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Question 1

•**Syndrome of inappropriate antidiuretic hormone (SIADH) secretion can be caused by each of the following EXCEPT**

- A. Meningitis
- B. Pneumonia
- C. Hyperthyroidism
- D. Thiazide diuretics
- E. Monoamine oxidase inhibitors

Answer & Comments

•**C**

•**Comments:**

–The diagnosis of SIADH is primarily one of exclusion that should be made in the absence of hypovolemia, hypervolemia, renal failure, and drugs that impair water excretion.

–The causes of this syndrome are diverse, ranging from central nervous system disorders and tumors (lung cancer, lymphoma, thymoma) to pulmonary and endocrine disorders, including glucocorticoid insufficiency and hypothyroidism.

–There are miscellaneous causes such as porphyria, pain, and nausea.

–Opiates, chlorpropamide, NSAIDs, cyclophosphamide, phenothiazines, MAO inhibitors, tricyclic antidepressants, and thiazide diuretics are among the drugs that have been implicated in this syndrome.



Question 2

•A young male presents to the ED unable to give a history. As part of the work-up, you find an anion gap (AG) of 38. All of the following are possible etiologies of this patient's problem EXCEPT

- A.Lactic acidosis
- B.Ethylene glycol
- C.Hyperglycemic hyperosmolar state
- D.Renal failure
- E.Isopropanol

Answer & Comments

•E

•Comments:

–Isopropanol, also known as isopropyl alcohol, is commonly found in rubbing alcohol.

–The clinical features of isopropanol intoxication are similar to those of ethanol intoxication.

–Laboratory studies of patients who have ingested this alcohol show a normal or minimal AG, with an elevated osmolar gap.

–Patients with an AG greater than 35 usually have ethylene glycol or methanol intoxication, hyperglycemic hyperosmolar coma, or lactic acidosis.

–**MUDPILES** is the mnemonic for the etiologies of an AG

- M for methanol,
- U for uremia,
- D for diabetic ketoacidosis,
- P for paraldehyde,
- I for iron/isoniazid,
- L for lactic acidosis,
- E for ethanol and ethylene glycol,
- S for salicylates



Question 3

•A patient is sent to the ED from his doctor's office because of hypocalcemia. One would expect all of the following EXCEPT

- A.Chvostek's sign
- B.Muscle spasms
- C.Prolonged QT interval
- D.Tinel's sign
- E.Weakness

Answer & Comments

•D

•Comments:

- The severity of signs and symptoms of hypocalcemia depends greatly on the rapidity of the fall of the calcium.
- Hypocalcemia is uncommon in the ambulatory setting unless the patient recently had surgery and is hypoparathyroid or has chronic renal disease.
- Symptoms of hypocalcemia include weakness, fatigue, perioral paresthesias, muscle spasms, and impaired memory.
- Hypocalcemia should be considered in refractory heart failure.
- Chvostek's** and **Trousseau's signs** are evidence of hypocalcemia.
- A positive **Tinel's sign** signals carpal tunnel syndrome.



Question 4

•A patient presents to the ED and has the following laboratory values: sodium 139 mEq/L, potassium 4.1 mEq/L, chloride 112 mEq/L, bicarbonate 15 mEq/L, BUN 22, creatinine 1.5, and glucose 180.

1)All of the following could be the etiology of these laboratory findings EXCEPT

- A.Salicylates
- B.Renal tubular acidosis, type II
- C.Acute diarrhea
- D.Uretero-sigmoidostomy
- E.Pancreatic fistula

2)What is the calculated osmolarity for the patient?

- A.157 mOsm/L
- B.274 mOsm/L
- C.296 mOsm/L
- D.310 mOsm/L
- E.347 mOsm/L

Answer & Comments

•1A •2C

•Comments:

–The **anion gap** (AG) is the difference between the measured sodium level and the sum of the measured chloride and HCO₃ levels.

