Beyond Repletion: Refractory Hypokalemia and the Search for a Cause

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History

- 63 yo male admitted to the hospital from his oncologist's office for severe hypokalemia
- Medical history included small cell lung carcinoma with bone metastases, COPD, and rheumatoid arthritis
- Patient endorsed chronic diarrhea being managed with Imodium

On Admission

- Blood Pressure **183/82**
- K 1.8 **low**
- CO2 45 **high**
- Chloride: 92 **low**
- Phosphorus 1.8 **low**
- Glucose: 351 **high**
- Mag 2.3

Initial Inpatient Work Up

- Spot Urine K:Cr ratio < 1.3
- No imaging performed, last CTA was 6 months prior, at time of cancer diagnosis (shown on the left)

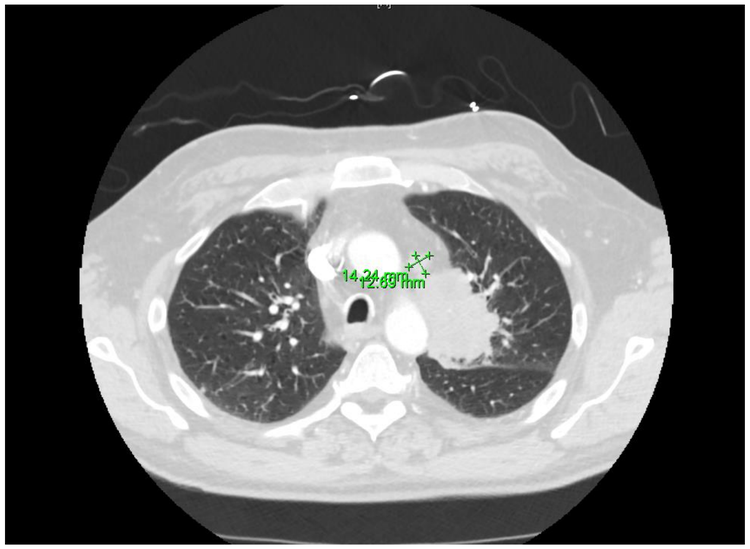
Hospital Course

- Received >400meEq of K including PO KCL, IV KCL and PO K-Bicarb
- GI loss as suspected cause of low K
- Prednisone taper started for suspected colitis.
- On Day 4 of admission, K remained 2.7
- Patient continued to have persistent metabolic alkalosis, hyperglycemia and hypertension

Differential Diagnosis

- Improper repletion
- Renal Tubular acidosis (RTA)
- Hypercortisolism/Ectopic ACTH

Image: Patient's CTA Chest w/contrast



Shift in Therapy

- Due to the patient's metabolic alkalosis and hypochloremia, K-bicarb was no longer utilized.
- He was repleted only with PO and IV KCL
- Renal tubular acidosis was ruled out as the patient's urine was not acidotic
- Serum morning ACTH level was 503. This was >8x the upper limit of normal.
- K normalized on Day 5 and patient was discharged

Working Diagnosis

Refractory hypokalemia due to Ectopic ACTH production originating from Small Cell Lung Carcinoma

After Discharge

- Resumed immunotherapy treatment for SCLC
- Despite daily oral and IV repletion at the infusion center, the patient became hypokalemic again
- Further endocrine testing was not possible as the patient was re-admitted a week later due severe weakness.
- His K on re- admission was 2.2
- Oncology and Family Practice attributed his refractory hypokalemia to an Ectopic ACTH producing tumor

Discussion

- Tailoring potassium repletion to the etiology of a patient's hypokalemia will lend itself to faster normalization
- Attention to the type of potassium salt used to replete is important to avoid driving K intracellularly and causing persistent hypokalemia.
- Potassium bicarb is effective in the setting of metabolic acidosis such as RTA, whereas KCL ensures extracellular maintenance of potassium due to the function of the cell membrane channels. KCL was the optimal choice in this patient who was also hypochloremic.
- For patients who do not respond to repletion, a broad differential can be narrowed down with urine potassium studies and consideration of their medical history.
- An ectopic ACTH producing tumor is a rare cause of hypokalemia, only 3-4% of SCLC patients will develop it but it is important to consider in such a refractory case.
- Spironolactone could have been an effective therapy since medical intervention, as opposed to surgical, was the only therapeutic option.

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