anesthesia was placed, the mouth prop was changed from the left to the right side and the pulse was noted to be 110. Thirty-two minutes after the local anesthetic had been placed, respiratory depression was noted by the dentist.

Emergency Treatment — An airway was placed and 100% oxygen administered. CPR was commenced and paramedics summoned. Atropine 0.2 mg and naloxone 0.3 mg IV were administered. Attempted endotracheal intubation failed. CPR continued, and the endotracheal tube was placed 20 minutes later when requested by the paramedical personnel.

Follow-up — The patient remained in a coma with brain damage and died 1 month later.

Comment: The parent had signed a permit for conscious sedation. The administration of fentanyl, diazepam, and local anesthesia together with nitrous oxide could be considered general anesthesia. Confirmation of anesthesia can be noted by the fact that a mouth prop was required. Classically, as conscious sedation deepens, the mouth closes. In addition, the conflicting testimony regarding food by mouth also posed a problem.

It was apparent that the nurse anesthetist administered the drugs, and the monitoring was left to the dentist. With conscious sedation, the patient need not be NPO, and the dentist can monitor the patient as well as operate. The problems of semantics in regard to anesthesia and sedation in dentistry are illustrated by this case.

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## 2

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# Preoperative Procedures

The preoperative procedures related to dentistry care are significant in that they safeguard the patient and dentist and prevent complications. They entail the careful assessment of the patient's past and current medical status together with a precise and thorough documentation of this information.

- Case 2      Preop — Female, stethoscopic examination of heart and lungs normal. Same anesthetic given ten days previously.  
Intraop — Administered nitrous oxide or “gas oxygen.” Several teeth extracted.  
Postop — Patient died.  
Follow-up — Anesthetic recognized as the safest and generally used everywhere. No other drugs used. The machine was the best, maintained properly, and regularly tested by competent persons. Death due to circulatory failure. The defendant dentist exercised the care legally required of him.

Comment: This report illustrates the value of good preoperative procedures and the many aspects of such care noted in this chapter. This includes history, physical examination, notation of previous response to anesthesia, and careful observation and maintenance of the equipment utilized.

## PREOPERATIVE EVALUATION

The safety of outpatient dentistry is dependent on careful selection of the patient and the pain control modality utilized.

While some of the cases presented here may suggest less than adequate selection and documentation, their uniqueness is evidence of the care normally practiced. Their rarity illustrates the ability of the dentist to suspect which apparently healthy patients have a silent disease. However, current events, both medically, legally, and philosophically, demand a more structured evaluation of the patient than is currently practiced. The availability of a brief standard record form assists routine evaluation prior to treatment. The standard of clinical assessment is universal, and requires that patient care be paramount. At no time should the standards of evaluation for the outpatient be less than those for an inpatient. However, many hospitals require investigations such as a routine ECG and chest x-ray prior to general and local anesthesia which are not essential for the relatively healthy outpatient, and should not be performed. The standards for outpatient care can be met by careful documentation and physical evaluation, essential parts of the treatment.

The earlier concept, that "in general, if a patient is able to walk up a flight of stairs without dyspnea or cardiac pain, we may assume that he is a safe risk for general anesthesia,"<sup>2</sup> is no longer acceptable. As indicated in a 1970 editorial, "more reliable and precise safeguards for dental patients are available."<sup>3</sup>

Careful preoperative evaluation becomes essential because many patients are on the streets while still under active medical care. There is an increased hazard as medications are continually changed, and new medications are introduced on each occasion the patient visits the physician. This is well illustrated by the changes in therapy for depression. Initially, monoamine oxidase inhibitors were in vogue for the treatment of depression, only to be replaced by the tricyclic antidepressants. There is now a resurgence of interest in the monoamine oxidase inhibitors. The iatrogenic problems produced by such changes must be considered.

The population aged over 65 years is increasing, and this increases the hazards for outpatient care, since the elderly patient usually has more complicating diseases. Careful physical assessment will allow selection of only those for whom the

anesthesia is indicated. In addition, the increasing number of insurance plans and welfare schemes for dentistry introduces another group of patients. In this latter group, sickle cell disease could be a problem. While the increasing use of drugs for social purposes has many medical implications, a drug history is a warning that other problems could arise.

