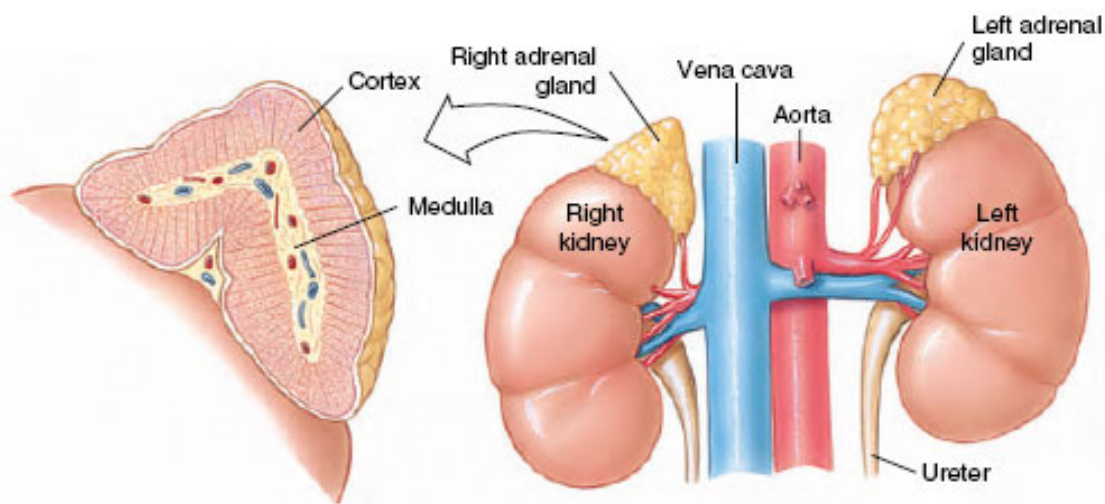


Chapter- 6 – The Endocrine System

STUDY MATERIAL- 4

ADRENAL GLANDS

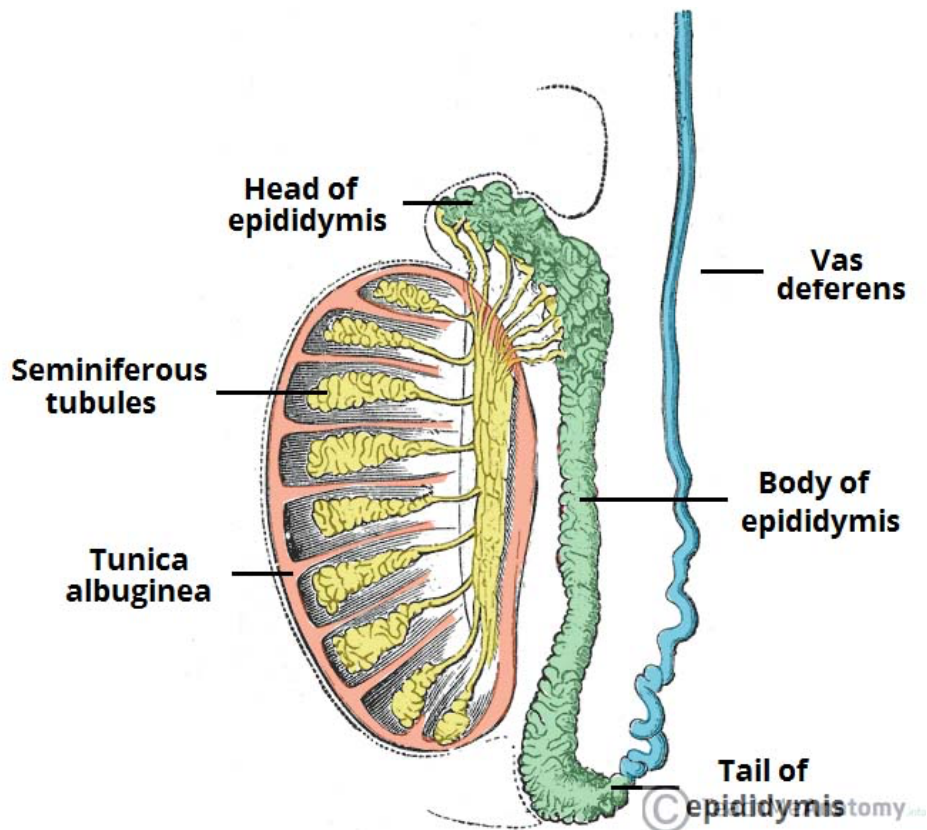


The Adrenal gland is actually a combination of two parts: **the adrenal cortex** and **the adrenal medulla**.

