Short quiz on endocrine pharmacology

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Question 1:

A type 1 Diabetes Mellitus patient whom you've been treating for a couple of years now presents to your clinic complaining about a recent episode of "unexplained" symptoms as stated by your patient. He tells you that he took his daily insulin shot, but was on a hurry so rushed his way to work without eating anything afterwards. When you ask him about the symptoms he experienced, he says that he is not really sure. What do you expect those symptoms to be based on this clinical scenario?

a) Palpitations
b) Tremulousness and shaking
c) Decreased sweating
d) None of the above
e) More than one of the above

Question 2:

Referring back to the first question, how can you explain such symptoms? What is the pathophysiology behind them?

a) The patient probably took too much insulin, a higher dose than usual.
b) The fact that he did not eat after taking the insulin shot caused his blood glucose levels to fall below normal.
c) Such symptoms cannot be explained, it is probably due to the fact that drugs act differently in different patients thus can subsequently cause different unexplained side effects.
d) The patient probably took too little insulin.
e) More than one of the above.

Answers: E for both questions.

Explanation: This is a type 1 Diabetes Mellitus patient who needs to take insulin injections to keep his blood glucose levels normal. However, either taking a dose higher than normal or not eating after the insulin injection would subsequently cause his blood glucose levels to fall below normal; insulin-induced hypoglycemia.

Symptoms of hypoglycemia include tachycardia (which is felt by the patient as a "racing heart", also called palpitations), increased sweating, tremulousness and shaking, increased hunger, nausea, and others. But why does hypoglycemia result in such symptoms? Hypoglycemia stimulates the release of stress hormones including catecholamines (Norepinephrine and epinephrine) in an attempt to elevate blood glucose levels back to normal. This high level of catecholamines would subsequently result in increased stimulation of the sympathetic nervous system, which clinically manifests as increased sweating, palpitations…

(Remember, the sympathetic nervous system increases the heart rate, sweating...)

Question 3:

Which of the following antidiabetic drugs act by blocking ATP sensitive K+ channels?

a) Tolbutamide
b) Repaglinide
c) Ciglitazone
d) A+B
e) Acarbose

Answer: D
Explanation: Sulfonylureas (e.g.: Tolbutamide) and meglitinides (e.g.: Repaglinide) both inhibit ATP sensitive K+ channels, each having a different binding site of course.

Question 4:

Which drug has GI disturbances as a ***major*** side effect?

a) Metformin
b) Rosiglitazone
c) Voglibose
d) Repaglinide
e) Phenformin

Answer: C

Explanation: Voglibose is an alpha-glucosidase inhibitor, which inactivates the brush border enzymes necessary for carbohydrate breakdown. This will cause carbohydrates to accumulate within the GI tract, and be acted upon by bacteria in the colon, fermenting those carbohydrates, causing flatulence and diarrhea.

Question 5:

A patient with ulcerative colitis presents to your clinic with the classical signs of hyperglycemia. After doing all the necessary diagnostic workup, you diagnose the patient with type 2 Diabetes Mellitus. Which of the following antidiabetic drugs should NOT be given to this patient?

a) Metformin
b) Rosiglitazone
c) Chlorpropramide
d) Miglitol
e) None of the above

Answer: D
Explanation: Miglitol is an alpha glucosidase inhibitor, which is contraindicated in patients with inflammatory bowel disease, as it would exacerbate the underlying condition. (Side note: alpha-glucosidase inhibitors are also contraindicated in patients with renal failure).

Question 6:

A stroke patient with cerebral edema presents to your clinic complaining from pain in his joints with apparent redness and swelling. You diagnose the patient with arthritis and decide to put him on a ***long term*** anti-inflammatory therapy. Which of the following drugs is best used in such a case?

a) Hydrocortisone
b) Budesonide
c) Acetaminophen
d) Dexamethasone
e) Beclometasone diproprionate

Answer: D
Explanation: Dexamethasone (as well as Betamethasone) do not have any salt retaining abilities. This is quite useful, especially for a high-dose therapy given long term. This generally prevents onset of edema like cerebral edema, and given the fact that the patient already has cerebral edema, it would be extremely harmful to give this patient a drug with salt retention ability.

- Side note: I know that in the slides Beclometasone diproprionate is mentioned as two separate drugs, but it's actually one drug, namely Beclometasone diproprionate.

Question 7:

A pregnant woman presents to your clinic with classical thyrotoxicosis signs and symptoms. Which of the following drugs is contraindicated?

a) Sodium iodide
b) Propylthiouracil
c) Potassium iodide
d) Radioactive iodine
e) More than one of the above.