•Normal AG = 12 ± 4

–The etiologies of this patient's normal AG (hyperchloremic) metabolic acidosis can be remembered by a helpful mnemonic,

HARDUP:

- H for hypo-aldosteronism (Addison's disease),
- A for acetazolamide,
- R for renal tubular acidosis,
- D for diarrhea,



- U for uretero-sigmoidostomy,
- P for pancreatic fistula.
- Salicylate toxicity causes an elevated AG with a normal osmolar gap.
- Serum osmolarity is measured directly by determining the freezing point of the serum.
- It is calculated from the sodium, glucose, and BUN values with the following equation:

$$\bullet \text{Osmolarity} = 2 (\text{Na}) + \text{glucose mg}/18 + \text{BUN mg}/2.8.$$

- The normal serum osmolarity is 275 to 296 mOsm/L.
- In this case, the calculated serum osmolarity is 296 mOsm/L.
- A difference between the measured and calculated osmolarity (osmolol gap) of more than 10 mOsm/L indicates the presence of osmotically active substances (such as alcohols) in the blood.



Question 5

•Which of the following statements regarding hyperkalemia is FALSE

- A. Leukocytosis may cause a pseudo-hyperkalemia
- B. Calcium chloride should be given for severe cases of hyperkalemia
- C. Kayexalate will not work for patients who have had a colon resection
- D. Inhaled albuterol can be used to treat hyperkalemia
- E. The effects of hyperkalemia are decreased in patients with hyperglycemia

Answer & Comments

•E

•Comments:

–Hemolysis, Leucocytosis, and thrombocytosis all can produce a **pseudo-hyperkalemia**.

–Effects of hyperkalemia are more pronounced in patients with concomitant hyponatraemia and hypocalcemia.

–There are many different ways to treat hyperkalemia.

- Kayexalate (sodium polystyrene sulfonate) is an ion-exchange resin that works in the distal colon to extract potassium.

- High dose inhaled albuterol is a useful temporizing measure to move potassium into the intracellular space.

- Glucose with insulin can also cause a temporary shift of potassium into the intracellular space.

- Sodium bicarbonate causes an alkalosis that tends to reduce serum potassium levels.

- Calcium (preferably CaCl because of the higher concentration of calcium) stabilizes the cell membrane.

- Dialysis should be used to rapidly remove potassium when the hyperkalemia is severe.



Question 6

Which of the following statements regarding hypoglycemia is FALSE?

- A. Counter regulatory hormones are released in a hypoglycemic state
- B. Hypoglycemia causes both autonomic and neuroglycopenic symptoms
- C. Hypoglycemic patients commonly present with altered levels of consciousness, lethargy, confusion, or agitation
- D. Hypoglycemia is diagnosed when the blood glucose is less than 60 mg/dL
- E. Glucagon is ineffective in the treatment of alcohol-induced hypoglycemia

Answer & Comments

•D

•Comments:

- The serum glucose level that causes hypoglycemic symptoms is variable.
- Levels of 35 mg/dL and lower are present in asymptomatic individuals, and levels in the “normal” range can cause symptoms of hypoglycemia that resolve with glucose administration.
- Patients with hypoglycemia experience both neuro-glycopenic and autonomic symptoms.
- Neuroglycopenic symptoms result from a direct effect on the brain and manifest as dizziness, confusion, tiredness, difficulty speaking, and headache.
- Autonomic or sympathomimetic symptoms are due to release of the counter regulatory hormone epinephrine and include diaphoresis, anxiety, trembling, and nausea.
- Glucagon is ineffective in alcoholics and the elderly because they have low glycogen stores.



Question 7

•All of the following are important in quickly mediating and correcting states of hypoglycemia EXCEPT

- A. Glucagon
- B. Epinephrine
- C. Glucocorticoid
- D. Decrease in insulin secretion
- E. Glycogenolysis

Answer & Comments

•C

•Comments:

- The counter regulatory hormones glucagon and epinephrine are released in response to hypoglycemia.
- Within minutes, glycogenolysis is activated and glucose is released into the bloodstream.
- Simultaneous to this process, there is a notable decrease in insulin secretion.
- Glucocorticoid and growth hormone are slower acting mediators.



