CASE STUDY (AKI)

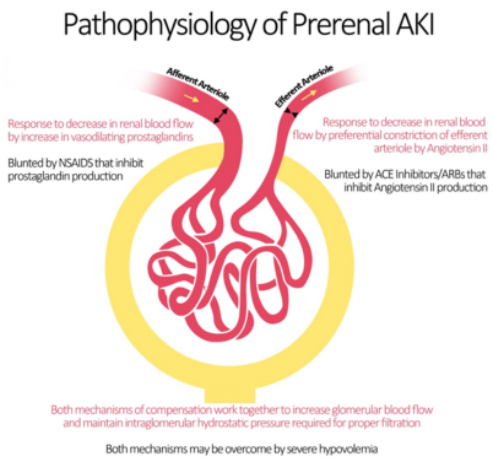
L.T. is a 61 year-old female (ht: 5'4", wt: 62 kg) with HTN, CAD, and diabetes, for which she had been taking HCTZ 25 mg PO daily, atorvastatin 10 mg PO daily, aspirin 81 mg PO daily, insulin glargine 30 units SC QAM and metformin 1000 mg PO BID with breakfast and dinner. L.T. is also taking naproxen 500 mg PO BID for mild-moderate osteoarthritic pain and OTC Alka-Seltzer prn for dyspepsia. At last week's clinic visit, she had 2 consecutive BP readings of 187/96 and 193/95, measured 20 mins apart. At that time, L.T.'s primary-care physician started her on lisinopril 5 mg PO daily. Other notable lab values at the time included HgA1C of 7.5%.

Two weeks later, L.T. presents to the ED with weakness, dizziness, and peripheral edema. Laboratory values and vital signs obtained at this visit include the following:

BP: 96/55
Na: 145 mEq/L (135-145)
Cl: 103 mEq/L (96-105)
Bicarbonate: 20 mEq/L (22-29)
K: 6.5 mEq/L (3.5-5.2)
Glucose: 252 mg/dL (70-110)
BUN: 62 mg/dL (6-20)
sCr: 2.7 mg/dL (baseline sCr: 1.0)
Beta-Hydroxybutyrate < 0.5 (< 0.5)
Anion Gap: 10 (< 12)
Lactate: 2.4 mmol/L (0.5-2.0)

(1) Why is L.T. experiencing AKI?
(2) How would you treat L.T. during this visit?

Why is L.T. experiencing AKI?



1. Intrinsic Causes of AKI: Acute Tubular Necrosis

- Naproxen → inhibits PGI (prostacyclin) in vascular smooth muscle → vasoconstricts afferent arteriole → reduces glomerular capillary perfusion → AKI
- Lisinopril → inhibits ACE → reduces Angiotensin-II production → dilates efferent arteriole → reduces glomerular capillary perfusion → AKI

2. Prerenal Azotemia

L.T. is hypotensive (BP: 96/55, MAP=69) → hypotension decreases renal perfusion → AKI

- Monitor BP closely and consider initiating norepinephrine infusion (1-30 mcg/min) to maintain MAP > 65, if needed.
- Vasopressors (e.g., Norepinephrine drip) improve renal perfusion in hypotensive patients by stimulating alpha-1 receptors in peripheral blood vessels.

How would you treat L.T. during this visit?

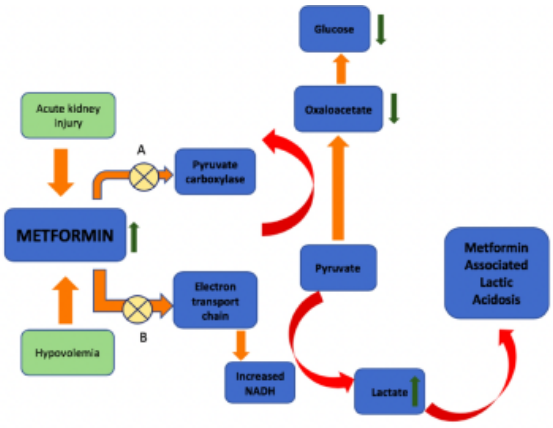
1. Discontinue Alka-Seltzer

- NaHCO3 → high Na^+ content in Alka-Seltzer contributes to peripheral edema.
- L.T. is edematous and fluid overloaded.

2. Discontinue Metformin

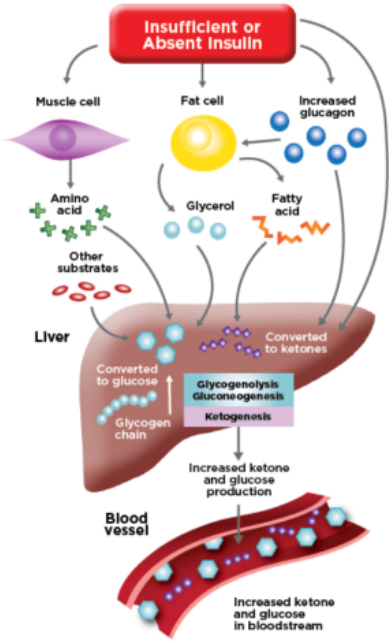
- Metformin is contraindicated in patients with CrCl < 30 ml/min → risk of lactic acidosis.

CrCl = (140-Age)(IBW) / (72)(sCr)
CrCl = (140-61)(54.7) / (72)(2.7) = 22.2 ml/min
CrCl (female): (22.7 ml/min)(0.85) = 18.9 ml/min



- Monitor lactate levels to rule out lactic acidosis secondary to metformin toxicity.
  - Hyperlactatemia: Lactate levels > 2 mmol/L
  - Lactic acidosis is defined as a serum lactate concentration > 4 mmol/L.
  - Type A lactic acidosis is most common and is due to tissue hypoperfusion resulting from hypovolemia, cardiac failure, sepsis, or cardiopulmonary arrest.
    - In sepsis, there is both an increase in lactate production resulting from circulatory failure and a decrease in lactate clearance.
  - Type B lactic acidosis is due to toxin-induced impairment of cellular metabolism and regional areas of ischemia (e.g., metformin toxicity, alcoholic liver disease).
  - Although the acidosis is usually associated with an elevated anion gap, moderately increased lactate levels can be observed with a normal anion gap.

How would you treat L.T. during this visit? (cont.)



3. **Does L.T. have DKA?**
   - Anion Gap and Beta-Hydroxybutyrate level are normal → rule out DKA.

4. **Correct Hyperkalemia (K=6.5)**

   a. **Calcium Gluconate 1000 mg IV over 2-3 mins**
      - CaGluc antagonizes membrane actions of hyperkalemia

   b. **Regular Insulin 5-10 UNITS IVP <u>without</u> Dextrose 50%, since patient's BG > 250 mg/dL**
      - Monitor BG Q1H for 5-6 hours

   c. **Albuterol 15 mg HHN versus $NaHCO_3$**
      - $NaHCO_3$ exacerbates peripheral edema due to high sodium content.

   d. **Furosemide (Benefit vs Risk)**
      - Avoid furosemide in patients who are hypotensive (BP: 96/55, MAP: 69)

   e. **GI Cation Exchangers**
      - Sodium Polystyrene Sulfonate (Kayexalate) 30 GM PO
      - Sodium Zirconium Cyclosilicate (Lokelma) 10 GM PO
      - Avoid Patiromer (Veltassa) in acute hyperkalemia (K > 6.5) since it has a delayed onset of action: 7 hours.