¿Cuál es el mejor tratamiento para la hiperkalemia en el prematuro?

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Pregunta: ¿Cuál es el mejor tratamiento para la hiperkalemia en el prematuro?

- Un neonato de 720 g en UCI desarrolla hiperkalemia severa y arritmia cardiaca. Un médico decide dar gluconato de calcio en bolo y comienza con BIC de suero glucosado+ insulina.
- Otro médico se pregunta por qué salbutamol y las resinas de intercambio iónico no fueron considerados como terapia, son frecuentemente usados en niños mayores y adultos.

Pregunta clínica estructurada

- ¿Qué intervenciones médicas reducen efectivamente el nivel de potasio sérico en RN muy bajo peso de nacimiento con hiperkalemia no oligúrica?

Estrategia de búsqueda y resultado

- Fecha de búsqueda: Agosto de 2006.
- Búsqueda secundaria: Revisión sistemática relevante de la librería Cochrane del 2006.
- Búsqueda primaria: Pubmed and Medline 1966–2006; Embase 1974–2006; Cinahl 1982–2006 using Dialog Datastar.
- Criterios (términos) de búsqueda: hiperkalemia neonatal y/o BIC insulina/glucosa, salbutamol, gluconato calcio, resinas de intercambio iónico, bicarbonato de sodio, exanguinotransfusión y peritoneodiálisis.

Estrategia de búsqueda y resultado

- Se encontraron un total de 343 estudios, de ellos 7 son relevantes: 3 estudios randomizados controlados, 1 revisión retrospectiva y 3 series de casos

Table 2 Studies of treatment for hyperkalaemia in preterm infants

Citation	Study group	Study type	Outcome	Key results	Comments
Singh *et al* (2002), USA[14]	Preterm neonates (n = 22) with hyperkalaemia were randomly assigned to receive albuterol (n = 8) or saline nebulisations (control; n = 11)	Prospective, randomised placebo-controlled, double-blinded clinical trial (level 1b)	Evaluation of the efficacy of inhaled salbutamol for treatment of hyperkalaemia in premature neonates	SK ↓ in first 4 h, from 7.06 (SD 0.23) mmol/l to 6.34 (SD 0.24) mmol/l (p = 0.003) vs no significant change in saline group. SK ↓ continued at 8 h, 5.93 (SD 0.3) mmol/l (p = 0.04)	Effect most pronounced in first 4 h, with a less marked decline by 8 h
Hu *et al* (1999), Taiwan[8]	VLBW infants (n = 40) with non-oliguric hyperkalaemia were randomly assigned to receive regular insulin (R/I) infusion (n = 20) or kayexalate resin enema (n = 20)	Randomised controlled trial (level 1b)	Evaluation of efficacy of glucose/insulin infusion vs kayexalate in treatment of hyperkalaemia in VLBW infants	Significant shorter duration of hyperkalaemia and lower incidence of intraventricular haemorrhage noted in R/I group No difference in peak potassium level or incidence of cardiac dysrhythmias between the 2 groups	Use of early continuous R/I therapy for the treatment of hyperkalaemia in VLBW infants is more effective than kayexalate in decreasing the duration of hyperkalaemia and decreasing the incidence of intraventricular haemorrhage
Malone (1991), USA[15]	ELBW preterm neonates (n = 12) with hyperkalaemia were randomly assigned to receive insulin/dextrose (I/D) infusion (n = 7) or sodium polystyrene sulfonate (n = 5)	Prospective randomised controlled trial (level 1b)	Comparison of glucose and insulin infusion with rectal administration of cation exchange resin for the treatment of hyperkalaemia in VLBW infants	Kayexalate (n = 5) treatment failed (↑ SK ≥0.5 mmol/l within first 6 h of treatment I/D infusion (n = 7) Within 24 h all SKs 7 mmol/l 0 had ↑ >0.5 mmol/l p = 0.001 Significant ↓ in SK in G/I group compared with resin group in the first 6 h of Rx. p = 0.002	Failure of resin probably related to slow mechanism of action and inability to be specific for potassium Further studies needed to determine if ability to exchange potassium is decreased in the preterm gastrointestinal tract I/D therapy seems preferable in initial management of hyperkalaemia in VLBW infants
Dilmen *et al* (1992), Turkey[16]	LBW neonates (n = 2) with hyperkalaemia (SK 9.5 and 7.8 mmol/l) in whom therapy with insulin and glucose was considered to be inappropriate, were commenced on salbutamol infusion	Case series (level 4)	Hypokalaemic effect of salbutamol in the treatment of hyperkalaemia in newborn infants	SK fell from 9.5 to 5.5 mmol/l and 7.8 to 6.1 mmol/l in patients 1 and 2, respectively, 7 h after salbutamol infusion (0.1 μg/kg/h) was commenced	Tremor and slight increase in heart rate were noted during the infusion which resolved after cessation of treatment. Infuse carefully in patients on ventilator or with PDA as tachycardia may complicate course. Careful monitoring of blood potassium, glucose and ECG is essential
Lui *et al* (1992), Australia[9]	ELBW premature infants (n = 99) over a 3-year period were retrospectively reviewed. n = 15 developed hyperkalaemia (SK> 7.4 mmol/l). n = 12 received hypertonic insulin/dextrose (I/D) infusion	Retrospective study (level 2b)	Normokalaemia	All infants showed an initial response. Time taken for SK to ↓ below 6.5 mmol/l was 5 (SD 2) h	Hypertonic dextrose/insulin infusion is effective in controlling severe hyperkalaemia in immature infants
Ohlsson *et al* (1987), Canada[6]	ELBW (n = 8) preterm neonates (<27 weeks' gestation, birth weight <1000 g) with hyperkalaemia (SK levels >7.4 mmol/l) commenced on oral doses of CPS or SPS at 1 g/kg/dose	Case series (level 4)	Benefits and adverse effects of exchange resins in neonates	Complications (n = 5) (2 isolated abdominal mass, 1 abdominal mass+distension, 1 NG embedded in gastric mass, 1 perforation with intra-abdominal resin). 3 neonates with an uncomplicated course during treatment	Oral administration of resin to critically ill preterm neonates (<26/40) with a proven or suspected functional ileus should be avoided
Setzer *et al* (1984), USA[14]	Neonates (n = 3) with symptomatic hyperkalaemia received an exchange transfusion with low potassium-containing saline-washed red blood cells reconstituted with fresh frozen plasma	Case series (level 4)	Can iatrogenic hyperkalaemia after exchange transfusion be avoided by the use of blood products containing low potassium levels?	Mean SK prior to exchange transfusion 9.23 mmol/l and post transfusion 6.3 mmol/l	Exchange transfusion with blood units prepared by washing stored red blood cells with saline and reconstituting them with blood group specific/compatible FFP may be useful as an emergency measure in anticipation of more prolonged management with resin/dialysis

