Chapter 1 Conscious IV Sedation Utilizing Midazolam

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INTRODUCTION

Dental fear and anxiety are the common reasons why patients avoid seeking proper dental care. A survey conducted in the US has reported up to 30.5% of both US adults and adolescents experience a moderate to high dental fear (Gatchel 1989). Therefore, it is important for dentists to understand the management of dental fear and anxiety as an integral component of the overall treatment.

As defined by the American Society of Anesthesiologists (see Table 1.1), the continuums of depth of sedation are:

- Minimal Sedation: Normal response to verbal stimulation.
- Moderate Sedation: Purposeful response to verbal or tactile stimulation.
- Deep Sedation: Purposeful response following repeated or painful stimulation.
- General Anesthesia: Unarousable even with painful stimulus.

According to the American Society of Anesthesiologists moderate sedation is also known as "Conscious Sedation," and by definition, conscious sedation is "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."

Conscious sedation can be achieved by different routes of administration such as enteral or parenteral administration. For the purpose of this chapter, parenteral administration of conscious sedation limited to intravenous administration of Midazolam (Versed) will be reviewed.

Training in Intravenous Conscious Sedation

While IV conscious sedation is relatively safe to practice, only a qualified and well-trained healthcare provider who is able to manage emergency complications should perform the practice. Dentists who practice IV conscious sedation are mandated by all states to be certified by an approved continuing education program. Furthermore, each state is governed by its own rules and regulations for the administration of conscious sedation, therefore it is important to verify with the individual state dental board for the proper requirements to obtain a permit to practice IV conscious sedation.

MIDAZOLAM (VERSED)

Midazolam is a water soluble, short acting benzodiazepine central nervous system (CNS) depressant. Pharmacologically, it produces anxiolytic, hypnotic, anterograde amnestic, muscle relaxation, and anticonvulsant effects (Reves et al. 1985). Metabolized in the liver by cytochrome P450 enzymes, its mechanism of action is through binding of the $GABA_A$ receptors, (causing an influx of chloride ion which causes hyperpolarization of the neuron's membrane potential) creating a neural inhibition effect.

The onset of intravenous administration of midazolam is relatively fast with a short acting duration. Intravenous administration of 5 mg of midazolam in healthy adults has shown to take effect one to two minutes after administration and has a half-life of approximately one to three hours (Smith et al. 1981).

It is important to understand that the use of midazolam is to produce conscious sedative effects and does not replace the need for proper local anesthesia. Therefore proper anesthetic should be administered prior to the starting of the dental procedure.

Practical Advanced Periodontal Surgery, Second Edition. Edited by Serge Dibart.

Companion website: www.wiley.com/go/dibart/advanced

Table 1.1 Continuum of sedation: definition and levels (2004).

Continuum of depth of sedation: definition of general anesthesia and levels of sedation/analgesia				
	Minimal sedation (Anxiolysis)	**Moderate sedation/analgesia (Conscious sedation)**	**Deep sedation/Analgesia**	**General anesthesia**
Responsiveness	Normal response to verbal stimulation	Purposeful[a] response to verbal stimulation	Purposeful[a] response following repeated or painful stimulation	Unarousable even with painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

[a] Reflex withdrawal from a painful stimulus is NOT considered a purposeful response.

ARMAMENTARIUM

Monitoring equipment for:

- Non-invasive Blood Pressure (NIBP)
- Electrocardiogram (EKG)
- Pulse Oximetry
- Capnography

IV Supplies:

- 0.9% Sodium Chloride Injection 250 ml bag
- Primary IV set (100″)
- 22 Gauge × 1″ Introcan Safety® IV Catheter
- 24 Gauge × ¾″ Introcan Safety IV Catheter

Basic Supplies:

- 1 ml Insulin Syringe
- Blunt Plastic Cannula
- Nasal Cannula
- Supplemental Oxygen
- 1″ Latex free Tourniquet
- 3M Tegaderm Film Transparent Film Dressing
- 3M Transpore Tape
- Gauze
- Band-Aids
- Alcohol Wipes

Basic Medications:

- Midazolam 5 mg/1 cc
- Flumazenil 5 cc
- ACLS Emergency Medical Kit (HealthFirst)

Please see Figure 1.1.

