Urogenital System

Sheet 3

Subject | physiology

Done by | Maryam Ali

Correction |Rawan Almujaibel

Doctor | Ebaa

Today , we'll disccuss the endometrial cycle ,the changings that take place in female uterus that will influence the ovaries functions (releasing hormones)

1-Descrive effects of estrogen and progestrone.

2- Describe the normal menstrual cycle.

3- Discuss the structural changes that occur in the endometrium during the menstrual cycle and explain how these changes are hormonally controlled.

4- Recognize the phases of the menstrual cycle.

5-Describe the physiology of menopause and the disorders of menstruation or ovulation.

- **Two main female sex hormones : ESTROGEN , PROGESTERONE**

1- effects of estrogen:

-A primary function of the estrogens is to induce cellular **proliferation and growth** of the tissues of the sex organs and other tissues related to reproduction.

-Induce growth of female sex organs: The ovaries, fallopian tubes, uterus, and vagina all are increase in size several times.

-Estrogens cause marked effect in inducing proliferation of the endometrial stroma and glands, (provide nutrition to the implemented ovum). Similarly in fallopian tubes and increase the number of **ciliated epithelial cells→to facilliate the transportation of a fertilized ovum into the urerus**

-Effect of Estrogens on the Breasts**. (1) development of the stromal (2) growth of ductile system, and (3) deposition of fat in the breasts**. The lobules and alveoli of the breast develop

slightly under estrogens alone, **but progesterone and prolactin that cause the ultimate role in growth and function**

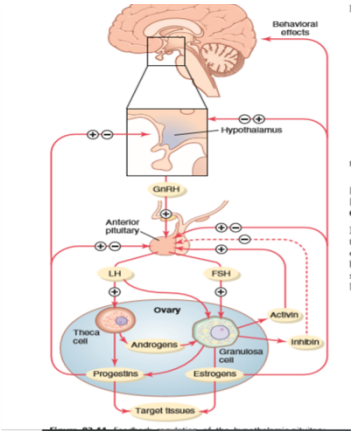
-Effect of Estrogens on the **Skeleton**; inhibit osteoclastic activity in the bones and therefore stimulate bone growth. However, they cause uniting of the epiphyses with the shafts of the long bones.that why→ female usually ceases earlier than growth of the male.

*that will be noticed after menapouse when the level of estrogen is low → then there will be high chance of having osteoporosis.(in this case we can give estrogen supplement as prophylaxis).

-Estrogens Slightly Increase **Protein Deposition**. Mainly due to growth of the sexual organs, the bones. Testosterone is much more general and much more powerful than estrogen in this regard.

-Estrogens **Increase Body Metabolism rate (has a slight effect)** (only about 1/3 as much as by testosterone) and increase fat deposition . →that why females have more fat deposition than males .Also , that will affect on the amount of the fluids percentage in the body, Females have less fluids than males.

-Estrogens **Have Little Effect on Hair Distribution.** Estrogens do not greatly affect hair distribution. However, the adrenal androgens have greater effect on female hair after puberty

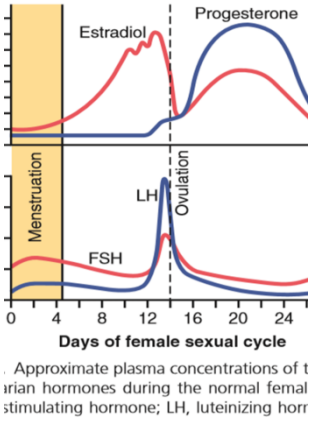


-Effect of Estrogens on **the Skin,** help in development of a texture that is soft and usually smooth in puberty, but still thicker in childhood.

-Estrogens also cause the **skin to become more vascular,** which is often associated with increased warmth of the skin and also promotes greater bleeding of cut surfaces than is observed in men.

-Effect of Estrogens on **Electrolyte Balance**. They are similar to aldosterone and some other adrenocortical hormones, which causes sodium and water retention by the kidney tubules in nephrons, it is Significant during pregnancy due to estrogens by the placenta.

2. progesterone:



Approximate plasma concentrations of t
arian hormones during the normal femal
stimulating hormone; LH, luteinizing horr

-Progesterone Promotes Secretory Changes in the Uterus during the second half of female cycle **(luteal phase),** thus preparing the uterus for implantation of the fertilized ovum, progesterone decreases the frequency and intensity of uterine contractions, thereby helping to prevent expulsion of the implanted ovum.

