

“Looking for hope”

Endocrine Block-Case 2

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Learning Objectives:

This PBL Package targets the following objectives:

- Discuss anatomy, histology and physiology of the adrenal gland.
- Understand the hypothalamo-pituitary-adrenal axes and the physiology of the negative feedback mechanisms.
- Discuss the formation and physiological actions of glucocorticoids and adrenal androgens.
- Use basic sciences to interpret symptoms, signs and investigations of a patient with Cushing syndrome.
- Discuss the pathology and pathogenesis of Cushing syndrome resulting from an adrenal adenoma.
- Discuss the impact of diseases such as Cushing syndrome on patient's psychological health.
- Identify management goals and management options for a patient with an adrenal adenoma.



Trigger

Amani Omar, a 27-year-old Lebanese is very excited as she plans with her parents to travel for Hajj. She also plans to meet an old friend, Aisha, who lives in Jeddah and has not seen for over 7 years. At the airport, Aisha and her family are waiting for Amani and her family. On greeting each other, Aisha is astonished because Amani's face is moonlike rounded and she has some acne and excessive facial hair. She also noticed that Amani has put on a lot of body weight.



Discussion Questions:

- Are there any difficult words you do not understand?
- List the key information about Amani.
- Identify Amani's presenting problems.
- For each problem, generate a list of possible causes (hypotheses).
- What further information would you like to know from history to refine your hypotheses?



New Terms/Difficult words

- *acne*
- *moonlike.*
- *facial hair*

Tutor: *Encourage students to use a medical dictionary resource to discuss the meaning of each of these words.*



Problems/Hypotheses

Rounded moonlike face:

- Simple obesity.
- Bilateral enlargement of the parotid glands.
- Generalised oedema (e.g., nephrotic syndrome).
- Chronic drug intake e.g., cortisol.
- Excessive secretion of cortisol.
- Mobilisation of fat to the face.
- Generalised anaphylaxis.



Problems/Hypotheses

Excessive facial hair in a female:

- Racial background.
- Familial.
- Increased sensitivity of hair follicles to circulating androgens.
- Drug-induced e.g., phenytoin.
- Increased secretion of corticosteroids and androgens from adrenal glands e.g., Cushing's syndrome.
- Increased secretion of androgens e.g., ovarian tumours, polycystic ovarian syndrome.

Problems/Hypotheses

Put on a lot of weight:

- Psychological factors.
- Excessive caloric intake.
- Increased appetite
- Lack of physical activities and exercise.
- Medications e.g.,
 - Corticosteroids for asthma or other inflammatory conditions
 - Oral contraceptive pill
 - Tricyclic antidepressants
 - Phenothiazines.
- Metabolic/ endocrine disorders e.g.,
 - Hypothalamic disorders (hyperphagia)
 - Hypothyroidism (added adipose tissue and myxoedema fluid)
 - Cushing's syndrome (excessive secretion of glucocorticoids)
 - Polycystic ovarian syndrome (due to associated hormonal changes)
- Genetic and familial causes.
- Pregnancy

Facilitation Questions

What are the anatomical structures that could be related to the development of moonlike face?

- Skin
- Subcutaneous tissues.
- Fat.
- Muscles.
- Parotid glands.
- Bones (less likely).

What are the patho-physiological changes that could contribute to the development of moonlike face?

- Anaphylaxis.
- Mobilisation of fat.
- Fluid retention.
- Enlargement of parotid glands.

Further Questions

- Age at onset of symptoms.
- Progression and areas affected by hair growth other than the axilla and pubic regions.
- Detailed dietary history
- Physical activities.
- Any other symptoms.
- Past medical history.
- Body weight during childhood.
- Family history of obesity or depression.
- Medication, alcohol intake and smoking
- Psycho-social history/any history of depression.

Please Read The History

On the second day of the family arrival, Amani has severe backpain. Aisha's family offered to take Amani to their local family doctor. On taking history and examining Amani, the doctor notices that Amani has acne and some hairs on her chin and upper lip. Amani says "I noticed the appearance of acne and the hair on my face about 6-8 months ago." She tried several ways to remove her facial hair but it usually appears again in a few days. She has gained over 10 kgs in body weight over the last 12 months. She has tried hard to loose weight by exercising and dieting but did not succeed. She easily develops skin bruising after minor trauma. She feels that her skin is fragile.

Recently, she noticed some difficulty on climbing stairs. Her menstrual periods are irregular for the last 4-5 months. She also has back pains for about 3-4 months on and off. She tried some NSAIDs, at times the medications help but no significant relief.

