

Conscious Intravenous Sedation in Dentistry - A Review of Current Therapy

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Background:

Historically, dental professionals Victor Goldman and Stanley Drummond-Jackson in England and Adrian Hubbell in the United States pioneered the use of IV anesthesia for ambulatory oral surgery patients in the 1930s.

In White PF, editor: *Outpatient anesthesia*, New York, 1990, Churchill Livingstone.

The management of anxious patients in the dental office has been, and still is a challenging aspect of dentistry. Despite the variety of local and systemic measures available, the dental office still has a negative stigma in the general population. Conscious sedation is a technique which allows patients to tolerate procedures. Safe and adequate sedation requires much attention to patient selection, clinical environment and careful pre-op, intra-operative and post-operative monitoring.

- A number of drugs can be used alone or in combination to achieve a desirable state of sedation
- oral and intravenous benzodiazepines can be safely administered by appropriately trained practitioners.

This article provides practitioners, surgeons, and recent graduates with a review of the literature, guidelines and methods used in the practice of (IV) conscious sedation. Goals of successful sedation should include a physical and psychological evaluation.

The plan should:

1. Determine the patient's physical status and the length of the procedure
2. Determine the patient's psychological status
3. Determine whether sedation is indicated
4. Determine whether treatment modifications are needed
5. Determine which drug regimen is appropriate
6. Determine whether contraindications exist for sedation or specific drugs

The American Society of Anesthesiologists (ASA) mandates that "during moderate or

deep sedation, the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and monitoring for the presence of exhaled carbon dioxide unless precluded or invalidated by the nature of the patient, procedure, or equipment.”

Moderate/Conscious Sedation: (also referred to as IV conscious sedation)

- Definition: a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate, as well as cardiovascular function.
- The therapeutic goal of most dental procedures
- Patients must retain the protective airway reflex, and be able to respond to verbal communication
- Drugs used must carry a margin of safety
- The practitioner should have the knowledge, training and skill to manage the level of sedation

ASA definitions of different levels of anesthesia

Table 1 Definitions for different levels of sedation and anesthesia	
Minimal or anxiolysis	A drug-induced state during which patients respond normally to verbal commands. Although cognitive function and physical coordination may be impaired, airway reflexes, ventilation, and cardiovascular functions are unaffected
Moderate or conscious sedation	A drug-induced depression of consciousness during which patients respond purposefully** to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained
Deep/analgesia	A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilation function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained
General	A drug-induced loss of consciousness during which patients cannot be aroused, even by painful stimulation. The ability to independently maintain ventilatory function is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired

Adapted from American Society of Anesthesiologists. Continuum of depth of sedation: definition of general anesthesia and levels of sedation/analgesia (approved by the ASA House of Delegates on October 13, 1999, and last amended on October 15, 2014).

PREOPERATIVE ASSESSMENT

- Successful outcome depends heavily on the experience of the clinician and patient selection.
- Having a comprehensive medical and dental history

Medical history

- Patient should provide a thorough medical, surgical and family history.
- History of drug or alcohol abuse should be documented
- The history is divided into major sections: the chief complaint, history of present illness, past medical history, review of systems, family history, and

- social history
- Concerning conditions:
 - ischemic disease resulting in angina, myocardial infarction, heart failure, valvular disease, and cardiac arrhythmias.
 - Conditions that might affect drug administration due to changes in metabolism and airway compromise:
 - Liver disease, renal function or respiratory disorders
 - Previous reactions to anesthesia or family history of adverse reaction to anesthesia

Medications:

- Gives insight of patient's medical status and drug interactions
- Medications including prescribed, over the counter, or homeopathic medications
- Steroid, insulin, anticoagulants, and use of sympathomimetics increase risks if not managed before sedation.

Physical Evaluation:

- Vital signs for baseline patient information
- Age, weight, height and BMI
- Patient is assigned an ASA classification
- Mallampati classification system classifies the airway to ensure that a patent airway is available before sedation.

