British Society of Interventional Radiology
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Sedation & Analgesia for IR Procedures - Opioids

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Introduction

Opioids are a type of analgesia commonly used in clinical practice. They can be used for pre or postoperative analgesia and procedural sedation in interventional radiology.

Mechanism of Action

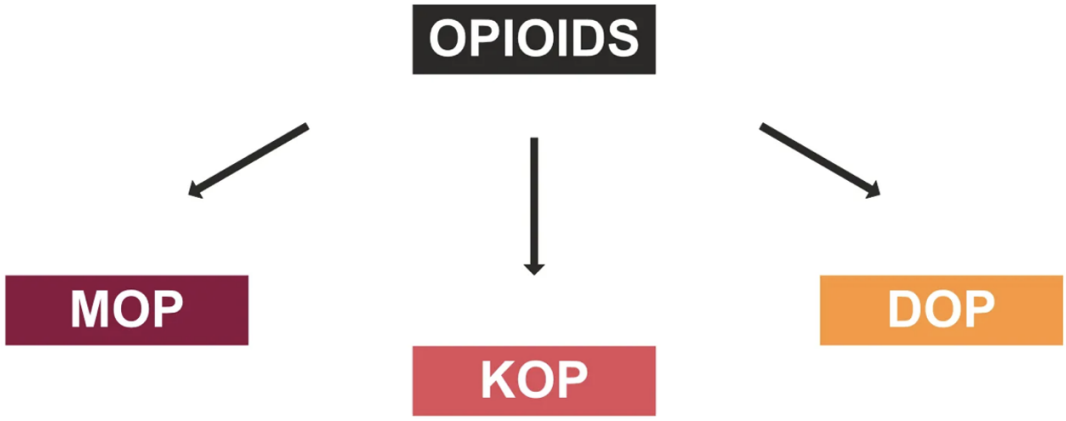


Figure 1. Opioid receptor types.

Opioids can act at these receptors as agonists, antagonists or partial agonists. Morphine mainly acts at MOP receptors, with some activity at DOP and KOP receptors.

Administration

Can be via oral, intravenous, subcutaneous, transdermal, sublingual, intramuscular, epidural, intrathecal and intra-articular routes.

Classification

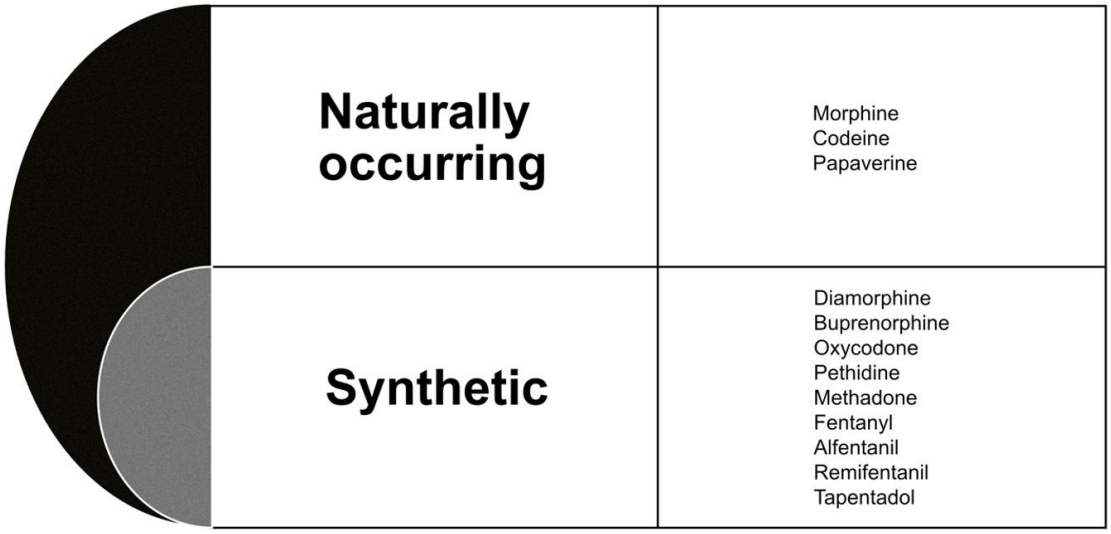


Figure 2. Classification of opioid drugs.[1]

Systemic Effects

Intravenous Administration	Alfentanil	Fentanyl	Remifentanil	Morphine
Onset	Ultrafast, 1-2 mins	Fast, 2-5 mins	Ultrafast, 1-2 mins	Slow, 20-40 mins
Offset	Ultrafast	Fast	Ultrafast	Slow
Duration of action	10 mins	20-30 mins	3 mins	3-4 hours
Total dose	10 mcg/kg	1-2 mcg/kg	0.05-2.0 mcg/kg/min	0.1-0.2 mg/kg
Metabolised	Liver	Liver	Esterases	Liver

Table 1. Pharmacokinetic and pharmacodynamic properties of commonly used opioid drugs.

