Propofol Sedation

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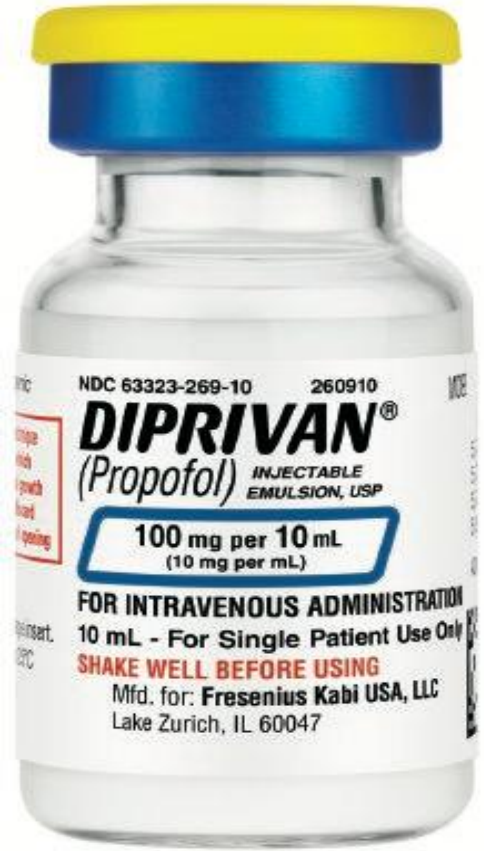
Propofol…… a smooth criminal?

Aims

- Conscious sedation definition
- Pharmacology of propofol including:
  - Pharmacokinetics
  - Pharmacodynamics
- Advantages and disadvantages of propofol
- Propofol indications
- Contraindications and precautions when using propofol
- Propofol drug interactions
- Administering propofol
- Propofol sedation in the literature
- The future of propofol in dentistry
- Conclusion

Pharmacology of propofol

Propofol



Propofol is a short acting hypnotic agent that can be given intravenously in low doses to achieve short acting and controlled sedation

Mode of action: Enhancing the GABA neurotransmitter system through the ligand gated GABAA receptors

Properties:

- Oil at room temp
- Insoluble in aqueous solution
- Aqueous white emulsion

Formulations:

1% or 2% propofol, 10% soya bean oil, 2.25% glycerol, 1.2% egg phosphatide

Propofol Pharmacodynamics

Central nervous system

- Decreases cerebral metabolism and blood flow
- Decreases intracranial pressure
- Marked lowering of systemic arterial pressures which can significantly diminish cerebral perfusion

Respiratory system

- Depressant > benzodiazepines

Cardiovascular system

- Myocardial depressant, decreases systemic vascular resistance = profound hypotension in large boluses

Propofol Pharmacokinetics

Enters the blood stream and crosses blood brain barrier to exert its effect on the GABA neurotransmitter system

Rapid distribution to peripheral tissues

Hepatic metabolism

Extrahepatic metabolism via lungs

Renal excretion

Arm to effect site – 30sec

T ½ alpha – 2-4mins

T ½ beta – 30-60 mins

Advantages and disadvantages of propofol as a conscious sedation agent

What makes propofol the ideal IV agent?

- **Rapid elimination and recovery**
- Rapid effect on injection (30 secs)
- Effects wear off considerably within 30mins of administration
- Induces moderate amnesia – not as profound as midazolam
- Antiemetic acitivity

Disadvantages of propofol

- Margin of safety between sedation and anaesthesia is much narrower than that for benzodiazepines
- Special equipment required for administration of continuous infusion -infusion pump
- Injection of propofol can be painful, should be given into larger veins or follow pre-infusion with La
- Only recommended for use by specialist anaesthetists in dental sedation
- At present it is not recommended as a suitable drug for safe operator-sedation technique
- No analgesic activity
- No reversal agent

Propofol indications

- **Induction and maintenance of GA**
  - Via continuous infusion

- **Conscious sedation**
  - Patient controlled target infusion
  - Target controlled infusion
  - Intermittent bolus administration

  - Can be used for very short or long procedures
  - When a patient is resistant to benzodiazepines

Contraindications and precautions when using propofol

- Hypersensitivity
- Epilepsy
- Fat metabolism

- Paediatric
- Elderly
- ASA 3 and 4
- Pregnant
- Breast feeding
- Other sedatives
- Driving/ skilled tasks

Administration of propofol

- Target controlled infusion (TCI)
- Patient controlled sedation (PCS)
- Midazolam and propofol

