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High-Dose Insulin Euglycemia Therapy (HDIE)/ Hyperinsulinemia-Euglycemia Therapy (HIE)



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Background

- For calcium channel blocker (CCB) & beta-blocker (BB) overdose (rarely for other toxicological CV instability), especially in patients with severe or persistent hypotension & bradycardia.
- High-dose insulin in this situation is used to treat the heart's metabolic problems, not the patient's blood sugar. Insulin has positive inotropic properties, stimulates myocardial glucose metabolism and lactate uptake.

Initiating HDIE Therapy

1) **Glucose**

- If initial blood glucose less than 11 mmol/L (200mg/dL), consider administration of 50mL D50W for adult (2-4mL/kg D25W in children).

2) **Potassium**

- Treat initial hypokalemia if present (potassium less than 3mmol/L or 3mEq/L) as per hospital IV potassium replacement protocol.

3) **Insulin**

- Prepare 1 Unit/mL IV solution of Insulin Regular.
- Administer a bolus of 1 Unit/kg of Insulin Regular, followed by a continuous infusion of 1 Unit/kg/hour Insulin Regular.

Titration & Monitoring

1) **Glucose**

- Maintenance infusion: D10W-1/2NS at 100mL/hour in adults (age-appropriate rate for children)
- Monitor blood glucose every 20 minutes during the first hour of therapy and during insulin dose titration, then every 1 hour when stable. Replace as necessary either with bolus dosing or maintenance infusions. BB overdoses tend to have higher glucose requirements to maintain euglycemia. Infusions of concentrated glucose solutions may be required (e.g. D25 or D50).
- Target: maintain euglycemia between 5-11mmol/L (100-200 mg/dL).

2) **Potassium**

- Monitor serum potassium hourly during titration, then every 2 hour if it has been stable. Replace if potassium less than 3mmol/L (or 3mEq/L).

3) **Insulin**

- If no hemodynamic improvement, insulin infusion rate may be increased by 1 Unit/kg/hour every 20-30minutes up to 10 Unit/kg/hour.
- Insulin can be concentrated as necessary to avoid fluid overload (e.g. 10 Unit/mL).
- Target: SBP >90mmHg, MAP >65mmHg, HR >50bpm.

Weaning

1) **Insulin**

- When patient is improving, titrate down the insulin infusion by 1 Unit/kg/hour.
- Typically, vasopressors would be weaned first and then High-dose Insulin Euglycemia Therapy as patient's status improves; however, this is at discretion of treating physician

2) **Glucose**

- For CCB overdoses, glucose requirements may increase as toxicity improves.
- Supplemental dextrose may be needed for up to 24 hours after the insulin infusion is discontinued.