MEOPA: Use of nitrous oxide in a palliative care setting

Laurent Adler, MD
Laurence Déramé, RN
Alexis Schneider, MD

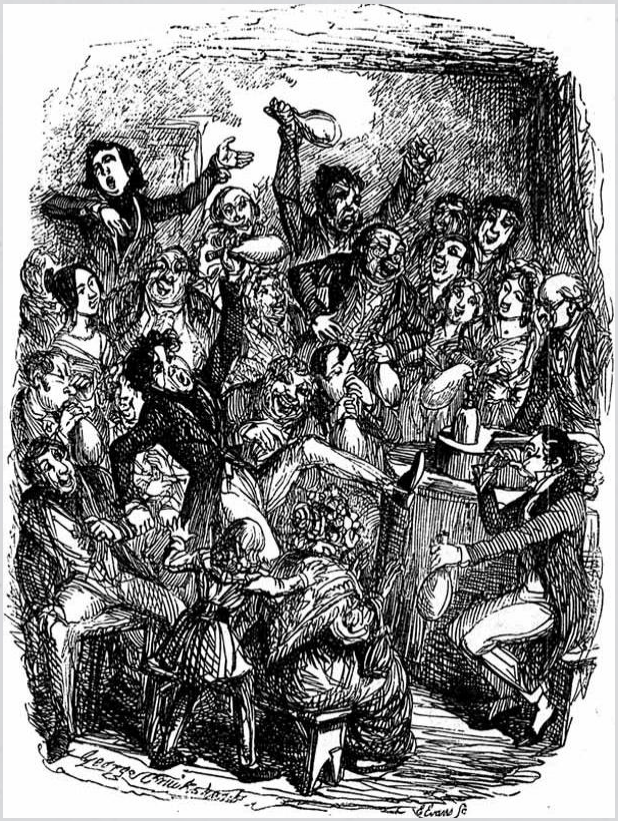
Hopitaux Universitaires de Genève

MEOPA

- French acronym: Mélange Equimolaire d'Oxygène et Protoxyde d'Azote
- A stable, equimolar gaseous mix of O_2 and N_2O
- Administered by inhalation under medical supervision resulting in analgesia (as well as anxiolytic, euphoric and amnestic effects)
- Commercially available in Switzerland and France (and elsewhere): Médimix, Kalinox, Entonox

A Brief History of Nitrous Oxide

- First synthesized by Joseph Priestly in 1772
- In 1800 the analgesic effects of nitrous oxide were recognized, but primarily used at « laughing gas parties »



A Brief History of Nitrous Oxide

- Medical use began in 1844 (Wells, Colton and Riggs) as an anesthetic during dental extraction
- Became popular as a dental anesthetic in 1863
- While not strong enough for major surgery, nitrous oxide was (and is) used to induce anesthesia

https://en.wikipedia.org/wiki/Nitrous_oxide#History

Indications

- Short-term anesthesia for induced pain
  - Dressing changes
  - Removal of a foreign body
  - Aspiration (joint, abscess, etc.)
  - Endoscopy
  - Biopsies

Benefits

- Period of amnesia around the painful experience reduces anticipatory anxiety
- Easy to use and non-invasive (patient holds mask)
- Patient participation enhances patient feeling of control
- Rapid onset with minimal side effects
- No post-procedure confusion or lethargy
- No interaction with opioids (likely effective through GABA and NMDA receptors)

Side Effects

- Nausea and vomiting (our practice: NPO x 2h prior to procedure)
- Diffusion hypoxia post-procedure
- Auditory or visual hallucinations (unusual)
- Paresthesia
- Euphoria, logorrhea, agitation, feeling “drunk”
- Somnolence, amnesia

