HYPERCALCEMIA

(Presented on 01/10/2020; Last reviewed 03/11/2017; Reviewers: Rudy Tedja, DO, Bibek Karki, MBBS)

PRESENTING COMPLAINT: Weakness, fatigue, constipation, depression

FINDINGS

- A  Check airway
- B  ↓/N RR
- C  ↑/N BP, ↓HR
- D  Variable altered (V, P, U, D)*
- E  Profound muscle weakness, bone pain
- L_Pc↑Ca, ↑/↓/N PTH, ↑/↓/N P
- U_PcRenal stone

*V (verbal), P (pain), U (unconsciousness), D (delirious)

LPC (point of care ultrasound)  LPC (point of care labs)

OTHER HISTORY

Signs and symptoms

- Neurological: Lethargy, confusion, stupor, coma
- Cardiac: Shortened QT interval, supraventricular, ventricular arrhythmias, bradycardia
- Renal: Polyuria, nephrolithiasis, nephrogenic diabetes insipidus, renal insufficiency, renal tubular acidosis
- MSK: Bone pain
- GI: Nausea/vomiting, abdominal pain, pancreatitis

Predisposing Conditions: Elderly are predisposed to neuropsychiatric symptoms and known history of malignancy

DIFFERENTIAL DIAGNOSIS

Other causes of drug induced or metabolic encephalopathy/coma, delirium, intracranial pathology

OTHER INVESTIGATIONS

- Lab: Creatinine
- Severity: Mild: Calcium < 12 mg/dL; moderate: Calcium 12-14 mg/dL; severe: Calcium >14 mg/dL
- Monitoring: Calcium level every 8 hours

THERAPEUTIC INTERVENTIONS

- Initial therapy
o Stop any offending agents, such as thiazides, lithium, exogenous calcium, vitamin A supplementation, vitamin D supplementation
  
o Intravascular volume repletion with isotonic saline at initial rate of 200-300 ml/hr
    • Depending on renal function and history of CHF
    • Titrate rate of normal saline to goal urine output of 100-150 ml/hr
  
o Calcitonin at 4-8 IU/kg IM or SQ q12 hr x 48 hr: Effective within 4-6 hr of administration
  
o Bisphosphonates: Zoledronic acid at 4 mg IV over 15 min or pamidronate at 60-90 mg over two hours, Bisphosphonate will be effective 2\textsuperscript{nd} - 4\textsuperscript{th} day
  
o Dialysis may be required in patients that have oligo/anuric AKI, advanced chronic kidney disease, or CHF where aggressive fluid resuscitation is contra-indicated
  
o Once euvolemia is restored, administration of loop diuretics to enhance calciuresis is indicated
  
• Consult: Nephrology, endocrinology

**MANAGEMENT AFTER STABILIZATION**

• Differentiate between parathyroid hormone (PTH)- mediated hypercalcemia and non-PTH-mediated:
  
o PTH mediated: Hyperparathyroidism
  
o Non-PTH mediated: Malignancy (Especially multiple myeloma), vitamin A and D toxicity, sarcoidosis, milk-alkali syndrome, paget’s disease, familial hypocalciuric hypercalcemia, adynamic bone disease, hyperthyroidism, adrenal insufficiency, drugs (thiazides, lithium)

• **Additional labs if non-PTH mediated:** PTH-related peptide, 1,25 OH vitamin D, vitamin A level, serum free light chains, UPEP, 24-hr urine calcium, TSH, cortisol

• **Follow up:** Goal is to prevent recurrence of hypercalcemia; Monitor serum calcium level every 4 hours

• **Further treatment:** Patients with malignancy and metastatic bone disease needs bisphosphonate every 3-4 weeks; For patients with malignancy, treat the underlying malignancy

• **Prophylaxis:** See above for prevention

**CAUTIONS**

• **Complications:** Watch for volume overload during saline hydration: Particularly in patients with renal failure or heart failure

• **Manage complications:** Furosemide for volume-overloaded patients, Electrolyte imbalance from furosemide-induced diuresis

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