

EEM 2019

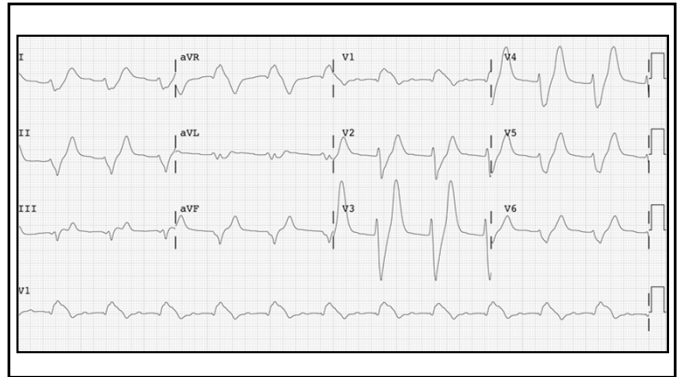
## Hyperkalemia

### New Looks at an Old Problem

Corey M. Slovis, M.D.  
Vanderbilt University Medical Center  
Metro Nashville Fire Department  
Nashville International Airport  
Nashville, TN

Hyperkalemia is the  
Most Dangerous Acute  
Electrolyte Emergency

HyperK = ECG



### STEP 1: Treating Hyperkalemia

#### Reversing Electrical Effect

##### Calcium Chloride

- 5 – 10 cc of 10% CaCl
- No more than 20 ccs

When do you use  
calcium for Hyperkalemia?

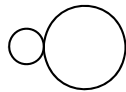
## Calcium in Hyperkalemia

- Tricks Cell
- Recreates Electrical Gradient
- Temporary, lasts only 5-20 minutes
- Dose is 5-20 cc CaCl IV
- Potentially Dangerous

*Be sure before using!*

CaCl

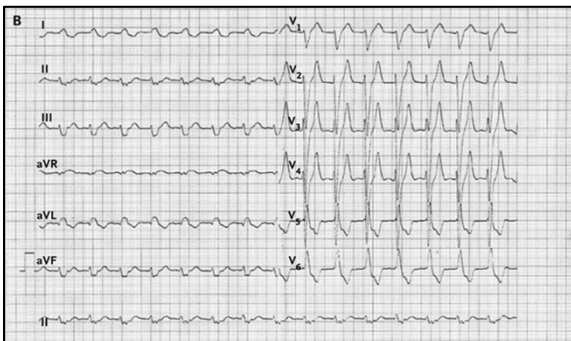
Ca Gluconate



X 1,000,000

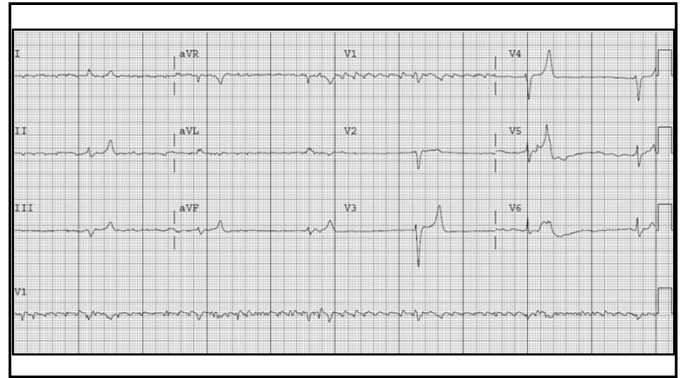
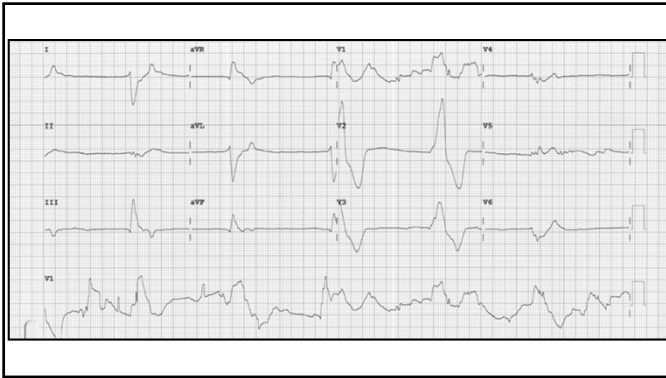


NEJM 2012;366:1824



NEJM 2012;366:1824

Only give calcium if . . .  
there is a wide QRS



### Hyperkalemia Indications for CaCl

- Wide QRS
- Sine Wave
- Bradycardia and/or Heart Block

### ECG Predictors of Adverse Events

*West J Emerg Med 2017;18:963-71*

- QRS prolongation most common predictor
  - Seen in 79% of pts with adverse events
  - Average QRS 152 msec
- Bradycardia second most common predictor
  - Seen in 60% of pts with adverse event
- 86% of patients had > 1 ECG abnormality

