DIABETIC KETOACIDOSIS

FLAME LECTURE: 9

AKACHE 10.27.18

LEARNING OBJECTIVES

- To describe Diabetic Ketoacidosis
- To understand the etiology, presentation, diagnosis, and treatment
- Prerequisites:
  - NONE
- See also – for closely related topics
  - FLAMEs on T1DM and T2DM and HHS

WHAT IS DKA?

- Complication of T1DM or ketosis-prone T2DM
  - Increased Glucagon, Decreased insulin
- Hyperglycemia caused by: increased gluconeogenesis, increased glycogenolysis, decreased cellular glucose uptake
- Ketoacidosis caused by: insulin deficiency causing lipolysis, increased free fatty acids for ketogenesis, increased hepatic ketogenic state, decreased clearance of ketones

ETIOLOGY

- Precipitating factors (Remember the I's!):
  - Infection (pneumonia, UTI, sepsis)
  - Insulin deficiency (discontinued use, inadequate therapy)
  - Ischemia (MI) or Infarction (CVA)
  - Inflammation (pancreatitis, cholecystitis)
  - Iatrogenic (SGLT-2 inhibitors, glucocorticoids, high dose thiazides, dobutamine, terbutaline, 2nd genereation atypical antipsychotics)
  - Intoxication (alcohol, cocaine)
  - Other: new onset T1DM, psychological problems (eating disorder), malfunction of subcutaneous infusion device

PRESENTATION

- Polyuria, polydipsia, and dehydration
  - Tachycardia, hypotension, dry mucous membranes, decreased skin turgor
- Nausea, vomiting, abdominal pain, ileus
- Kussmaul respirations (deep compensatory hyperventilation)
- Acetone "fruity" odor to breath
- Mental status change
  - Somnolence, stupor, coma
  - Neurologic findings are more common in HHS

DIAGNOSIS

- DKA Triad:
  1. Increased anion gap metabolic acidosis
  2. Positive urine and serum ketones
  3. Increased serum glucose (generally 350-500 mg/dL; usually <800mg/dL)
- Increased BUN and creatinine
- Hyponatremia
- Hypo- or Hyperkalemia (total body potassium is depleted)
- Decreased total body phosphorus
- Leukocytosis
- Increased amylase and lipase (not necessarily indicating pancreatitis)

TREATMENT

- Address precipitants (infection, inflammation, ischemia, etc)
- Aggressive hydration: NS 10-14 mL/kg/hr
- Insulin
  - 10U IV push followed by 0.1u/kg/hr, continue drip until normal anion gap
  - Add dextrose to IVF if glucose <250 and anion gap is still increased and continue insulin to metabolize ketones
  - Subcutaneous insulin once anion gap closes (overlap IV and subcutaneous for 2-3 hours
- Electrolyte repletion
  - Potassium: add 20-40mEq/L to IVF if serum K<4.5 (note that insulin promotes cellular uptake of K+ causing decreased serum K)
  - Bicarb: replete if pH <7 or if cardiac instability is present
  - Phosphorus: replete if <1

REFERENCES

1. Sabatine MS. Pocket Medicine. 6th Ed. The Massachusetts General Hospital Handbook of Internal Medicine. 2017.
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