Please note – this learning resource has been produced by the GUMS Academic Team. It is possible that there are some minor errors in the questions/answers, and other possible answers that are not included below. Make sure to check with other resources.

**Scenario 1**

1. A 65-year old male comes to your GP clinic complaining of chronic headaches, lower back pain and right hip pain. This all started approximately 6 months ago and seems to be getting worse. History and physical examination are unremarkable except for the patient noting that his hat seems to not fit anymore. A skull x-ray shows a “cotton wool” pattern. A pelvic x-ray shows a thickening of the cortex, accentuation of the trabecular pattern and an increased density of the bone. What is the most likely diagnosis?
2. Bone metastasis from prostatic cancer
3. Hypervitaminosis D
4. Vitamin D deficiency
5. **Paget Disease of the Bone**
6. Acromegaly
7. What would you expect to find on blood tests?
8. Normal labs
9. Decreased serum phosphate and calcium levels + increased PTH
10. **Increased alkaline phosphate + normal serum calcium and phosphate**
11. Increased parathyroid hormone and serum calcium + decreased phosphate
12. Increased serum phosphate and calcium + decreased PTH

Explanation: Paget’s disease of the bone is a disorder of bone remodeling where there is excessive bone resorption followed by increased bone formation. It commonly occurs in multiple sites but can affect only a single bone.

While Paget’s can be completely asymptomatic, the most common symptoms include nerve root compression, spinal stenosis, pathological fractures, secondary osteoarthritis, osteosarcoma and high-output heart failure.

Radiological findings: cotton wool appearance on skull x-ray, and classically accentuation of the trabecular pattern, increased density of bone and thickening of the cortex.

Lab results: Increased alkaline phosphate (ALP) with **normal** serum calcium, phosphate and parathyroid hormone. Additionally, urinary pyridine and deoxypyridine can be increased.

**Scenario 2**

A 65 year-old woman comes to your GP clinic complaining of fatigue and weakness. She has a history of **type 2 diabetes mellitus** that is poorly controlled. You take her blood pressure and she is **hypertensive**. You also note **lower extremity edema.** What should be at the top of your differential for her symptoms?

**Answer:** Diabetic Nephropathy

Long standing poorly-controlled diabetes puts a patient at risk of diabetic nephropathy amongst other serious sequalae. This manifests in its early stages as microalbuminuria.

**Scenario 3**

A 14-year-old girl presents to ED with complaints of progressive weakness, fatigues and headaches persisting for several months. The headaches seem to be increasing in severity and frequency and on examination her blood pressure is 180/90.

Laboratory tests reveal:

Very high morning renin activity

High morning aldosterone concentration

Low serum potassium level.

What diagnosis should you be suspecting?

1. Primary hyperaldosteronism
2. Cushing’s Disease
3. Paget’s Disease
4. **Secondary hyperaldosteronism**
5. Renal artery stenosis

Explanation: In a patient presenting with fatigure, weakness, and headache who also has high morning renin, and aldosterone, you should suspect **secondary hyperaldosteronism**.

Which of the following would be seen on further evaluation?

1. High levels of ACTH from a pituitary adenoma
2. High levels of metanephrines excreted in urine
3. Increased 17-hydroxyprogesterone levels
4. Involution of zona glomerulosa of adrenal gland
5. **Pleomorphic smooth cells in renal cortex (juxtaglomerular tumour**)

Explanation: Pleomorphic smooth cells in renal cortex, in combination with elevated renin annd aldosterone, indicates the presence of a juxtaglomerular tumor. This is a very difficult question, but you should understand that excessive renin production leads to secondary hyperaldosteronism which leads to the symptoms described above.

**Scenario 4**

A 65-year-old man presents to his GP complaining of fatigue and muscle cramps for the last two months. He is on atorvastatin, ramipril and sertraline.

On further questioning, he also reports feeling tingling around his mouth and in his fingers and toes. An ECG is done which reveals prolonged QT interval. Which of the following serum abnormalities would you expect to see on his lab results?