STEPS IN IV SEDATION

Patient pre-op evaluation: As with all dental procedures, a thorough review of the patient's medical history is essential to ensure safe and successful treatment. Review of the patient's medical history with complete review of the system, current medications, as well as drug allergies will provide you the necessary information to assess the patient utilizing the ASA Physical Status Classification System (see Table 1.2). The authors recommend limiting the administration of conscious sedation with patients with ASA Physical status of 2 or less to reduce the chance of medical emergencies.

Contraindication:

- Hypersensitivity
- Acute narrow-angle glaucoma
- Hypotension
- Pregnancy
- Renal disease
- Critically ill patients

Pre-op instructions

- No food or drinks eight hours prior to procedure.
- Please wear comfortable loose-fitting clothing with short sleeves to allow for monitoring of your blood pressure.
- Must be accompanied by a person of legal age to escort you home.
- No sedatives for 24 hours before appointment.

Day of Procedure:

- Seat the patient
- Review medical history. *If patient has medical history of asthma instruct patient to take two puffs of asthma inhaler prior to starting of procedure.*

Figure 1.1 Armamentarium needed to provide sedation: monitor, drug, IV sedation set.

Table 1.2 ASA physical status classification (American Society of Anesthesiologists 2015).

ASA physical status classification system	
ASA Physical Status 1	A normal healthy patient
ASA Physical Status 2	A patient with mild systemic disease
ASA Physical Status 3	A patient with severe systemic disease
ASA Physical Status 4	A patient with severe systemic disease that is a constant threat to life
ASA Physical Status 5	A moribund patient who is not expected to survive without the operation
ASA Physical Status 6	A declared brain-dead patient whose organs are being removed for donor purposes

Figure 1.2 Pulse oximetry, oxygen cannula, blood pressure cuff.

- Attach patient monitors (See Figure 1.2) for:
  - Blood pressure
  - Electrocardiography (EKG)
  - Pulse oximetry (Oxygen saturation)
  - Capnography (CO2 partial pressure) Give earliest warning of respiratory distress
- Record pre-operatory vital signs: Blood pressure, pulse, respiratory rate, oxygen saturation, end tidal CO_2 level. If vital signs not within normal range re-evaluate patient for the procedure.

Pre-operative vital signs chart

Diagnosis	Systolic (mm Hg)	Diastolic (mm Hg)
Normal	Less than 120 and	Less than 80
Prehypertension	120–139 or	80–89
Hypertension Stage 1	140–159 or	90–99
Hypertension Stage 2	160 or higher or	100 or higher

	Average range
Pulse Rate	Adult 60–80 beats/min
Respiratory Rate	12–20 breaths/min
Oxygen Saturation	95–100%
End tidal CO_2	35–45 mm Hg

- Starting of IV:
  - Complete assemble of Primary IV infusion set with 0.9% Sodium Chloride Injection bag See Figure 1.3.
  - Exam and select visible superficial vein for venepuncture: Location: Dorsum of hand/wrist, Ventral Forearm, or Antecubital Fossa.
    - Contraindication for venepuncture site are:
      - Mastectomy
      - Cannulas
      - Scarring
      - Vein with valves or bifurcations

Figure 1.3 Saline bag used for IV sedation.

- Methods of venous distension to facilitate venepuncture.
  - Application of tourniquet 3–4 in. above collection area with appropriate compression
  - Opening and closing of hand
  - Hanging of the arm below heart
  - Light slapping or rubbing of the area with alcohol wipe
- Select appropriate Introcan Safety I.V. Catheter *(22/24 gauge is recommended).* See Figures 1.4 and 1.5.
- Disinfect selected area of venepuncture with 70% isopropyl alcohol wipe
- Insertion of needle and observe for blood return in the flashback chamber
  - *Caution: At no time should venepuncture be performed on an artery*
- Remove tourniquet
- Attach infusion set to catheter adaptor
- Start IV drip, constant drip should be observed. See Figure 1.6.

