

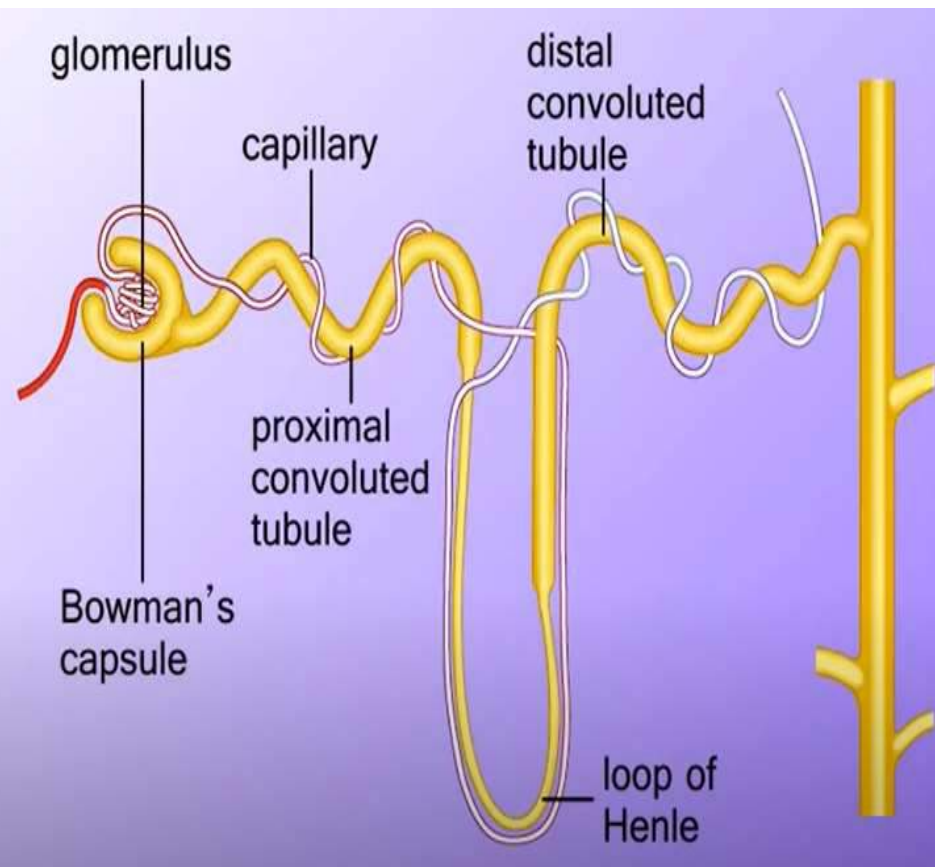
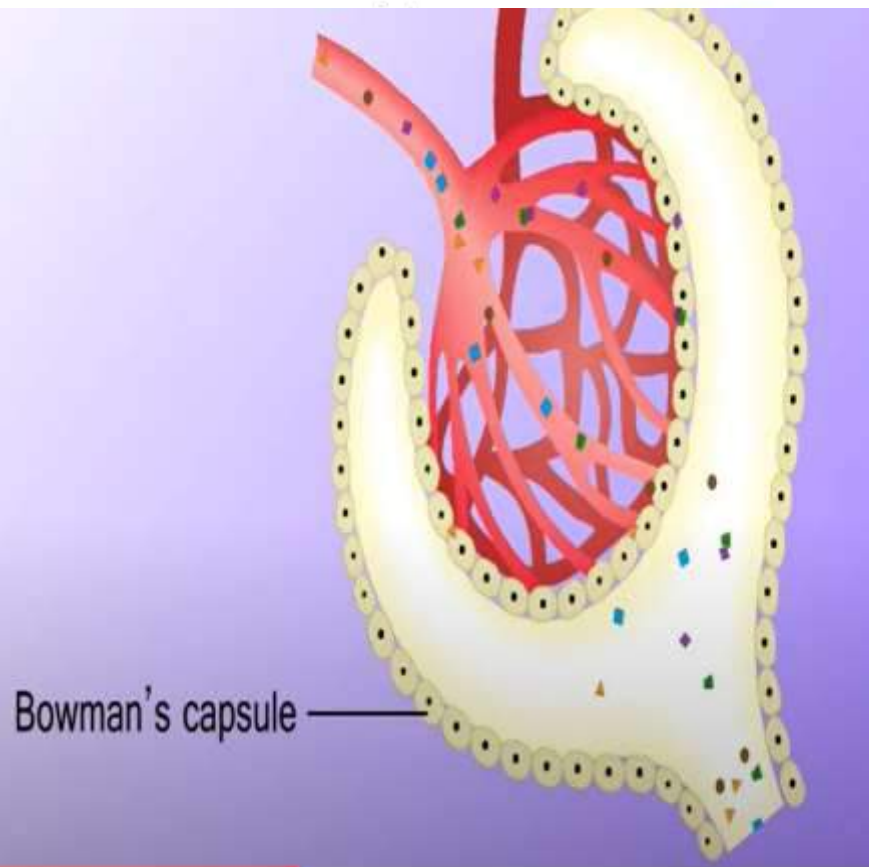
CARDIOLOGY
2024

