A Mnemonic for the Treatment of Hyperkalemia

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Hyperkalemia

- 30 YOF, ESRD, missed 2 dialysis sessions over the last week
- Potassium level came back at 7 mEq/L
- EKG shows widened QRS
- Urgent dialysis indicated; however, while waiting for nephro to see patient....
- What are your med options to treat her hyperkalemia?

Mnemonic

Calcium – Chloride/Gluconate – Stabilize Cardiac Membrane
Albuterol – Move K Intracellularly
Bicarbonate
Insulin + Glucose (Dextrose)
Kayexalate (Sodium Polystyrene)
Loops - Diuretics
Dialysis – Remove K from blood

Peaked T Waves

Calcium

- For severe hyperkalemia with EKG changes
  – Does NOT LOWER SERUM K!
  – “Stabilizes” ventricles against arrhythmia
- Chloride vs gluconate
  – Elemental calcium
    • One ampule 10% CaCl$_2$= 270mg elemental Ca
    • One ampule 10% CaGluconate= 90mg elemental Ca
  – Osmolality
    • CaCl$_2$ = 2053 mOsm/L – Central line preferred
    • CaGluconate= 697 mOsm/L – Good for peripheral
- Dosing: 1000-3000 mg IV over 3-5 min
  – Can be repeated in 5 min if EKG changes still
  – Effect in minutes, lasts 30-60 min

Calcium

- Never with bicarbonate as can precipitate CaCO$_3$!
- Give even if Ca levels are normal or elevated
- Case reports of sudden death in patients given IV calcium while receiving digoxin
Albuterol
- $\beta_2$ agonist
  - Drives K into cells via Na/K ATPase
- Dosing is 4-8x normal albuterol dosing
  - 10-20 mg via med neb over 10 minutes
  - Drops K by 0.5-1.0 mEq/L
  - Modest K lowering (0.4mEq) can be seen with an albuterol MDI
- Mild tachycardia can be seen
- Not effective for patients on non-selective Beta Blockers
- **Should never be used for single treatment of hyperkalemia**

Bicarbonate
- Increases pH, H ions leave cells as part of buffer system; only use if acidic
  - K moves into cells to balance loss of H
  - Enhance insulin-mediated K uptake??
- **Short-term infusions of bicarb (up to 4 hours) have little effect on serum K levels**
  - Probably works best via prolonged infusion rather than IV push 50 mEq
  - 150mmol/L IV at variable rate
  - Bicarb complexes with calcium
  - Counterproductive when calcium is antagonizing membrane effects of hyperkalemia

Insulin/Glucose
- Drives K into cells via Na-K-ATPase pump in skeletal muscle
  - Give glucose to prevent drop in blood sugar, don’t give glucose if blood sugar > 250 mg/dL
- 10 units of short-acting insulin IV (we use Humalog)
  - With 50 ml of 50% dextrose IV (if necessary)
  - Giving glucose in hyperglycemia could worsen hyperkalemia
- **Effect within 10-20 min**, peaks at 30-60 min, lasts 4-6 hrs
  - Check sugar within an hour
  - K should drop 0.6 mEq/L
  - **Utilized in emergency treatment of hyperkalemia**

Kayexalate
- Sodium polystyrene sulfonate (SPS)
  - Cation exchange resin
  - Exchanges Na for excreted potassium in the gut
  - Most exchange takes place in the colon
  - Each gram can bind 0.65mEq of K – though this is unpredictable
- Can give orally (preferred) or by retention enema
  - Oral dose 15-30 grams, repeat every 4-6 hours
  - Enema: 50 grams with 150 ml tap water
  - Can cause constipation – given with a laxative (20% sorbitol)
  - Very little effects of SPS over sorbitol alone

Kayexalate
- Two Main Concerns
  - Slow Effect
    - Onset is at least 2 hours, may take 6 hours for max effect
    - SPS enema is more rapid, but less of a K removing enema
  - Case reports of necrotic bowel lesions
    - Recs to not use in postop, SBO, ileus patients
  - **Can remove K from body, but poor choice for urgent hyperkalemia**

Loop Diuretic
- Spills K into urine
  - **Makes sense ONLY IF pt hypervolemic, normovolemic**
  - Furosemide 40-80mg IV; Bumetanide 1-2mg IV
  - Furosemide 40 mg = bumetanide 1 mg
  - Onset 15min, duration of 2-3 hours
Dialysis

- Most effective option for K removal
  - 1mEq/L drop in first 60min
  - 2mEq/L drop after 3 hours
- K rebound after dialysis
  - Rebound K amount is proportional to K removed during HD
    - Precipitates ventricular arrhythmias??
    - Patients should have continuous EKG monitoring

Wuzzle

Remember...

References