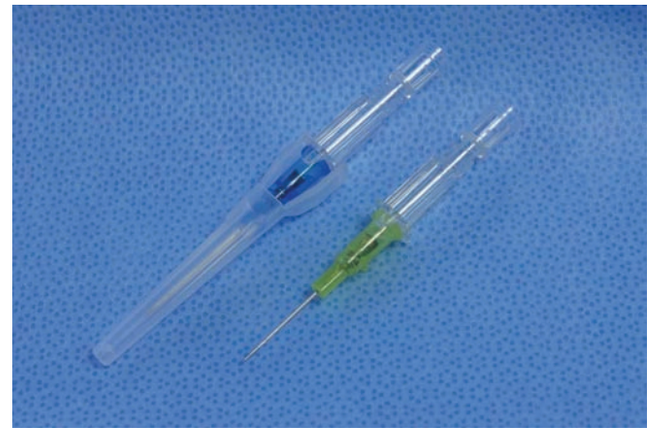

Figure 1.4 IV catheters of various size.

  - *Caution: Initially exam the area of venepuncture after starting IV drip for swelling to ensure proper venepuncture has been performed*
- Stabilize the catheter with 3M Tegaderm Film Transparent Film Dressing and 3M Transpore Tape. See Figure 1.7.

- **Dosage and Administration**
  - Use the 1 ml Insulin Syringe U-100 to draw up 1 ml of 5 mg/ml midazolam. See Figure 1.8.
  - Dosage and administration indicated for the intravenous administration of midazolam as provided by pharmaceutical company Hospira Inc. is as follows:
    - **Healthy Adults Below the Age of 60:** Titrate slowly to the desired effect (e.g. the initiation of slurred speech). Some patients may respond to as little as 1 mg. No more than 2.5 mg should be given over a period of at least two minutes. Wait an additional two or more minutes to fully evaluate the sedative effect. If further titration is necessary, continue to titrate, using small increments, to the appropriate level of sedation. Wait an additional two or more minutes after each increment to fully evaluate the sedative effect. A total dose greater than 5 mg is not usually necessary to reach the desired endpoint.
    - **Patients Age 60 or Older, and Debilitated or Chronically Ill Patients:** Because the danger of hypoventilation, airway obstruction, or apnea is greater in elderly patients and those with chronic disease states or decreased pulmonary reserve, and because the peak effect may take longer in these patients, increments should be smaller and the rate of injection slower. Titrate slowly to the desired effect (e.g. the initiation of slurred speech). Some patients may respond to as little as 1 mg. No more than 1.5 mg should be given over a period of no less than two minutes. Wait an additional two or

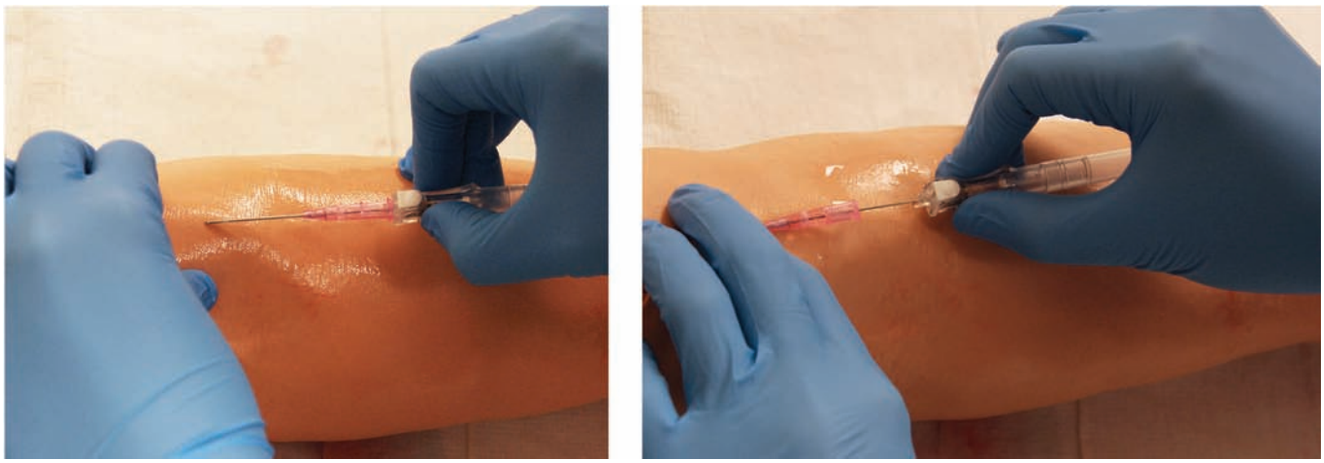

Figure 1.5 Catheter insertion in the vein.