-Effect of Progesterone on the Fallopian Tubes. promotes increased secretion activities by the mucosal lining of the fallopian tubes. These secretions are necessary for nutrition of the fertilized, dividing ovum Progesterone Promotes Development of the Breasts.

-Progesterone promotes development and proliferation of the lobules and alveoli of the breasts, causing the alveolar cells to become secretory (not for milk secretion). Progesterone also causes the breasts to swell (due to secretory mechanesim and fluids deposition).

- **Monthly endometrial cycle and menstruation:**

It is associated with the monthly cyclical production of estrogens & progesterone by the ovaries in the lining of the uterus

Uterine (endometrial) Cycle (has 2 phases):

1-proflirative pahse.

OR

(Estrogen phase)

OR

(Preovulatory)

2-secretory phase.

OR

(Progestational phase)

OR

(Postovulatory)

Here at the middle between these phases we

Have the ovulation event

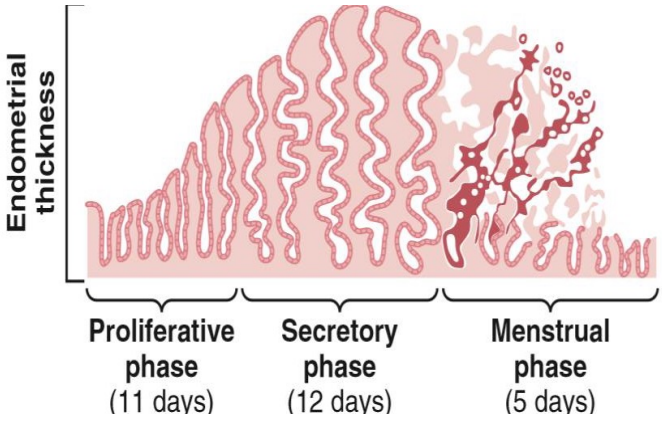
1-Proliferative phase (estrogen phase)

-At the beginning of each cycle, most of the endometrium has been desquamated by menstruation. After menstruation only thin layer of the endometrial stroma remains & the deeper portions of the glands &crypts of the endometrium.

-under the influence of estrogens, the stromal cells & epithelial cells proliferate rapidly.(in the previos cycle)

- The endometrial surface re-epitheliaze within 4-7 days after the beginning of menstruation. Before ovulation the endometrium thickness increase, due to increase numbers of stromal cells and progressive growth of the glands as well as new blood vessels.

- At the time of **ovulation**,(at the secretory phase lasts for 12 days) the endometrium is 3-5 mm thick. The endometrial glands, cervical region secrete a thin, stringy mucus which helps to guide sperm in the proper direction from the vagina into the uterus.
- In proliferative phase (11 days) , we can notice the progressive increasing in thickness of the endometrium.

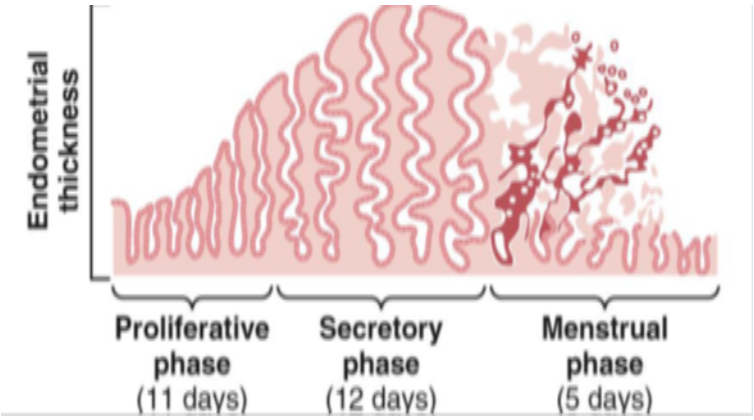


2- Secretory phase (progestational phase)

-After ovulation, progesterone & estrogen are secreted in the later part of the monthly cycle by the corpus luteum (luteal phase). Estrogen causes slight proliferation in the endometrium and progesterone causes marked swelling & secretory development of the endometrium. The glands increase in tortuosity, excess secretory substances accumulate in the glands so this phase get its name

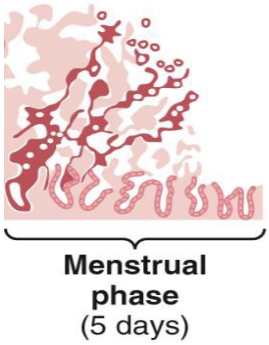
- **Stromal cells** cytoplasm increase lipid &glycogen deposits in the cells & blood supply to the endometrium increases and become more tortuous. 1 week after ovulation, the endometrium thickness will be about 5-6 mm.

