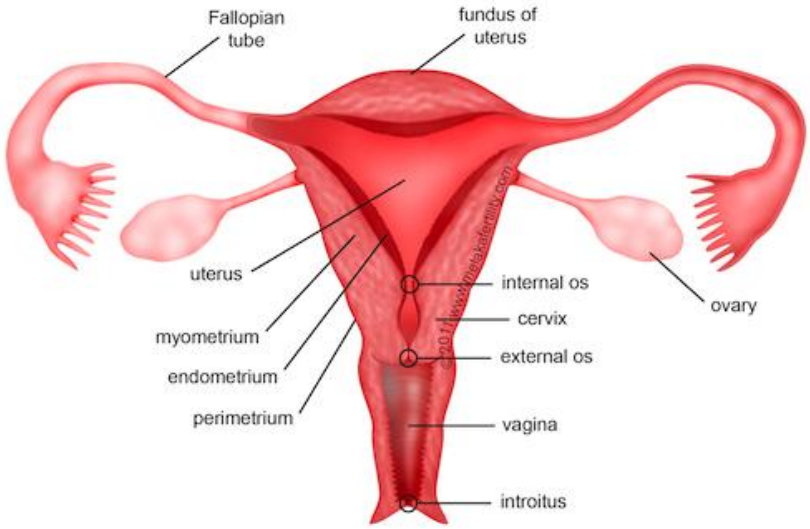
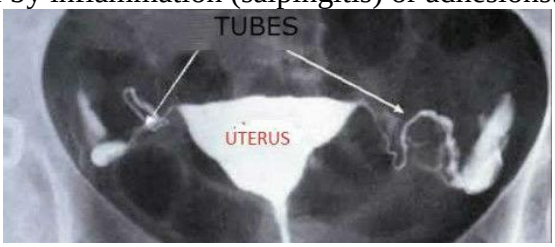
Unit IV – Problem 12 – Clinical: Infertility

- **Anatomy of the female reproductive system:**



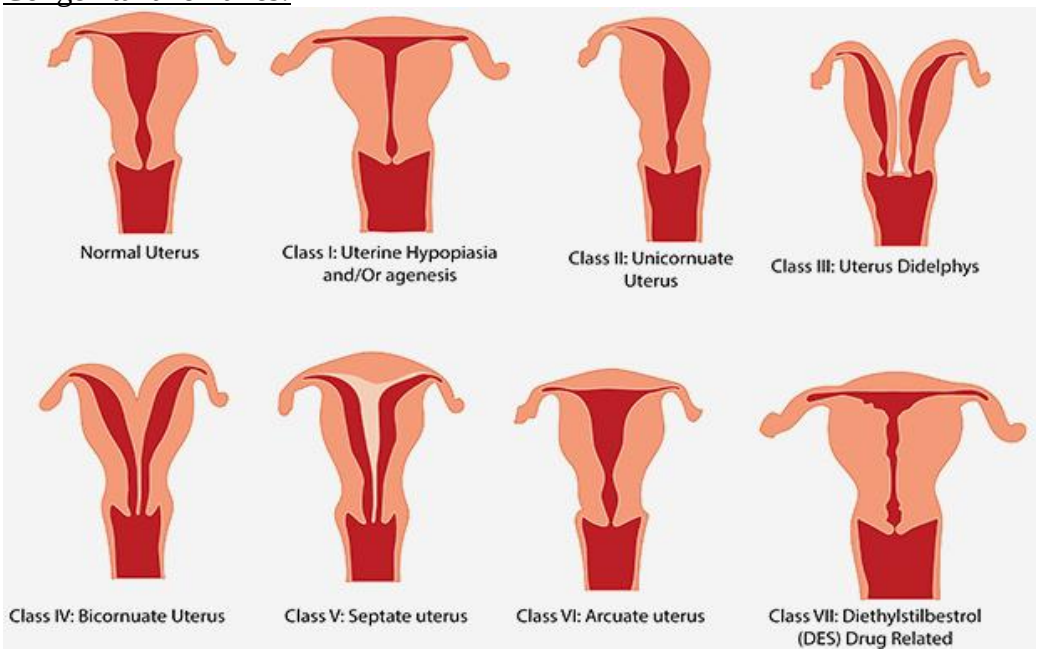
  - **Notice that the anterior wall of the vagina is 9 cm long while the posterior wall of the vagina is 11 cm long.**
- **The ovaries are controlled by the pituitary gland which is further controlled by the hypothalamus.**
  - The ovaries undergo a recruitment phase in which they stimulate the nearest 100 egg cells (present near the surface).
  - The pituitary gland will produce FSH which is required for the growth of egg cells, but the amount of FSH is only enough to allow one egg cell to grow → this egg cell will be known as the "dominant follicle".
  - When the dominant follicle binds to FSH, granulose cells will proliferate → resulting in the release of estrogen.
  - When estrogen reaches 600 picograms in the blood, pituitary gland will sense that the follicle has reached its maturity.
  - Then, pituitary gland will produce LH which is going to induce ovulation.
  - The oocyte will be caught by the fimbriae of fallopian tube. within this period, estrogen from the follicle and progesterone from corpus luteum will prepare the endometrium to receive the fertilized egg. If no fertilization occurs within 2 days of ovulation → the oocyte will start to degenerate within 2 weeks.
  - If fertilization occurs, the oocyte will start to divide for 5 days in fallopian tube until it reaches the stage of a blastocyst which will implanted in the uterine wall at day 7.
- **What is the difference between the phases of the menstrual cycle and those of the ovarian cycle:**
  - **Phases of the menstrual cycle**: menstrual phase – proliferative phase – secretory phase
  - **Phases of the ovarian cycle**: follicular phase – ovulatory phase – luteal phase
- **What is the definition of infertility?**
  - Failure to conceive after 1 year of continuous marital life and without the use of contraception.
- **Types of infertility:**
  - **Primary**: in which there was no previous pregnancy.
  - **Secondary**: 2 years following a previous pregnancy.

