

CHAPTER 21

Sedation—rationale

IV sedation is a relatively new technique in the dental profession. The use of IV general anesthesia in dentistry has had a long history, but it has only been within the past 20 to 30 years that intravenously induced sedation has gained a foothold. Until recently the IV route was employed almost exclusively by oral and maxillofacial surgeons, primarily because their postdoctoral training placed great emphasis on this route of drug administration. Most dental schools in the United States did not (until recently) include training in IV drug administration in their curricula and there are woefully few available courses where the postgraduate doctor can receive such training. The past 10 years, however, have seen the implementation by a growing number of dental schools of predoctoral courses in IV sedation. Because of this, and the present availability of a handful of excellent postgraduate programs in IV sedation, as well as the continued availability of 1- and 2-year residencies in general anesthesia for dentists, the number of dentists employing this valuable technique of patient management has continued to grow. It is impossible to even guess the number of dentists employing the IV route today; however, for the patient who requires this form of therapy it has become quite a bit easier to locate a doctor who employs this route for nonsurgical procedures.

ADVANTAGES

1. The onset of action of intravenously administered drugs is the most rapid of the techniques discussed in this book. The usual arm-brain circulation time is approximately 20 to 25 seconds. Though there may be some individual variation in this and in the onset of action for different drugs, overall the IV route of drug administration permits the most rapid onset of action.

2. Because of the rapid onset of action of most intravenously administered drugs, the dosage may be tailored to meet the needs of the patient. Guesswork involved in determining proper dosage of a drug employed orally, rectally, or intramuscularly is eliminated when the drug is administered via the IV route. As has been mentioned earlier, this concept of individualizing drug dosages is termed *titration* and represents one of the most important safety factors involved in IV drug administration.

3. Because of the rapid onset of action of most drugs, the doctor is able to provide the patient with a suitable level of sedation. The level of sedation must never, of course, venture beyond that level to which the doctor has been trained. Light, moderate, and deep levels of sedation can easily be achieved via the IV route and the doctor must always be cognizant of his or her limitations, as based on prior experience and training.

4. The recovery period for most intravenously administered drugs will be significantly shorter than that seen for the same drug when administered via the oral, rectal, or IM route. The recovery from intravenously administered drugs will, however, be considerably longer than that following inhalation sedation.

5. In the continuous IV infusion technique, as recommended in this book, a patent vein is maintained throughout the procedure. This facilitates reinjection of additional medication (though this is rarely necessary), however, the major significance of the patent vein is that an avenue exists through which emergency drugs may be administered in the event of a serious medical emergency arising during IV therapy.

6. The side effects of nausea and vomiting are extremely uncommon when drugs are administered intravenously, as recommended in this book.

7. Control of salivary secretions is possible through IV administration of anticholinergic medications. This will be of benefit to the doctor during various forms of dental therapy.

8. The gag reflex is diminished. Patients receiving IV sedation will rarely experience difficulty with their gag reflex. This action is similar to that occurring with N₂ O-O₂ inhalation sedation. If the only requirement in a patient is a decrease in gag reflex, inhalation sedation is much preferred over IV therapy. Only in the event that inhalation sedation fails to alleviate gagging should IV sedation be employed for this purpose.

9. Many of the medications employed intravenously for sedation will effectively diminish motor disturbances (e.g., seizure activity and cerebral palsy).

10. The ability to readily establish an IV infusion may prove to be important in any emergency situation. Although antidotal drug therapy is not always recommended for the effective management of all emergency situations, the ability to establish an IV line provides immediate access to the cardiovascular system should it become necessary to administer drugs to the victim. By using IV sedation on a regular basis, the doctor is better able to maintain proficiency in venipuncture.

DISADVANTAGES

1. Venipuncture is necessary. Although most patients will tolerate the venipuncture with little or no difficulty, some patients are unable to psychologically accept needles anywhere in their body.