Cardiac Medications Review Diuretics

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TYPES OF DIURETICS

Loop

Thiazide

Carbonic
Anhydrase
Inhibitor

Potassium
Sparing

11 MONTH OLD, SUB AS, MITRAL VALVE REGURG

- Hx of Shone's Complex & aortic arch repair (2 mo of age)
- Shone's complex- small left-sided structures (at least 3)
 - Bicuspid aortic valve and small aortic valve annulus
 - Coarctation of aorta
 - Cor triatriatum
 - Hypoplastic left heart ventricle
 - Parachute mitral valve.
 - Small aortic arch
 - Subaortic stenosis
 - Supramitral ring

POST-OPERATIVE COURSE

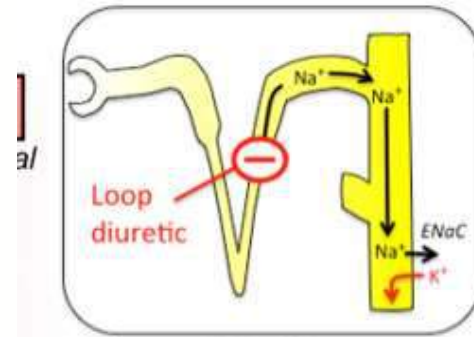
- Surgical repair: Sub-aortic resection, aortic valvuloplasty, mitral valvuloplasty
 - POD #1-fluid positive- **lasix IV**

Loop

Furosemide
Bumetanide
Ethacrynic acid* (\$\$\$)

- Loop of Henle
- "high ceiling"
- Na^+ , K^+ , Cl^- loss

LOOP



Enhanced Na^+ delivery results in K^+ loss in the collecting duct

25% of filtered Na
is normally reabsorbed
in the loop of Henle

Loop diuretics:

- Loss of Na & Water
- Hypokalemic metabolic alkalosis
- Increased Ca^{2+} loss

LASIX

- Furosemide (Lasix): Inhibits reabsorption of Na^+ and Cl^- in ascending loop of Henle
- Dose: 1-2 mg/kg/dose IV/po up to every 6 hours
- Continuous Infusion: 0.1-0.2 mg/kg/hr
- Onset: IV-5 min; Half-Life: 2-4 hours
- Common side effects: hypokalemia, hyponatremia, metabolic alkalosis, ototoxicity, dehydration
- Poor response to single dose- ? predictor of AKI & prolonged ventilation

BUMETANIDE (BUMEX)

- Inhibits reabsorption of Na^+ and Cl^- in the ascending loop of Henle and proximal renal tubule
- Dose: 0.1 mg/kg/dose IV up to q6hr
- Cont. Infusion: 0.01mg/kg/hr or 0.4mg/kg/day
- Onset: IV-5 min; Half-Life: 2-4 hours
- 10-40 times more potent than Furosemide
- Common side effects: hypokalemia, hypochloremia, hyponatremia,

