Hypernatremia

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History

"Every thing about sodium imbalance is complex except its definition"

-Harrisson,1955

Problem Statement

80% of Hypernatremia is iatrogenic

WHY?

Diuretics

Solute Diuresis

Avoiding Electrolyte free water

FOCUS

Overview about Etiology

Practical Protocol for management

Hypernatremia-Etiology

Impaired Thirst- 80%

Water Loss- 15%

Sodium Gain- 5%

Impaired Thirst

a.Elderly

b.Critically Ill

c.Ventilated Pts

d. Post-op

Water Loss

Non-renal

a. Insensible water loss

b. G.I.T

Renal

a. Osmotic Diuresis

b. Diabetes Insipidus

Sodium Gain

Bicarbonate Therapy

Sea Water

TPN

Diagnosis of Etiology

Urine Volume

Urine Osmolality

Vasopressin analog

Uncertain Clinical Relevance??

When to Treat?

Na > 150 meq/L

Symptomatic

Issues in Management

Choice of fluid

Rate of Na correction

Guiding Na correction

Choice of Fluid

Oral Water

RT Water

Parenteral Fluid

Choice of Fluid

Pure Water loss-5% Dextrose

Hypotonic loss-0.45% Saline

a.Renal

b.GIT

c.Skin

Rate of Correction

0.5 meq to 1 meq/L/hr

Not > 12 meq/L/24hr

What is Water Deficit?

Amount of water required to normalise Na (140 or 145)

$$\{(\text{Pt Na} - 140) \times \text{BW}\} \div 140$$

Pitfalls??

Is the estimated deficit,real??

40-50%- Underestimates deficit

20-30%-Overestimates deficit

15-20%-Correct

DOES NOT GUIDE THERAPY

How to Guide Therapy?

Step 1:

Calculate the expected amount of Na fall with 1Litre of Infusate

(Infusate Na- Pt Na) ÷ (BW +1)

Example

A 60 kg male presenting with probable insensible water loss and symptomatic Na of 161 meq/L

Choice of fluid- 5% Dextrose

Rate of correction-1 meq/L/hr

Step 1

How much is the expected Na fall with 1 L of 5% Dextrose?

(Infusate Na- Pt Na)÷(BW + 1)

(0-161) ÷(30+1)= -5.0

1L of 5% Dextrose=↓ Na by 5meq

Step 2

What is the desired Na fall over the next 3 hrs?

3meq over 3 hrs

Amount of infusate required

3÷5= 0.6L

Expected Na after 3hrs= 158meq

Plan for 0-3 hrs

0.6L of 5% Dextrose+Ongoing Loss

Step 3: Reasses Na after 3hrs

Possibilities:

a. Rpt Na : 158 (expected value)

b. Rpt Na : 160(inadequate resp)

c. Rpt Na : 156(over correction)

Rpt Na after 3hrs-160 output-n

0.6L of 5% Dextrose decreased Na by 1meq (exp-3meq)(33% resp)

Where was the calculation wrong?

Assesment of body water

Step 4: Plan for 3-6 hrs

Initial Infusate + 60% Initial infus

0.6L + 0.36L=app 1L

Replacement of ongoing loss

Step 5: Reasses Na at 6th hr

Expected Na= 157 (160-3)

Patient Na =158meq

Urine output was negligible

1L OF 5% DEX =2meq FALL

Step 6:Follow same princ q 3hr

a.Asses response=100%,50%,>100%

b.Add or deduct a suitable volume of the infusate based on response

c.Supplement ongoing loss.

(renal,git,lungs,skin)

d.ensure total ≤ 12 meq/L/24hr

REMEMBER

1. Decide choice of fluid
2. Decide rate of correction
3. Calculate Water deficit.
4. Calculate the expected Na fall with 1L of Infusate.

REMEMBER

5.Plan the desired fall in Na over the next 3 hrs and calculate infusate volume

6.Reasses Na after 3 hrs.

7.Based on response add or deduct a suitable volume from the prev inf.

REMEMBER

8.Follow this principle q 3hr ,ensure not to go above 12meq/24hr

Modification of this protocol is required to address the ongoing loss and possible variation in response to obtain a favourable outcome.