Amani worries a lot about her body image, sometime she goes to her room and cries, she always feels depressed and unhappy.

Continue-History

Past medical history

She has always been well and healthy. No history of acne or facial hair during teenage.

Allergy and Medication

Nil

Family history

Her mother and two sisters do not have facial hair or acne and they are not obese. No family history of depression.

Continue-History

Alcohol & Smoking

Nil

Social history

She completed a degree in Arts at a university in Lebanon. She worked part time for a year and she is currently looking for a job.

Discussion Questions

- Are there words that you do not understand?
- Summarize key information that you have obtained from this progress.
- Identify patient's new problems. Provide hypotheses for each problem.
- What further information would you like to know through clinical examination?

New Terms

(Tutor: encourage students to use their medical dictionary to find out more about these words)

- Bruising.
- Body image.

Tutor: Encourage students to use a medical dictionary resource to discuss the meaning of each of these words/phrases.

Key information

- She has severe back pain.
- Seen by a doctor.
- Has severe acne and facial hair (6-8 months).
- Tried to remove the facial hair... reappear
- Gained over 10 kg in body weight (12 months).
- Unable to loose body weight.
- Skin bruising.. Fragile skin.
- Difficulty in climbing stairs.
- Irregular menstrual period (4-5 months).
- Tried NSAIDs.
- Worried about her body image.

Continue- Key information

- No history of acne or facial hair during teenage.
- Not on any medications.
- No history of allergy.
- No family history of acne, facial hair or obesity.

Hypotheses/Ranking

Rounded moonlike face:

- Simple obesity. ?/+
- Bilateral enlargement of the parotid glands. ?/-
- Generalised oedema (e.g., nephrotic syndrome). ?/-
- Chronic drug intake e.g., cortisol. --
- Excessive secretion of cortisol. ?/+ / ++
- Mobilisation of fat to the face. ?/++
- Generalised anaphylaxis. --



Hypotheses/Ranking

Excessive facial hair in a female:

- Racial background. -
- Familial. -
- Increased sensitivity of hair follicles to circulating androgens. ?/++
- Drug-induced e.g., phenytoin. --
- Increased secretion of corticosteroids and androgens from adrenal glands e.g., Cushing's syndrome. ?/++/++++
- Increased secretion of androgens e.g., ovarian tumours, polycystic ovarian syndrome. ?/++

Hypotheses/Ranking

Put on a lot of weight:

- Psychological factors. ?/+
- Excessive caloric intake. ?/-
- Increased appetite ?/--
- Lack of physical activities and exercise. --
- Medications e.g.,
 - Corticosteroids for asthma or other inflammatory conditions -
 - Oral contraceptive pill -
 - Tricyclic antidepressants --
 - Phenothiazines. --
- Metabolic/ endocrine disorders e.g.,
 - Hypothalamic disorders (hyperphagia) ?/--
 - Hypothyroidism (added adipose tissue and myxoedema fluid) /--
 - Cushing's syndrome (excessive secretion of glucocorticoids) ?/++
 - Polycystic ovarian syndrome (due to associated hormonal changes) ?/+
- Genetic and familial causes. --
- Pregnancy ---

New Hypotheses

Severe back pain:

- Problems with inter-vertebral discs.
- Problems with the muscles of the back.
- Problems with vertebrae (osteoporosis, fracture).
- Problems with joints.
- Nerve compression.
- Referred pain to the back.

New Hypotheses

Difficulty in climbing stairs:

- Problems with the proximal muscles of lower limbs.
- Problems with the motor nerve.
- Problems with anterior horn cells.
- Problems with the spinal cord.
- Problems with the higher centres.
- Problems with the bones.
- Problems with the joints (e.g., hip joint).
- Problems with body weight.
- Other problems (e.g., heart, lung problems)

**Please Read
The Clinical
Examination**

Clinical Examination

Amani has a moonlike face, she looks depressed. She has a collection of subcutaneous fat at the base of her neck (a buffalo hump). There are several acne lesions and abnormal hair on her upper lip and chin. The skin of her arms and legs show a few bruises.

Vital signs

Vital signs	Amani	Normal range
Pulse rate	80 regular	60-100/min
Blood pressure	160/90 mmHg	100/60-120/80 mmHg
Temperature	37.1	36.6-37.2 °C
Respiratory rate	14	12-16/min

Continue- Clinical Examination

Abdominal examination:

She has obesity mainly located in her trunk. The skin of the abdomen and upper thighs shows a number of purplish striae.

