Disorders of the adrenal glands

Lecture: 5 Dr. Saif Saadedeen

Disorders of the adrenal glands can result in underproduction (hypoadrenalism or adrenal insufficiency) or overproduction (hyperadrenalism).

Adrenal insufficiency is divided into two categories: primary and secondary. Primary adrenocortical insufficiency, also known as Addison’s disease, is characterized by destruction of the adrenal cortex with resulting deficiency of all of the adrenocortical hormones. The more common form, secondary adrenocortical insufficiency, may be the consequence of hypothalamic or pituitary disease or the administration of exogenous corticosteroids.

Hyperadrenalism results from excessive secretion of adrenal cortisol, mineralocorticoids, and androgens in isolation or combination. The most common type of overproduction is known as Cushing’s disease.

Primary adrenocortical insufficiency (Addison's disease)

Addison's disease (Adrenocortical Insufficiency) is hypofunction of the adrenal cortex. There is a decrease in adrenal steroids which are: glucocorticoids, mineralcorticoids, and androgen. The adrenal cortex function is inadequate to meet the patients need for steroids.

Causes
1. Autoimmune or idiopathic atrophy of the adrenal glands which is responsible for 80% to 90% of cases.
2. Surgical removal of both adrenal glands.
3. Infection of the adrenal glands (Tuberculosis and histoplasmosis are the most common infections that destroy adrenal gland tissue).

**Signs and Symptoms**

Tiredness, weakness, loss of appetite, weight loss, dizziness when standing, muscle aches, abnormal hair distribution, patches of darkened skin or unexplained tanning, depression and gastrointestinal disturbances.

**Diagnosis:**

- Early stages difficult to diagnose
- Cortisol levels
- ACTH Stimulation Test
- CRH Stimulation Test

Patients with this disease exhibit low levels of plasma cortisol but high levels of ACTH. The increase in ACTH levels represents a vain attempt by the pituitary to stimulate hormone production in the unresponsive adrenal cortex.

**Treatment**

Hormone replacement therapy; depending on which hormone is low.

**Addisonian Crisis**

Symptoms include sudden penetrating pain in lower back, abdomen or legs, severe vomiting, diarrhea followed by dehydration, low blood pressure and loss of consciousness.

**Secondary Adrenal Insufficiency**

- Much more common than primary adrenal insufficiency
- Traced by the lack of ACTH
- Abruptly stopping glucocorticoid therapy
- Surgical removal of pituitary gland tumor
Cushing’s syndrome

Cushing’s syndrome is caused by excessive activation of glucocorticoid receptors. By far the most common cause is iatrogenic, due to prolonged administration of synthetic glucocorticoids such as prednisolone (exogenous Cushing’s syndrome).

Classification of endogenous Cushing’s syndrome

- **ACTH-dependent** – 80%
  - Pituitary adenoma secreting ACTH
- **Non-ACTH-dependent** – 20%
  - Adrenal adenoma
  - Adrenal carcinoma
- **Hypercortisolism due to other causes (pseudo-Cushing’s syndrome)**
  - Alcohol excess
  - Depression
  - Obesity

Clinical assessment

Some common disorders can be confused with Cushing’s syndrome because they are associated with alterations in cortisol secretion, e.g. obesity and depression.

A careful drug history is vital to exclude iatrogenic causes; even inhaled or topical glucocorticoids can induce Cushing’s syndrome.

Symptoms

Cardiovascular (hypertension and heart failure), obesity, moon face, buffalo hump, hyperglycemia, peptic ulcers, muscle weakness, mood alterations, impaired wound healing, increased susceptibility to infections and decreased inflammatory response.

This collection of clinical features of glucocorticoid excess is known as Cushing’s syndrome.
**Investigations**
- 24-hour urinary cortisol
- serum cortisol
- Additional tests include plasma electrolytes and glucose
- CT/MRI detects most adrenal adenomas

Because of the negative feedback mechanism of the HPA axis, the patient’s cortisol levels are high and the ACTH levels are low.