Target controlled infusion

- Infusion pump containing software simulating the best pharmacokinetic model for propofol
- The pts age and weight are programmed into the software and the desired target blood/ propofol concentration is selected
- A precisely calculated bolus dose is delivered to generate the selected target blood/Propofol concentration, followed by continuous propofol infusion calculated to maintain that concentration
- The target concentration can be increased or decreased depending on pt response
- If increased an additional bolus is given and then the continuous infusion is set at a higher rate to maintain the new concentration

Target controlled infusion

- If lower target the infusion stops until the new blood propofol concentration is reached and the new lower target is then given by continuous infusion
- Once treatment is complete the infusion is switched off and the patient will be fully recovered and fit for D/C within 10-15mins
- Because of the short duration of action of propofol microcomputer based syringe pumps have been developed that enable a continuous controlled dose of drug to be administered. This enables maintenance of therapeutic blood levels of propofol for prolonged periods
- Drugs administered by infusion pumps are admin on dose/weight/time basis microgram/kg/min

Patient maintained sedation

- Uses TCI technology
- A requested target plasma concentration of propofol is delivered
- If the patient wants additional sedation they use a patient controlled handset which is connected to the TCI pump in order to administer more propofol
- In some systems a lock out can be set in which no further increments can be administered within a certain time period so as to avoid overdose
- There is also a decrement time in which if the patient had not requested further increments that the plasma concentration is recalibrated and decreases

Midazolam and propofol IVS

- The sedation is induced with a titrated dose of midazolam and then maintained with a continuous infusion of propofol

- IACSD
  - This technique is particularly useful for longer dental procedures
- NICE
  - The use of midazolam in combination with propofol, does not seem to result in any additional improvement in efficacy and the group agreed that midazolam is not necessary when using propofol

  - Propofol is a schedule IV controlled drug – locked cupboard
  - Same pre and post operative instructions as for midazolam

Becoming a non anaesthetist administrator of propofol (NAAP)

Concern has been raised regarding the safety of propofol administered by non-anaesthetists

In the UK/IRE propofol is only licensed for use by those trained in anaesthesia

Cost of anaesthetic manpower would be a major drawback if this was to be introduced clinically

In Austrailia and the USA there has been non-anaesthetists providing propofol sedation

In 2010 the EU guidelines for NAAP in endoscopy were published

In the UK at the moment there is no nationally recognized training/qualification in NAAP

IACSD advise 20 supervised cases, dedicated seditionist

A clear clinical justification is required, having excluded simpler techniques – As Advanced technique

1. Anaesthetic drugs and infusions e.g. propofol used as sedative agents have narrower therapeutic indices and reduced margins of safety, potentially increasing the likelihood of adverse events

2. Anaesthetic drug techniques should only be considered by those skilled in their use, where there is clear clinical justification, after having excluded simple techniques, and must only be used in an approved setting where team skills are sufficient to resuscitate and stabilise a patient until arrival of emergency services

References

- Sedation, a guide to patient management. S. J. Malamed. 2018. Elsevier, 6th edition, p331-333
- Conscious sedation for dentistry. N. M. Girdler, C.M. Hill, K.E. Wilson. 2018. Wiley Blackwell, 2nd edition, p63-65
- BNF – Propofol interactions – www.bnf.nice.org.uk/interaction/propofol-2.html
- Sumary or product characteristics – Diprivan 1% - www.medicines.org.uk/emc/product/5492/smpc
- Standards for conscious sedation in the provision of dental care. Report of the intercollegiate advisory committee for sedation in dentistry (IACSD) 2015
- Safe sedation practice for healthcare procedures: standards and guidance. Academy of Medical Royal Colleges. 2013
- Hosey MT. UK National Clincal Guidelines in Paediatric Dentistry. Managing anxious children: the use of conscious sedation in paediatric dentistry. International journal of paeditric dentistry
- NICE – Sedation in children and young people 2010
- A prospective randomised controlled study of patient- controlled propofol sedation in phobic dental patients N. M. Girdler, D. Rynn, J. P. Lyne and K. E. Wilson. 2000. Anaesthesia, 55, p327-333
- A partially blinded randomised controlled trial ofpatient-maintained propofol sedation and operator controlled midazolam sedation in third molar extractionsJ. A. Leitch,K. Anderson,S. Gambhir,K. Millar,N. D. Robb,S. McHugh and G. N. C. Kenny.2004. Anaesthesia, 57, p853-860
- Propofol target controlled infusions for sedation – a safe technique for the non-anaesthetist? Blaney M.R., Ryan J.D., Malins A.F. BDJ. 2003