

Nitrous Oxide/Oxygen Conscious Sedation in the Pediatric Patient

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Indications

- Reduce anxiety
- Increase pain threshold
- Suppress gag reflex
- Increase tolerance for longer appointments
- Eliminate need for sedative premedication
- Potentiate effects of sedative premedication

Physical Properties of Nitrous Oxide

- A non-flammable, sweet-smelling gas
- Relatively insoluble
- Stable
- Stored in BLUE cylinders

Chemical Properties

- Nitrous oxide is inert
- Quickly absorbed from the alveoli of the lungs and physically dissolved in the blood
- Eliminated unchanged from the body
- Gas is rapidly excreted from the lungs when the concentration gradient is reversed

CNS Pharmacology

- CNS depressant
- Weak anesthetic potency- MAC >100%
- Relatively potent analgesic
- Response to suggestion enhanced
- Cough reflex moderately suppressed

Cardiovascular Effects

- Parallels inhaling 100% oxygen
- Slight decrease in heart rate
- No evidence of increased myocardial irritability
- No change to slight decrease in blood pressure

Respiratory Effects

- Slight stimulation-resulting in increased tidal volume
- Sense of smell decreased

Diffusion Hypoxia

- Upon termination of nitrous oxide administration, the outpouring of nitrous oxide into the lungs can dilute the amount of oxygen available to the patient
- This danger is probably insignificant in healthy patients
- However, it is recommended that the patient receive 100% oxygen for 3-5 minutes at the termination of N₂O use to prevent possibility

Gastrointestinal Effects

- Nausea and Vomiting
 - Very low incidence
 - Usually, no special eating instructions prior to administration
 - Correlation with fluctuating concentrations of N₂O?

Relative Contraindications

- COPD-bronchitis, emphysema
- URI
- Otitis Media
- Severe emotional disturbances
- Claustrophobia or irrational fear of “gas”
- Maxillofacial deformities or nasal obstructions
- Pregnant patients-especially in first trimester

Advantages

- Rapid onset and recovery
- Ease of dose control (titration)
- Limited physiologic effects
- Analgesic
- Suppression of gag reflex
- Potentiation

Disadvantages

- Weak agent
- Lack of patient acceptance
- Inconvenience-when working on maxillary anterior teeth
- Potential chronic toxicity
- Potential for abuse
- Necessary equipment
- Potentiation

Equipment

- Numerous types of machine available
- Fail-safe mechanism- minimum 20% O₂
- Audible or visual alarm if O₂ interruption
- Flush lever
- Pin-indexed yoke system
- Gas cylinders color coded
 - Green-oxygen
 - Blue-nitrous oxide

Safety Issues for Dental Personnel

- Chronic exposure (>8 hrs. per week)
 - Increases in liver, kidney and neurologic diseases
 - Increase in spontaneous abortion
 - Increase in congenital abnormalities

Minimizing Risk

- Good scavenging system
- Adequate circulation of room air
- Limiting speech and mouth breathing of patient
- Proper size nasal hood
- ? Use in uncooperative child

Potential for Abuse

- A real concern in our profession
- Secure safely
- Common signs of abuse
 - Parasthesia or clumsiness of hands and legs
 - Loss of balance
 - Unsteady gait

Patient Selection

- Medical history and physical exam
- Parental consent
- Mild-moderate anxiety
- Strong gag reflex
- Capacity to be compliant and follow directions

Administration

- Prior to seating patient
 - Make sure equipment is set up and working properly
 - Select nasal hood of proper size
 - Have patient use restroom if necessary
 - Make sure you have an assistant!

Administration-continued

- Introduce child to equipment (slowly)-use tell, show, do
- Make adjustments to ensure mask fits snugly but comfortably
- Establish a total liter per minute of gases first with 100% O₂
 - 3-7 liters per minute depending on size of patient

Administration-continued

- Encourage the patient to breathe through nose
 - Light finger pressure under lower lip
 - Tap on nosepiece
 - Keep reminding them verbally
- Slow vs. Rapid induction

Administration-continued

- During induction explain what the child might be feeling-use suggestion
 - Tingling feeling of hands and feet
 - Numbness of lips and tongue
 - Sensation of warmth
 - Sensation of floating
 - Feeling of heaviness
 - Droning sounds
 - Hearing distinct but distant

Administration-continued

- Watch patient for signs of proper level of sedation
- Therapeutic nitrous oxide levels usually between 30%-50%
- Do NOT exceed 50%
- Vomiting is rare but watch for signs of nausea
- If patient does vomit-
 - Don't panic
 - Turn head to side
 - Suction mouth
 - 100% O2 and complete procedure

Administration-continued

- Upon termination of procedure
 - Inhalation of 100% O2 for 3-5 minutes
 - Have child sit up in chair for several minutes

Remember!

- Nitrous oxide is not a substitute for traditional behavior management techniques
- It should be considered an adjunct to aid in the management of the mild to moderately anxious patient who is capable of cooperating in the dental chair