- **The secretory changes prepare the endometrium** (to stored nutrients) for implantation of the fertilized ovum and it's growth as well .Uterine secretions **called "uterine milk**" provide nutrition for the dividing ovum. The trophoblastic cells on the surface of the implanted ovum begin to digest the endometrium and then absorb endometrial stored substances. → that how they get nutrition in the gland and the lining endometrium)



3- Menstruation (last phase):

-If the ovum was not fertilized (about 2 days before the end of the monthly cycle), the corpus luteum in the ovary suddenly involutes and the ovarian hormones (estrogens and progesterone) will decline to a very low levels of secretion. Then, this will lead to inatiate necrosis in the endometrial blood vessels, due to:
1) vasospasm to the blood vessels.
2) decrease nutrients to the endometrium.
3) loss of the hormonal stimulation.



- The mass of desquamated tissue & blood plus the contractile effects of prostaglandins all initiate contractions which therefore expel the uterine contents(desquamated tissue and blood vessels).

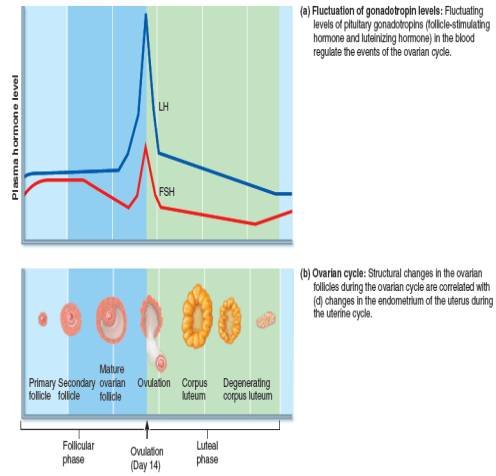
- In normal menstruation, about 40 ml of blood as well as 35 ml of serous fluid are going to be lost. The menstrual blood is normally non-clotting due to the presence of fibrinolysin. → important in a pathological condition if there is any clot in a menstruation blood , and the volum of the lost blood is increased that mean fibrinolysin is lost.
-Within 4 to 7 days after menstruation, the loss of blood ceases & the endometrium become re-epithelialized.

Leukorrhea during menstruation:
During menstruation, leukocytes are released with the necrotic material & blood so the uterus is highly resistant to infection during menstruation as protective mechanism.

To sum up:

- **Ovarian cycle** is parelle to **the endometrium cycle**
-The **hormones** that are secreted by the ovaries will influence the endometrial (uterian cycle)

- In the **preovulation phase we will have a proliferative phase** in the uterus . after that we will have a parelle phase which is the secretory phase → at the end we will have menstruation phase. then the begauning of a new ovarian cycle.
- **Estrogen is the main hormone that will increase the endometrial proliferative phase** . but the **progesterone is the main hormone in the secretory phase for the lining endometrium**. Lose of both estrogen and progesterone we will have a **menstrual cycle** where menstruation and a new ovarian and uterian cycles begain.



(a) **Fluctuation of gonadotropin levels:** Fluctuating levels of pituitary gonadotropins (follicle-stimulating hormone and luteinizing hormone) in the blood regulate the events of the ovarian cycle.

(b) **Ovarian cycle:** Structural changes in the ovarian follicles during the ovarian cycle are correlated with (d) changes in the endometrium of the uterus during the uterine cycle.

(c) **Fluctuation of ovarian hormone levels:** Fluctuating levels of ovarian hormones (estrogens and progesterone) cause the endometrial changes of the uterine cycle. The high estrogen levels are also responsible for the LH/FSH surge in (a).

(d) **The three phases of the uterine cycle**
Menstrual: Shedding of the functional layer of the endometrium.
Proliferative: Rebuilding of the functional layer of the endometrium.
Secretory: Begins immediately after ovulation. Enrichment of the blood supply and glandular secretion of nutrients prepare the endometrium to receive an embryo.