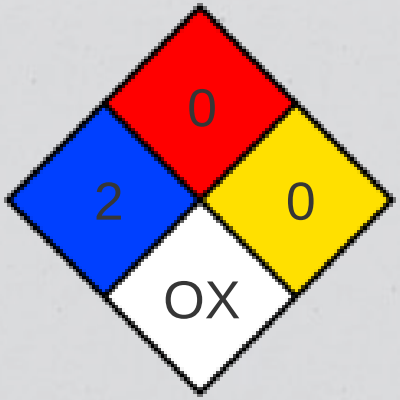
Contraindications (1)

- Fear of mask (claustrophobia)
- Severe cognitive impairment
- Intracranial hypertension
- B_{12} deficiency (N_2O inactivates the cobalamin form of vitamin B_{12} by oxidation leading to demyelination, neuropathy and hematologic disorders)

Contraindications (2)

- N_2O will diffuse into air-containing cavities 34x faster than nitrogen. Thus it diffuses in faster than nitrogen diffuses out which can result in a temporary increase in pressure and/or volume.
- Hence contraindicated in patients with:
  - PTX, pneumomediastinum or bullous emphysema
  - Severe colonic distention, ileus, bowel obstruction
  - Maxillofacial trauma, middle ear obstruction, sinusitis, cerebral air-contrast studies
  - Air emboli

Safety



- Colorless
- Faint odor (sweet)
- Inert at room temperature; non-flammable
- Respiratory excretion with an elimination half-life of 5 minutes

Our Experience (1)

- EMASP: pain and palliative care consult service (Equipe Mobile Antalgie et Soins Palliatiffs)
- Hôpital de Bellerive: 104 bed hospital (32 acute palliative care, 72 rehabilitation)
- Hôpital de Trois Chêne: 294 bed geriatric acute care
- Data collection regarding MEOPA since 2007

Our Experience (2)

- From 2007 - 2011 we received 80 consult requests (for 68 individuals, 9 with multiple requests) for MEOPA for procedure-related pain.
- In nine requests the indication resolved prior to initiation of MEOPA treatment (no MEOPA initiated). Five requests (6%) were denied due to contraindications (noted above). Ten requests (13%) refused care or were transferred prior to initiation.
- One request had insufficient data to report.

Patient Characteristics

- 44 patients were treated (233 individual treatments)
- Patient ages ranged from 34 - 96 years (mean 81 years)
- Gender: 35 patients (76%) female

Treatment Characteristics

- Treatment indication was primarily pain related to dressing changes (94% consults, 93% patients).
- Complications requiring treatment cessation occurred in 2 patients.
- Complications were hypotension (patient was hypotensive prior to treatment) and lethargy. Neither was life-threatening.

Clinical Vignette (1)

- Mme P., 78 years old, PVD, DM-2, bilateral necrotic LE ulcers, minimally verbal with moderate dementia (MMSE 22/30)
- Pain assessment via DOLOPLUS 2/30, but with increase in pain behaviors during dressing changes
- Tramadol and lidocaine gel attempted prior to wound debridement with incomplete relief
- Use of morphine 5mg PO prior to procedure resulted in nausea and frightening hallucinations. Rotation to hydromorphone without improvement

Clinical Vignette (2)

- MEOPA initiated during next dressing change (vitamin B_{12} level WNL)
- Pre-procedure tramadol and lidocaine gel used along with MEOPA.
- 76 minutes of MEOPA (four treatments lasting 24, 23, 16 and 13 minutes) with notable improvement.
- Pain behaviors greatly reduced. Patient in good spirits after MEOPA, thanking care team.

Clinical Vignette (3)

- Adverse effects: patient reporting feeling slightly light-headed; dry mouth noted after one treatment.
- Wound status improved after 2 weeks, no further debridement required.
- Wound care nurse and treatment team expressed satisfaction at no longer being responsible for inducing pain

Conclusion

- MEOPA (nitrous oxide) is an inhaled anesthetic and analgesic.
- It has relatively few contraindications, and can be used for the management of induced pain.
- In our experience N_20 can be safely used in a broad range of geriatric patients with a very low risk of adverse reactions and a high likelihood of successful pain control.