Children may be particularly difficult to manage via this route because veins are proportionally smaller in smaller patients, making the venipuncture itself more difficult. Younger children requiring IV sedation will usually be severe management problems or be physically unable to control themselves.

Not all patients have veins that are easy to visualize and gain access to with a needle. Probably the most significant hurdle facing the doctor learning to use IV sedation is to become proficient at the technique of venipuncture. Venipuncture is a learned skill, one that becomes easier to perform as experience is gained.

2. Complications may arise at the site of the venipuncture. As will be discussed in Chapter 27, there are a variety of minor and some major complications that might arise at the site of venipuncture. These include hematoma, phlebitis, and intraarterial injection of a drug.

3. Monitoring of the patient receiving IV sedation must be more intensive than that required in other conscious sedation techniques. Because intravenously administered drugs act so rapidly the entire dental team must be trained to assess the physical condition of the patient throughout the procedure. The more profound the degree of sedation, the greater the significance of increased patient monitoring.

4. Recovery from intravenously administered drugs is not complete at the end of the dental treatment. All patients receiving any intravenously administered CNS depressant must be escorted from the dental office by a responsible adult companion.

5. Although the depth of sedation provided by intravenously administered drugs can be deepened relatively rapidly (by administration of additional drug), the converse is not true. Most intravenously administered drugs cannot be reversed by antagonist drugs. Though antagonists do exist for several agents, specifically narcotics, diazepam, and scopolamine, these antagonists possess potentially serious side effects and are not recommended for routine administration. Should a patient become overly sedated, the most effective management in all situations is the maintenance of basic life support: assure a patent airway, assist or support ventilation, and provide for effective circulation of oxygenated blood. Following these steps consideration may be given to antidotal drug therapy.

CONTRAINDICATIONS

1. Unless a doctor has received specific training in the administration of CNS depressant drugs to patients under the age of 6 and over 65 years of age, IV sedation is relatively contraindicated in these groups. The primary reason for this recommendation is that in both of these groups there is a greater than usual incidence of overreaction to therapeutic dosages of CNS depressants. In other words, many of these patients will require smaller dosages of a drug to achieve a desired clinical level of sedation. This ought not be a problem since the doctor administering the drug will always be titrating slowly; however, extreme caution must be exercised whenever the younger or older patient receives CNS depressants via any route. Because of the extremely rapid onset of action of intravenously administered drugs, this route should be reserved for use by the individual specifically trained or experienced in managing these patients (e.g., pediatric dentist).

2. Pregnancy is a relative contraindication to the use of IV sedation because most central nervous system depressants will cross the placenta into the fetus and may produce birth defects in the developing fetus. The subject of sedation in pregnancy is fully discussed in Chapter 5.

3. A history of significant hepatic disease is a contraindication to the use of IV sedation. Most intravenously administered drugs undergo biotransformation within the liver into pharmacologically inactive products. The presence of significant liver damage may alter the rate at which these drugs undergo inactivation. This can lead to a prolongation of the clinical action of the drug as well as a more profound effect from the same dose. Most patients with serious liver impairment (cirrhosis, hepatitis) are not ambulatory; however, whenever a patient has a history of liver disease, the doctor should pursue an in-depth dialogue history and give consideration to medical consultation should any doubt remain as to the patient's physical status.

4. Thyroid dysfunction is a relative contraindication to the use of IV sedation. Patients who are *clinically* hypothyroid are particularly sensitive to CNS depressants, such as sedative-hypnotics, anti-anxiety agents, and narcotic analgesics. Patients exhibiting clinical signs of hypothyroidism should not be administered IV sedation. Table 21-1 lists clinical signs and symptoms of hypothyroidism. This represents a relative contraindication, for in the event that other sedative techniques (e.g., inhalation sedation) prove to be inadequate, lighter levels of IV sedation may be provided. Titration ought to be carried out even more slowly than is

usually recommended. Patients who are hypothyroid but are currently being treated through the administration of thyroid medications can safely receive IV sedation.

