

Hyponatremia

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Case Presentation

- A 23-year-old male with a past medical history of alcohol abuse presented with nausea, vomiting, numbness and tingling
 - He reported a four month binge of 2-3 pints of whiskey daily
 - No food for ten days

Case Presentation

	Ref. Range	8/23/2015
		13.20
SODIUM	Latest Range:	109 (LL)
Potassium	Latest Range:	1.9 (LL)
Chloride	Latest Range:	54 (LL)
CO2	Latest Range:	23
Anion Gap	Latest Range: 6-14	32 (H)
Glucose	Latest Range:	116 (H)
Creatinine, Serum	Latest Range:	1.66 (H)
Calcium	Latest Range:	7.4 (L)

Total Protein	Latest Range: 6.4-8.3 g/	7.7
ALBUMIN	Latest Range: 3.2-5.0 g/	4.2
Total Bilirubin	Latest Range: 0.2-1.0 mg/	6.5 (H)
Alkaline Phosphatase	Latest Range: 45-117 U/L	136 (H)
AST	Latest Range: 10-39 U/L	247 (H)
ALT	Latest Range: 15-60 U/L	292 (H)
Osmolality Calc	Latest Range: 275-295 mOsm/kg	223 (L)
GFR Estimate	No range found	52
BUN	Latest Range: 5-20 mg/dL	14
Lipase	Latest Range: 70-400 U/L	2299 (HH)
Magnesium	Latest Range: 1.8-2.4 mg/	1.5 (L)
Ethanol Lvl	Latest Range: 0-9 mg/dL	214 (H)

Hyponatremia – is this real?

- Let's look back at the labs:

	Ref. Range	8/23/2015 13:20
SODIUM	Latest Range: 135-145 mmol/L	109 (LL)
Potassium	Latest Range: 3.5-5.1 mmol/ L	1.9 (LL)
Chloride	Latest Range: 98-107 mmol/ L	54 (LL)
CO2	Latest Range: 23-32 mmol/L	23
Anion Gap	Latest Range: 6-14	32 (H)
Glucose	Latest Range: 65-100 mg/dL	116 (H)
Creatinine, Serum	Latest Range: 0.60-1.36 mg/ dL	1.66 (H)
Calcium	Latest Range: 8.3-10.3 mg/ dL	7.4 (L)

Diagnosing Hyponatremia

- Urine osmolality:
 - > 100 mOsm/kg indicates renal dysfunction in concentrating urine (polydipsia)
 - also may occur in diuretic therapy
- Serum osmolality:
 - Helps differentiate between pseudo and true hyponatremia
 - Normal or elevated would suggest pseudohyponatremia
- Urine sodium concentration
 - Differentiates between dehydration and Syndrome of Inappropriate Antidiuretic Hormone (SIADH)
 - If dehydrated, sodium < 25 mEq/L
 - SIADH usually between 25-40 mEq/L (can vary)

Pseudo-hyponatremia

- Lipids and protein are the most common cause
 - Hemolysis can cause this, as well, but likely from the hemoglobin being released
 - Our patient: not lipids/triglycerides ordered
 - no hemolysis
 - was lipemic, which can affect as well
- Most important when the specimen is diluted
 - Proteins and Lipids are taking up fluid that does not contain sodium, when you dilute, it does not do so proportionately

Back to the patient

- How do we know this patient was not pseudo-hyponatremia?
- Methods used to measure sodium
 - Pseudohyponatremia was typically associated with flame photometry - when dilution was used
 - Ion-selective electrodes measure the true sodium, despite any interference that may be caused by proteins/lipids
 - We use this method in our lab
 - Indirect can have some issues with
- Patient Labs
 - Hypokalemia
 - Hypochloremia

What causes hyponatremia in alcohol abuse

- Most common cause: dehydration
- Second most common cause: pseudohyponatremia
 - Due to increased triglycerides most often
- Other causes: Beer potomania
 - Seen in patients who heavily consume beer
 - Beer has low sodium content
 - Likely low intake of food
 - This resets their osmostat
- Most articles have found hyponatremia in patients who abuse alcohol tend to be asymptomatic - so should you treat?

Complications with treatment

- Some schools of thought don't think you should treat hyponatremia unless symptomatic
 - most articles say $< 120\text{mEq/L}$ should be treated, but not necessarily to a normal range
- Treating needs to be extremely slow - if not can lead to Central Pontine myelinolysis
 - no more than 6 mEq/L per day correction

Flowsheet	
	SODIUM
Ref. Range	Latest Range: 135-145 mmol/L
5/5/2015 1650	131 ▼
8/23/2015 1320	109 * ▼
8/23/2015 1830	114 * ▼
8/24/2015 0105	117 * ▼
8/24/2015 0548	111 ▼
8/24/2015 0625	116 * ▼
8/24/2015 1615	122 ▼
8/24/2015 2353	127 ▼
8/25/2015 0333	128 ▼
8/25/2015 0820	128 ▼
8/25/2015 1136	122 ▼
8/25/2015 2211	130 ▼
8/26/2015 0430	131 ▼
8/26/2015 1726	131 ▼
8/27/2015 0311	132 ▼
8/27/2015 1813	131 ▼
8/28/2015 0535	136
8/28/2015 0855	135
8/28/2015 2000	136
8/29/2015 0607	139
8/30/2015 0458	138

Central Pontine Myelinolysis

- Neurons adjust slowly to changes in sodium
- If there was a rapid change in the tonicity of serum by treating sodium rapidly, water would leave the cells to “treat” the hypertonic serum, causing demyelination
- Used to be thought it only occurred in the Pons, but can occur elsewhere in the CNS
- When this happens, can cause dysarthria, dysphagia, confusion, coma, and severe cases of “locked in” syndrome

Patient Follow-up

- Was discharged home with a sodium of 136

References

- Kim GH. Psuedohyponatremia: does it matter in clinical practice? *Electrolyte and Blood Pressure*. 2006; 4:77-82.
- Liamis GL, et al. Mechanisms of Hyponatremia in Alcholic Patients. *Alc and Alcoholism*. 2000; 35(6): 612-616.
- Milionis HJ, et al. The hyponatremic patient: a systematic approach to laboratory diagnosis. *CMAJ*. 2002; 166 (8): 1056-1062.