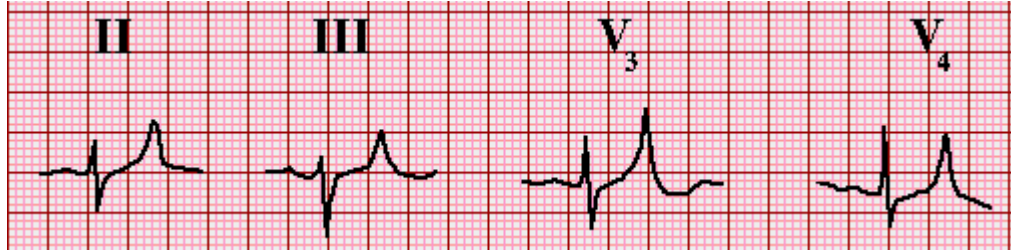


# Teaching Points:

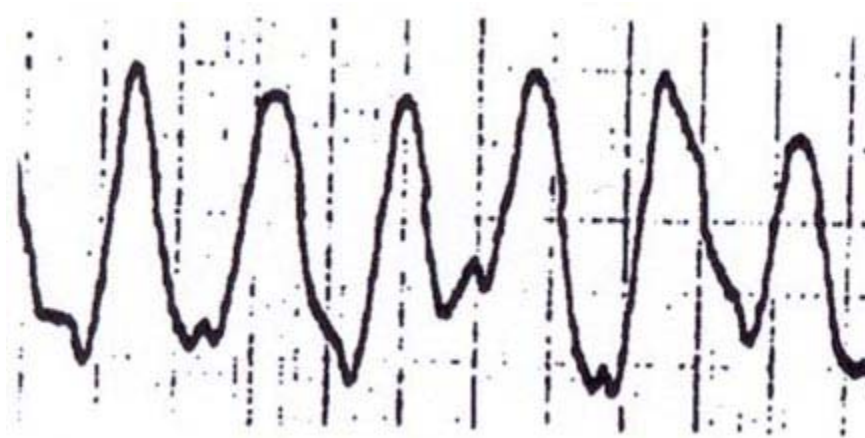
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## Recognize hyperkalemic cardiac toxicity on ekg

- a. Peaked T Waves and short QRS early ( $K > 6$ )



- b. PR interval increases ( $K = 6.5-7$ )
- c. P waves fade away and QRS widens ( $K > 7-8$ )
- d. Sinusoidal wave  $\gg$  Vfib, asystole



- e. Accelerating factors = hypocalcemia, acidosis, hyponatremia, rate of K increase

## Treatment of Hyperkalemia

### Treatment of hyperkalemia

<b>Antagonism of membrane actions of potassium</b>
Calcium
<b>Drive extracellular potassium into the cells</b>
Insulin and glucose
Sodium bicarbonate, primarily if metabolic acidosis
$\beta$ <sub>2</sub> -adrenergic agonists
<b>Removal of potassium from the body</b>
Loop or thiazide diuretics
Cation exchange resin
Dialysis, preferably hemodialysis if severe

#### Stabilize cardiac membranes with calcium:

- Give only for **hyperkalemia with significant ECG findings** (eg, widening of the QRS complex or loss of P waves, but not peaked T waves alone) or severe arrhythmias thought to be caused by hyperkalemia
- Give adults **calcium chloride 500 to 1000 mg** (5 to 10 mL of 10 percent solution) by IV infusion slowly over 2 to 3 minutes, preferably via a central line; or give calcium gluconate 1000 mg (10 mL of 10 percent solution) also infused slowly; may be given peripherally in large vein; time to onset is immediate
- Calcium treatment may be repeated after 5 minutes if ECG changes persist; patient must be on cardiac monitor when receiving calcium; calcium can exacerbate digoxin toxicity
- Since the effect of calcium is immediate but transient, patients with hyperkalemia also require treatments to shift potassium into cells and to remove potassium

#### Shift potassium into cells:

- Give insulin and glucose to hyperkalemic patients with serum K [Greater than or equal to] **6.5 meq/L**, except patients with chronic renal failure and no ECG changes, who are treated with hemodialysis
- Insulin and glucose: Give **IV bolus of regular insulin 10 units** with 50 mL (1 amp) of a 50% glucose solution
  - i. Lasts for hours, onset 20-30min
- Beta 2 agonist: May give albuterol 10 to 20 mg in 4 mL saline nebulized over 20 minutes (may use metered dose inhaler); stop bbl

- Sodium bicarbonate: Has minimal effect on shifting potassium intracellularly unless patient is acidemic; may promote renal excretion; give 45 meq (1 amp of 7.5 percent solution) slow IV infusion over 5 minutes; do not give in same IV as calcium
  - i. Lasts for hours, onset 20-30min
- Since the effect of shifting potassium into the cells is transient, treatments to remove potassium are also required

### Remove potassium

- f. Cation exchange resin (sodium polystyrene sulfonate; Kayexalate): Give 15 to 30 grams orally; time to **onset is approximately 1 to 2 hours**; may repeat dose after 4 hours based upon repeat serum K
- g. Loop diuretic: May give furosemide 20 to 40 mg IV; the fluid losses must be replaced unless the patient is volume expanded
- h. Hemodialysis: Can be used if the conservative measures listed above fail, if hyperkalemia is severe, if the patient has renal failure, or if the patient has marked tissue breakdown and is releasing large amounts of potassium from injured cells