

Cases for Colloquium #4. Pathophysiology of endocrine system

Class 1 Stress. Pathophysiology of hypothalamo-pituitary-adrenal system

Case 1.

Patient D., 48 years old, has been suffering from bronchial asthma for 30 years. In the last 10 years asthma attacks have become more frequent and the patient was prescribed glucocorticoids. Later, the patient began to take these preparations without consulting his doctor to relieve asthma attacks. Over the last year he has become obese (with predominant fat deposits on his cheeks and abdomen), his blood pressure has become higher (180/100 – 190/110 mm Hg). Asthma attacks ceased, and the patient stopped taking the hormonal medications. Several days after the medication had been discontinued, dizziness, acute muscle weakness, anorexia and diarrhea developed. The symptoms worsened, and the patient was hospitalized.

Examination data: The patient is of medium height, with signs of upper-body obesity. There are purple striae on his abdomen, numerous acnes on the face. BP is 70/50 mm Hg; pulse – slow and feeble. Blood glucose level is 2.7 mmol/l; obvious hyponatremia.

1. What syndrome developed in this patient due to long-term treatment with glucocorticoids? What syndrome developed after he had stopped taking these medications?
2. What is “upper-body obesity”?
3. What is the mechanism of obesity, striae formation and hypertension in the long-term use of glucocorticoids?
4. Why did hypotension, hyponatremia and hypoglycemia develop after withdrawal of the medications?
5. Point out the principles of treatment and prevention.

Case 2.

Patient R., a 35-year-old woman, presents with complaints of attacks of pulsating headaches, palpitations, pallor, profuse sweating, visual impairment, tremor of the limbs, pains in the chest and abdomen. These attacks have occurred for the last two years several times a week, sometimes several times daily; they develop after emotional excitement or physical exercise and usually last about 30 minutes (sometimes several hours). At the end of the attack the patient has a slow pulse, her face reddens, she voids large quantities of light urine; sometimes there is nausea, vomiting and hypersalivation. She has considerably lost weight.

Examination data at the moment of the attack: BP – 210/180 mm Hg; the pulse is 120/min; arrhythmia. Blood glucose level is 14 mmol/l; increased content of fatty acids and lactate. X-ray examination revealed a tumor of the left adrenal gland.

1. What pathology of the endocrine system can be suspected in this patient?
2. Explain the pathogenesis of the observed disorders.
3. What complications can lead to the lethal outcome?

Case 3.

Patient F., 47 years old, is being treated by an endocrinologist for a severe form of obesity, arterial hypertension, coronary heart disease, diabetes mellitus type 2, dysmenorrhea. Some years

ago she was treated for multiple fractures of the limbs, concussion and contusion of the brain after a car accident.

Examination data: height – 167 cm, body mass – 110 kg. Fat deposits are mainly on the face (moon-like face), breasts, hips and abdomen, around the 7th cervical vertebra. On the extremities the subcutaneous adipose layer is not expressed. There are purple and cyanotic striae on the thin (“parchment”) skin of the hips and abdomen. The scars at the sites of injuries and appendectomy are hyperpigmented. Hirsutism of the male type; mild degree of virilization. BP is 210/120 mm Hg; heart boundaries are expanded, on ECG – signs of myocardial ischemia. *In the blood:* erythrocytosis, neutrophil leukocytosis, eosinophilia and lymphocytopenia, hypernatremia, hypokalemia, pH = 7.52. Blood glucose is 11 mmol/l; cholesterol – 9 mmol/l; HDL/LDL ratio is decreased. Diurnal diuresis is increased. *In the urine:* moderate proteinuria, glucosuria, increased content of 17-OKS (oxyketosteroids). Ketonuria is absent.

1. What disease of the endocrine system is characterized by this clinical picture?
2. Explain the etiology and pathogenesis of the disease and its complications in this patient.
3. What additional investigations can help to make a differential diagnostics with other disorders?
4. Explain the mechanism of lipid, protein, carbohydrate and fluid-electrolyte metabolism disturbances in this patient. Assess the acid-base balance.
5. What complications can be life-threatening for this patient?

Case 4.

A 31-year-old woman is being treated at the endocrinology department.

Examination data: The patient is of medium height and normal build, but extremely exhausted (looks like a skeleton). She moves with difficulty, quickly gets tired, speaks slowly, with long pauses and in a very low voice (almost whisper). The skin is dry, flaccid, hyperpigmented, especially at the sites where it is rubbed by clothes. The turgor is decreased. There are white depigmented spots on the skin of the chest and arms (vitiligo). Appetite is absent, but there is an increased need in table salt. The patient has frequent vomiting and diarrhea. BP is 80/50 mm Hg, pulse – slow and weak. Circulating blood volume (BV), stroke volume (SV) and cardiac output (CO) are decreased. *In the blood:* decreased count of erythrocytes and neutrophils, lower glucose level and Na⁺ and Cl⁻ concentration, but increased content of K⁺ and H⁺ as well as ACTH (adrenocorticotrophic hormone).

Antibodies to ACTH and MSH (melanocyte-stimulating hormone) are revealed.

1. What disease is characterized by this clinical picture? Give all the names of the disease.
2. Explain the etiology of this disease and point out other possible causes if its development.
3. Explain the pathogenesis of the disease and its main clinical features.
4. List the principles of treatment of this disease.

Class 2 Diabetes Mellitus. Oral manifestations

Case 1

Patient D., aged 62, was admitted to hospital with complaints of constricting pains in the heart area, pains in the legs which appeared during walking, constant torturing thirst and frequent urges to urinate, as well as sharp visual deterioration.