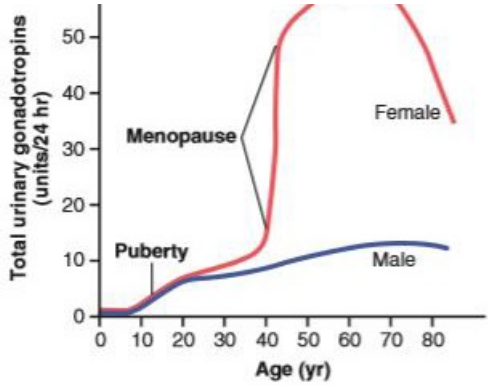
Both the menstrual and proliferative phases occur before ovulation, and together they correspond to the follicular phase of the ovarian cycle. The secretory phase corresponds in time to the luteal phase of the ovarian cycle.

• Menopause:

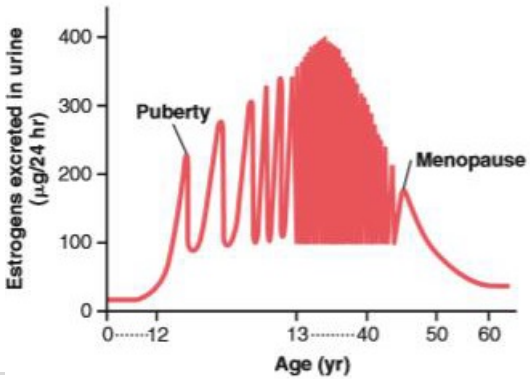
At the age of **40 to 50 years**, the sexual cycle becomes irregular, ovulation fails to occur & the cycle ceases.

The sudden loss of estrogens causes marked physiological changes in the function of the body including:

1.Hot flushes, characterized by extreme flushing of the skin.
2.Psychic sensations and dyspnea.
3.Increase irritability.
4.Fatigue.
5.Anxiety.
6.Occasionally various psychotic states.
7.Decreased strength and calcification of bones throughout the body.(increasing the risk of having osteoporosis).



ure 82-12. Total rates of secretion of gonadotropic hormones ughout the sexual lives of female and male human beings, wing an especially abrupt increase in gonadotropic hormones at opause in the female.



The first figure , is showing the total secretion of gonatropic hormones in the urine(y axis) and the different sexual life (x asix)
Before puberty, level of gonadtropic hormones are very low in both males and females
After puberty, both males and females will increase the leve of gonadotropic hormones in the urine.
After menopause period starts, females will have a sudden increase in gonadotropic hormones due to the lose of the negative feedback of the estrogen and progesterone (due to the lose of these hormones). HOWEVER, in males after ago of 40, you can't see that much increase in gonadotropine hormones, it's increase slightly while aging and that is due to the level of testosterone hormone high enough to not induce the negative feedback as estrogen and progesterone do because of loss of these hormones..

In the second figure, we see the level of estrogen that will start to decrease before the menopause to get ready for the menapaues age in females.

Abnormalities of secretion by the ovaries:

1- Hypogonadism-Reduced Secretion by the Ovaries:

Can result from poorly formed ovaries, lack of ovaries, or genetically abnormal ovaries that secrete the wrong hormones because of missing enzymes in the secretory cells.

When ovaries are absent from birth or when they become nonfunctional before puberty, female eunuchism occurs.

2- Hypersecretion by the ovaries:
It is clinically rare, when the ovaries increased their secretions of sex hormones, then it will inhibit the gonadotropine hormones and inhibit the secretion of female sex hormones secretion as well. The hypersecretion of hormones is might be as a result of having a tumer.

Some common Disorder of memnstruation:

- **Amenorrhea**: Is absence of menstrual period either;

1-Primary amenorrhea in which menstrual bleeding has never occurred.
2-Secondary amenorrhea cessation of cycles in a woman with previously normal periods, the main causes:
***Pregnancy** (is the most common cause)
***Emotional** stimuli and changes in the environment.
***Hypothalamic** diseases (decrease of GnRH pulses)
***Pituitary disorders**
***Primary ovarian disorders and various systemic disease.**

- **Menorrhagia:** Refer to abnormally heavy or prolonged bleeding.

- **Hypomenorrhea**: Refer to scanty flow.

- **Dysmenorrhea:** Painful menstruation (cramps due to accumulation of prostaglandins in the uterus and treatment with inhibitors of prostaglandin synthesis).