بسم الله الرحمن الرحيم

Female Physiology Before Pregnancy (Pt.3)

FINAL | Lecture 3

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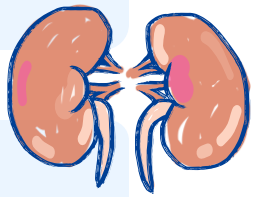


﴿ قُلْ بِفَضْلِ ٱللَّهِ وَبِرَحْمَتِهِۦ فَبِذَٰلِكَ فَلْيَفْرَحُوا۟ هُوَ خَيْرٌ مِّمَّا يَجْمَعُونَ ﴾

Online lecture

FEMALE REPRODUCTIVE SYSTEM BEFORE PREGNANCY LECTURE #3

GUYTON & HALL, CHAPTER 82

EBAA M ALZAYADNEH,PHD
ASSOCIATE PROF.

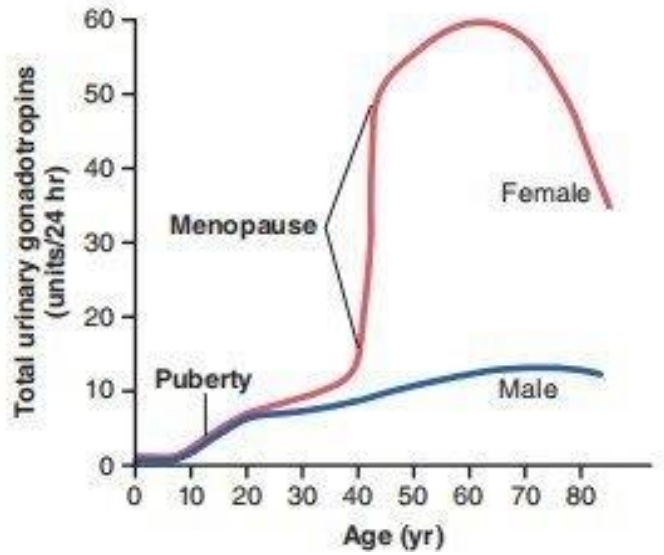
PUBERTY AND MENARCHE

- Puburty: physical maturation that occurs for a male or female, and developing the capability to reproduce.
- Menarche: the beginning of the cycle of menstruation.
- Gonadotropins, begin gradually to increase before age of ten in about the eighth year of life , and usually culminating in the onset of puberty and menstruation between ages 11 and 16 years in girls (average, 13 years).
- In the female, as in the male, the infantile/childhood pituitary gland and ovaries are capable of full function if they are appropriately stimulated. a fact that has been proven to be true by experimental stimulation of the pituitary by the hypothalamus and of the ovaries by the pituitary gonadotropins.
- However, as is also true in the male, and for reasons that are not understood, the hypothalamus does not secrete significant quantities of GnRH during childhood.
- Hypothalamus may be capable of secreting this hormone, but the appropriate signal is lacking.
- it is now believed that the onset of puberty is initiated by some maturation process that occurs elsewhere in the brain, perhaps in the limbic system

PUBERTY AND MENARCHE

The period of puberty is caused by a gradual increase in gonadotropic hormone secretion by the pituitary, beginning in about the eight year of life (before the age of 10).

after the onset of puberty , the gonadotropins increase significantly, and the monthly female reproductive cycles occur regularly.



HYPOTHALAMIC CENTERS FOR RELEASE OF GONADOTROPIN RELEASING HORMONE.

- The neuronal activity that causes pulsatile release of GnRH occurs primarily in the mediobasal hypothalamus, (the arcuate nuclei of this area).Therefore, it is believed that these arcuate nuclei control most female reproductive activity
- The neurons located in the preoptic area of the anterior hypothalamus also secrete GnRH in moderate amounts.
- Multiple neuronal centers in the higher brain's "limbic" system (the system for psychic control) transmit signals into the arcuate nuclei to modify both the intensity of GnRH release and the frequency of the pulses, thus providing a partial explanation of why psychic factors often modify female sexual function.