Patients who are *clinically* hyperthyroid (Table 21-1) are likely to prove extremely difficult to sedate. Additionally, drugs such as the anticholinergics atropine and scopolamine ought not be administered to the clinically hyperthyroid patient. Both of these drugs possess vagolytic properties, producing an increase in the heart rate. As hyperthyroid individuals have a significant increase in heart rate already, further increase in the rate of the heart might well prove deleterious to the patient. Patients with a history of being hyperthyroid but who through either surgery or drug therapy are presently euthyroid (normal thyroid function) may receive IV drug therapy with minimal increase in risk.

5. Adrenal insufficiency is a relative contraindication to the use of IV sedation. Patients receiving chronic corticosteroid therapy or patients suffering from Addison's disease may be less able to physiologically handle the stresses involved in dental therapy than are patients with normal functioning adrenal cortices. Though these patients require careful management (see stress reduction protocol—Chapter 5), deeper levels of sedation are not recommended. IV sedation may be employed; however, only light to moderate sedation levels are recommended.

6. Patients receiving either MAOIs or tricyclic antidepressants should be carefully evaluated prior to the administration of any CNS depressants. These drugs are employed in the management of states of depression. Prior to the administration of any other drugs that have the ability to alter mental function (e.g., CNS depressants), medical consultation with the patient's psychiatrist or physician is recommended. Narcotic analgesics and barbiturates are synergistic with these two groups of drugs.

7. IV sedation is not contraindicated in patients with a history of psychiatric disorders; however, it is strongly recommended that medical consultation be sought prior to the administration of CNS depressant medications.

8. Patients who are extremely obese present a variety of problems. It may be extremely difficult to locate any superficial veins because of the excessive amounts of skin and fat. Of greater importance is the fact that in markedly obese persons there is usually a concomitant decrease in their cardiovascular and pulmonary reserves. Other

Table 21-1. Signs and symptoms of hypothyroidism and hyperthyroidism

<i>Hypothyroidism</i>	<i>Hyperthyroidism</i>
Weakness	Nervousness
Dry skin	Increased sweating
Lethargy	Hypersensitivity to heat
Slow speech	Palpitation
Sensation of cold	Fatigue
Gain in weight	Eye signs (exophthalmos)
Cold skin	Increased appetite
Thick tongue	Tachycardia
Edema of face	Goiter
Pallor of skin	Tremor
Memory impairment	Weight loss
Decreased sweating	Weakness
Loss of hair	

forms of sedation, especially inhalation sedation, ought to be considered first, IV sedation being considered only if other techniques prove ineffectual.

9. Probably one of the most significant contraindications to the use of IV sedation in the dental office is a dearth of visible superficial veins. All IV procedures in the dental office will be of an elective nature. It seems patently unfair to the patient to have to endure three or more unsuccessful venipuncture attempts so that we can give them a drug to help them to relax. As is discussed in Chapter 24, one of the objects of the preliminary visit is to determine whether or not the patient is an acceptable candidate for the proposed procedure. One of the objectives of the visit will be to look for the presence of adequate veins.

10. When employing IV sedation the doctor must specifically question the patient regarding prior history with each of the drugs being employed in the procedure. Allergic responses and "hyperresponders" may be found in this manner. In addition, each drug has specific contraindications to its use. The package insert for the specific drug or Chapter 25 of this book should be reviewed for this important information. Examples of these contraindications follow:

Narcotics (specifically meperidine); asthma

Barbiturates: asthma, porphyria

Anticholinergics: glaucoma, prostatic hypertrophy

INDICATIONS

The major indications for the use of IV sedation are essentially the same as those of other sedative techniques. There are, however, a number of indications for IV sedation that are not found for other techniques. These include the control of salivary secretions and the production of amnesia.