Question 8

•All of the following pathways occur as DKA develops EXCEPT

- Hyperglycemia → glycosuria → dehydration and loss of electrolytes
- Hyperglycemia → cell dehydration → altered level of consciousness
- Insulin and glucagon deficiency → increased hepatic gluconeogenesis
- Lipolysis → ketosis → acidosis
- Muscle breakdown → azotemia → loss of sodium

Answer & Comments

•C

•Comments:

A–DKA occurs when inadequate insulin is secreted from pancreatic cells.

B–In response, glucagon levels soar.

C–The elevated glucagon levels result in gluconeogenesis and glycogenolysis.

D–This hyperglycemic state produces an osmotic diuresis, leading to cell dehydration, electrolyte abnormalities, and an altered level of consciousness.

E–The catabolic processes of lipolysis and muscle breakdown are also activated.

in diabetes, there is dysregulation of islet cell function,
i.e. decreased

or absent insulin secretion and increased glucagon secretion, so (c) is the except answer.



Question 9

•All of the following are appropriate treatments for DKA EXCEPT

- A. Administering normal saline in the first 4-6 h
- B. Replacing the 3 to 5 mEq KCl/kg deficit gradually over the first 2-3 days
- C. Infusing insulin at 0.1 U/kg/h after the initial bolus is given
- D. Stopping insulin administration when glucose levels fall to 250 mg/dL
- E. Administering phosphate if levels fall below 1.0 mg/dL

Answer & Comments

•D

•Comments:

–Patients with DKA have an average water deficit of 5-10 % secondary to the osmotic diuresis that occurs with high serum glucose levels.

–Normal saline administration prevents a rapid fall in osmolality that could lead to excessive transfer of water into the central nervous system.

–Although the initial serum potassium level is elevated, repletion of potassium is necessary to restore low intra-cellular levels.

–To prevent hypoglycemia, dextrose should be added to intravenous fluids when the serum glucose falls to a level between 250 and 300 mg/dL.

–Even with this level of glucose, continued insulin is needed to resolve the acidosis and ketonemia.

–Phosphate levels only become critical when below 1.0 mg/dL.



Question 10

•Which of the following statements concerning hyperosmolar hyperglycemic non ketotic syndrome (HHNS) is TRUE?

- A.The mortality rate of HHNS is less than that of DKA
- B.HHNS and DKA are easily distinguishable
- C.A majority of HHNS patients present with coma
- D.Metabolic acidosis excludes the diagnosis
- E.Seizures occur in up to 15 percent of patients with HHNS

Answer & Comments

•E

•Comments:

- HHNS occurs primarily in diabetics, although most cases are undiagnosed at the time of presentation.
- The mortality of HHNS is 3-7 times greater than that for DKA.
- HHNS is characterized by severe dehydration (8–12 L deficit), hyperglycemia (greater than in DKA), and hyper-osmolality.
- In patients with HHNS, high levels of glucose occur without the ketone body formation seen in DKA. However, metabolic acidosis may occur in HHNS from other causes (eg. excessive lactic acid levels or uremia).
- Neurologic signs can be prominent in HHNS, with about 15 % of patients manifesting seizures.
- Although HHNS is frequently referred to as hyperosmolar non ketotic coma, coma occurs in fewer than 10 % of such patients.
- HHNS and DKA can be difficult to distinguish clinically.



Question 11

•Which of the following statements regarding lactic acidosis is FALSE?

- A.It is an uncommon cause of metabolic acidosis
- B.The source of elevated lactic acid comes from the conversion of pyruvate to lactate
- C.In anoxic states, the cellular lack of NAD prevents mitochondrial reduction of lactate to pyruvate
- D.Lactic acidosis caused by tissue hypoxia is classified as type A lactic acidosis
- E.Liver and kidney gluconeogenesis contribute significantly to lactate utilization

Answer & Comments

•A

•Comments:

–Lactic acidosis

•Lactic acidosis is the most common cause of metabolic acidosis.

•Lactate is produced in the anaerobic glycolysis pathway.

•Normally, physiologic levels of lactate are cleared through gluconeogenesis in the kidney and liver.

•When this system is overwhelmed and NAD is lacking, lactate levels rise.

•This commonly occurs in hypoxic or hypovolemic states and is referred to as type A lactic acidosis.



Question 12

Which of the following is TRUE regarding hormones produced in the adrenal glands?

