Female Reproductive Anatomy & Physiology

1. Female Anatomy
    1. Overview
        1. ovaries
            1. gametogenesis
            2. hormones
                1. estrogen
                2. progesterone
        2. accessory ducts
            1. uterine tubes
            2. uterus
            3. vagina
            4. functions
                1. transport & support
    2. Ovaries
        1. support
            1. ovarian ligament
            2. broad ligament
                1. suspensory ligament
                2. mesovarium
        2. supply
            1. ovarian arteries
            2. ovarian branch of uterine arteries
        3. anatomy
            1. tunica albuginea
            2. outer cortex- gamete formation
                1. follicles
                    1. contain oocytes
                    2. surrounded by:
                        1. follicle cells if single layer
                        2. granulosa cells if > 1 layer
                    3. maturation
                        1. primordial follicle - one layer
                        2. primary follicle - two or more layers
                        3. secondary follicle - antrum formation
                        4. Graafian (or vesicular) follicle
                        5. oocyte gets ejected at ovulation
                        6. ruptured follicle becomes corpus luteum
            3. inner medulla - vessels & nerves
    3. Duct System
        1. uterine or Fallopian tubes
            1. isthmus
            2. ampulla
                1. infundibulum
                2. fimbriae
            3. ectopic pregnancy
            4. PID
        2. uterus
            1. body
            2. isthmus
            3. cervix
            4. cervical canal
                1. cervical glands
                    1. mucus
                        1. antibacterial
                        2. antisperm (except @ midcycle)
                2. cervical cancer
                    1. Human Papilloma Virus (HPV) = genital warts
            5. support
                1. mesometrium
                2. lateral cervical ligaments
                3. uterosacral ligaments
                4. round ligaments
                5. prolapse with tearing of urogenital & pelvic diaphragms
            6. uterine wall
                1. perimetrium
                    1. visceral peritoneum
                2. myometrium
                    1. “muscle”, bulky
                3. endometrium
                    1. mucosal lining
                        1. stratum functionalis
                        2. stratum basalis
                        3. spiral arteries - degenerate & regenerate
        3. vagina
            1. layers
                1. adventitia- fibroelastic
                2. muscularis
                3. mucosa

1. cervical mucus glands
2. pH acid in adults

2. hymen

4. External Genitalia
    1. vulva or pudendum
        1. mons pubis
        2. labia majora
        3. labia minora
        4. vestibule
            1. greater vestibular glands
                1. homologous to bulbourethral glands
        5. clitoris
            1. prepuce (hood)
        6. perineum
    5. Mammary Glands
        1. external
            1. areola
            2. nipple
                1. sebaceous glands
                    1. reduce chapping
                2. ANS
        2. internal
            1. lobes: 15 - 25
            2. suspensory ligaments
            3. lobules
                1. alveoli- produce milk
                2. lactiferous ducts
            4. cancer
                1. risk factors
                    1. early onset menses & late menopause
                    2. no pregnancies or late first pregnancies
                    3. previous history
                    4. family history
                2. vigilance!

2. Female Physiology
    1. Oogenesis
        1. oogonia- diploid stem cells
            1. divide mitotically to about 400,000!
            2. lay in nutrient reserves
        2. primary oocytes
            1. single layer of flattened follicle cells
            2. “stall” in prophase of meoisis I by birth
            3. resumes at puberty
        3. oocytes selected each month
            1. complete meiosis I
                1. first polar body
                2. secondary oocyte
            2. meiosis II
                1. polar bodies may divide further
                2. oocyte arrests at metaphase II and is ovulated
                3. if fertilized then complete meiosis II
                    1. ovum
                    2. second polar body
                4. if not fertilized then deteriorates
    2. Ovarian Cycle
        1. overview
            1. follicular phase: day 1 - 14
            2. luteal phase: day 14 - 28
            3. ovulation at mid-cycle
            4. variation
                1. 21 - 40 days!
                2. luteal phase constant
                3. follicular phase varies
                    1. (why rhythm method method is not effective)
                4. stress, age
        2. follicular phase
            1. primordial
            2. primary
            3. secondary
                1. zona pellucida
            4. vesicular
                1. corona radiata
        3. ovulation
            1. 2ndary oocyte expelled
            2. “mittelschmerz”
            3. multiple ovulations more common in older moms- fraternal twins
        4. luteal phase
            1. ruptured follicle becomes corpus luteum
                1. secretes progesterone & estrogen

        2. if fertilized, then persists for 3 months until placenta takes over hormonal role
        3. if not fertilized, then degenerates in to corpus albicans
3. Hormonal Regulation
    1. childhood
        1. ovaries secrete low levels of estrogen
        2. estrogen inhibits GnRH
    2. pre-puberty & puberty
        1. hypothalamus becomes less sensitive to estrogen
        2. release GnRH
        3. stimulates anterior pituitary to release
            1. LH
            2. FSH
        4. menarche (first menstrual period) after about 4 years
        5. cycle stabilizes and is ovulatory after 3 years post menarche
    3. hormonal interactions (numbers below correspond to figure above)
        1. day one, rising GnRH levels from hypothalamus stimulates FSH & LH production & release by anterior pitiuitary
        2. FSH & LH stimulate follicle growth (FSH on follicle cells, LH on thecal cells to produce androgens, converted to estrogen)
        3. rising but low estrogen inhibits release of FSH & LH, but stimulates their synthesis & storage
        4. high estrogen now stimulates brain & anterior pituitary
        5. surge of LH and FSH released
        6. ovulation is triggered
        7. corpus luteum formation
        8. CL produces estrogen & progesterone
    4. menstrual cycle
        1. days 1 - 5 menstrual
        2. days 6 - 14 proliferative phase
        3. day 14 ovulation
        4. days 15 - 28 secretory phase
            1. if no fertilization, corpus luteum degenerates, progesterone falls,
            2. cycle repeats
        5. adaptive value?
    5. secondary effects of estrogen & progesterone
        1. estrogen
            1. growth spurt
            2. fuse epiphyses
            3. breast growth
            4. sub-Q fat
            5. widening & lightening of pelvis
            6. growth of axillary & pubic hair
            7. low cholesterol & calcium uptake
        2. progesterone
            1. uterine cycle
            2. mucus changes
            3. inhibits uterine motility during pregnancy
            4. preparation for lactation
4. Developmental Considerations