Lower limbs:

Her thighs are thin.

She has bilateral proximal muscle weakness.

Continue- Clinical Examination

Back

Tenderness over L 4 and 5. No neurological deficit

Dipstick urinalysis:

Glucose ++

Discussion Questions

- Are there words that you do not understand?
- Summarize key information that you have obtained from this progress.
- Identify patient's new problems. Provide hypotheses for each problem.
- Summarize your "learning issues."

Difficult words

- Buffalo hump.
- Truncal obesity (central obesity).
- Purple striae.

Facilitation Questions

- Do you think these findings are due to a localised problem or a systemic change?
- What are the body systems affected so far?
- Go back to your hypotheses and circle those with +++ or ++ against them. Use a different colour pen.
- Summarise your findings. What did you find?

Facilitation Questions

- Discuss the histology of the adrenal gland.
- What are the physiological functions of each layer?
- Which layer is responsible for the secretion of cortisol?
- What are the physiological actions of glucocorticoids?
 - On carbohydrates.
 - On proteins.
 - On fats.

Hypotheses: Ranking

Most likely:

-Hormonal – excessive secretion of cortisol.

- Supportive evidence:

- Excessive acne and facial hair.
- Rounded moonlike face, buffalo hump.
- Truncal obesity, thin limbs.
- Easy bruising of the skin.
- Irregular menstrual periods.
- Back pains
- Hypertension
- Depressed mood.

Learning Issues

- Structures and functions of the adrenal cortical gland.
- Role of the hypothalamic-pituitary-adrenal axis in control of glucocorticoids secretion.
- Physiology of glucocorticoids.
- Pathology and pathogenesis of Cushing syndrome.
- Physiological basis for the symptoms and clinical signs of a patient with Cushing syndrome.
- Investigations needed for a patient with Cushing syndrome and interpretation of results.
- Impact of Cushing syndrome on psychological health.

Tutorial Two


Investigations

Because Amani's presenting problems and the clinical examination findings (acne, abnormal facial hair, moonlike face, buffalo hump, truncal obesity, purpural abdominal triaie, thin week thigh muscls, and presence of glucose in urine), the doctor arranges for some investigations. The results of these investigations are shown below:

Full Blood Count

Blood test	Amani	Normal Range
Haemoglobin (Hb)	155	115-160 g/L
PCV	0.45	0.37-0.47
WBCs	12	4.0 – 11.0 x 10 ⁹ /L
Platelet count	380	150-400 x 10 ⁹ /L



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time to scan all the inves. 
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New words

- Serum cortisol.
- Dehydroepiandrosterone (DHEA) sulfate.
- Testosterone.
- Serum ACTH
- Adrenal gland.

Interpretation of findings

Item	Change	Interpretation/possible causes
Haemoglobin (Hb)	Upper limit of normal	Normal ? due to cortisol effects on the haemopoietic system.
Serum potassium	Low	
Fasting blood glucose	Increased	Glucocorticoids interfere with gluconeogenesis
Blood cholesterol	Increased	Could be due to increased secretion of cortisol. What are the physiological actions of cortisol on fats?
Serum triglycerides	Increased	Could be due to increased secretion of cortisol. What are the physiological actions of cortisol on fats?
Serum cortisol	Loss of diurnal variations	The control of secretion of cortisol is lost. It is not regulated by the ACTH from the anterior pituitary.
Serum dehydroepiandrosterone (DHEA) sulfate	Increased	There is increased secretion of glucocorticoids and androgens (more than one layer affected). What is the possible cause?
Serum ACTH	Very low	Suppression of the anterior pituitary due to increased secretion of cortisol.



Progress 1

The doctor explains to Amani and her family that her symptoms (weight gain, acne, excessive facial hair, skin bruising, and back pain) and the clinical findings (high blood pressure, weak thigh muscles, vertebral compression fracture and depressed mood) are all related to one disease and suggest excessive secretions of a hormone known as cortisol. This hormone is normally secreted in small amounts from a gland located over the kidneys. In Amani's case the hormone is secreted in large amounts. The investigations conducted including blood test results and radiological images support this diagnosis. There is no medical treatment for this condition and I would recommend to Amani to see an endocrine surgeon for further opinion and management. The mass from the gland as shown by the radiological images need to be removed so that the excessive secretion of cortisol can be controlled.

The rest of the papers do not contain any additional info. They're the same as those in your papers! So good luck ☺