- A. Corticotropin releasing factor emanates from the pituitary and stimulates cortisol release
- B. Cortisol is a potent hormone that increases glucose uptake into cells
- C. Aldosterone is an important mineralocorticoid that increases sodium resorption and potassium excretion
- D. Adrenally produced androgens are an important source of androgens in men
- E. Adrenal insufficiency occurs primarily because of decreased epinephrine and norepinephrine production in the medulla

Answer & Comments

•C

•Comments:

- Adrenal insufficiency is a deficiency produced by inadequate hormone production from the adrenal cortex, not the medulla.
- Adrenal medulla deficiency does not result in clinical disease.
- The following hormones are released from the adrenal gland:
 - (a) aldosterone: increases sodium resorption and potassium excretion;
 - (b) cortisol: maintains adequate glucose levels by decreasing glucose uptake and facilitating gluconeogenesis;
 - (c) androgens: important for certain sexual characteristics.
- Cortisol is released in response to pituitary release of adreno-corticotrophic hormone (ACTH).
- ACTH is stimulated by corticotropin releasing factor from the hypothalamus.
- The male gonads are the most important source of androgens; adrenal production is trivial by comparison.



Question 13

•An 18 year old, ill appearing female presents to the ED with low blood pressure. She has a 1 day history of headache and fever. Examination is significant for petechial skin lesions. Waterhouse Friderichsen syndrome is suspected. All of the following statements are TRUE EXCEPT

- A. Bilateral adrenal gland hemorrhage frequently occurs with this disorder
- B. The bacterial organism implicated in this severe infection is *Neisseria meningitidis*
- C. Although controversial, administration of glucocorticoids is indicated in most cases
- D. Abdominal CT is not sensitive in determining adrenal hemorrhages
- E. Pregnancy is a risk factor for developing adrenal hemorrhage

Answer & Comments

•D

•Comments:

–Waterhouse Friderichsen syndrome

- Is a life threatening disorder resulting from overwhelming septicemia due to infection with *N. meningitidis*.
- Only about 10 % of meningococemia cases result in this syndrome.
- Bilateral adrenal hemorrhage is common.
- CT and ultrasound are both helpful in making the diagnosis.
- Although steroids are controversial, they are usually administered before antibiotic therapy.
- Risk factors for adrenal hemorrhage include: stress, trauma, anticoagulants, pregnancy, surgery, and burns.



Question 14

•A 24 year old male comes to the ED in adrenal crisis. His wife reports that he has been feeling poorly for about 48 h. He is mumbling incoherently, BP: 80/60, and T: 39°C. Which of the following actions is LEAST likely to benefit this patient initially?

- A. Starting mineralocorticoid therapy
- B. Infusing isotonic saline
- C. Administering dextrose
- D. Administering 100 to 200 mg hydrocortisone
- E. Administering appropriate intravenous antibiotics

Answer & Comments

•A

•Comments:

- This patient's initial stabilization should include all of these measures except beginning mineralocorticoid therapy.
- Hydrocortisone replenishes the patient's inadequate steroid levels and provides some mineralocorticoid effect. Therefore, early administration of mineralocorticoids is not necessary.
- Correction of hypoglycemia and hypotension are essential.
- Early antibiotic administration is important to prevent potentially fatal infections leading to adrenal crisis.



there is an equation to calculate any concentration of Dextrose
amount of highest concentration = (total amount of fluid used x
desired dextrose conc - amount of dextrose x lowest conc)
/(difference between to concentrations)

ex : total amount of fluid = 300 ml

saline = 60 ml

need conc. of 15 %

dextrose conc present like 5% and 25%

so amount of highest concentration (D25%) =

$$(300 \times 15 - 240 \times 5) / (25 - 5)$$

$$= (4500 - 1200) / 20$$

$$= 3300/20$$

$$= 165$$

so D25% = 165 ml

$$D5\% = 240 - 165 = 75 \text{ ml}$$

total amount of fluid means dextrose + saline + any additivtes like
kcl , amino acids , etc

this equation can calulate any concetration of dextrose

may be appeared difficult but accutally very fast if you know how to
use it

just calculaion no gussing at all