Hypokalemia // Author: Nnenna Ejesieme, DO

Case: 40ish yo female with PMHx of Squamous cell carcinoma of the cervix (Stage IIB) and presenting for syncope and near syncopal episodes PTA. Pt had been NPO since yesterday for surveillance lab work and nuclear medicine study. Afterwards as she was walking down the hallway she became light-headed, weak, and fainted. Upon arrival pt is AOx4 and hemodynamically stable with heart rate 105 and BP 118/78. The only complaint she had at the time was abdominal pain which she attributed to hunger. The rest of her exam was unremarkable with no focal neurologic deficits.

Our patient's syncopal episode was most likely due to dehydration and malnutrition however due to the patient's history of metastatic cancer and tachycardia the suspicion of PE was there. Initial work up revealed no PE or DVT however her K was 2.6 and her EKG revealed flattening of T waves in V2-4 with U wave present in V3.

Hypokalemia

1. Etiologies
    a. **Transcellular shift** – Alkalosis (for every 0.1 increase in pH expect a 0.5 decrease in K+) , Insulin, B agonist, increased hematopoiesis, hypothermia, antipsychotics (especially atypicals and lithium)
    b. **GI losses** – Diarrhea and laxative use

2. **Renal losses** can be separated by blood pressure for differential –
    a. Hypertensive patients should make you suspicious of adrenal involvement such as hyperaldosteronism.
    b. Hypotensive or normotensive – look for signs of acidosis
        i. Acidosis is suggestive of renal losses such as RTA or Adrenal involvement such as primary or secondary aldosteronism. Also consider DKA

3. Clinical Manifestations are **weakness, cramping, decreased reflexes, fatigue, N/V/D, polyuria**
    a. EKG: **flattened T waves, U waves, PVCs, bradycardia, prolonged QT → risk of torsades**

4. Work-up in the ED includes vitals, CBC, BMP, EKG → AND ALWAYS CHECK A **MAGNESIUM LEVEL**
    a. Additional labs include urine electrolytes and osmol

5. Treatment :
    a. Mild : typically **KCL PO** every 4-6 hours
    b. Moderate -severe: pts that are symptomatic +/- EKG changes or K+ < 2.5: initiate **PO and IV KCL**
    c. Recall every 1 mEq/L deficit is equivalent to 200 mEq of total body loss. And **Every 10mEq should increase serum by 0.1mEq/L** roughly
    d. Options

i. **PO** KCL: absorbed quickly. Tastes awful; give your patients something to sip on after ingestion for comfort.
    1. Comes in pill form or elixir
ii. **IV**: runs over a long period of time → 10 mEq/hour through PIV; increasing the rates runs the risk of phlebitis or necrosis

e. Lastly replete any other electrolyte abnormalities that are often associated with hypokalemia
    i. Hypomagnesemia: IV $MgSO_4$ 1-2g q 2 hrs; oral Magnesium oxide can cause diarrhea and worsening symptoms
    ii. Hypocalcemia: Calcium Gluconate 1-2g IV q 20 minutes
f. What's the goal?
    i. Depending on the source there is no magic potassium level to really aim for. Most replete to a range of **>3.5**; some set goals of **>4.0** in critically ill patients. ID and address underlying cause!

Conclusion: the etiology of our patient's hypokalemia may have been secondary to diarrhea, a side effect of her chemotherapy medication Topotecan. The patient did well with PO and IV repletion and was discharged feeling better.

References // Further Reading

1. B Phillips. Electrolyte Replacement: A Review. The Internet Journal of Internal Medicine. 2003 Volume 5 Number 1
2. http://doctechmd.com/potassium-repletion/
3. Expert Rev Anticancer Ther. 2014 Mar;14(3):319-32. doi: 10.1586/14737140.2014.866041. Epub 2014 Jan 10.
4. Elit LM; Hirte. H. Management of advanced or recurrent cervical cancer: chemotherapy and beyond. Expert Anticancer Therapy. 2010 Mar, 14
5. http://www.wikem.org/wiki/Hypokalemia
6. http://www.ncbi.nlm.nih.gov/pubmed/25107385
7. http://www.ncbi.nlm.nih.gov/pubmed/24766936
8. http://www.ncbi.nlm.nih.gov/pubmed/23531202
9. http://www.ncbi.nlm.nih.gov/pubmed/22413702
10. http://www.ncbi.nlm.nih.gov/pubmed/21316179