

## Endocrine SBA Questions

Questions were made by students on behalf of The Peer Teaching Society. We hope there are no mistakes but are not liable for any false or misleading information.

1. A 27-year-old woman presents to her GP complaining of feeling more tired than usual in the past few months and has noticed she's lost about 5 kg over that time without trying, saying she's not really had that much of an appetite. She also says she's been getting "dizzy-spells" where she feels light-headed on standing up – but has never fainted from them.

On examination, you notice some darkened skin in the creases of her palms, when asked about this she says she's also noticed a scar on her knuckle has started to turn much darker. What is the most appropriate investigation to **confirm** your suspected diagnosis?

  - a) A Cortisol measurement
  - b) Abdominal ultrasound scan
  - c) SynACTHen test
  - d) Low-dose dexamethasone test
  - e) Urinary free cortisol measurement
  
2. A 54 year-old patient presents with increased confusion. His family reports that over the past month he has become more irritable, and has complained about headaches and muscle cramps. He has recently been diagnosed with Small cell lung cancer. You suspect SIADH.

What finding would you expect to see in SIADH?

  - a) Hypernatremia
  - b) Hyponatraemia
  - c) Hypercalcaemia
  - d) Hypocalcaemia
  - e) Hypomagnesium
  
3. Billy, a 62 year-old man, is admitted to A&E with a mild exacerbation of asthma. He suffers from hypertension which is controlled with medication. On the way to hospital, paramedics gave him 5mg salbutamol and 500 µg ipratropium nebulisers. Since admission to A&E he has been given regular salbutamol 5mg nebulisers. He was then transferred to AMU where he received his antihypertension medication and given regular nebulisers. Before being discharged, you check his blood results and notice that his serum potassium is low at 2.3 mmol/L (normal range: 2.6- 5.2 mmol/L). Which drug is most likely to have caused his hypokalaemia?

  - a) Ipratropium
  - b) Amlodipine
  - c) Ramipril
  - d) Salbutamol
  - e) Paracetamol

4. Lucy presents with symptoms of polyuria, polydipsia and dehydration. You suspect Diabetes insipidus. What test would you perform to differentiate between cranial or nephrogenic?
- a) Oral glucose tolerance test
  - b) Dexamethasone suppression test
  - c) CT scan
  - d) Water deprivation test
  - e) Random plasma glucose

5. A 50yr old female presents to clinic with a 6-month history changes to her appearance. Her facial features have become coarse, her voice has deepened, and her joints ache more than usual.

What is the first line investigation for the most likely diagnosis?

- a) OGTT (oral glucose tolerance test)
  - b) Serum IGF-1
  - c) Pituitary MRI
  - d) Serum GH
  - e) Serum GHRH
6. Joe, a 32-year-old male, presents to clinic after reporting that his third type of antihypertensive is not working, and his blood pressure is still through the roof. He also reports a constant headache, muscle cramps and fatigue that he is worried might be due to COVID-19.

You take a thorough history and find a positive family history of early-onset hypertension. His father had passed away from a stroke at age 50.

On examination, his BP is 142/110. His COVID-19 swab comes back negative.

What is the first line investigation of the most likely diagnosis?

- a) Adrenal vein sampling
- b) Serum aldosterone
- c) Abdominal HRCT
- d) Aldosterone renin ratio
- e) Short synACTHen test

7. Karen, a 45 year old woman presents with hirsutism and central obesity and she is starting to develop purple striae on her abdomen. She is upset because she had a holiday planned and feels she can no longer wear her bikini. She has a past medical history of severe asthma which is medically controlled with the blue and brown inhaler.

ACTH levels are low and there is no cortisol suppression following high dose dexamethasone suppression test.

How would you initially manage this condition?

- a) Metyrapone
- b) Ketokonazole
- c) Bilateral adrenalectomy
- d) Transsphenoidal pituitary resection
- e) Medication review – stop the ICS

8. Joanne, a 76-year-old woman presents with polyuria and polydipsia. Blood results show:

<b>Fasting blood glucose</b>	<b>5.2 mmol/l</b>
<b>Ca<sup>2+</sup></b>	<b>2.95 mmol/l (2.1-2.6 mmol/l)</b>
<b>Phosphate</b>	<b>0.6 mmol/l (0.8-1.4 mol/l)</b>
<b>PTH</b>	<b>5.9 pmol/l (1.6-6.9 pmol/l)</b>
<b>ADH</b>	<b>1.5 pmol/l (0.9-4.6 pmol/l)</b>

What is the most likely underlying diagnosis?

