Isoprenaline infusion

Alert
Indication
Temporary treatment of symptomatic bradyarrhythmia or heart block especially if caused by beta blocker overdose.

Action
Isoprenaline is a β₁- and β₂-adrenoceptor agonist. Its action on cardiac β₁-adrenoceptors results in positive inotrophic and chronotropic effects on the heart elevating blood pressure. Its action on arteriolar β₂-adrenoceptors results in vasodilation and lowering of diastolic blood pressure. The overall effect is to decrease mean arterial pressure due to the β₂-adrenoceptor mediated vasodilation. [1]

Drug Type
Catecholamine, β-adrenoceptor agonist drug

Trade Name
Isuprel Solution for injection

Presentation
Solution for injection 1:5000: 1 mg/5 mL ampoule = 200 microgram/1 mL

Dosage / Interval
0.05–1 microgram/kg/minute. Doses may need to be many times higher in the management of beta blocker overdose. Consult with a clinical toxicologist (Poisons Information Centre 131126).

Maximum daily dose
2 microgram/kg/minute. Doses may need to be many times higher in the management of beta blocker overdose. Consult with a clinical toxicologist (Poisons Information Centre 131126).

Route
Continuous IV infusion.

Preparation/Dilution
Isoprenaline hydrochloride (1:5000)*

<table>
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<th>Infusion strength</th>
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<td>1 mL/hour = 0.05 microgram/kg/minute</td>
<td>150 microgram/kg isoprenaline and make up to 50 mL</td>
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Draw up 150 microgram/kg [0.75 mL/kg] of 1:5000 isoprenaline and add glucose 5% or sodium chloride 0.9% to make a final volume of 50 mL. Infusing at a rate of 1 mL/hour = 0.05 microgram/kg/minute.

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Draw up 1500 microgram/kg [7.5 mL/kg] of 1:5000 isoprenaline and add glucose 5% or sodium chloride 0.9% to make a final volume of 50 mL. Infusing at a rate of 1 mL/hour = 0.5 microgram/kg/minute.

*Maximum reported concentration of the infusion preparation is 64 microgram/mL.

Administration
Continuous intravenous infusion. Change infusion every 24 hours.

Monitoring
Continuous heart rate, ECG and blood pressure monitoring preferable. Assess urine output and peripheral perfusion frequently. Blood glucose.

Contraindications
Tachyarrhythmias; tachycardia or heart block caused by digitalis intoxication; ventricular arrhythmias which require inotropic therapy; coronary insufficiency; hypersensitivity to isoprenaline. Isoprenaline should not be given simultaneously with adrenaline because their combined effects may induce serious arrhythmia.

Precautions
Isoprenaline infusion may produce an increase in myocardial work and oxygen consumption. Titrate drug dose to heart rate. Correct acidosis prior to commencement. Ensure adequate circulating blood volume prior to commencement. As isoprenaline is a vasodilator, additional volume expansion may be required during infusion. Monitor for hypoglycaemia – stimulates insulin secretion.

Drug Interactions
Inhalational anaesthetics can increase the effects of isoprenaline. Use of isoprenaline hydrochloride in conjunction with aminophylline and corticosteroids.
Isoprenaline infusion

Adverse Reactions
- Tachycardia.
- Cardiac arrhythmias.
- Systemic vasodilation and hypotension.
- Hypoglycaemia.

Compatibility
- Fluids: Glucose 5%; sodium chloride 0.9%.
- Y-site: Aciclovir, adrenaline (epinephrine), amikacin, amiodarone, amphotericin B liposomal, atracurium, atropine, azithromycin, aztreonam, benzylpenicillin, caffeine citrate, calcium chloride, calcium gluconate, cefazolin, cefotaxime, ceftazidime, ceftriaxone, chloramphenicol, clindamycin, dexamethasone, digoxin, dobutamine, dopamine, fentanyl, fluconazole, gentamicin, heparin, hydrocortisone, metronidazole, milrinone, morphine, nitroprusside, nitroglycerin, noradrenaline (norepinephrine), panceuronium, penicillin, piperacillin-tazobactam, potassium chloride, propofol, ranitidine, remifentanil, ticarcillin, vasopressin, vitamin K.

Incompatibility
- Aminophylline, ampicillin sodium, amphotericin B conventional colloidal, amphotericin B lipid complex, diazemum, diazoxide, frusemide, ganciclovir, hydralazine, ibuprofen, indomethacin, insulin, pentobarbitone (pentobarbital), phenytoin, sodium bicarbonate, sulfamethoxazole-trimethoprim.

Stability
- Do not administer if the solution is pinkish or darker than slightly yellow or if a precipitate is present. Change the infusion every 24 hours.

Storage
- Store below 25°C. Protect from light.

Special Comments

Evidence summary

Efficacy:
The efficacy and dosing of isoprenaline in newborns has only been assessed in case reports.

Infants with congenital complete heart block: Case reports of response to isoprenaline infusion in newborns with congenital heart block.[2-4] (LOE IV, GOR D)

Children with asthma: Case series report response to isoprenaline infusion in infants and children with asthma. [5, 6] (LOE IV, GOR D)

The European Society of Cardiology Guidelines recommend for patients with bradyarrhythmia, positive chronotropic drug infusion (e.g. isoprenaline, adrenaline (epinephrine), etc.) may be preferred for a limited time, unless there is a contra-indication, compared to use of a temporary pacemaker. [7]

These are insufficient data reported to determine its safety or efficacy in newborns with pulmonary hypertension.

Safety:
- Case reports of arrhythmia/tachycardia [8] [6], elevated serum CPK-MB levels [9] and hypotension.[10] In animal studies, use of isoprenaline hydrochloride in conjunction with aminophylline and corticosteroids have been shown to be additive in cardiotoxic properties and can lead to myocardial necrosis and death. [13]

Pharmacokinetics:
In children age 2 days to 14 years, average plasma half-life 4.2 ± 1.5 minutes, with linear relationship between steady state concentration and dosing rate.[11]

References
5. Bohn D, Kalloghlian A, Jenkins J, Edmonds J, Barker G. Intravenous salbutamol in the...