ISOPRENALINE
For initiation by cardiology consultant only

Background

Isoprenaline is a non-selective β-adrenergic receptor agonist. It has a positive inotropic and chronotropic effects, increasing cardiac output by increasing the heart rate and cardiac contractility. Isoprenaline also decreases diastolic blood pressure by lowering peripheral vascular resistance.

Isoprenaline is unlicensed in the United Kingdom therefore its use is restricted to consultant approval. It has an immediate onset of action and its half-life is 2.5-5 minutes.

Indications

- Heart block.
- Treatment of permanent bradycardia due to atrio-ventricular block pending with haemodynamic compromise and pending or in case of contraindication of pacemaker.
- Treatment of Adams-Stokes syndrome.

Contraindication

- Hypersensitivity to isoprenaline or any of the excipients.
- Concomitant use with adrenaline (if concomitant administration is required give alternatively every 4 hours).
- Pre-existing ventricular arrhythmias.
- Tachyarrhythmia.
- Cardiac glycoside (digoxin) intoxication.
- Myocardial infarction – may increase myocardial oxygen demand.
- Angina – may exacerbate it.

Cautions

- Hypotension due to uncorrected hypovolaemia.
- Phaeochromocytoma.
- Diabetic patients – isoprenaline stimulates insulin secretion thus increasing the risk of hypokalaemia.
- Cases of hyperthyroidism / uncontrolled hyperthyroidism.
- Cardiovascular disorders especially coronary insufficiency, arrhythmias and hypertension.
- Convulsive disorders.
- When using on patients who respond to sympathomimetic amines in unusual manner.

Preparation and administration

Available as isoprenaline hydrochloride 2mg in 2mL solution for injection or infusion AND as isoprenaline sulphate 200micrograms/mL solution for injection.

Dilution

IV injection

Isoprenaline hydrochloride – Dilute 2mg in 2mL concentrate with 100mL of Glucose 5% or sodium chloride 0.9% to give a concentration of 200microgram in 10mL (20microgram in 1mL). Give slowly over at least 3 minutes.
Isoprenaline sulphate – dilute the equivalent of 20microgram/mL isoprenaline hydrochloride. Give by slow IV injection over 3-5 minutes.

Continuous IV infusion – Adjust the infusion rate according to patient response.

When using isoprenaline hydrochloride

Recommended diluent is Glucose 5% and dilution should be as follow:

- Add 200microgram (0.2ml) to 100ml Glucose 5% (gives concentration of 2microgram in 1mL)

When using isoprenaline sulphate

- Add 225microgram (1.13ml) to 100ml Glucose 5% (gives concentration of 2.25 microgram in 1ml)

Dose

<table>
<thead>
<tr>
<th>DOSE ISOPRENALINE HYDROCHLORIDE (microgram/minute)</th>
<th>DOSE ISOPRENALINE SULPHATE (microgram/minute)</th>
<th>Infusion rate (ml/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.125</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>2.25</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>3.375</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>120</td>
</tr>
</tbody>
</table>

Adjust the infusion rate according to patient response

Once diluted the infusion should be set up and administered via an infusion pump and the expiry date (24 hours) should be written on the label. Do not allow the infusion to run out (a new infusion should be prepared promptly when the previous one is due to finish).

Infusion rate and dose calculation

Isoprenaline hydrochloride infusion rate (mL/hr) = \( \frac{\text{Dose (micrograms/min) x 60 mins}}{\text{Concentration (microgram/mL)}} \)

For example, to administer a dose of 6micrograms/minute using a solution of 80microgram in 1mL of isoprenaline hydrochloride, the calculation would look as follow:

\[
\text{Infusion rate} = \frac{6\text{micrograms/min} \times 60\text{mins}}{80\text{micrograms/mL}} = 4.5\text{mL/hr}
\]

Flushing

To avoid adverse effects resulting from an unintentional ‘bolus’ dose flush with sodium chloride 0.9% at the same rate the medicine was administered:

- IV bolus: flush with sodium chloride 0.9%.
- IV infusion: disconnect the administration set before flushing the cannula with sodium chloride 0.9%.
- Central venous access device: aspirate the cannula contents before flushing with sodium chloride 0.9%
**Fluid restriction**

Suggested minimum dilutions: 2mg to 4mg in 50mL (40-80 microgram/mL) of the equivalent of isoprenaline hydrochloride. To be administered by **central line only**.

**Adverse effects**

- Tachycardia, cardiac arrhythmias, palpitations, hypotension, hypertension
- Tremor
- Headache, dizziness
- Sweating, facial flushing

Both isoprenaline salts have a low pH and may cause venous irritation and tissue damage in cases of extravasation. If a central venous access device is unavailable, administer via a large peripheral vein monitoring insertion site closed. Re-site cannula at first signs of inflammation.

**Monitoring**

ECG, arterial blood pressure, heart rate, urine flow, central venous pressure, blood pH, blood pCO₂ or bicarbonate and cardiac output.

**Compatibilities**

For compatibilities details please refer to Medusa ([Medusa - Isoprenaline Hydrochloride](https://medusa.wales.nhs.uk/IVGuideDisplayNewFormat.asp)) or the IV compatibility chart from the Handbook of Drugs in Intensive Care.

**Storage**

Isoprenaline hydrochloride 2mg in 2mL – Store below 25 degrees Celsius.

Isoprenaline sulphate 200 micrograms/mL – Store in fridge.

Protect unopened ampoules from light. Discard the injection if it is pinkish or darker than slightly yellow or contains precipitate.

**References**

- Summary of Product Characteristic. Isoprenaline Macure 0.2mg/mL concentrate for solution. Last Updated 17/5/2021. Accessed online via: [https://www.medicines.org.uk/emc/product/12511](https://www.medicines.org.uk/emc/product/12511)
- Lexicom. Isoprenaline. Accessed online via: [https://online.lexi.com/lco/action/search?q=isoprenaline&t=name&va=isoprenaline](https://online.lexi.com/lco/action/search?q=isoprenaline&t=name&va=isoprenaline)

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