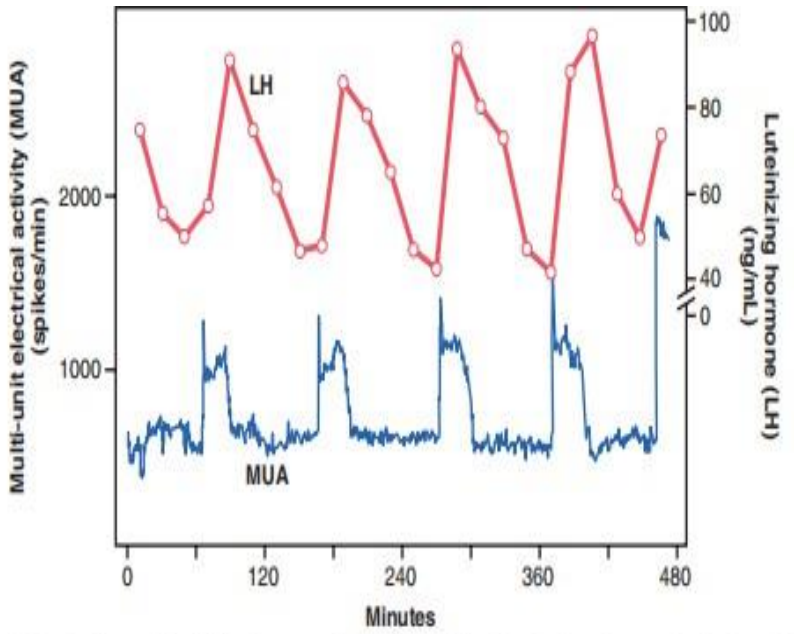
PUBERTY AND MENARCHE

- **Intermittent, Pulsatile Secretion of GnRH by the**

Hypothalamus Stimulates Pulsatile Release of LH from the Anterior Pituitary Gland.

- pulses lasting 5 to 25 minutes that occur every 1 to 2 hours.
- when GnRH is infused continuously its ability to cause the release of LH and FSH by the anterior pituitary gland is lost.
- The pulsatile release of GnRH also causes intermittent

output of LH secretion about every 90 minutes

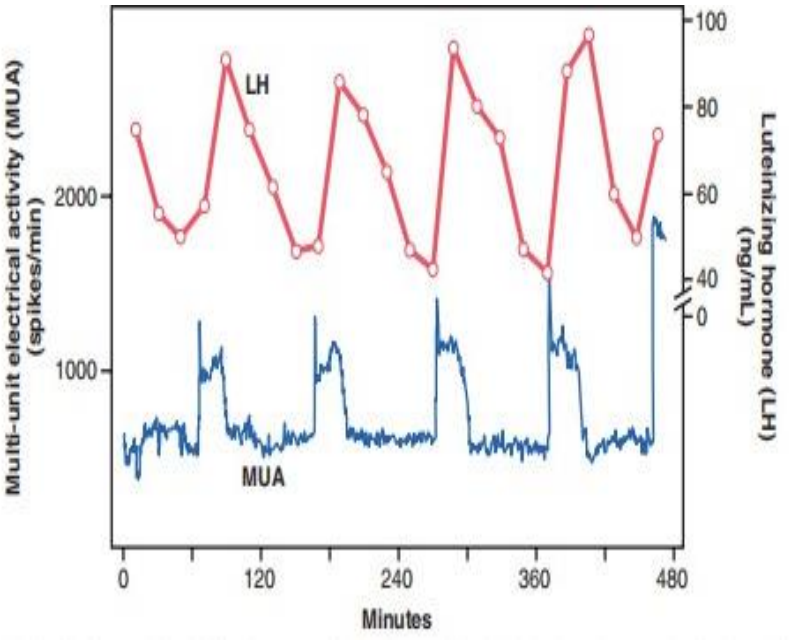


PUBERTY AND MENARCHE

The lower curve shows the electrical pulsatile signals in the hypothalamus that cause the pulsatile output of GnRH. The signals appear as pulses that last from 5 to 25 minutes and recure every one to two hours in a rhythmic pattern.

It is believed that this pulsatile pattern is essential for promoting and stimulating the gonadotropins secretion. If GnRH is infused continuously without this pulsatile pattern, both LH and FSH secretion are eventually lost.

As shown in the graph, especially for LH secretion, the response is highly dependent on the pattern of GnRH pulses. LH is also released in pulses, every 90 minutes, and each increase in LH secretion corresponds closely to the hypothalamic electrical pulses and GnRH release. Thus, LH secretion from the anterior pituitary faithfully follows the pulsatile pattern of GnRH secretion.