A useful guide is to have a danger list for the person administering the sedation or anesthesia. Consideration should be given to medical conditions such as a bleeding tendency, cardiovascular disease, diabetes, liver disease or renal problems, endocrine disorders, and drug addiction including alcohol. The list would include drugs such as  $\beta$ -adrenergic blockers, anticoagulants, antibiotics, antihypertensive medications, diuretics, monoamine oxidase inhibitors, and steroids which have been administered in the recent past. Surgical conditions too may alter the assessment of the patient, and an accident or injury may well dictate the type of sedation administered, and its outcome.

There would seem to be little need for a dentist trained in physical evaluation to introduce a physician to perform routine physical assessment. The dentist or physician administrator of anesthesia is more than competent to evaluate the patient for outpatient dental anesthesia, and is sufficiently alert to prevent the complications of iatrogenic disease which can occur.

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## Current Health

If an obvious problem appears the treatment appointment is deferred. Any chronic respiratory or cardiac condition can be evaluated and the patient improved and optimally prepared for treatment. Similarly, allergic problems require delay and treatment until the patient is free of symptoms and, if possible,

free of medication. It is, however, with minor viral infections that problems arise, and the decision may be difficult.

Two deaths reported by Tomlin<sup>4</sup> in his study of outpatient dental anesthesia were due to myocarditis. A female, aged 21 years, who had an abscess and tonsillitis 2 weeks before anesthesia died of severe myocarditis, and a male, aged 35 years, was found to have viral myocarditis. Both had received halothane.

### Case 3

Preop — A 16-kg 4-year-old male presented for full mouth restoration under sedation.

Intraop — Chloral hydrate 750 mg was administered by mouth, and then 50% nitrous oxide-oxygen followed by 1.8 mL of 2% mepivacaine injected into the maxilla and 1.8 mL of mepivacaine 3% into the mandible. After ten minutes of sedation, the patient seemed overly sleepy, and at 30 minutes was limp with shallow respirations but good heart sounds.

Emergency treatment — A pediatrician stopped the procedure, and admitted the child to hospital where he was placed in an oxygen tent. Recovery was without incident.

Follow-up — It was found that a double dose of brompheniramine (Dimetapp) had been administered as an antihistamine and decongestant by the parents.

Comment: The dentist failed to ask about current illnesses and medications. The patient had been seen two days previously by a pediatrician and received treatment for an upper respiratory infection.

### Case 4

Preop — A 13-year-old male with acute respiratory infection presented for tooth extraction.

Intraop — Two deciduous teeth in the left upper quadrant were removed under nitrous oxide-oxygen with halothane. The surgery lasted 30 seconds.

Postop — When the anesthetic was turned off, the boy collapsed with an ashen color. One hundred



percent oxygen was administered. The oxygen cylinder and the reserve cylinder ran empty and the patient had to be maintained with mouth-to-mouth resuscitation until the ambulance arrived. Cardiac massage and intracardiac epinephrine together with nikethamide were given but were unsuccessful.

Medicolegal, two dental deaths. *Br Med J* 1:341, 1975.

Comment: A prior recent cold was noted, and on the journey to the center the patient had been sick with a headache. The anesthesiologist had been informed by the assistant that the boy was unwell. As postmortem examination cultures yielded a mixed infection with hemolytic *Streptococcus* and virulent *Staphylococcus aureus*. The lungs were congested, red, and edematous; the larynx and trachea were congested with marked pharyngitis.

#### Case 5

Preop — A 20-year-old female patient.

Intraop — Methohexital 80 mg was administered followed by diazepam 10 mg and atropine 0.6 mg. A gag was inserted and a pack placed in the mouth. Additional methohexital 20 mg was given and drilling begun, with two further increments of methohexital 20 mg. The patient was then noted to have shallow respirations but a strong carotid pulse.

Emergency Treatment — The mouth pack was removed and the head turned to allow suction. Breathing still remained shallow and two additional dentists appeared and administered ventilation by a resuscitator. The patient was placed on the floor after a diagnosis of cardiac arrest was made and external cardiac massage begun. The ambulance arrived and the patient given oxygen. The patient died 12 hours later in the hospital.

Medicolegal, another death during dentistry. *Br Med J* 4:352, 1974.