Nitrous Oxide Inhalation Sedation in Dentistry

Dayna Rosenthal
15/5/2020
Inhalation Sedation and Aerosol Generating Procedures (AGP’s)

The delivery of urgent and emergency dental care in patients with high levels of anxiety, special care or paediatric patients during the COVID-19 pandemic may be facilitated using sedation. Current evidence indicates that inhalation sedation (IS), is an aerosol generating procedure and appropriate PPE should be worn to reflect this.

At the end of treatment, the IS machine and attachments should be cleaned in line with local infection control protocols, based upon national guidance.

Guidance from PHE, GDC and BDA should be followed. It should be remembered that this is a rapidly evolving situation and guidelines should be checked periodically.

SAAD recommends dental clinics providing urgent dental care produce Standard Operating Procedures (SOP) reflecting the type of sedation offered.

References:


GDC website link: COVID-19 guidance and standard operating procedure Urgent dental care systems in the context of coronavirus NHS

COVID-19 guidance and standard operating procedure: Urgent dental care systems in the context of coronavirus. VERSION 1, 15 APRIL 2020

NHS England and NHS Improvement


Aims and Objectives

- Understand the role of nitrous oxide in dentistry
- Understand the indications and contraindications of nitrous oxide
- Understand the advantages and disadvantages of nitrous oxide
- Understand the levels of anaesthesia
- Understand the complications of delivering nitrous oxide inhalation sedation
- Understand the safety features on dedicated nitrous oxide machines in dentistry
The role of N$_2$O in dentistry
× First dental use 1844

× Aka relative analgesia, happy air, laughing gas or giggle gas

× Mix of nitrous oxide and oxygen e.g. Entonox

× Lung Alveoli $\rightarrow$ Blood $\rightarrow$ Brain
  - opioids, endorphins and dopamine
  - $\text{GABA}_A$
Properties of Nitrous Oxide

- Colourless
- Non-irritant
- Odourless (mostly!)
- Mild analgesic
- Suppresses gag reflex
- Supports combustion
- <0.004% metabolised
- Low potency
- High Minimum Alveolar Concentration (MAC)
In other words, it would take 104% of nitrous oxide to fully anaesthetise 50% of the population!

(Normal use in dentistry around 30%)
Guedel's stages of anaesthesia

Stage I — analgesia

Stage II — delirium aka excitement— Uncontrolled movement, irregular heart rate/respiration

Stage III — surgical anaesthesia

Stage IV — medullary paralysis and death

Planes of Analgesia:

1: Moderate sedation 5–25%
2: Dissociation sedation 20–55%
3: Total analgesia >50%

Relative Analgesia
### Sedation Scoring

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fully awake and orientated</td>
</tr>
<tr>
<td>2</td>
<td>Drowsy</td>
</tr>
<tr>
<td>3</td>
<td>Eyes closed, responds promptly on verbal command</td>
</tr>
<tr>
<td>4</td>
<td>Eyes closed, rousable on mild physical stimulus</td>
</tr>
<tr>
<td>5</td>
<td>Eyes closed, unarousable on mild physical stimulus</td>
</tr>
</tbody>
</table>
Other scoring methods
### Ellis grading

<table>
<thead>
<tr>
<th>Grade</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No uninvited limb movement. Total co-operation - no restlessness.</td>
</tr>
<tr>
<td>2</td>
<td>Small amount of uninvited limb movement. Still total co-operation and no restlessness.</td>
</tr>
<tr>
<td>4</td>
<td>Considerable degree of limb movement. Perhaps unhelpful head movements. Poor co-operation. Patient quite restless and anxious. Able to perform only basic dentistry. Advanced delicate work not possible.</td>
</tr>
<tr>
<td>5</td>
<td>Restless, anxiety and limb movements severe. Impossible to perform any dentistry.</td>
</tr>
</tbody>
</table>
Operating conditions