**Management**
- Most patients are treated surgically (Surgery for tumors of the adrenal and pituitary glands).
- Radiation therapy.
- Drug therapy.
Dental Considerations

Many patients taking large doses of corticosteroids for different diseases. These drugs are important because their use can result in adrenal insufficiency and potentially render the patient unable to mount an adequate response to the stress of an infection or invasive dental procedure such as extractions. To avoid an adrenal crisis in patients on such regimens, the dental clinician should ensure that the usual corticosteroid dose is taken before surgical procedures and will need to monitor the patient closely during the postsurgical phase of care. Generally, however, most routine dental procedures do not require administration of supplemental steroids.

- **Minor surgical stress** 25 mg hydrocortisone equivalent preoperatively.

- **Moderate surgical stress** 50 -75 mg hydrocortisone equivalent on the day of surgery and up to one day after.

- **Major surgical stress** 100 -150 mg hydrocortisone equivalent per day given for 2 to 3 days preoperatively. Postoperatively, 50 mg hydrocortisone IV every 8 hours for the first 48 to 72 hours after surgery.

Surgical procedures lasting longer than 1 hour are more stressful than shorter procedures and are considered major surgery.

Patients who take corticosteroids for prolonged periods have an increased likelihood of having hypertension, diabetes, delayed wound healing, osteoporosis, and peptic ulcer.

To minimize the risk of an adverse outcome:

- Blood pressure should be taken at baseline and monitored during dental appointments. A systolic blood pressure below 100 mm Hg or a diastolic pressure at or below 60 mm Hg represents hypotension. A diagnosis of hypotension dictates that the clinician must take corrective action. This would include proper patient positioning (i.e., head lower than feet) and fluid replacement.

- Blood glucose levels should be determined.
• Follow-up appointments should be arranged to assess proper wound healing.
• Because osteoporosis has a relationship with periodontal bone loss, implant placement and bone fracture, periodic measures of periodontal bone loss are indicated.
• Because of the risk of peptic ulceration, postoperative analgesics should not include aspirin and other nonsteroidal antiinflammatory drugs (NSAIDs).
• Surgery should be scheduled in the morning when cortisol levels are highest.
• Proper stress reduction should be provided because fear and anxiety increase cortisol demand.
• Blood and fluid volume loss exacerbate hypotension, thereby increasing the risk for development of adrenal insufficiency–like symptoms. Thus, methods of reducing blood loss are important in this setting.
• A fasting state can contribute to hypoglycemia which can mimic features of an adrenal crisis, but does not require glucocorticoids for resolution.
• Provide adequate operative and postoperative anesthesia; routine use of epinephrine (1:100,000) is appropriate. Consider using long-acting local anesthetics (e.g., bupivacaine) at the end of the procedure to provide longer postoperative pain control.

**Emergencies**

Acute adrenal crisis is a medical emergency. Apply wet/ice packs, assess and monitor vital signs, start intravenous saline solution, administration of 100 mg of hydrocortisone or 4 mg of dexamethasone IV, start intravenous infusion of glucose solution and transport patient to emergency medical facility.
**Oral Complications and Manifestations**

In primary adrenal insufficiency, diffuse or focal brown macular pigmentation of the oral mucous membranes is a common finding. Pigmentation of sun-exposed skin often follows the appearance of oral pigmentation.

**Summary**

If the patient is at risk from adrenal insufficiency, the dentist must consider the need for the following: (1) antibiotic therapy, (2) anxiety control, and (3) increased administration of glucocorticoids. If a patient experiences adrenal crisis, the dentist must be capable of manage the case.

- In lecture 3 please change the lines in page 5 to (Local anesthesia with 1:100,000 epinephrine contains 0.01 mg/ml epinephrine …one carpule of 1.8 ml contains **0.018** mg).

    The end