IV sedation is not a technique that should be employed as readily as is inhalation sedation. Before using IV techniques the doctor should carefully consider other procedures, especially inhalation sedation. IV sedation should be considered for use only in those situations in which there exists a specific indication for it.

Anxiety

As with inhalation sedation and the other techniques discussed in this book, the primary indication for use of sedation is the presence of anxiety. Unlike inhalation sedation, however, the use of IV sedation ought to be reserved for those patients in whom other techniques have proved in-

adequate or for patients in whom prior history or the doctor's experience indicates that the IV route is the only method to employ.

In most instances the IV route should be reserved for patients exhibiting rather pronounced levels of apprehension and fear of the dental situation. Inhalation sedation can often effectively manage the patient with a lesser degree of anxiety. However, there will be occasions when IV sedation is required even for these patients.

Amnesia

A significant advantage of the IV route of administration is its ability to provide a degree of amnesia or a lack of recall. Whether or not amnesia develops following IV drug administration is dependent on a number of items.

Some drugs are much more likely to provide amnesia than others. Diazepam, midazolam, and scopolamine are examples of agents that have a greater degree of amnesia associated with their administration; meperidine and pentobarbital are less likely to provide an amnesic effect.

The depth of sedation has an effect on whether or not amnesia develops and on the duration of the amnesic period. In general, given the same patient and the same drug (e.g., diazepam), more profound levels of sedation will provide greater degrees of amnesia. This factor is the major reason for my considering amnesia "the icing on the cake" during a sedation procedure. The major goal of sedation is to relax the patient. In most cases this can be achieved with the patient lightly sedated. The patient may tolerate the procedure quite well but at its conclusion may not appear to be amnesic. In such a situation, the sedation procedure must be considered a success. The goal of managing the difficult patient more easily and effectively was accomplished. Should there appear to be a lack of recall of events developing during the procedure, so much the better. It is safer to provide the patient comfortable dental treatment with total recall at a lighter level of sedation than it is to provide comfortable dental treatment with total lack of recall at deeper levels of sedation. With the loss of consciousness lack of recall (amnesia) is virtually 100%, yet the risk to the patient is significantly greater.

As with all other factors relating to drug response, there is a significant degree of individual variation in the development of amnesia. Some patients will be amnesic following seemingly very light levels of sedation, while others may demonstrate no apparent amnesia after deeper levels of

sedation. Such response is consistent with normal variation in response to drug administration.

Medically compromised patient

The IV route of sedation is indicated in the management of persons who are medically compromised and are unable to tolerate stress in a normal manner. Though inhalation sedation is the preferred route in most of these patients, *light* levels of IV sedation can also be employed in many of these situations.

ASA II or III cardiovascular risk patients

Examples of cardiovascular situations in which the IV route should be considered include angina pectoris, previous myocardial infarction, certain arrhythmias, congestive heart failure, and high blood pressure. The preferred route of sedation for all of these disorders is inhalation sedation with N₂O and O₂. In all of these cardiovascular disorders, the clinical status of the patient will deteriorate should the level of O₂ in the myocardium or in the blood become insufficient to meet the heart's demands. With N₂O-O₂ sedation the occurrence of such a situation is virtually impossible. Whenever IV sedation is employed in the ASA III patient there are two recommendations:

1. Employ only light levels of sedation.
2. Administer 3 lpm of O₂, via nasal cannula or nasal hood, throughout the sedative procedure.

Previous cerebral vascular accident

The patient who has suffered a stroke falls into the ASA II, III, or IV category. The ASA status of the patient is determined by the duration of time since the CVA and the presence or absence of residual signs and symptoms of CNS dysfunction.

As with cardiovascular risk patients, the CVA patient may require sedation during dental treatment. Although N₂O-O₂ is the preferred technique because of the increased percentage of O₂ being administered, IV sedation can be employed if the same recommendations (as listed for cardiovascular risk patients) concerning depth of sedation (light only) and the administration of O₂ are strictly adhered to.

