Hyperglycaemia – Neonatal Management

Glucose utilisation

Total glucose intake is usually kept between 4-8mg/kg/min
The maximum glucose oxidative capacity in the neonate is about 12mg/kg/min. Beyond this level conversion to fat occurs.

The intervention/treatment threshold for treating neonatal hyperglycaemia is:

- >10mmol/l in the very low birth weight or unwell infants
- >10mmol/l with established glycosuria of > 2% in all infants
- >12mmol in the well neonate + glycosuria

All based on two readings taken within 2 hours

Blood sugar measurements are more reliable on the blood gas machine or from a true blood sugar reading from the laboratory than from cotside meters

Aetiology

Hyperglycaemia may result from a high glucose infusion rate, a low glucose uptake or high glucose production

Very low birth weight infants
Iatrogenic -Excess glucose intake
Infection/ stress - is probably the most common cause
Transient Neonatal Diabetes Mellitus

Rarer conditions include

Hyperosmolarity e.g. from PN
Maternal drugs include diazoxide
Drugs in the infant include corticosteroids, caffeine and phenytoin

Consequences of hyperglycaemia

Polyuria/ osmotic diuresis
Dehydration
Convulsions
Acidosis

Management

The aim should be to maintain normoglycaemia without compromising the baby’s nutrition

Aim is to keep blood glucose readings between 3-8mmol/l
The recommended glucose infusion rate is 4 - 8 mg/kg/min

1) Confirm reading
2) Look for and treat the underlying cause
3) Calculate the amount of glucose the baby is receiving. Include all infusions and feeds containing glucose.
Use the **Online Glucose Calculator**

or

Formula for calculating glucose infusion rate:

\[
\text{a) } \text{mg/kg/min} = \frac{\% \text{dextrose} \times \text{ml/kg/d}}{144}
\]

or

\[
\text{b) } \text{IV rate (ml/hr)} \times \text{dextrose conc. (g/dl)} \times 0.167
\]

\[
\frac{\text{Weight}}{}
\]

Approximate glucose concentration in milk:
- Term Breast milk – 7.1g/100ml
- Term formula milk – 7.1g/100ml
- Preterm milk – 8.5g/100ml

1) **Reduce Glucose intake by**

  Reducing Total intake
  The concentration of glucose in fluids

  - Reduce the glucose infusion rate by 1-2mg/kg/min depending on how high the initial blood sugar is. This can be done by changing glucose containing infusions from 10% dextrose to 5% dextrose, normal saline or 0.45% saline depending on compatibility with other infusions
  - Do not infuse below 5mg/kg/min – this is the minimum needed for adequate calorie intake
  - Monitor the blood sugar at 1-2 hourly intervals
  - If blood sugar level has fallen to an acceptable value, check the blood sugar level again in 2 hourly intervals until 2 consecutive values are between 3 and 8 mmol
  - Monitor the blood sugar level as above

If the glucose intake cannot be adjusted further (discuss with consultant) consider insulin

2) **Insulin**

Check its compatibility with other infusions in the neonatal formulary

Make up the infusion according to the neonatal formulary

**Prime the extension tubing with the insulin solution**

Leave for 10 minutes

Purge the line

Then connect to baby

Babies can be very sensitive to insulin

The aim is to avoid a blood sugar level of less than 6mmol/l while the baby is on an insulin infusion. Take the trend/rate of fall into account. Try not to exceed a rate of fall of 3-4mmol/l/hr.
Infusion rate

Start with a rate of 0.02 – 0.05 units/kg/hr.
Check the blood sugar level in 1 hour
Adjust the insulin infusion rate by 0.01 – 0.02 units/kg/hr according to response.

Monitor the blood sugar

- 1 hour after starting the insulin infusion
- 1-2 hours after every change in the infusion rate then
- 2-4 hourly depending on the initial blood glucose level and trend of fall

After stopping the insulin infusion

- Check blood sugar level in 1 hour
  If within normal limits recheck again in 2 hours then 4-6 hours later unless more frequent blood gas measurements are required.
  Further checks depend on the clinical situation
  It can then be checked on the gas machine

  If the BSL is rising again, monitor level 1-2 hourly

Do not restart insulin until the criteria for hyperglycaemia treatment is met

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REFERENCES