POST-OPERATIVE COURSE

- POD #2- fluid positive- **lasix IV q6**, added **diuril IV q12**
- Labs:
 - Na, K, Cl low
 - Ca low

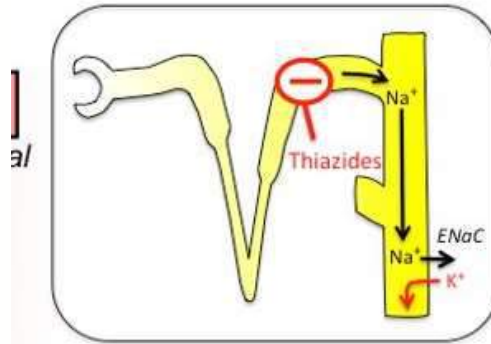
Thiazide

Chlorothiazide
Hydrochlorothiazide
Metolazone*

- Distal convoluted tubule
- Weak relative to loops
 - Calcium sparing
- Na⁺, K⁺, Cl⁻ loss



Thiazide



*Enhanced Na^+ delivery results
in K^+ loss in the collecting duct*

10% of filtered Na
is normally reabsorbed
in the distal convoluted tubule

Thiazide diuretics:

- Loss of Na & Water
- Hypokalemic metabolic alkalosis
- Increased Ca^{2+} reabsorption

CHLOROTHIAZIDE (DIURIL)

- Inhibits Na^+ reabsorption in the distal tubules.
- Dose: 5-10 mg/kg/dose IV q12hr
 - 10-20 mg/kg/dose PO q12hr- only thiazide available in IV
- Onset: IV-15 min; Half-Life: 1-2 hours
- Common side effects: hyponatremia, hypokalemia, hypochloremia, hyperglycemia
- Used in combination with loops- augments diuresis

HYDROCHLOROTHIAZIDE

- Inhibits Na^+ reabsorption in the distal tubules
- Dose: 1-2 mg/kg/day PO q12-24hr
- Onset: PO 2-4 hours; Half-Life: 6-12 hours
- Common side effects:
hypokalemia, hypomagnesemia, hypercalcemia,
and hyponatremia
- Commonly combined with ACE's or ARB's

METOLAZONE

- Dose: 0.2 to 0.4 mg/kg/day PO divided every 12 to 24 hours (in combination with furosemide)
- Onset: PO 1 hour; Half-Life: 8-14 hours
- Common side effects: hypercalcemia, hyperglycemia, hyperuricemia, hypochloremia, hypochloremic alkalosis, hypokalemia, hypomagnesemia, hyponatremia, hypophosphatemia **electrolyte derangements**

POST-OPERATIVE COURSE

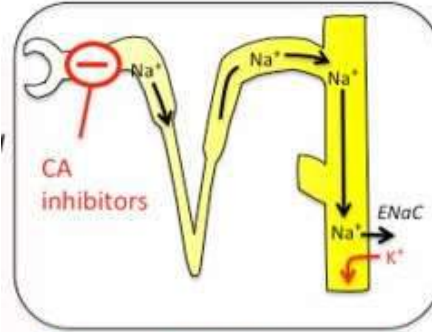
- Severe MV regurgitation (defect in anterior leaflet)
- Moderately depressed LV systolic function
 - POD #6- **bumex gtt** 0.01 mg/kg/hr. Add **diamox**
 - Labs:
 - Low K, **low Cl**, metabolic alkalosis, elevated LFTs, BUN, & nt-BNP

Carbonic Anhydrase Inhibitor

Acetazolamide
(Diamox)

- Proximal convoluted tubule
- weak diuretic
- Used for its effect on bicarbonate (HCO_3)

Carbonic Anhydrase Inhibitor



Enhanced Na^+ delivery results in K^+ loss in the collecting duct

~66% of filtered Na &
85% of NaHCO_3
is normally reabsorbed
in the proximal tubule

Carbonic Anhydrase Inhibitors:

- Loss of NaHCO_3
- Hypokalemic metabolic acidosis
- Tolerance develops after 2-3 days