CPS, calcium polystyrene sulfonate; ELBW, extremely low birth weight; FFP, fresh frozen plasma; LBW, low birth weight; PDA, patent ductus arteriosus; SK, serum potassium; SPS, sodium polystyrene sulfonate; VLBW, very low birth weight.

Conclusiones

- Hiperkalemia no oligúrica es una complicación común y potencialmente amenazante para la vida del RNPT de UCI neonatal.
- Hiperkalemia >50% de los RNPTMBPN.
- A menudo causan arritmias cardiacas y pueden conducir a leucomalacia perivetricular y muerte.
- Hiperkalemia puede ocurrir como resultado de consumo de potasio aumentado, una disminución en la excreción o cambio desde el intracelular al extracelular.

Conclusiones

- Esta pérdida de K no está relacionada con la destrucción celular asociada a hematomas, HIC, hemólisis, asfixia perinatal, acidosis y tolerancia a la glucosa.
- Se sugiere que la pérdida de K se debe a inmadurez en la función de la Na/K ATPasa del eritrocito.
- Los tratamientos usados en prematuros con hiperkalemia no oligúrica intentan disminuir la arritmogenicidad de la hiperkalemia, redistribuir el K del espacio extracelular al intracelular o remover el K del cuerpo.

Conclusiones

- La insulina y glucosa disminuyen el potasio sérico al facilitar el transporte de K hacia el intracelular. Un estudio retrospectivo mostró disminución del K a <6,5 a las 5 hrs de tratamiento.
- La eliminación del K se puede incrementar a través de resinas de intercambio iónico, pero estudios demuestran que los neonatos han desarrollado obstrucción o perforación gastrointestinal.

Conclusiones

- El salbutamol aumenta el flujo de potasio en un 50% a través de la membrana por estimulación de la Na/K ATPasa, estudiada en eritrocitos neonatales.limitada evidencia en el neonato. Efectos colaterales: taquicardia, temblor e hiperglicemia.
- Exanguinotransfusión puede ser considerada tras fracaso de otras terapias, pero tiene riesgo de NEC y muerte.
- Se ha usado bicarbonato ya que la acidosis reduce la excreción renal de K y aumenta las arritmias provocadas por la hiperK

Conclusiones

- RNPT presentan hipocalcemia durante las 24-48 hrs de vida paralelo al inicio de la hiperK, por lo que varios estudios avalan el uso de gluconato de calcio para las arritmias cardiacas secundarias a hiperkalemia,
- Es esencial lograr revisiones más sistemáticas con estudios que permitan concretar un consenso en el manejo de hiperkalemia.

Clinical bottom line

- Insulin and dextrose infusion should form the first line of therapy in hyperkalaemia of the premature infant. (Grade A)
- Oral and rectal ion exchange resins should be avoided as they are ineffective and associated with significant and potentially life threatening complications. (Grade A)
- No substantial data show the superiority of salbutamol over insulin/dextrose for premature infants (Grade D)
- Exchange transfusion may be used as a last resort therapy. (Grade D)

Gracias por su atención…