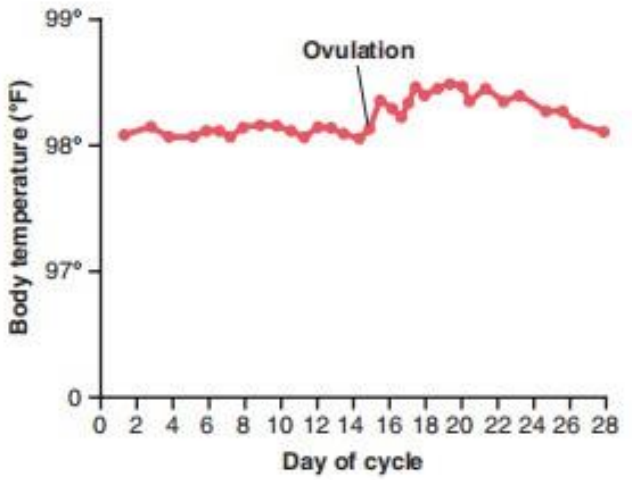


FEMALE FERTILITY

- Fertile Period of Each Sexual Cycle.
- The ovum remains viable and capable of being fertilized probably no longer than 24 hours after it is expelled from the ovary .Therefore, sperm must be available soon after ovulation if fertilization is to take place.
- A few sperm can remain fertile in the female reproductive tract for up to 5 days.
- Therefore, for fertilization to take place, intercourse must occur sometime between 4 and 5 days before ovulation up to a few hours after ovulation.
- Thus, the period of female fertility during each month is short—about 4 to 5 days.

BODY TEPMERATURE

- Another common test is for the woman to chart her body temperature throughout the cycle. Secretion of progesterone during the latter half of the cycle raises the body temperature about 0.5°F , with the temperature rise coming abruptly at the time of ovulation. Such a temperature chart, showing the point of ovulation



one of the methods used to estimate the time of ovulation is measuring body temperature. A woman can chart her body temperature throughout the days of the menstrual cycle. When the temperature increases significantly, usually in the middle of the cycle, this corresponds to the ovulation process. Therefore, a sudden increase in the body temperature indicates that ovulation has occurred. This happens because progesterone increases body temperature by about 0.5 F (approximately for 0.28C). thus, measuring body temperature can be a simple method for estimating the time of ovulation.

CONTRACEPTION

- Rhythm Method of Contraception :To avoid intercourse near the time of ovulation.
- The difficulty with this method, is predicting the exact time of ovulation. Yet, the interval from ovulation until the next succeeding onset of menstruation is almost always between 13 and 15 days.
- If the menstrual cycle is regular, ovulation usually occurs within 1 day of the 14th day of the 28 cycle. (subtract 14 from the length of the cycle)
- ex, if the cycle is 40 days, ovulation usually occurs within 1 day of the 26th day of the cycle. if the periodicity of the cycle is 21 days, ovulation usually occurs within 1 day of the seventh day of the cycle.
- Therefore, avoidance of intercourse for 4 days before the calculated day of ovulation and 3 days afterward may prevent conception.
- The failure rate of this method of contraception, resulting in an unintentional pregnancy, may be as high as 20 to 25%/year.

CONTRACEPTION

One of the methods used to prevent pregnancy (contraception) is the rhythm method of contraception. This is a simple natural method that does not require the use of drugs. It depends on avoiding intercourse during the period near ovulation, because this is the time when pregnancy is most likely to occur.

The time of ovulation can be estimated by using the body temperature method or by following the rhythm of the monthly female cycle. Normally, the interval between ovulation and the onset of the next menstrual cycle is relatively constant, ranging from 13 to 15 days with an average of about 14 days.

This method assumes that the menstrual cycle is regular. For example, if the cycle length is 28 days, subtracting 14 from 28 gives 14 (28-14=14). Therefore, ovulation is expected to occur within one day of the 14th day of the cycle, and intercourse should be avoided around this time.

If the cycle length is 40 days, subtracting 14 from 40 gives 26 (40-14=26). In this case, ovulation is expected to occur within one day of the 26th day of the cycle.

Similarly, if the cycle length is 21 days, subtracting 14 from 21 gives 7 (21-14=7). Therefore, ovulation is expected to occur within one day of the 7th day of the cycle.

Since sperm may survive for several days and the ovum remains viable for a short period after ovulation, intercourse should be avoided beginning about 4 days before and continuing until about 3 days after the predicted day of ovulation. This may help reduce the chance of pregnancy and is the basis of the rhythm method of contraception .

HORMONAL SUPPRESSION OF FERTILITY—"THE PILL"

- It has long been known that administration of either

estrogen or progesterone, if given in appropriate quantities

during the first half of the monthly cycle, can inhibit ovulation.

The reason for this is that appropriate administration of either of these hormones can prevent the preovulatory surge of LH secretion by the pituitary gland, which is essential in causing ovulation.

- Why administration of estrogen or progesterone prevents the preovulatory surge of LH secretion.

