

3.1 General Anaesthetic Techniques

Inhalational anaesthetic agents

Introduction

Apart from nitrous oxide, inhalational anaesthetic agents are rarely used in the ED. Occasionally may be needed for gaseous induction with imminent upper airway obstruction (usually sevoflurane), and patients arrive using methoxyflurane. Inhalational agents tend to cause venodilatation which facilitates IV access. The halogenated hydrocarbons/ethers generally depress the myocardium to varying degrees, cause ↓RR, raised P_aCO_2 , ↓hypoxic drive and carry a small risk of malignant hyperthermia. The exact site of action for these anaesthetics is debated. They likely have membrane altering properties which differ amongst neuronal groups, rather than specific receptor interactions.

Nitrous Oxide (N_2O)



- Schedule 4 drug - clear, odourless gas, not flammable but supports combustion.
- Actions: Weak anaesthetic - MAC 102%. Good for analgesia/sedation/amnesia. Carrier gas for other anaesthetic agents reducing their MACs by ~40%.
- Pharm: Poorly soluble in blood so rapidly absorbed by inhalation, onset/offset <5mins. Beware diffusion hypoxia at offset (alveoli filled with nitrous diffusing out from blood) so pt to breathe 100% O_2 for ~5-10mins after N_2O ceased. 35x more soluble in blood than N_2 so can exchange for nitrogen in air cavities (see Cons).
- Usage: Mainly ED use is conscious sedation for painful procedures: Requires 2 hours fasting, age normally >1 year
- Pros: Airway reflexes preserved. Good analgesia, well tolerated.
- Cons: Closed HI, ICP or decreased LOC, airway obstruction/burns, pneumothorax, resp distress, recent middle ear surgery, suspected bowel obstruction. S/E: nausea, Vit.B12 oxidation/marrow depression (chronic use), behavioural
- Presentation: Neat cylinders for anaesthetic use. For ED use: usually mixed with O_2 - cylinder Entonox (50%) or blending system Quantiflex (up to 70%). Mask/mouthpiece valve system requires patient to form seal and actively inhale.

Methoxyflurane

- Halogenated ether
- Pharm: MAC 0.16% (i.e. very potent). Onset/offset is slow
- Pros/Usage: Powerful analgesic, in sub-anaesthetic doses

- Cons: Delirium, ↓BP, arrhythmias, hepatic necrosis, Fluoride (nephrotoxic) produced by metabolism
- Presentation: Used by ambulances as patient controlled inhaler (green tube)
- Dosage: 6mg/inhaler - single dose only

Comparison table for other inhalational anaesthetic agents:

<i>Drug</i>	<i>Blood:Gas partition coefficient (solubility)</i>	<i>Onset & Offset</i>	<i>Metabolism</i>	<i>Notes</i>	<i>MAC* %</i>
Nitrous Oxide	0.47	Very rapid	None	See above	102
Halothane	2.3	Medium	>40% (20% by liver thus risk of hepatic necrosis 1:35000)	Respiratory & myocardial depression. Arrhythmias (heart sensitised to adrenaline)	0.75
Enflurane	1.8	Medium	8% (2% hepatic)	Seizure risk	1.7
Isoflurane	1.4	Medium	<2% (0.2% hepatic)	Less myocardial depression, ↓BP	1.4
Sevoflurane	0.69	Rapid	2-5% (produces fluoride)	Unstable in soda lime (→ nephrotoxic Compound A)	2.0
Desflurane	0.42	Very rapid	<0.05%	Needs heater vaporizer. Quite airway irritant - thus poor for induction. CO produced by soda lime.	6-7
Methoxyflurane	12	Slow	>70% (produces fluoride)	Not used for general anaesthesia	0.16

*MAC=Minimum alveolar concentration (conc. of anaesthetic that results in immobility of 50% pts exposed to a std noxious stimulus e.g. surgical incision.)

References:

1. Dunn R. *The Emergency Medicine Manual* 3rd Ed.
2. Katung B. *Basic & Clinical Pharmacology* 8th Ed.
3. Cameron P. et al. *Textbook of Adult Emergency Medicine* 2nd Ed.
4. Mahadevan S. & Garmel G. *An Introduction to Clinical Emergency Medicine*
5. Neal M. *Medical Pharmacology at a Glance* 3rd Ed.

Links:

1. [MetroHealthAnesthesia Education Info](#)