1. **THE ADRENAL CORTEX** is essential for life, as opposed to the adrenal medulla which is important but not indispensable. The anterior pituitary controls the adrenal cortex by secreting the hormone ACTH. All of the secretions of the adrenal cortex are known as steroids, many of which can now be manufactured synthetically. The adrenal cortex is made up of three layers associated with three classes of hormones:
 - **Mineralocorticoids** are produced by the outer layer of the adrenal cortex, the most important of which is aldosterone. Aldosterone promotes the retention of sodium (Na^+) and the excretion of potassium (K^+). This helps to maintain both the electrolyte and water content of the body.
 - **Glucocorticoids** are produced by the middle cortex. These affect almost every cell in the body regulating the metabolism of fats, proteins, and carbohydrates. Cortisone is one such glucocorticoid.
 - **Gonadal hormones** are produced by the inner cortex, there are roughly even amounts of two types of hormones secreted: Androgen (male) and Oestrogen (female). The adrenal gland is not the only gland to secrete sex hormones.

2. **THE ADRENAL MEDULLA** is the inner part of the adrenal gland. The hormones secreted effect the structures in the body that are under the control of the sympathetic nervous system, aiding the body to deal with stressful situations such as fright, attack or pursuit. They are both associated with an increased heartbeat, higher blood pressure, and higher blood glucose levels, thus preparing the body for quick action.
- **Adrenaline** (epinephrine) –increase in blood sugar level, increase in heart rate, etc.
 - **Noradrenaline** (Norepinephrine) – causes blood vessels to narrow and increase blood pressure

