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?
Peaked T Waves
Mnemonic

C
Calcium – Chloride/Gluconate
Stabilize Cardiac Membrane

A
Albuterol

B
Bicarbonate
Move K Intracellularly

I
Insulin + Glucose (Dextrose)

G
Kayexalate (Sodium Polystyrene)

K
Loops - Diuretics

L
Dialysis
Remove K from blood

D
Potassium (K)
Level (L)
Decrease (D)

See (C)

A
BIG

Potassium (K)
Level (L)
Decrease (D)
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

- $B_2$ 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 acidotic
  - 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