No patient with only peaked Ts or prolonged P-R duration had an adverse event

*West J Emerg Med 2017;18:963-71*

### ECG Changes and HyperKalemia Take Homes

- Widened QRS and Bradycardia in Hyperkalemia portends disaster
- Tall peaked T waves do NOT
- Do not use calcium for those patients who merely have peaked T waves and/or a prolongation of the P-R interval

## STEP 2: Treating Hyperkalemia

### Drive K Intracellularly

#### Glucose and Insulin

- 2 amps of D<sub>50</sub>%
- 10 units regular insulin

#### Beta Agonist Mask

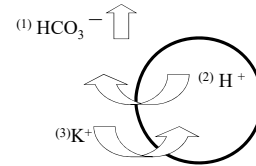
#### Bicarbonate if acidotic

- 1 – 2 amps of NaHCO<sub>3</sub>

#### Consider Saline Bolus

- 200 cc NSS

## Bicarbonate For Hyperkalemia



(1) As HCO<sub>3</sub><sup>-</sup> is added to serum

(2) H<sup>+</sup> from cell will move extracellularly to buffer alkali load

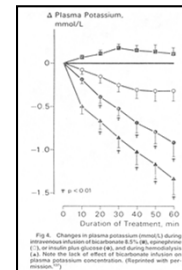
(3) K<sup>+</sup> will move intracellularly to maintain the cell's electroneutrality.

Bicarbonate is Great in Hyperkalemia

*but only if:*

The Patient is Acidotic

## Potassium Lowering Effects



Bicarb  
Epi  
Glucose/Insulin  
HD

*Amer J Kidney Disease 1991;18:421-440*

## STEP 3: Treating Hyperkalemia

### Removing K from the Body

#### Forced Diuresis

- 250 - 500cc/hr NaCl
- Supplemented with Lasix

#### Ion Exchange Resin

- 30 – 60G Kayexalate

#### Dialysis

- Hemodialysis &/or Peritoneal

### Letter to the Editor

#### Taking a Second Look at Kayexalate

Dennis J. Malone, PharmD\*

*Hosp Pharm 2015;501:959-60*

More current and better designed studies have been unable to demonstrate efficacy of SPS (*Kayexalate*) for the treatment of hyperkalemia

### Ion-Exchange Resins for the Treatment of Hyperkalemia: Are They Safe and Effective?

Richard H. Sterns, Maria Rojas, Paul Bernstein, and Sreedevi Chennupati  
Rochester General Hospital and University of Rochester School of Medicine and Dentistry, Rochester, New York

*J Am Soc Nephrol* 2010;21:733-5

- No convincing evidence that kayexalate works in humans or animals
- May be harmful per rectum
- A “largely unproven and potentially harmful therapy”

CLINICAL COMMENTARY www.jasn.org

### Ion-Exchange Resins for the Treatment of Hyperkalemia: Are They Safe and Effective?

Richard H. Sterns, Maria Rojas, Paul Bernstein, and Sreedevi Chennupati  
Rochester General Hospital and University of Rochester School of Medicine and Dentistry, Rochester, New York

*J Am Soc Nephrol* 2010;21:733-735

- Colonic Necrosis reported
- All used 70% Sorbitol
- Use 35% PO; no enemas
- Does not work for 12-24 hours

### MANAGEMENT OF HYPERKALEMIA WITH A CATION-EXCHANGE RESIN\*

LAWRENCE SCHEER, M.D.,† DAVID A. OGDEN, M.D.,‡ ALLEN W. MEAD, M.D.,  
NORTON SPRITZ, M.D.,§ AND ALBERT L. RUBIN, M.D.¶

NEW YORK CITY

*NEJM* 1961;264:115-119

- 32 ARF or CRF patients
- Oral therapy was 4 doses over 24 hours
- Largest falls seen if BUN > 150 mg/dl

*“Resin therapy was found to be effective in controlling hyperkalemia”*

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#### NOTE:

5/32 had no change (0.0)  
4/32 fell 0.4 mg/dl or less over 24 hours  
8/32 got bicarbonate or glucose plus insulin

### Effectiveness of Sodium Polystyrene Sulfonate for Short-Term Treatment of Hyperkalemia

Josh Bartenfink, Jane Lin, Sarah Hin-Mei Au-Yang, and Tara Cissford

*Can J. Hosp Pharm* 2015;68:296-303

- 138 patients randomized
- Lowered potassium by 0.14 mmol

### Hyperkalemia Indications for CaCl

- Wide QRS
- Sine Wave
- Bradycardia and/or Heart Block

### Hyperkalemia Treatments 5 Key Concepts

|               |                   |
|---------------|-------------------|
| Calcium       | Wide QRS/Brady/HB |
| Bicarb        | Acidosis          |
| Glu/Insulin   | Hypoglycemia      |
| Beta Agonists | Benign and Easy   |
| Kayexalate    | Just say NO!      |

