

# Hyperkalemia: Dx/Tx

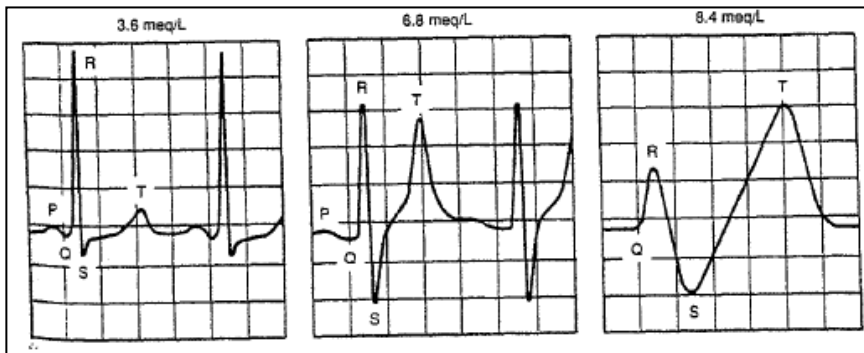
## Anesthetic Pearls: Anesthetic Implications and Management of Hyperkalemia

### I. Diagnosis

- Plasma [K+] > 5.5 meq/L
- Cardiac (standstill in diastole)
- Skeletal muscle weakness

#### Hyperkalemic Progression

1. Peaked T ( $\pm$  shortened QT)
2. Widening QRS
3. Prolongation P-R
4. Loss of P wave
5. Loss of R wave amplitude
6. ST changes
7. Sine wave
8. V-fib / Asystole



	Dose	Mechanism	Onset	Duration
Calcium gluconate	10-20 ml of a 10% solution IV	Direct antagonism	Rapid	15-30 min
Sodium bicarbonate	50-100 mEq IV	Shift intracellular	15-30 min	3-6 h
Glucose and insulin	25-50 g with 10-20 units IV	Shift intracellular	15-30 min	3-6 h
Hyperventilation	PaCO <sub>2</sub> 25-30 mmHg	Shift intracellular	Rapid	
Kayexelate		Remove	1-3 h	
Peritoneal dialysis		Remove	1-3 h	
Hemodialysis		Remove	Rapid	

### III. Treatment (see above)

**C-BIG-K:** Calcium, Bicarb, Insulin, Glucose, Kayexelate

### IV. Miscellaneous Points

1. Elective surgery should **not** be undertaken
2. Succinylcholine is contraindicated
3. Avoid K+ containing IV solutions (Ringers Lactate)
4. Avoid respiratory acidosis (Hypoventilation)
5. Avoid metabolic acidosis (Alkalosis => lower plasma [K+])
6. Hyponatremia, hypocalcemia, and acidosis accentuate the cardiac effects of hyperkalemia
7. Hyperkalemia can accentuate neuromuscular blockers (can increase effect & duration; may need diminished dose)
8. Avoid sedation ( $\downarrow$  ventilation with respiratory acidosis) prior to K+ normalization

### II. Etiology

#### 1. Pseudohyperkalemia

- In vitro red cell hemolysis
- Marked leukocytosis
- Marked thrombocytosis

#### 2. Intercompartmental shifts

- Acidosis
- Hypertonicity
- Tissue breakdown
- Rhabdomyolysis
- Severe exercise
- Beta-2 adrenergic blockade
- Periodic paralysis
- Succinylcholine
- Digitalis overdose
- Arginine HCl

#### 3. Decreased renal potassium excretion

- Renal failure
- Decreased mineralocorticoid activity
  - Primary adrenal insufficiency
    - Addison's disease
    - Bilateral adrenalectomies
    - Congenital adrenal hyperplasia
    - Hydroxylase enzyme deficiency
  - Hyporeninemic hypoaldosteronism
    - Acquired Immunodeficiency syndrome
- Competitive K+ sparing diuretics
  - Spirolactone
  - ACE inhibitors
  - Cyclosporine
  - Heparin
- Isolated decreased K+ secretion in distal nephron
  - Pseudohypoaldosteronism
    - Noncompetitive K+ sparing diuretics
      - Amiloride
      - Triamterene
    - Sickle Cell Disease
    - Renal allograft
    - Systemic lupus erythematosus
    - Urinary obstruction

#### 4. Increased potassium intake

- Transfusion of whole blood
- Salt substitutes
- Potassium penicillin