ACETAZOLAMIDE (DIAMOX)

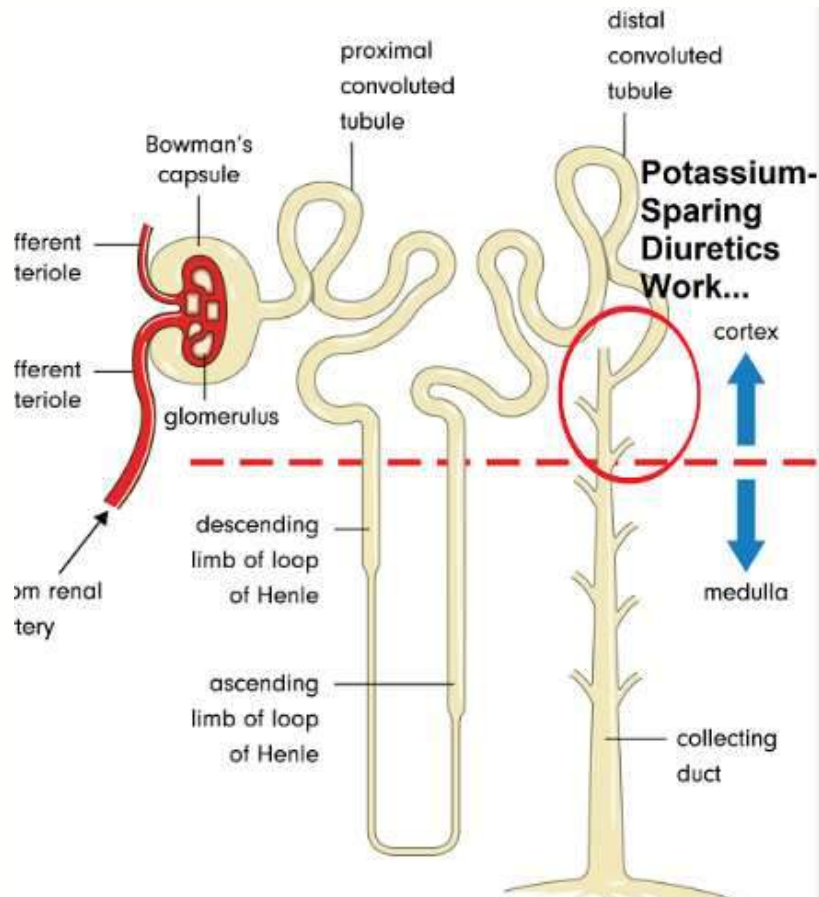
- Causes an accumulation of carbonic acid by preventing its breakdown & blocking reabsorption of bicarbonate
- Increases urinary sodium and bicarbonate excretion and improvement of hypochloremic metabolic alkalosis
- Dose: 5 mg/kg/dose IV/po q6-8 hr
 - Limited # doses (usually x 24 hours)
- Common side effects: metabolic acidosis, hypokalemia, hyponatremia

Potassium Sparing

Spironolactone
(Aldactone)

- Collecting duct
- Conserves K & H⁺
- Na & water excretion
- Weak diuretic
- Aldosterone receptor blocker

Potassium Sparing



2-5% of filtered Na is normally reabsorbed in the collecting duct

Aldosterone antagonists

- Loss of Na & Water
- Hyperkalemia
- Some risk for acidosis

SPIRONOLACTONE (ALDACTONE)

- Used frequently in Heart Failure
- Competes with aldosterone for receptor sites in the collecting duct, increasing sodium chloride and water excretion while conserving potassium and hydrogen ions
- Not a strong diuretic
- Dose: 1-3 mg/kg/day IV/po q6-12 hr
- Short half life (1-2 hrs)
- Common side effects:
 - Hyperkalemia- may be severe when combined with ACE inhibitor, beta blocker or Bactrim
 - Reduces renal tubular secretion of digoxin & can attenuate its positive inotropic effect

SPECIAL THANKS

- Amanda Gansen- PharmD
- Angel Pope- PharmD

REFERENCES

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