Answer: D

Question 8: **** We did not take this idea, but I thought I'd add it to make some sense of the topic. ****

Concerning question 7, why do you think this drug is contraindicated in pregnancy?

a) The drug causes liver damage to the mother and baby.
b) The drug is thought to cause severe hypertension.
c) Congenital cretinism of the baby might result.
d) A+B
e) The drug causes renal destruction of the parathyroid.

Answer: C

Explanation: To understand this, we need to explain briefly the mechanism of action of radioactive Iodine 131. This drug is radioactive, and once it penetrates the thyroid gland, it subsequently emits Beta rays that destroy the thyroid gland. This helps treat thyrotoxicosis. However if you think about it, irreversible thyroid destruction would subsequently cause hypothyroidism. So what is the rationale behind replacing one disorder (thyrotoxicosis) with another (Hypothyroidism)?

The point is hypothyroidism can be more easily managed, simply by giving the patient hormone supplements. (Levothyroxine and the other drugs mentioned in the slides to treat hypothyroidism).

So, why is it contraindicated in pregnancy?

Maternal thyroid deficiency that would result would result in lower than normal thyroid hormones reaching the fetus, which needs thyroid hormones for proper mental development, so congenital cretinism results.

Question 9: Why are NaI and KI given to a patient before undergoing thyroidectomy?

a) They help prevent the negative consequences of this operation.
b) They decrease the duration of the surgery.
c) They help decrease vascularization of the thyroid gland
d) NaI and KI are not given before thyroidectomy!

e) A+B

Answer: C
Explanation: Iodides help decrease the size and **VASCULARITY** of the "hyperplastic gland". This results in less blood flowing to the gland. This is of absolute significance to help limit post-surgical bleeding. (This is the same reason why we ligate blood vessels after removal of any organ!)

Question 10:

Which of the following drugs if given in excessive amounts over long periods of time would result in a severely increased risk of infections and sepsis in the patient?

a) Levothyroxine
b) Glybenclamide
c) Bromocriptine
d) Propylthiouracil
e) Miglitol

Answer: D
Explanation: Propylthiouracil is a member of the thionamides family. One MAJOR side effect of thionamides when given in high amounts for long periods of time is ***agranulocytosis***. Agranulocytosis would subsequently cause leukopenia (most commonly neutropenia). Thus the patient is at a higher risk of getting severe infections and sepsis.

Question 11:

Which of the following statements is not correct?

a) Swollen salivary glands and mucous membrane ulcerations are side effects of Iodides (NaI, KI)
b) Propranolol is the most commonly used beta blocker in the symptomatic treatment of thyrotoxicosis.

c) Cytomel is the trade name for a T3-analogue used in the treatment of hypothyroidism especially for maintenance therapy.
d) Psychosis, rash, cholestatic jaundice, drug fever, and agranulocytosis are all side effects of Thionamides.
e) All the statements above are true.

Answer: C

Explanation: Cytomel is the trade name given for liothyronine sodium, which is a T3 analogue used in the treatment of hypothyroidism. However, because T3 has a very short half-life, this drug can NOT be used in maintenance therapy. A T4 analogue, like levothyroxine sodium, is rather recommended for such use.

Question 12:

Your aunt, a 55 year old widow, visits you asking for medical advice since she knows you're a medical student. Nevertheless, she tells you that she started experiencing new symptoms that she couldn't possibly explain. Those include irregular periods and vaginal dryness. You think that she might be experiencing peri-menopausal symptoms. What medical advice would you give her that would help her in her upcoming years of life?

a) There is nothing much she can do, just tell her to relax and enjoy.
b) Start taking some Vitamin D and Calcium supplements.
c) Estrogen replacement therapy, particularly with progestin, is recommended.
d) B+C
e) She should seek professional medical advice as soon as possible, as those symptoms are suggestive of severe underlying illness.

Answer: D

Explanation: Your aunt is about to experience menopause in the coming few years. Post-menopausal osteoporosis is a very common cause of osteoporosis. To reduce that risk, Ca+2 supplements as well as Vitamin D

are needed. Estrogen replacement therapy would also be recommended especially with progestin to reduce the side effects of ERT (which include increased risk of stroke, Deep vein thrombosis, breast cancer and endometrial cancer).