Her sister has diabetes mellitus.

Examination data: height – 160 cm, body mass – 110 kg; BP – 180/110 mm Hg; weak pulse in the vessels of the lower extremities. *Blood test:* fasting glucose level - 20 mmol/l; the levels of cholesterol, LDL and glycosylated hemoglobin are increased. *In the urine:* presence of glucose, no acetone. Diurnal diuresis – 3 liters.

1. Calculate and assess the body mass index of the patient.
2. Explain a possible pathogenesis of the disease.

3. What is the mechanism of hyperglycemia, glucosuria, polyuria? Why is prolonged hyperglycemia dangerous?
4. Explain the mechanism of the disorders of lipid metabolism and their significance in the development of the disease complications.
5. What kind of coma is most typical of this disease?
6. List the principles of therapy.

Case 1

Patient K., 19 years old, was admitted to hospital with complaints of frequent urges to urinate and large quantities of urine in each micturition; constant thirst (he drinks several liters of water daily). Despite normal appetite he has lost 6 kg of weight over the last year. Three years ago he suffered a severe form of rubella, in the last year he has once had tonsillitis, and twice – an acute respiratory viral infection. Recently he has begun to notice quick fatigability on exertion. The patient's grandmother suffered from diabetes mellitus from her childhood.

Examination data: height – 175 cm, body mass – 56 kg; the skin is dry, tissue turgor is decreased. Fasting blood glucose level is 15 mmol/l; increased content of glycosylated hemoglobin, fatty acids and ketone bodies. There is glucose and acetone in the urine.

1. Explain a possible etiology and pathogenesis of this disease.
2. What is the mechanism of hyperglycemia, ketonuria and clinical symptoms?
3. What long-term complications can develop in this patient? What is their mechanism?
4. List the principles of therapy.

Class 3 Pathophysiology of thyroid and parathyroid glands . Oral manifestations

Case 1.

Patient A., aged 62, presented with complaints of severe palpitations and pains in the heart, profuse sweating, tremor of hands, irritability, constant feeling of heat, lacrimation and photophobia. Over the last three months he lost 10 kg of body weight in spite of increased appetite.

Examination data: The patient is of normal build, deficient nutrition. The thyroid gland is slightly enlarged (diffuse goiter of the 1-st degree). Exophthalmos of medium degree, brightness of the eyes, impaired convergence. Body temperature is 37.4°C; BP – 160/80 mm Hg; heart rate - 120/min. On ECG – atrial flutter and polytopic extrasystoles, signs of myocardial changes. Basal metabolism is increased by 40%. *In the blood:* LATS-factor and antibodies to periorbital tissues are detected.

1. List all the names of this disease.
2. What is LATS-factor and what role does it play in the disease pathogenesis?
3. What levels of TRF (thyrotropin-releasing factor), TSH (thyroid-stimulating hormone, thyrotropin), T₄, and T₃ are likely to be found in this patient?
4. Explain the mechanism of the development of goiter, increase in basal metabolism and body temperature, disturbance of heart activity and ocular symptoms.
5. What are the principles of treatment of this disease?

Case 2.

Patient N., a 19-year-old woman, applied to her physician with complaints of an increasing goiter. Lately she has begun to experience a sensation of a foreign body in the esophagus and

difficulty in swallowing. She lives in an area where 32% of adult population have goiter of various degrees; 6% of children are mentally and physically retarded.

Examination data: proportional build, height – 156 cm, body mass – 78 kg, goiter of considerable size partly located behind the sternum. Body temperature is 36.0 °C; BP - 100/60 mm Hg, pulse - 58/min, weak. Basal metabolism is decreased by 15 %. Uptake of iodine by the thyroid gland is accelerated.

1. What is the name of this syndrome?
2. Explain the mechanism of goiter formation.
3. Explain the functional state of the thyroid gland in the patient basing on the clinical manifestation of the disease. Explain their mechanism.
4. What types of goiter do you know?
5. What endocrine syndrome develops in children of this region?
6. Explain the mechanism of their physical and mental retardation.

Case 3.

Patient D., 50 years old, was admitted to hospital two weeks after a strumectomy with complaints of periodic convulsions in the muscles of the extremities, constricting pains in the epigastrium, attacks of asphyxia (she does not have bronchial asthma). She complains of numbness and tingling in the extremities, feeling creepy and increased sensitivity of the teeth.

Examination revealed hypocalcaemia and hyperphosphatemia; Chvostek's and Trousseau's signs, as well as lung hyperventilation test are positive.

1. What complications developed in the patient after strumectomy?
2. List other possible causes of this pathology.
3. Explain the pathogenesis of the observed disorders.
4. List the principles of treatment.

Case 4.

Patient G., 35 years old, complains of appetite loss, nausea, constipations, pains in the abdomen, muscle and bone aches (especially during movement), muscle weakness, loosening of healthy teeth. Over the previous year he has had two fractures of the forearm bones and one attack of a renal colic.

Examination data: increased content of calcium and alkaline phosphatase and decreased content of phosphorus in the blood. *In the urine:* increased content of calcium and oxyprolin. X-ray examination showed signs of fractures of the forearm bones, deformation of the phalanges of both hands, signs of osteoporosis. Ultrasound investigation of the kidneys revealed nephrocalcinosis and calculi in the renal pelvis.

1. What endocrine pathology can be suspected in this case?
2. What investigation should be done and what are its presumptive results?
3. If your presumption is correct, explain the pathogenesis of the observed disorders.