Figure 1.6 IV drip, monitoring the fluid that goes into the IV line.

more minutes to fully evaluate the sedative effect. If additional titration is necessary, it should be given at a rate of no more than 1 mg over a period of two minutes, waiting an additional two or more minutes each time to fully evaluate the sedative effect. Total doses greater than 3.5 mg are not usually necessary. If concomitant CNS depressant premedications are used in these patients, they will require at least 50% less midazolam than healthy young unpremedicated patients.

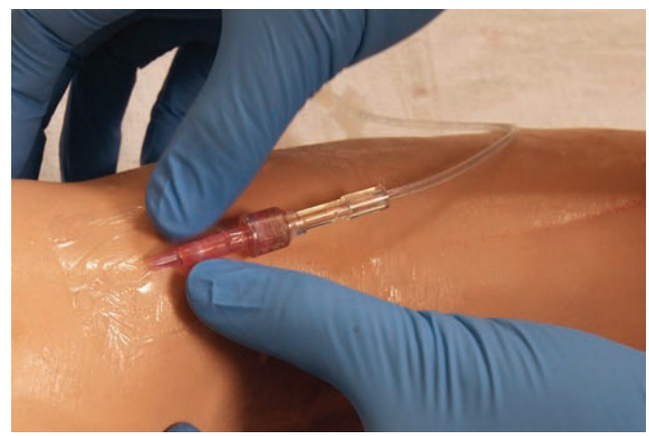

Figure 1.7 IV portal secured with transparent film dressing.

- Starting of procedure is initiated with administering of appropriate local anesthesia after desired sedative effect is achieved.
  - **Maintenance Dose:** Additional doses to maintain the desired level of sedation may be given in increments of 25% of the dose used to first reach the sedative endpoint, but again only by slow titration, especially in the elderly and chronically ill or debilitated patient. These additional doses should be given only after a thorough clinical evaluation clearly indicates the need for additional sedation. For conscious sedation in diagnostic or surgical interventions carried out under local anesthesia (Hospira, Inc., Midazolam Injection 2010).
- Upon completion of the procedure, stop the flow of the IV infusion followed by the removal of the IV catheter.

Figure 1.8 Use the 1 ml Insulin Syringe to draw up 1 ml of 5 mg/ml midazolam.

Place sterile gauze over site of venepuncture and apply firm pressure for three to five minutes to prevent hematoma.

- Escort patient to recovery room and continue to monitor patient's vital signs, once recovered release patient to escort.

Post-operative instructions:

a. No sedatives 12 hours after procedure.

b. No consumption of alcoholic beverages after procedure.

c. No stairs without assistance or heavy lifting until completely recovered.

d. Do not drive, operate heavy machinery, or do any dangerous activities for the rest of the day.

e. Do not make important decisions for 24 hours after your appointment.

f. Drink lots of water for at least 12 hours after your appointment.

Reversal agent for midazolam:

In a situation when a patient is oversedated and does not respond purposefully to verbal commands. The reversal agent for benzodiazepine, flumazenil (Romazicon) can be administered. It reverses the effects of benzodiazepines by competitive inhibition at the benzodiazepine binding site on the $GABA_A$ receptor. The initial dose of 0.2 mg of flumazenil can be administered and takes about 2–2.5 minutes to take effect.

Initial dose: 0.2 mg IV one time over 30 seconds.

Repeated doses: 0.5 mg may be given every minute.

Maximum total dose 3 mg. Patients responding partially at 3 mg may receive additional doses up to 5 mg.

Most patients respond to 1–3 mg.

Resedation doses: 0.5 mg every 20 minutes to a total of 1 mg/dose and 3 mg/hour.

Medical Emergencies: As with all medical procedures where drugs are being introduced in the bloodstream while performing dental/surgical therapy, there is a risk of unexpected outcomes. The list below is not exhaustive and the discussion regarding these eventualities and how to deal with them is outside the scope of this chapter.

- Laryngospasm
- Bronchospasm
- Airway Obstruction
- Aspiration
- Angina Pectoris
- Myocardial Infarction
- Hypotension
- Hypertension
- Phlebitis
- Intra-Arterial Injection
- Syncope
- Hyperventilation
- Seizures
- Severe Allergic Reaction
- Bradycardia
- Ventricular Tachycardia
- Ventricular Fibrillation
- Asystole
- Malignant Hyperthermia

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