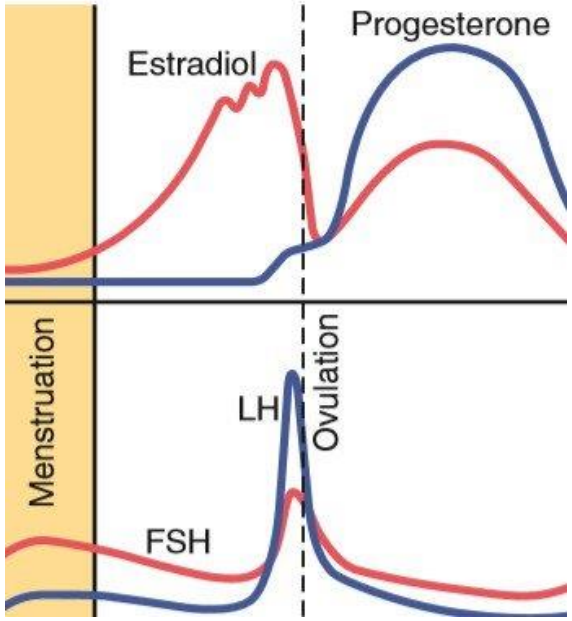
1 Immediately before the surge occurs, a sudden depression of estrogen secretion by the ovarian follicles probably occurs, which might be the necessary signal that leads to the LH surge.The administration of sex hormones (estrogens or progesterone) could prevent the initial ovarian hormonal depression that might be the initiating signal for ovulation. Progesterone has a negative feedback on GnRH and LH

2 Steady levels of OCP unlike normal cyclical female hormones

- Failure around 8-9 %year

HORMONAL SUPPRESSION OF FERTILITY—"THE PILL"

Another more successful method of contraception is the hormonal suppression of fertility, which is achieved by using pills that contain either estrogen, progesterone, or a combination of both. It is well known that administering these hormones in proper quantities during the first half of the monthly cycle can inhibit ovulation and conception because they prevent the LH surge before it occurs, which is essential for ovulation. The LH surge is essential for rupture of the ovarian follicle and release of the ovum, preventing this surge inhibits ovulation and reduces the chance of pregnancy.



What is the explanation of their effect?

The first explanation is that immediately before the LH surge occurs, as seen in the graph, estrogen normally reaches a peak followed by a sudden drop. It is thought that administering estrogen and progesterone prevents this sudden drop in estrogen levels, which may prevent the LH surge from occurring. In addition, progesterone alone, when used in certain amounts, can produce negative feedback on GnRH and LH secretion and therefore inhibit their release. Since the LH surge is essential for ovulation, preventing this surge prevents reales of the ovum from the ovarian follicle.

The second explanation is that the levels of oral contraceptive hormones remain relatively steady, unlike the normal female hormones during the menstrual cycle, which normally change in a cyclical pattern. These steady hormones levels can produce continuous negative feedback on the hypothalamus and anterior pituitary, thereby inhibiting the LH and FSH surges required for ovulation. As a result, ovulation does not occur and the chance of pregnancy is reduced.

Failure of this contraceptive method may result in unintentional pregnancy, with a failure rate of approximately 8-9% per year.