- a) Primary hyperparathyroidism
- b) Multiple myeloma
- c) Diabetes mellitus
- d) Secondary hyperparathyroidism
- e) Diabetes insipidus

9. A 35-year-old male presents with frequent and recurring episodes of dizziness when standing. On further questioning he explains that he also has frequent headaches and has noticed he is sweating a lot and experiences episodes of palpitations. On examination it was found that he has postural hypotension. He states that he has no past medical history of significance and there is also no significant family history. A urine dipstick was taken, and the patient was also referred for a CT scan. The urine sample showed high levels of plasma catecholamines and metanephrines.

What is the most likely diagnosis?

- a) Adrenal Insufficiency
- b) Conns syndrome
- c) Hyperaldosteronism
- d) Wilm's tumour
- e) Pheochromocytoma

10. Which of the following produces and secretes corticosteroids such as cortisol?

- a) Anterior pituitary gland
- b) Zona glomerulosa
- c) Zona reticularis
- d) Zona fasciculata
- e) Adrenal medulla

11. A 30-year-old female presented to her GP after her optician had advised her to visit her GP. She had recently visited her optician as vision was becoming worse. The optician noticed redness and watering of her eyes and noticed that her eyes appeared to be 'bulging out' as described by her husband. The patient also stated that she is feeling increasingly tired and often feels that her heart is racing out of her chest. The GP ran some routine bloods including thyroid function tests which found raised T3. TSH receptor antibodies were also detected.

Which of the following would not be a typical sign of Grave's disease?

- a) Tremor
- b) Palpitations
- c) Weight gain
- d) Pretibial myxoedema
- e) Ophthalmopathy

12. A 25-year-old man is brought to A&E by ambulance complaining of abdominal pain and had been vomiting through the last few hours. Since yesterday he stated that he feels very thirsty and is going to the bathroom more frequently. On the way to the hospital, the patient had deteriorated and was losing consciousness. When the patient arrived at A&E, the doctors used an ABCDE approach to examine the patient. The following were found. A - airway was patent. B - respiratory rate was 40 breaths per minutes and noticed that his breath smelt of pears. There was also generalised abdominal tenderness without voluntary guarding.

Which of the following is the most appropriate in the first line management of this patient?

- a) IV fluid resuscitation
- b) Antibiotics
- c) Insulin therapy
- d) Sepsis screen
- e) Glucose

13. Which of the following is not associated with hypothyroidism?

- a) Weight gain
- b) Increased sweating
- c) Cold intolerance
- d) Constipation
- e) Menorrhagia

14. Which of the following is the first line medicinal treatment for diabetes mellitus type II?

- a) Lifestyle modification
- b) Metformin
- c) Glimepiride
- d) Gliclazide
- e) Insulin

15. Which of the following is considered the gold standard diagnosis for pheochromocytoma?

- a) Elevated plasma free Metanephrine
- b) 24hr Urinary Metanephrine
- c) MRI
- d) CT
- e) X Ray

16. A 19-year-old woman has a previous history of type I diabetes. She has come back to the doctor as some new symptoms have developed. She describes looking more tanned than usual despite no sun exposure, anorexia, she craves salty foods (blood tests show low Na<sup>+</sup>), and is less able to control her blood sugar as she has more regular low readings.

What is causing her new symptoms?

- a) Administering too much insulin to herself
- b) Primary adrenal failure (Addison's disease)
- c) Diabetic ketoacidosis
- d) Cushing's syndrome
- e) Conn's syndrome