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Good</td>
<td>Patient fully cooperative with optimum degree of sedation</td>
</tr>
<tr>
<td>2</td>
<td>Fair</td>
<td>Minimal interference from patient due to over/under sedation</td>
</tr>
<tr>
<td>3</td>
<td>Poor</td>
<td>Operating difficult due to over/under sedation</td>
</tr>
<tr>
<td>4</td>
<td>Impossible</td>
<td>Action taken (e.g. GA)</td>
</tr>
</tbody>
</table>
Who can have it?
<table>
<thead>
<tr>
<th>Indications</th>
<th>Contraindications</th>
<th>Sometimes contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓  Mild-moderate anxiety (children or adults)</td>
<td>✓  Blocked airway/mouth breathers</td>
<td>✓  Pregnancy?</td>
</tr>
<tr>
<td>✓  Needle-phobics</td>
<td>✓  Pre/unco-operative</td>
<td>✓  COPD?</td>
</tr>
<tr>
<td>✓  Strong gag reflex</td>
<td>✓  Extreme anxiety</td>
<td>✓  Muscular depression?</td>
</tr>
<tr>
<td>✓  Unpleasant/unfamiliar procedures</td>
<td>✓  Lack of training or consent</td>
<td>✓  Pernicious anaemia?</td>
</tr>
<tr>
<td>✓  Some medical contraindications to IV/GA</td>
<td>✓  Naked flames</td>
<td>✓  Psychological fears?</td>
</tr>
<tr>
<td></td>
<td>✓  Air pockets/raised pressure conditions (ocular, middle ear)</td>
<td>✓  Psychiatric disorders?</td>
</tr>
<tr>
<td></td>
<td>✓  Bleomycin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓  Methotrexate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓  1st trimester</td>
<td></td>
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</tbody>
</table>
Advantages and Disadvantages
<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗ Wide margin of safety</td>
<td>✗ Low potency</td>
</tr>
<tr>
<td>✗ Easy to master</td>
<td>✗ Variable</td>
</tr>
<tr>
<td>✗ Easy to alter (titration)</td>
<td>✗ Variable effectiveness</td>
</tr>
<tr>
<td>✗ Easy to end</td>
<td>✗ Operator technique</td>
</tr>
<tr>
<td>✗ No fasting</td>
<td>✗ Position of hood</td>
</tr>
<tr>
<td>✗ No escort (16+)</td>
<td>✗ Costly</td>
</tr>
<tr>
<td>✗ Suppresses gag reflexes</td>
<td>✗ Chronic exposure complications</td>
</tr>
<tr>
<td>✗ Any age group</td>
<td></td>
</tr>
<tr>
<td>✗ Medically complex</td>
<td></td>
</tr>
<tr>
<td>patients</td>
<td></td>
</tr>
<tr>
<td>✗ Mild analgesic</td>
<td></td>
</tr>
</tbody>
</table>
Scavenging
Passive & Active
Is it safe?
Complications

✗ Nausea, vomiting and headaches

✗ Oversedation - unable to open their mouth on their own, uncontrollable laughter, eye closure, no response to commands

✗ Delusions

✗ Diffusion hypoxia: give 3+ minutes of 100% oxygen at the end
Second gas effect

Nitrous oxide → ALVEOLUS

PULMONARY BLOOD CAPILLARIES

...increased concentration of oxygen and carbon dioxide in alveoli
Third gas effect (diffusion hypoxia)

PULMONARY BLOOD CAPILLARIES

ALVEOLUS

Nitrous oxide

...nitrous oxide dilutes the gases in the alveolus, leading to hypoxia
Safety features

- Pin Index system
- Colour coding
- Maximum of 70% \( \text{N}_2\text{O} \) on dedicated machines
- \( \text{N}_2\text{O} \) cut off
- Air entrapment valve
- \( \text{O}_2 \) flush
Training
Training

✗ Mostly IASCD accredited - some exceptions
✗ Minimum 10 cases for competency in N₂O
✗ 2nd appropriately trained person
✗ Age-appropriate ILS course
✗ High quality records and clinical log book (number, type, complications)
✗ Clinical governance and audit
✗ Revalidation: 12+ hours CPD/5 years
Top tips

BEFORE APPOINTMENT
- Information sheets
- Try it on
- Warm tingly feeling
- Avoid chatting
- and too many people in the room

“Mickey/Minnie Mouse Nose”
“Keep your lips together”
“Tiger Stripes”

Hypnotic suggestion:
- Beach, aeroplane, magic carpet, starry night

Hand signals

Teamwork
References and Useful Links

- https://pocketdentistry.com/14-inhalation-sedation-equipment/#st0175; photo and information
- https://pocketdentistry.com/15-inhalation-sedation-techniques-of-administration/; photo and information
Thanks!

Any questions?

https://toothfairead.wordpress.com/

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