

Welcome to Journal Club

Presented by

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Salbutamol for Hyperkalaemia in Children

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(A Review Article)

Introduction

Hyperkalaemia in children is life threatening that demands urgent treatment. A serum potassium level exceeding 7.5mmol/L can cause arrhythmia and heart failure. The efficacy of traditional medical treatment is unpredictable, limited and some times carries the risk of serious adverse effect.

Homeostasis

- *Normal serum level potassium:*

Term newborn- 5.1±0.2mmol/L

Premature babies- 5.5-7.0mmol/L

Average children- 3.8-5.0mmol/L

- *Hyperkalaemia:*

Term newborn- >6.0mmol/L

Premature babies- >7.0mmol/L

Average children- >5.5mmol/L

Causes of hyperkalaemia in children-

Acute renal failure, Trauma, Burn, Congenital adrenal hyperplasia, Addison's disease, Tumour lysis syndrome, VLBW.

Very low birth weight infants are prone to have hyperkalaemia due to-

- a) Low intracellular K^+ /plasma K^+ ratio
- b) Decreased $Na^+ k^+$ -ATPase activity.
- c) Insufficient clearance of potassium.

Features of Hyperkalaemia

- Muscular weakness.
- Cardiac arrhythmia's(bradycardia, ventricular fibrillation, asystole)
- ECG changes-
 - 5.5-7.0mmol/L: Peaked or tented T wave
 - 7.0-8.0mmol/L: Prolonged P-R interval, wide QRS complex.
 - >8.0mmol/L: P-Wave disappear,
Sine wave(P-Wave on T-Wave).

Treatment of hyperkalaemia

- Traditional :

1. *Calcium gluconate 10%*, 0.5 ml/kg I/V slowly(This dose can be repeated twice).It effect is immediate(Within 1-3 minutes) but transient(About 30 minutes).

Adverse effect- Hypercalcaemia,
bradycardia and tissue necrosis,

2. *Sodium bicarbonate 8.4%*, 1-2 mmol/kg I/V slowly. Its potassium lowering effect is slow(10-30 minutes) and limited.

Adverse effect : Hyponatremia, Alkalosis.

3. *Insulin and glucose*: 25% glucose,
2 ml /kg/hr ; 4 gm glucose/1 unit soluble
insulin. Action is very rapid.

Adverse effects : Hypoglycaemia,
hyperosmolarity and volume overload .

4. *Ion exchange resins : Sodium polystyrene sulphate*-1 gm/kg initial dose follow by 0.5 -1gm/kg/day in 2-3 doses (oral/per rectal), result is effective but slow diffuse in serum potassium

adverse effect : Nausea, vomiting (when given orally). Less effective when given per rectally.

- *5. Effective and costly treatment of hyperkalaemia :*

- Haemodialysis
- Peritoneal dialysis
- Haemofiltration

Salbutamol for hyperkalaemia

Salbutamol fulfils the criteria of a rapid, effective and reliable effective and potassium lowering drug with only transient side effects including elevation in heart rate, mild vasomotor flushing and mild short lasting tremor. Besides this, Paediatrician have experience with this drug and Salbutamol is available in every where.

Mechanism of action of Salbutamol in hyperkalaemia:

Salbutamol (β_2 -adrenoreceptor agonist)



Stimulate Intracellular adenylylase



Increase cyclic AMP in Liver and muscle cells



Acts on Na^+K^+ -ATPase pump



Shift K^+ from extracellular to intracellular



Lower Extracellular Potassium level

Doses and Route of Administration

- Salbutamol IV- 5 μ g/kg once over 20 min
Lower Serum K⁺ 0.87 \pm 0.46mmol/L at 30min
1.69 \pm 0.65mmol/L at 2 hr.
- Nebulised Salbutamol 2.5- 5mg/dose 2hrly 2doses
Lower Serum K⁺ 0.61mmol/L at 30 min
0.53mmol/L at 1hr after 2nd dose
(Total decrease 1.14mmol/L at 3rd hr)

Conclusions

Salbutamol, inhaled or infused, is safe and efficacious with long lasting reduction in serum potassium level. If follow-up with haemodialysis is required, the administration of salbutamol gives time to make the necessary preparations.

Message

Salbutamol can be used to treat hyperkalaemia in children

Thank You