1. Hyperkalaemia
2. Hypokalaemia
3. Hypercalcaemia
4. **Hypocalcaemia**
5. Hypermagnesaemia

Explanation: Hypocalcaemia includes the typical features described above: paraesthesias, muscle cramps, Chvostek sign and a prolonged QT interval.

Which of the following hormone abnormalities could result in this patient’s electrolyte imbalance?

1. **Hypoparathyroidism**
2. Hyperthyroidism
3. Hypothyroidism
4. 17-hydroxyprogestrone deficiency
5. Hyperaldosteronism

Explanation: Hypoparathyroidism is a common cause of hypocalcaemia. This is due to the effect of the parathyroid hormone on regulating calcium levels in the blood by increasing osteoclast activity. It is secreted in response to low blood serum calcium by the Chief cells in the parathyroid glands.

Which of the following is the most common cause of hypoparathyroidism?

1. Kidney failure
2. Steroid use
3. **Surgical destruction of parathyroid glands**
4. DiGeorge Syndrome

Explanation: Surgical destruction of parathyroid glands (either on purpose or as an adverse effect during a thyroidectomy) is the most common cause of hypoparathyroidism. This is followed by autoimmune destruction of parathyroid cells and congenital causes such as DiGeorge syndrome.

**Thyroid Disorders**

**What is the most common cause of hyperthyroidism in the West?**

Grave’s disease

**What is the most common cause of hypothyroidism in the West?**

Hashimoto’s disease

**A 43 year old female presents to the GP clinic with 5kg of weight loss. Upon further questioning/examination, she is found to be/have sweaty palms, fatigue, a HR of 110bpm, wearing thongs and shorts in winter, and has bulging eyes. Her only significant history is rheumatoid arthritis.**

**What are the main differentials for weight loss?**

Hyperthyroidism

TIDM

Malignancy

GIT stuff - coeliac, IBD, CF etc.

Depression

Gastric ulcers

Chronic viral illness e.g. hep C

Etc. etc.!

**What is the most likely diagnosis?**

Grave’s disease

**What risk factors does she have for the disease above?**

Middle aged female

Other autoimmune disease

**The presence of which clinical feature makes this diagnosis more likely than another cause of hyperthyroidism? Explain why by making reference to the pathophysiology.**

Exophthalmos (bulging eyes) - drill into them that this is NOT a sign of hyperthyroidism, but rather due to the TSH receptor autoantibodies directly stimulating fibroblasts in the eye.

**What other clinical feature in Grave’s has the same pathophysiological basis as the sign in the above question?**

Myxoedema esp. Pre-tibial

**What other clinical features would you ask about/examine for?**

Diarrhoea

amenorrhoea

Reflexes - brisk

Proximal myopathy

Mood symptoms - anxiety etc.

Many more

**What investigations would you consider in this patient?**

Bedside:

ECG (for AF!)

Bloods:

FBC

Lipid profile - low lipids

**TFT** - low TSH, high T3 and T4

**Antibodies - TRAb, TPOAb, TgAb -** even though TRAb are most specific, drill into them that you order all three and they can all be elevated in Grave’s

If antibodies aren’t confirming the diagnosis but still have a high suspicion, consider **radioactive iodine uptake scan**

**What is the first line management in a pregnant vs non-pregnant lady? What to consider if first line management does not work?**

Carbimazole (all the time) PTU (only in first trimester pregnancy because carbimazole is teratogenic). If these fail, consider a radioactive iodine ablation or thyroidectomy!

**What is the most feared side effect of antithyroid medications?**

Agranulocytosis - advise patient to go to ED if they develop sore throat or something like that! (something you usually wouldn’t go in for)

**What are the next 2 most common causes of hyperthyroidism? What are some others?**

Grave’s > TMNG > toxic adenoma. Others = thyroiditis, early Hashimoto’s etc.

**What if - someone presented with hyperthyroidism, but no exophthalmos and rather a headache and peripheral vision loss. What to consider? What would be seen in the TFT?**

Pituitary adenoma, high T3, T4 AND high TSH (secondary hyperthyroidism)