Table 2 ASA classification system for administration of anesthesia	
ASA I	Healthy (ie, nonsmoking, no or little alcohol use)
ASA II	Mild systemic disease (ie, current smoker, well-controlled disease, pregnancy, obesity)
ASA III	Severe systemic disease (ie, 1 or more moderate to severe diseases)
ASA IV	Severe systemic disease that is a constant threat to life (ie, unstable disease myocardial infarction, cardiovascular accident)
ASA V	Patient who is not expected to survive without surgical intervention
ASA VI	Organ donor, patient is brain dead
*The addition of E denotes emergency surgery (an emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part)	

Adapted from American Society of Anesthesiologists (ASA). ASA physical status classification system. Available at: <http://www.asahq.org/resources/clinical-information/asa-physical-status-classification->

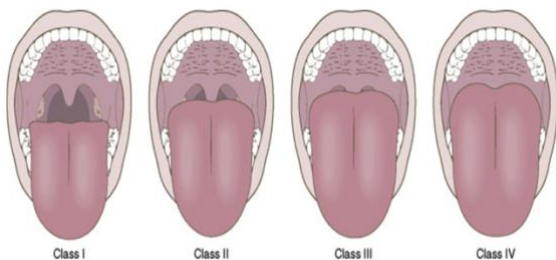


Fig. 1. Different classifications. (From Sweitzer BJ. Preoperative evaluation and medication. In: Miller RD, Pardo MC. Basics of anesthesia. 6th edition. Philadelphia: Saunders, 2011; with permission.)

Table 3 Mallampati classification system	
Class I	Complete visualization of the uvula, tonsillar pillars, and soft palate
Class II	Partial visibility of the uvula and complete soft palate
Class III	Only the soft palate is visible
Class IV	Only the hard palate is visible

From Mallampati SR. Clinical sign to predict difficult tracheal intubation (hypothesis). Can Anaesth Soc J 1983;30:316-7.

Inhalation Agents:

Nitrous oxide:

- An inhaled anesthetic
- Potency defined by minimum alveolar concentration (MAC)
- Diffusion hypoxia seen in the first 10 minutes of recovery
- Nitrous oxide is contraindicated in patients with pneumothorax or in procedures in which air embolus is a risk, as well as in middle ear surgical procedures
- Rapid onset of <5 min and recovery is rapid
- When combined with a benzodiazepine or fentanyl, a deeper level can be reached with lower dosage of the narcotic or benzodiazepine.
- 50% percent nitrous with oxygen can produce minimal sedation and 70% nitrous with oxygen can produce moderate sedation

Benzodiazepines

- diazepam and midazolam are widely used in dentistry for moderate sedation
 - amnesic, hypnotic, sedative, anxiolytic, anticonvulsant, and muscle relaxant properties
- Midazolam is formulated with 1 mg or 5 mg/mL of midazolam plus 0.89% sodium chloride and 0.019% disodium edetate, with 1% benzyl alcohol as a preservative.
- Midazolam is highly lipophilic, therefore has a fast onset in the CNS, and a large volume of distribution
- Patient age, weight and hepatic and renal function all affect the duration of action of the drug.
- Decreased respiratory rate seen when combined with opioids
- Combination with nitrous oxide and midazolam has minimal hemodynamic effects compared to the combination of opioids and benzodiazepines
- Nitrous administration prior to benzodiazepines may decrease anxiety prior to placing IV line.
- Adult dose is 0.5 mg to 1.0 mg IV administered over 2 minutes and titrated until the desired level of sedation is obtained

Reversal Agent:

Flumazenil

- Competitive GABA receptor antagonist, and can effectively reverse the effects of a benzodiazepine
- Reverses respiratory depression, amnesia, and sedative effects

Naloxone

- Opioid antagonist can reverse respiratory depression, urinary retention, rigidity, and nausea and vomiting associated with opioids.

Monitoring:

1. Arterial blood pressure must be monitored every 5 minutes for patients receiving anesthesia.
 - a. Non invasive blood pressure monitoring using a cuff is sufficient
2. Pulse oximetry
 - a. Baseline reading of arterial oxygen saturation. Must be continually monitored to ensure the patient is being sufficiently oxygenated
3. Capnography
 - a. Measurement of carbon dioxide in expired gas
4. Electrocardiogram
 - a. A measurement of the electrical voltages produced by the heart
 - b. For moderate sedation, ECG monitoring is required if there is a cardiovascular disease history or when a dysrhythmia is anticipated or detected. It is recommended that an ECG monitor be used for any in-office sedation procedure.

Summary:

- Sedation is an integral part in providing high-quality dental care
- Goals should be to maximize comfort, decrease pain by providing sedation, amnesia and analgesia
- Careful patient pre-operative assessment, intra-operative monitoring, and post-operative care is extremely important to decrease the risk during procedures where sedation will be used

Reference:

J.H. Southerland, L.R. Brown

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