<p><b>1. C</b></p>	<p>Based on the signs and symptoms described here you suspect Addison’s disease, which would be diagnosed using a <b>Synacthen test</b>. Addison’s disease is caused by the autoimmune destruction of the adrenal cortex which results in the decrease in production of glucocorticoids (e.g. cortisol), mineralocorticoids (e.g. aldosterone) and adrenal androgens. This leads to some of the symptoms described above, such as postural hypotension (due to reduced aldosterone) and increased pigmentation in palmar creases/ newly formed scars. Other symptoms include, weight loss, fatigue, GI upset.</p> <p>Remember “lean, tanned, tired, tearful” when thinking about Addison’s.</p> <p>A short synacthen test (= ACTH stimulation test) would be done to diagnose adrenal insufficiency.</p> <ul style="list-style-type: none"> <li>- Normal adrenals: synthetic ACTH would stimulate cortisol production = cortisol levels increase</li> <li>- In 1° Adrenal Insufficiency (Addison’s disease): giving synthetic ACTH would NOT lead to cortisol levels rising</li> </ul> <p>A long synacthen test would have to be done to diagnose 2° adrenal insufficiency (usually due to long-term use of corticosteroids/ damage to pituitary glands)</p> <p>Options <b>E</b> (urinary free cortisol measurement) and <b>D</b> (low-dose dexamethasone test) would be used to investigate Cushing’s syndrome.</p> <p>One cortisol measurement (<b>A</b>) is not a very valuable investigation for diagnosis. Although cortisol would be reduced in Addison’s, cortisol levels have diurnal variations and so one measurement is not a very specific or sensitive test for Addison’s.</p>												
<p><b>2. B</b></p>	<p>ADH(=vasopressin) is an anti-diuretic hormone that causes the reabsorption of water into the blood. In SIADH, excessive ADH is inappropriately released, so too much water is reabsorbed into the blood, causing the plasma to become more dilute which leads to hyponatraemia. Hyponatraemia is a common cause of confusion.</p> <p>Calcium and magnesium levels would not usually be affected in SIADH.</p>												
<p><b>3. D</b></p>	<p>Regular nebulised salbutamol is commonly associated with hypokalaemia. Ipratropium shouldn’t cause any electrolyte disturbances. Amlodipine and paracetamol aren’t known to cause hypokalaemia. Ramipril can cause <b>hyper</b>kalaemia, not hypokalaemia.</p>												
<p><b>4. D</b></p>	<p>A water deprivation test using desmopressin would be used to differentiate between nephrogenic and cranial diabetes insipidus. This is because a large amount of water is lost during DI. This is either due to a decrease in production of ADH (Cranial cause) or due to an impaired response to ADH (nephrogenic cause)</p> <p>You would deprive the patient of water, test their osmolality pre and post giving desmopressin (desmopressin is man-made ADH)</p> <table border="1" data-bbox="269 1727 1481 2119"> <thead> <tr> <th></th> <th>Explanation</th> <th>Urine osmolality After Water Deprivation</th> <th>Urine Osmolality After Desmopressin is given</th> </tr> </thead> <tbody> <tr> <td>Cranial</td> <td>Hypothalamus doesn’t secrete enough ADH but kidneys can still respond to ADH → so by giving desmopressin you can concentrate the urine</td> <td>&lt;300 (low)</td> <td>&gt; 800 (high)</td> </tr> <tr> <td>Nephrogenic</td> <td>Kidneys are unable to respond to ADH, so</td> <td>&lt; 300 (low)</td> <td>&lt; 300 (low)</td> </tr> </tbody> </table>		Explanation	Urine osmolality After Water Deprivation	Urine Osmolality After Desmopressin is given	Cranial	Hypothalamus doesn’t secrete enough ADH but kidneys can still respond to ADH → so by giving desmopressin you can concentrate the urine	<300 (low)	> 800 (high)	Nephrogenic	Kidneys are unable to respond to ADH, so	< 300 (low)	< 300 (low)
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		can't concentrate urine even when desmopressin is given		
5. B	<p>The presentation is that of acromegaly.</p> <ul style="list-style-type: none"> <li>• 1st IGF-1</li> <li>• 2nd OGTT</li> <li>• 3rd Pituitary function tests (including prolactin)</li> <li>• 4th MRI pituitary</li> </ul> <p>(Also investigate for complications e.g echocardiogram for cardiomyopathies)  <i>Serum IGF1 can also be used to monitor the disease</i>  Oral glucose tolerance test (OGTT)</p> <ul style="list-style-type: none"> <li>• in normal patients, GH is suppressed to &lt; 2 mu/L with hyperglycaemia.</li> <li>• in acromegaly there is no suppression of GH</li> <li>• may also demonstrate impaired glucose tolerance which is associated with acromegaly.</li> </ul>			
6. D	<p>The history and presentation describe primary hyperaldosteronism. This can be either due to Conn's syndrome which is an adrenal adenoma (1/3), or bilateral adrenal hyperplasia (2/3). Too much aldosterone production can lead to excess potassium excretion leading to hypokalaemia and alkalosis. This can cause muscle cramps, paraesthesia, and fatigue. It can also cause excess sodium and water reabsorption leading to hypertension and excessive thirst. The kidneys are unable to concentrate urine, leading to frequent urination.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>• <b>Hypertension</b> (resistant to 3+ antiHT)</li> <li>• <b>Hypokalaemia</b> e.g. muscle weakness</li> <li>• alkalosis</li> </ul> <p><b>Investigations</b></p> <ul style="list-style-type: none"> <li>• first line = ARR (aldosterone renin ratio): high aldosterone levels + low renin levels (negative feedback due to sodium retention from aldosterone)</li> <li>• Adrenal Venous Sampling (AVS): identify the gland secreting excess hormone in primary hyperaldosteronism</li> <li>• HRCT abdomen + AVS is used to differentiate between unilateral (Conn's) and bilateral adrenal hyperplasia</li> </ul>			
7. E	<p>Karen's dexamethasone suppression test showed no cortisol suppression with a low ACTH level, suggesting an ACTH independent cause of Cushing's syndrome. The most likely cause of Cushing's syndrome is iatrogenic. She also has chronic asthma which is controlled via medication and the brown inhaler indicates an inhaled corticosteroid. Therefore, a medication review and stopping the ICS should be the first line treatment.</p> <p>A review would be required if there is no improvement in her symptoms.</p>			
8. A	<p>Primary hyperparathyroidism.</p> <p>High serum calcium would normally suppress PTH by negative feedback. However, with this patient's, their PTH is in the normal range. This suggests an inappropriately raised serum calcium, making the most likely diagnosis primary hyperparathyroidism, with autonomous secretion of PTH by the parathyroid gland.</p> <p>In secondary hyperparathyroidism, serum calcium and phosphate are usually both low/normal. PTH would be raised due to negative feedback from the low serum calcium, e.g. due to vitamin D deficiency or CKD. This can lead to tertiary hyperparathyroidism, whereby chronic hypocalcaemia causes autonomous parathyroid function, which results in high serum calcium and phosphate.</p>			
9. E	<p>The patient in this case has a pheochromocytoma, a pheochromocytoma is a tumour that secretes catecholamines derived from the chromaffin cells within the adrenal medulla. Management of a pheochromocytoma is commonly a surgical resection of the tumour with alpha-blockers e/g phenoxybenzamine typically given before surgery.</p>			

