HYPERNATREMIA

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IMMEDIATE CONSIDERATIONS

FINDINGS

- **Signs & Symptoms**
  - Due to osmotic disturbance of the neuronal cells of the brain and depend on the acuity and severity of the rise in serum sodium level
  - **Acute (minutes to hours) and severe (above 150 mEq/L)**
    - Altered mental status
    - Headache
    - Disorientation
    - Drowsiness
    - Lethargy
    - Seizures
    - Coma
  - **Chronic (>48 hr) and (>145 mEq/L)**
    - Lethargy
    - Muscle weakness
    - Confusion
    - Seizure
    - Coma

- **Labs**
  - Serum sodium value > 145 meq/l, with serum Osmolality > 295 mosm/L

- **Predisposing Conditions**
  - Unavailability of water
- Abnormality of thirst mechanism
- Difficulty in accessing water to drink for being sick
- Intubated
- Elderly or infants
- Diarrhea

**Differential Diagnoses**
- Ingestion or infusion of large amount of concentrated salt
- Dialysis errors
- Osmotic diuresis
- Recovery from hyponatremia and use of vasopressin antagonist
- Nephrogenic and neurologic diabetes insipidus
- Diarrhea
- Lactulose treatment

**DIAGNOSTIC INTERVENTIONS**

**Labs**
- Serum osmolality
- Urine osmolality
- Sodium
- Potassium
- Chloride
- Calcium
- BUN/Creatinine
- Blood glucose levels

**Monitoring**
Monitor neurologic status

- Monitor Serum Na, K, and blood glucose frequently until sodium level below 145 mEq/L
- Water deprivation test
  - In case of undiagnosed diabetes insipidus

- Imaging
  - CT head to r/o acute intracranial pathology

THERAPEUTIC INTERVENTIONS

- Management
  - Severity of the symptoms dictates the pace of correction

- Treat the underlying cause
  - Fever
  - Hyperglycemia
  - Glycosuria
  - Stop lactulose and diuretics
  - Treat hypercalcemia and hypokalemia
  - Correct feeding preparation
  - Stop and replace ongoing water losses
  - Severe symptomatic hypernatremia
    - Emergent situation
      - Seizure
      - Coma
      - Intracranial bleed
      - Sinus thrombosis
    - Rapid infusion of 5% dextrose in water 3-6 ml/kg/hour or emergent hemodialysis
- Aim for the immediate resolution of clinical signs and symptoms and restoration to normonatremia over time
- Desmopressin therapy in patients with diabetes insipidus
- Avoid excessively rapid correction
  - Symptomatic hypernatremia
    - Nonemergent situation
    - The aim is to slowly decrease sodium level by 0.5-1 mEq/L per hour until plasma sodium is <145 mEq/L
    - Consider to stop the ongoing water losses and replace as needed
  - Options
    - Oral/enteral free water supplementation preferred
    - 5% dextrose in water
    - 0.2% or 0.45% saline
  - Excessive correction should be avoided
    - Limit of lowering sodium level is 8-10 mEq/L per day in adults

**MANAGEMENT AFTER STABILIZATION**

- **Follow-Up**
  - Monitor serum sodium
  - Adjust replacement according to the calculated water deficit and ongoing loss
  - Correct associated electrolyte abnormalities, particularly hypokalemia
  - Close watch on blood sugar level to avoid water losses from glycosuria/osmotic diuresis
- **Further diagnostics**
  - Investigate the underlying cause of water loss after initial stabilization
- **Further Treatment**
o Continue to replace water
o Increase access to water
o Treat diabetes incipidus

• Manage Complications
  o Anticonvulsants in case of seizure
  o Respiratory care

CAUTIONS

• Complications
  o Devastating complications mostly occur either due to severe hypernatremia itself or the mistake in the correction of the chronic hypernatremia
  o Fatal Herniation
    ▪ Predominantly associated with rapid correction of chronic hypernatremia due to precipitous fall in plasma sodium level
    ▪ Causes cerebral edema and uncal herniation similar to rapid onset hyponatremia
    ▪ Higher risk among females, children, and underlying CNS pathology
  o Seizure
ALGORITHM

Hyponatremia

1. Estimate the water deficits
2. Choose appropriate rate and regimen
3. Replace both ongoing water loss and deficit

Check:
- Sosm, Uosm, U, Na, K, Cl
- Serum K and Ca level

Unreplaced water loss
- Skin losses
- GI losses
- Urinary losses
  - Osmotic diuresis
  - Diabetes insipidus

Water loss into cells
- Severe exertion
- Seizure induced by electric shock

Sodium overload
- Salt poisoning
- Iatrogenic sodium overload
REFERENCE & ACKNOWLEDGEMENT

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