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Use of Opioids in Interventional Radiology

Analgesia

Opioids are commonly used for intra-procedural and post-procedural analgesia. Here is a list of considerations for the commonly used opioids in IR.[2]

Drug	Codeine/dihydrocodeine	Morphine	Fentanyl	Alfentanil
Route	Oral	Oral, intravenous, sucutaneous, intramuscular	Intravenous	Intravenous
Dose (for adults)	30-60 mg every 4-6 hours	Usually 1-2 mg bolus dose up to total calculated dose	Usually 10-25 mcg bolus dose up tp total calculated dose	Usually 100-250 mcg bolus dose up to total calculated dose
Indication	Moderate pain	Severe pain	Severe pain	Severe pain
Considerations	Dihydrocodeine is 2-3 times more potent than codeine. Constipation is a common side effect.	Use renal adjusted dose in renal failure. Nausea and vomiting are a common side effect.	Preferentially used in patients with renal failure. Dose-dependenet respiratory depression may occur. Can be used in a PCA	

Table 2. Dose, route and indications for commonly used opioid drugs.

Remifentanil: is a synthetic derivative of fentanyl, with a similar potency but shorter duration of action. It requires reconstitution with saline and is delivered as an infusion at rates between 0.05- 2.0 micrograms/kg/min. As it is metabolised by esterases, it is context-insensitive, meaning its half-life, clearance and volume of distribution are independent of the duration of infusion, thus making it ideal for long procedures.[3]

Pethidine: originally developed as an antimuscarinic drug, is used in moderate to severe pain, typically labour analgesia. It can be administered orally (50-150mg), subcutaneously (50-100 mg), intramuscularly (50-100mg) or intravenously (25-100mg). Doses can be repeated every 4 hours, but at higher concentrations hallucinations and convulsions may occur. It can also accumulate in renal failure and readily crosses the placenta. Side effects include tachycardia, hypotension and dry mouth. It is absolutely contraindicated in patients on monoamine oxidase inhibitors.[3]

Tramadol: is a synthetic opioid with effects similar to codeine. It is a weak agonist at opioid receptors. It is used for moderate to severe pain in doses of 50-100mg per 4 hours. In equianalgesic doses to morphine, tramadol produces less respiratory and cardiovascular depression than morphine but more side effects, including dizziness, nausea, vomiting, and drowsiness. These unpredictable side effects have seen tramadol decline in use over the years. It is contraindicated in patients on monoamine oxidase inhibitors and patients who suffer with epilepsy.[3]

Meptazinol: is a synthetic opioid with mixed agonist and antagonist activity at opioid receptors. Its analgesic effects may be due to its central cholinergic activity, whilst less respiratory depression may be due to its selectivity for MOP-1 receptors. However, incidence of nausea and vomiting is higher, though potentially reduced with administration of antimuscarinic drugs. It is 1/10th as potent as morphine, with a quick onset and duration of action of 2-4 hours.[3]

Sedation

Opioids are often used in sedation to provide analgesia, anxiolysis and a state of relaxation. They can be used pre-procedure or intra-procedure. They have a synergistic effect when used with other sedatives like benzodiazepines and propofol, therefore, doses should be adjusted appropriately.

Short-acting opioids are used during the procedure to provide analgesia; therefore, it is key to understand the timing of your dose according to the stimulating parts of the procedure. Alfentanil will reach peak plasma concentration in 1-2 minutes, whilst fentanyl takes 2-5 minutes.

Long-acting opioids, such as morphine or dihydrocodeine, may be administered pre-procedure to achieve peak plasma concentration at the time of the procedure.
Anaesthetic-led sedation will likely include remifentanil, administered as an infusion and titrated to effect.

Cautions

All opioids

1. Respiratory conditions: opioids can cause respiratory depression, so cuation is needed when using them in patients with pre-existing respiratory problems i.e., COPD, obstructive sleep apnoea.
2. Opioid tolerance: patients who already take regular opioids may need higher doses of opioids. But caution must be shown to avoid overdose.
3. Renal failure: patients with severe renal failure or end-stage renal failure may be at risk of accumulation of repeated doses of opioids. Shorter acting opioids may be preferable.
4. Elderly patients: are more sensitive to opioids and doses should be adjusted accordingly.
5. Pregnancy: opioids can cross the placenta and thus affect the foetus. Pethidine is the most commonly used opioid in pregnancy.
6. Tramadol is contraindicated in patients on monoamine oxidase inhibitors and patients with a history of epilepsy

MHRA/CHM advice:

1. Benzodiazepines and opioids: risk of potentially fatal respiratory depression.
2. Tapentadol: risk of seizures and reports of serotonin syndrome when co-administrated with other medicines.[4]

References

1. https://www.ncbi.nlm.nih.gov/pmc/ articles/PMC4590096/
2. Analgesics | Treatment summaries | BNF | NICE
3. https://resources.wfsahq.org/atotw/ pharmacology-of-opioids-part-2-anaesthesia-tutorial-of-the-week-67/
4. Tapentadol (Palexia): risk of seizures and reports of serotonin syndrome when co-administered with other medicines – GOV.UK (www.gov.uk)