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 exhaled 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