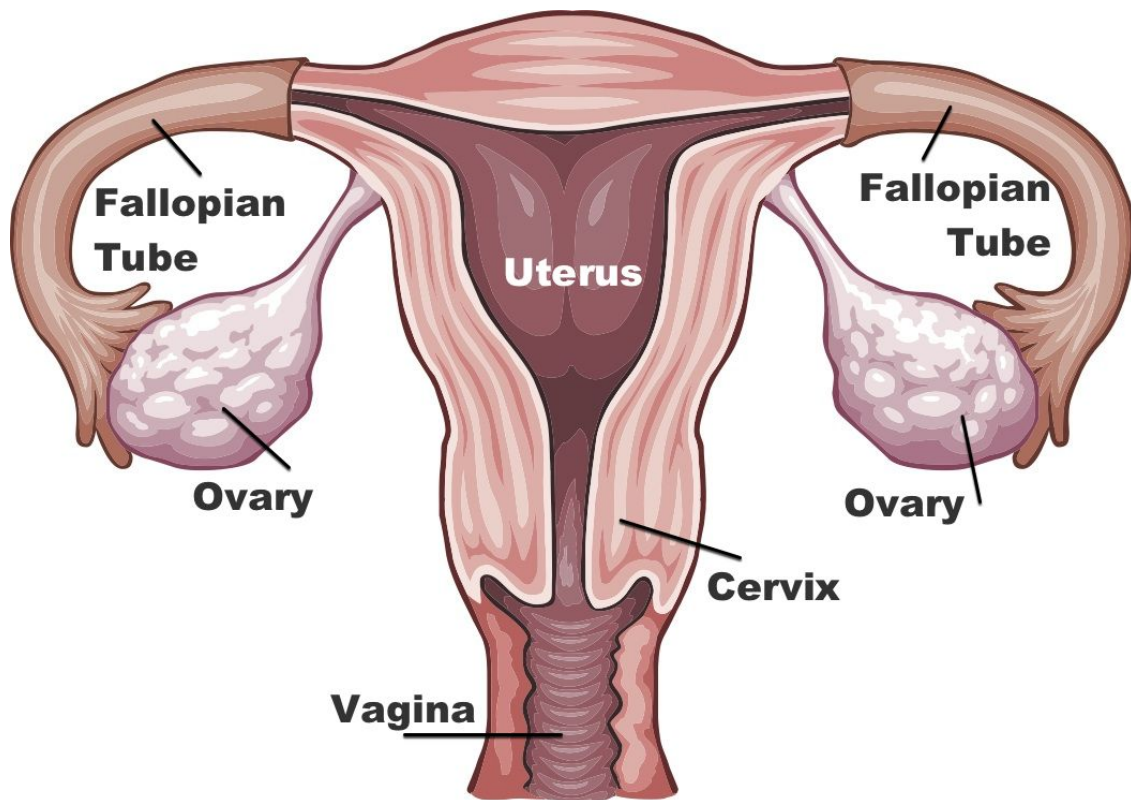
TESTES



Male testes are egg shaped glands located in the sac like scrotum, and serve two main functions:

- (i) The production of sperm cells
- (ii) The secretion of testosterone- Testosterone is the male hormone inducing male secondary sexual characteristics after puberty.

OVARY



They have three main functions;

- (i) Containing immature ova (eggs)
- (ii) Secretion of Oestrogen - Oestrogen is secreted by the adrenal cortex as well as the ovaries, and is present in the blood of all females from puberty through to the menopause. Oestrogen acts on the structure of the reproductive organs, especially during the menstrual cycle. This induces and maintains female secondary sexual characteristics.
- (iii) Secretion of progesterone- Progesterone works on the uterus to prepare it for the implantation of a fertilized ovum (egg). It causes the development of the breasts, and is essential for the complete development of the maternal proportion of the placenta.

CHANGES AT PUBERTY

1. Increase in Height

The most conspicuous change during puberty is the sudden increase in height. At this time the long bones, that is, the bones of the arms and the legs elongate and make a person tall. The rate of growth in height varies in different individuals. Some may grow suddenly at puberty and then slow down, while others may grow gradually.

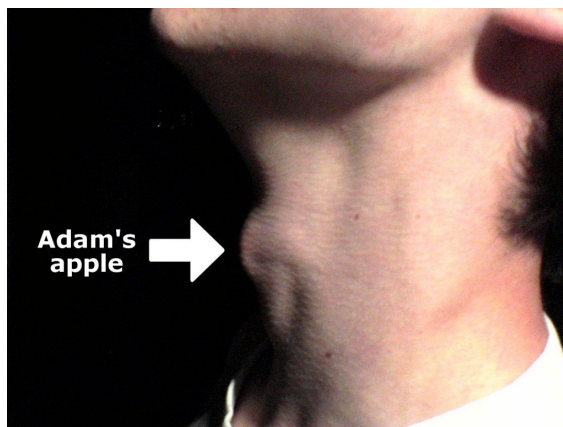
Initially, girls grow faster than boys but by about 18 years of age, both reach their maximum height.

2. Change in Body Shape

- In boys: shoulders generally broaden as a result of growth and chest becomes wider. The muscles grow more prominently than in the girls.
- In girls: the region below the waist (pelvic region) becomes wider. Thus, changes occurring in adolescent boys and girls are different.

3. Change in voice

- In boys: The voice box or larynx can be seen as a protruding part of the throat called Adam's apple. So boys have a low pitched voice.



- In girls: The larynx is generally smaller and hardly visible from outside. So girls have a high- pitched voice.

4. Increased Activity of Sweat and Sebaceous Glands

During puberty the secretion of sweat glands and sebaceous glands (oil glands) increases. Many young people get acne and pimples on the face at this time because of the increased activity of these glands in the skin.

5. Development of Sex Organs

- In boys: the male sex organs like the testes and penis develop completely. The testes also begin to produce sperms.

- In girls: the ovaries enlarge and eggs begin to mature. Also ovaries start releasing mature eggs.

6. Reaching Mental, Intellectual and Emotional Maturity

- Adolescence is also a period of change in a person's way of thinking. Adolescents are more independent than before and are also self-conscious.
- Intellectual development takes place and they tend to spend considerable time thinking. In fact, it is often the time in one's life when the brain has the greatest capacity for learning.
- There are a lot of emotional changes during puberty. One has to deal with the rapid physical change. Sometimes, however, an adolescent may feel insecure while trying to adjust to the changes in the body and mind.

However there is no reason for these emotional swings as puberty is a natural process of growing up that everyone passes through.

Manjaree Guha