Management of hyperglycaemia in preterm newborns

Hyperglycaemia is defined as a whole blood glucose concentration of >7 mmol/l. It occurs commonly in preterms with a reported incidence of 40-80% among VLBW (1000-1500g) babies. Insulin resistance and defective islet cell processing of proinsulin are thought to be the cause for hyperglycaemia in these infants.

The differential diagnosis includes:
- Factitious
- Stress – Infection / intracerebral catastrophe/ incipient NEC/ post surgery
- Drug treatment- Steroids, theophylline, caffeine overdose
- High IV infusion rate

Complications of hyperglycaemia include:
- Osmotic diuresis & electrolyte imbalance
- Hyperosmolar state and intraventricular haemorrhage in premature babies.
- Increased episodes of sepsis

Various studies have established that insulin therapy in the hyperglycaemic ELBW infant improves blood glucose control, caloric intake, and probably weight gain, however it is not clear whether this confers any long term advantage. Insulin enhances uptake of glucose in insulin sensitive tissues, enhances glycogen and fat synthesis, enhances muscle uptake of amino acids and cellular uptake of potassium. It inhibits lipolysis and gluconeogenesis. Plasma half-life is short (approximately 9 minutes in adults), with degradation in liver and kidneys.

Consideration of insulin use:

The use of insulin is a Consultant decision based on a number of individual factors in individual cases, taking into consideration glucose infusion rates, calorie intake, blood sugar and glycosuria.

For example:
- Tolerating<100 calories/kg/day and persistent glycosuria >2+ and blood sugar >15mmols. (Resting energy expenditure in preterm babies is considered to be 60 kcal/kg/day)
- Tolerating < 4mg/kg/min, glycosuria >2+, BM>15 (In utero glucose accretion rate 4-6 mg/kg/min)

Exceptions to insulin use:
- First 72 hours of life
- Acute transient stress (e.g. post surgery, acute sepsis etc)
Special considerations when using insulin:

- Administer in same line as intravenous fluids, so if there are any interruptions, both are interrupted together
- Prepare an infusion so that when infused at a rate of 0.1ml/hour, the baby receives a dose of 0.01units/kg/hr (see iv infusion guide).
- Starting dose usually 0.01units/kg/hr, then adjusted according to requirements
- **Do not** include insulin in the total daily fluid intake - it should be titrated on top of the prescribed fluid intake
- Monitor blood glucose, initially hourly, and once stable at least 8 hourly
- Aim for blood glucose ≥4mmol with glycosuria ≤1+
- **Remember ELBW infants may have relative insulin resistance**

Sliding scale:

<table>
<thead>
<tr>
<th>BM result</th>
<th>Rate of infusion (ml/hr)</th>
<th>Dose of insulin (units/kg/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td>0.1</td>
<td>0.01</td>
</tr>
<tr>
<td>10-14</td>
<td>0.25</td>
<td>0.025</td>
</tr>
<tr>
<td>14-17</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>17-20</td>
<td>0.8</td>
<td>0.08</td>
</tr>
<tr>
<td>&gt;20</td>
<td>1.0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Adverse effects:

- Hypoglycaemia
- Hypokalaemia

References:


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