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1. CYCLIC CHANGES IN BREASTS AND CERVIX

CYCLIC CHANGES IN BREASTS

- ❖ Breast development is a vital part of a woman's reproduction. Breast development happens in certain stages during a woman's life: first before birth, again at puberty, and later during the childbearing years. Changes also happen to the breasts during the menstrual cycle and when a woman reaches menopause

➤ STAGES OF BREAST DEVELOPMENT

Stage 1	Preteen. Only the tip of the nipple is raised.
Stage 2	Buds appear, and breast and nipple are raised. The dark area of skin around the nipple (the areola) gets larger.
Stage 3	Breasts are slightly larger, with glandular breast tissue present.
Stage 4	The areola and nipple become raised and form a second mound above the rest of the breast.
Stage 5	Mature adult breast. The breast becomes rounded and only the nipple is raised.

➤ CYCLIC CHANGES THAT HAPPENS TO THE BREAST ARE:

- During menstrual cycle
- During pregnancy and milk production
- At menopause

✓ **Menstrual cycle stage**

Each month, women go through changes in the hormones that make up the normal menstrual cycle. The hormone estrogen is produced by the ovaries in the first half of the menstrual cycle. It stimulates the growth of milk ducts in the breasts. The increasing level of estrogen leads to ovulation halfway through the cycle. Next, the hormone progesterone takes over in the second half of the cycle. It stimulates the formation of the milk glands. These hormones are believed to be responsible for the cyclical changes that many women feel in their breasts just before menstruation. These include swelling, pain, and soreness.

During menstruation, many women also have changes in breast texture. Their breasts may feel very lumpy. This is because the glands in the breast are enlarging to get ready for a possible pregnancy. If pregnancy does not happen, the breasts go back to normal size. Once menstruation starts, the cycle begins again.

✓ **Pregnancy and lactation stage**

Many healthcare providers believe the breasts are not fully mature until a woman has given birth and made milk. Breast changes are one of the earliest signs of pregnancy. This is a result of the hormone progesterone. In addition, the dark areas of skin around the nipples (the areolas) begin to swell. This is followed by the rapid swelling of the breasts themselves. Most pregnant women feel soreness down the sides of the breasts, and nipple tingling or soreness. This is because of the growth of the milk duct system and the formation of many more lobules.

By the fifth or sixth month of pregnancy, the breasts are fully capable of producing milk. As in puberty, estrogen controls the growth of the ducts, and progesterone controls the growth of the glandular buds. Many other hormones also play vital roles in milk production. These include follicle-stimulating hormone (FSH), luteinizing hormone (LH), prolactin, oxytocin, and human placental lactogen (HPL).

Other physical changes happen as well. These include the blood vessels in the breast becoming more visible and the areola getting larger and darker. All of these changes are in preparation for breastfeeding the baby after birth.

✓ Menopause stage

By the time a woman reaches her late 40s and early 50s, peri menopause is starting or is well underway. At this time, the levels of estrogen and progesterone begin to change. Estrogen levels dramatically decrease. This leads to many of the symptoms commonly linked to menopause. Without estrogen, the breast's connective tissue becomes dehydrated and is no longer elastic. The breast tissue, which was prepared to make milk, shrinks and loses shape. This leads to the "saggy" breasts associated with women of this age.

CYCLIC CHANGES IN THE CERVIX

❖ Mucosa of uterine cervix does not undergo cyclic desquamation as the body of uterus

➤ **The regular changes in cervical mucus occur under influence:**

✓ Estrogens (Ovulation)

- Mucus thinner
- More alkaline - promotion of survival and transport of sperm, spinnbarkeit at ovulation

✓ Progesterone (after ovulation, during pregnancy)