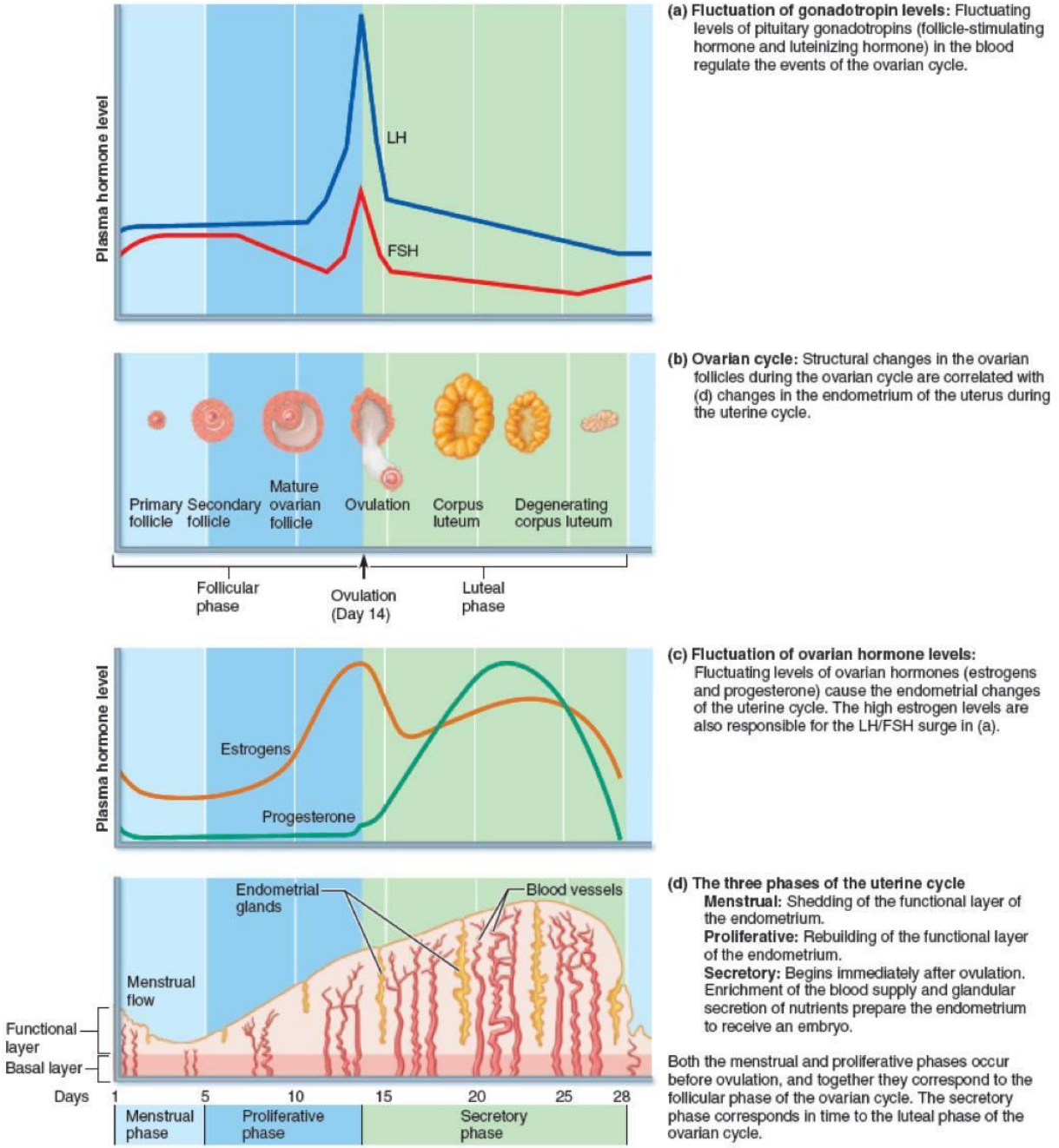
Summary

Fluctuations in the gonadotropins LH and FSH regulate the events of the ovarian cycle. During the ovarian cycle, structural changes occur in the ovarian follicles, and these changes are associated with the release of different hormones during the different phases of the cycle. These hormonal changes also affect the endometrial lining and the menstrual cycle.

As shown in the figure, the release of the female hormones estrogen and progesterone during the different phases of ovarian follicular development induces changes in the endometrial lining of the uterus.

In the first half of the cycle, estrogen levels increase progressively and stimulate proliferation of the endometrium. Therefore, this phase is called the proliferative phase. This phase begins after menstruation and is characterized by rebuilding and thickening of the endometrial lining under the effect of estrogen.

In the second half of the cycle, progesterone becomes the dominant hormone, although estrogen is still present. Progesterone stimulates further thickening of the endometrium and increases glandular secretion, preparing the uterus for possible implantation of a fertilized ovum. This phase is called the secretory phase.



(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.

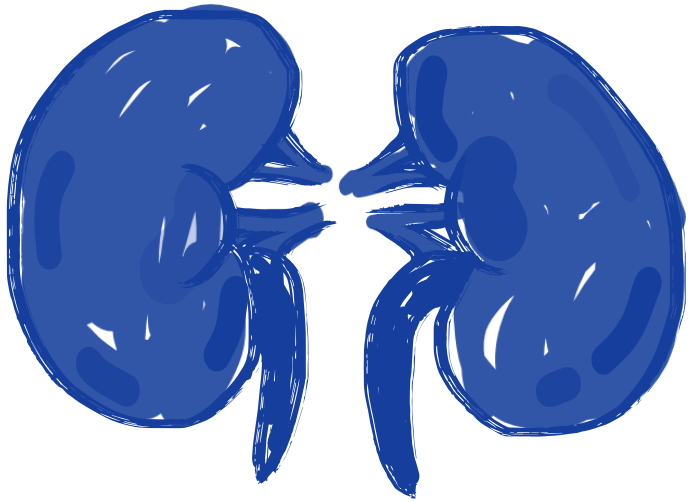
(b) Ovarian cycle: Structural changes in the ovarian follicles during the ovarian cycle are correlated with (d) changes in the endometrium of the uterus during the uterine cycle.

(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.

Human Anatomy /8th edition /chapter 25



PHYSIOLOGY QUIZ

LECTURE

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