Epilepsy

Epileptic patients are acceptable candidates for IV sedation. In most cases the seizure activity of the patient is controlled through the administration of anticonvulsant medications on a daily ba-

sis. Such patients will be able to tolerate almost any technique of sedation with little or no difficulty. It is in the patient whose seizure activity has not been controlled effectively that the IV route may prove particularly beneficial. Stress is one factor that acts to precipitate seizure activity; therefore stress reduction is recommended. Though inhalation sedation may prove to be effective, the use of intravenously administered benzodiazepines, particularly diazepam and midazolam, is recommended. The Jorgensen technique, which includes pentobarbital, may also be used in these patients. These agents are effective anticonvulsants, agents that will be administered intravenously should a protracted seizure develop. Their use as IV sedative agents will greatly diminish (though not entirely eliminate) the likelihood of a seizure developing during treatment. Consultation with the patient's physician is recommended prior to IV sedation in these patients. The use of O₂ via nasal cannula or nasal hood is strongly recommended in these patients, as any degree of hypoxia may precipitate a seizure. Light to moderate levels of sedation may be safely employed in these patients.

Other medically compromised patients

The IV route can also be employed for many other medically compromised patients. ASA IV patients should not receive IV sedation within the dental office, such treatment being relegated to the operating room or the hospital where medical consultation and a more controlled environment can be provided. The ASA II and III patients are usually acceptable candidates for sedation. Whether or not the IV route is appropriate can be determined through a consultation with the patient's physician. The administration of supplemental O₂ throughout the IV procedure is recommended for all ASA II, III, and IV patients.

Control of secretions

There are occasions during dental treatment when it may be beneficial to decrease the volume of salivary secretions. The major indication for this will be impression taking following preparation of teeth for full coverage. Other occasions when drying of the mouth may prove beneficial are during restorative dentistry and surgical procedures. Anticholinergic medications may be administered orally, intramuscularly, and intravenously. It is the IV route, however, that provides the most effective and reliable results. Agents such as atropine, scopolamine, and glycopyrrolate

may be administered intravenously either in conjunction with other CNS depressants or alone.

Analgesia

Though not the ideal method of providing a degree of pain control in dentistry, intravenously administered analgesics may be employed to *assist* in obtaining clinically adequate pain control. Local anesthetics remain the ideal drug for eliminating discomfort during dental treatment; however, occasions do arise when these drugs do not provide entirely adequate relief of discomfort. In such situations the administration of some CNS depressant agents, such as N₂O-O₂ or narcotic analgesics, will elevate the pain reaction threshold of the patient, thereby decreasing or at least modifying the patient's response to noxious stimulation.

The use of intravenously administered drugs as the sole means of achieving pain control is ineffective in the absence of general anesthesia. General anesthesia should not be considered unless the doctor has completed a residency in it (see Section Six).

Diminish gagging

Some dental patients have a significant problem with gagging whenever instruments or fingers are placed in the posterior part of their oral cavity. Whatever the reason for this response, it becomes difficult, if not impossible, for the doctor to treat these patients. Several sedation techniques have the added benefit of diminishing the gag reflex. Most notable among these is IV sedation followed

closely by inhalation sedation with N₂O-O₂.

In most instances, the use of inhalation sedation is recommended to control a hyperactive gag reflex. To obtain a few intraoral radiographs or an impression takes but a few minutes and IV sedative techniques are too long-acting for these procedures; therefore inhalation sedation is recommended. If a patient has difficulty whenever anything is placed in his or her mouth (e.g., hand-piece, explorer) and treatment is to last for an hour or more, the use of IV sedation becomes more reasonable.

The indications for the use of intravenously administered drugs are quite numerous. Although the obvious indication is fear and apprehension, the doctor should be aware that many other indications for the use of IV sedation do exist.

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