- Mucus thick
- Tenacious
- Cellular

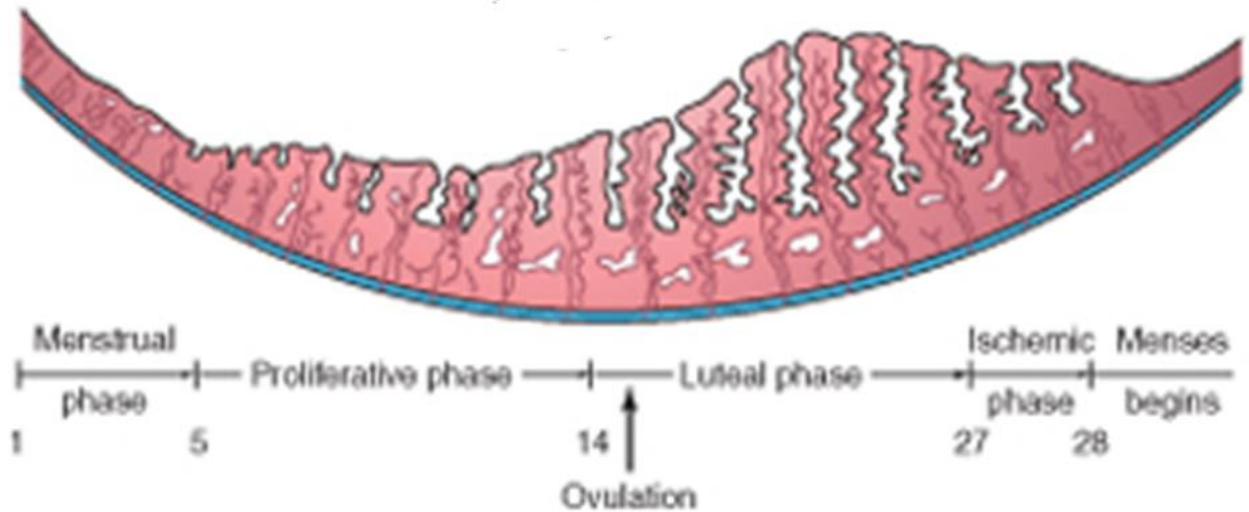
2. MENSTRUAL CYCLE

- The **menstrual cycle** is the regular natural change that occurs in the female reproductive system (specifically the uterus and ovaries) that makes pregnancy possible. It constitutes the monthly changes in the internal layer of the uterus

- It is also called the **endometrial cycle**
- The cycle is required for the production of oocytes, and for the preparation of the uterus for pregnancy. The menstrual cycle occurs due to the rise and fall of estrogen. This cycle results in the thickening of the lining of the uterus, and the growth of an egg, (which is required for pregnancy). The egg is released from an ovary around day fourteen in the cycle; the thickened lining of the uterus provides nutrients to an embryo after implantation. If pregnancy does not occur, the lining is released in what is known as **menstruation**.
- Up to 80% of women report having some symptoms during the one to two weeks prior to menstruation. Common symptoms include acne, tender breasts, bloating, feeling tired, irritability and mood changes. These symptoms interfere with normal life and therefore qualify as **premenstrual syndrome** in 20 to 30% of women. In 3 to 8%, they are severe.^[4]
- During this period, menstruation (flow of blood from the uterus) is an obvious event. The first period usually begins between twelve and fifteen years of age, a point in time known as **menarche**. They may occasionally start as early as eight, and this onset may still be normal.
- The average menstrual cycle is 28 days, day 1 of this (28 days) cycle designated as the day on which menstrual flow begins. Menstrual cycles normally vary in length by several days. In 90% of women, the length of the cycles ranges between **23** and **35** days.
- Almost all these variations result from alterations in the duration of the **proliferative phase** of the menstrual cycle
- The menstrual cycle is governed by hormonal changes. These changes can be altered by using hormonal birth control¹ to prevent pregnancy. Each cycle can be divided into **three phases** based on events in the ovary (ovarian cycle) or in the uterus (uterine cycle).

Phases of the Menstrual Cycle

- **Menstrual phase**
- **Proliferative phase**
- **Luteal phase**
- ❖ **Ischemic phase (only occur if the oocyte is not fertilized)**