<p><b>10. D</b></p>	<p>The adrenal gland is divided into the cortex and medulla. The adrenal cortex is further divided into:</p> <ul style="list-style-type: none"> <li>• Zona glomerulosa - produces and secretes mineralocorticoids e/g aldosterone</li> <li>• Zona fasciculata - produces and secretes corticosteroids e/g cortisol</li> <li>• Zona reticularis - produces and secretes androgens</li> <li>• The adrenal medulla contains chromaffin cells which secretes catecholamines such as adrenaline</li> </ul>
<p><b>11. C</b></p>	<p>Graves' disease is the most common cause of hyperthyroidism caused by TSH receptor antibodies. Hyperthyroidism typically leads to weight loss and <u>not</u> weight gain, the other signs are typical of Graves' disease.</p>
<p><b>12. A</b></p>	<p>This patient has presented with an episode of diabetic ketoacidosis. The first line management for this patient would be to start IV fluids before insulin therapy.</p>
<p><b>13. B</b></p>	<p>Weight gain is a common side effect of hypothyroidism. As thyroid hormones decrease regulation of metabolism also decreases. Sweating is a symptom of hyperthyroidism not hypothyroidism. Cold intolerance is a consequence of lack of thyroid hormone which is normally used to convert and utilise stored energy effectively. Lack of thyroid hormones leads to decreased gut motility. This is not well understood however it is thought to be due to anovulation.</p>
<p><b>14. B</b></p>	<p>Lifestyle modification would be considered the first line treatment, but the question is highlighting medicinal. Metformin is usually given first line to patients with newly diagnosed diabetes. Glimepiride is an example sulfonylurea which added to treatment when metformin is not enough to keep the glucose levels under 58 mmol/L. Gliclazide is an example sulfonylurea which added to treatment when metformin is not enough to keep the glucose levels under 58 mmol/L. Insulin therapy is initiated in patients with persistently raised glucose levels even after the administration of medicinal therapy.</p>
<p><b>15. A</b></p>	<p>This is the gold standard as serum Metanephrine in pheochromocytoma are continuously high. This test is also used but only when test a is not available. It is not as sensitive as test a. MRI is used in imaging the adrenal tumour. This is after the gold standard test is conducted. CT is also used in imaging the adrenal tumour however is less sensitive compared to the MRI.</p>
<p><b>16. B</b></p>	<p>Addison disease (primary adrenal insufficiency) causes decreased production of adrenocortical hormones (cortisol, aldosterone and dehydroepiandrosterone). May be caused by a destructive process directly affecting the adrenal glands or a condition that interferes with hormone synthesis. Key diagnostic factors are fatigue, anorexia/weight loss, hyperpigmentation, salt craving (low sodium and high potassium). Most commonly in developed countries it is an autoimmune condition which is more common when other AI conditions are present e.g. T1DM.</p> <p>Secondary adrenal insufficiency interferes with pituitary function and decreased ACTH secretion. Symptoms are the same as Addison disease, normally associated with corticosteroid use or cessation or tumours.</p> <p>Cushing's syndrome is an increase in cortisol caused from increased ACTH. This presents with moon face, buffalo hump, central weight gain, muscle and bone weakness and hypokalaemia.</p> <p>Insulin excess would cause hypoglycaemia but would cause weight gain as the glucose is being stored in cells. High insulin would also cause hypokalaemia as the glucose transporter uses K<sup>+</sup> to take it into cells.</p> <p>Ketoacidosis presents with excessive thirst, frequent urination, nausea and vomiting, abdo pain, weakness and fatigue. Potassium levels are likely to be low due to excessive urination.</p>