Question 13:

Why shouldn't a type 1 Diabetes Mellitus patient keep on taking the insulin injection in the same exact body spot?

a) There isn't such a thing, the patient can keep on taking the insulin injection in the same exact spot without fearing any complications.
b) Doing that would INDIRECTLY result in less efficient insulin absorption.
c) Some studies show that doing that would most likely cause insulin induced hypoglycemia.
d) Insulin resistance would result if the patient keeps on injecting insulin at the same exact spot.
e) C+D

Answer: B

Explanation: Subcutaneous injection of insulin at the same exact spot would subsequently result in lipodystrophy. Lipodystrophy would either manifest as LIPOATROPHY where adipocytes in the subcutaneous tissue get dedifferentiated. Or it can manifest as LIPOHYPERTROPHY, where extra fat is deposited in the subcutaneous injection site because insulin has a "hypertrophic effect" on fat cells. **Those conditions result in less amount of insulin being absorbed from the site of injection**. The best thing to do is to keep on rotating your injection sites.

Question 14:

Which of the following drugs can be used in the treatment of Diabetes insipidus?

a) Voglibose
b) Metformin
c) Chlorpropramide
d) Pioglitazone
e) Acarbose

Answer: C

Explanation: A direct question, nothing to explain here. Chlorpropramide is an antidiabetic drug with an antidiuretic potential, thus it's used in treatment of diabetes insipidus.

Question 15:

Which of the following drugs has PPAR- γ as its target?

a) Ciglitazone
b) Metformin
c) Tolazamide
d) Repaglinide
e) Glybenclamide

Answer: A
Explanation: A direct question, nothing to explain here.
Ciglitazone is an antidiabetic drug from the thiazolidinedione group. This family of drugs bind to PPAR- γ to induce its effects.

Question 16:

Which one of the following statements is true?

a) Metformin helps in treating atherosclerosis as it downregulates LDL/VLDL receptors.
b) Lactic acidosis is a major side effect of pioglitazone, so abiding by the exact dose as noted by the Doctor is mandatory.
c) Glyburide mediates its hypoglycemic effects by increasing insulin release from beta cells, increasing insulin sensitivity, and also indirectly inhibiting glucagon release from alpha cells.
d) Insulin injections are mandatory in all type 2 Diabetes Mellitus patients.
e) More than one of the above is true.

Answer: E

Explanation: A and C are true statements. Direct question from the slides, nothing to be explained here.

Question 17:

A patient presents to your clinic with an acute severe episode of hypercalcemia due to hyperparathyroidism. How would you best manage your patient in such a case?

a) Wait for a week or so, then carry out surgery in which parathyroid glands are removed.
b) Start the patient on oral phosphate.
c) Start the patient on bisphosphonates and calcitonin.
d) Adequate hydration with saline, along with forced diuresis by using diuretics.
e) None of the above.

Answer: D

Explanation: An acute severe form needs to be dealt with on spot. Although surgery is indicated in all cases of established hyperparathyroidism, correction of

the underlying acute cause is essential first. Increased diuresis would decrease the amount of Calcium ions reabsorbed into the bloodstream, adequate hydration is necessary to prevent dehydration.

Question 18:

Which of the following statements is false?

a) Glucocorticoids have been long used to treat inflammatory conditions.
b) A patient taking glucocorticoids for a long period of time is probably at an increased risk of infection.
c) Glucocorticoids only act against inflammatory conditions, without real impact on treating leukemia and lymphomas
d) Lipocortin inhibits Phospholipase A2.
e) C+D

Answer: C.

Explanation: Glucocorticoids are used to treat lymphomas and leukemia.

Why? *** Extra***

Glucocorticoids bind to their glucocorticoid receptors (GR) which then arrest growth and induce apoptosis in lymphoid tissue. This is actually in contrast to other steroid hormone receptors, which act as oncogenes. Examples include estrogen receptors which drive cell growth, proliferation and metastasis in breast cancer. Androgen receptors also play a similar role in prostate cancer.

Just know that glucocorticoids are used to treat lymphomas and leukemia.

Question 19:

Which of the following drugs is more active when applied topically because it poorly passes cell membranes? (Thus used to treat severe eczema).

a) Triamcinolone
b) Hydrocortisone
c) Prednisolone

d) Budesonide
e) Betamethasone

Answer: D
Explanation: Direct question, no explanation is needed here.

Question 20:

Which of the following drugs is most likely to induce hepatic injury?
a) Ciglitazone
b) Pioglitazone
c) Rosiglitazone
d) Troglitazone
e) Acarbose

Answer: D
Explanation: In the slides, it is mentioned that Troglitazone occasionally induces hepatic injury. In fact, Troglitazone was withdrawn from the market in 2000 because it causes acute liver failure.