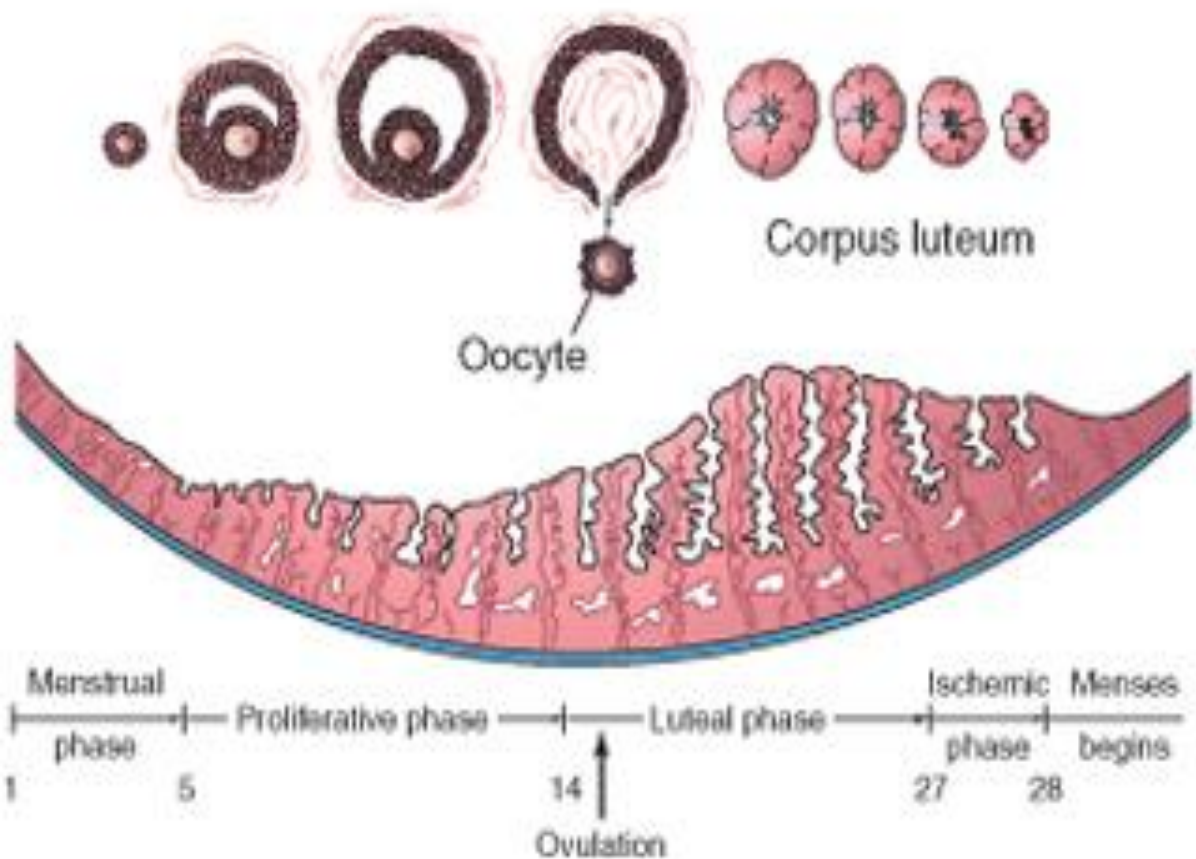
➤ Menstrual Phase

- Menstruation is the first phase of the uterine cycle
- Menorrhagia denotes normal, regular menstruation that lasts for a few days (usually 3 to 5 days, but anywhere from 2 to 7 days is considered normal). The average blood loss during menstruation is 35 milliliters with 10–80 ml considered normal. Women who experience menorrhagia (heavy menstrual bleeding) are more susceptible to iron deficiency than the average person. An enzyme called **plasmin** inhibits clotting in the menstrual fluid.
- The **functional layer** of the uterine wall is sloughed off and discarded with the menstrual flow-menses (monthly bleeding)
- The blood discharged through the vagina is combined with small pieces of endometrial tissue
- After menstruation, the eroded endometrium is **thin**

➤ Proliferative Phase

- The proliferative phase is the second phase of the uterine cycle when estrogen causes the lining of the uterus to grow, or proliferate, during this time
- Also known as the **follicular /estrogenic phase**
- lasting approximately **9 days**

- Early during this phase, the surface epithelium reforms and covers the endometrium. Uterine glands increase in number and length , the spiral arteries elongate.
- It coincides with growth of ovarian follicles and is controlled by estrogen secreted by these follicles.
- As they mature, the ovarian follicles secrete increasing amounts of estradiol, and estrogen. The estrogens initiate the formation of a new layer of endometrium in the uterus, histologically identified as the **proliferative endometrium**. The estrogen also stimulates crypts in the cervix to produce **cervical mucus**, which causes vaginal discharge regardless of arousal, and can be tracked by women practicing fertility awareness.
- There is a 2-3 fold increase in the thickness of the endometrium and in its water content.
- Early during this phase, the surface epithelium reforms and covers the endometrium. Uterine glands increase in number and length , the spiral arteries elongate



➤ ***Luteal Phase***

- The secretory phase is the final phase of the uterine cycle and it corresponds to the luteal phase of the ovarian cycle.
- This also called the secretory/ progesterone phase, lasting approximately 13 days and coincides with the formation, functioning, and growth of the corpus luteum.
- The progesterone produced by the corpus luteum stimulates the glandular epithelium to secrete a glycogen-rich material
- The uterine glands become wide, tortuous, and saccular, and the endometrium thickens because of;
 - ✓ the influence of progesterone and estrogen from the corpus luteum
 - ✓ and because of **increased fluid** in the connective tissue

- As the **spiral arteries** grow into the superficial compact layer, they become increasingly coiled. The venous network becomes complex and large lacunae (venous spaces) develop.
- **Direct arteriovenous anastomoses are prominent features of this stage.**
- During the secretory phase, the corpus luteum produces progesterone, which plays a vital role in making the endometrium receptive to implantation of the blastocyst and supportive of the early pregnancy, by increasing blood flow and uterine secretions and reducing the contractility of the smooth muscle in the uterus.

If fertilization does not occur:

- The corpus luteum degenerates
- Estrogen and progesterone levels fall and the secretory endometrium enters an ischemic phase
- Menstruation occurs

➤ **Ischemic Phase**

- **occurs when the oocyte is not fertilized**
- *Ischemia (reduced blood supply) occurs as a result of constriction of spiral arteries giving the endometrium a pale appearance*
- *There is decrease secretion of hormones, primarily progesterone, by the degenerating corpus luteum*
- *a loss of interstitial fluid*
- *shrinking of the endometrium*
- *This results in venous stasis and patchy ischemic necrosis (death) in the superficial tissues*
- *Eventually, rupture of damaged vessel walls follows and blood seeps into the surrounding connective tissue*
- *Small pools of blood form and break through the endometrial surface, resulting in bleeding into the uterine lumen and from the vagina.*