- **What are the general causes of infertility:**
  - **Anovulation.**
  - **Luteal phase defects.**
  - **Tubal factors.**
  - **Cervical factors.**
  - **Uterine factors.**
  - **Vaginal factors.**
  - **Male factors.**
  - **Unexplained infertility**: in which all of the factors mentioned above are checked and normal but a female is still unable to conceive!
- **Some systemic causes of infertility include the following:**
  - **Anemia.**
  - **SLE.**
  - **Neurological disorders.**
  - **Hypothyroidism.**
- **Anovulation:**
  - **Causes can be**
    - ✓ Physiological: pregnancy, lactation or before puberty.
    - ✓ Pathological:
      - ❖ *Ovarian*: Polycystic Ovarian Syndrome (POS), turner syndrome (X), functioning ovarian tumors and autoimmunity.
      - ❖ *Hypothalamic*: anorexia nervosa, exercise and post-pill amenorrhea.
      - ❖ *Pituitary*: Sheehan's syndrome and adenomas.
      - ❖ *Hypothyroidism*: Cushing syndrome.
  - **The following parameters are detected with ovulation (if they are not detected, there is anovulation):**
    - ✓ ↑ Basal body temperature.
    - ✓ ↑ Discharge and sexual desire.
    - ✓ Pelvic pain and sometimes minimal bleeding.
    - ✓ Ultrasound: the follicle must reach 20-22 ml before ovulation.
    - ✓ Chemistry: estrogen, progesterone and LH increase at day 21.
    - ✓ ↑ Endometrial thickness
  - **Induction of ovulation:**
    - ✓ By providing external FSH (already developed) or stimulating FSH secretion in the body.
- **Luteal phase defects:**
  - Sometimes, the corpus luteum dos not secrete enough progesterone. Therefore, the endometrium will not be well-prepared to receive the fertilized egg.
- **Tubal factors:**
  - Normally, the cilia which is present in fallopian tubes guide the sperms toward the egg so one of them can fertilize it. If these cilia are damaged → this might be a cause of infertility.
  - Any defects in fallopian tubes can be detected by hysterosalpingography. These defects can be caused by inflammation (salpingitis) or adhesions.



  - **Treatment**: tuboplasty but this was replaced by IVF.

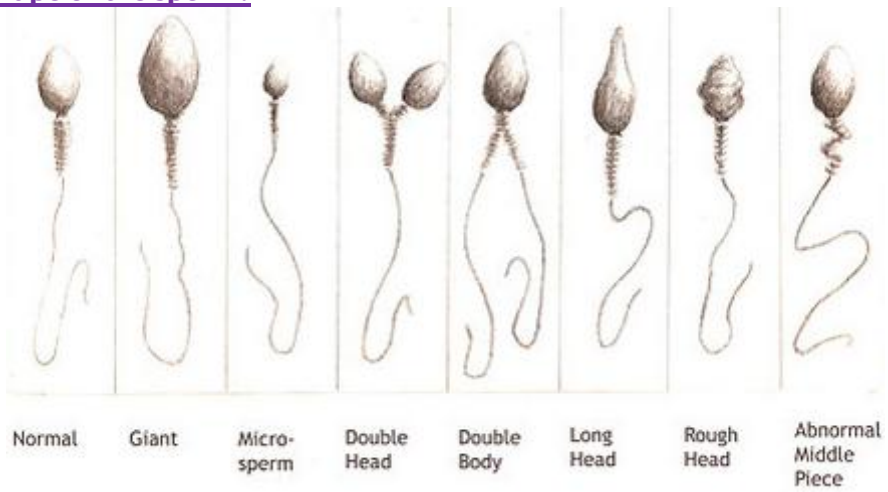
- **Cervical factors:**
  - **Cervical capacitation**: sperms rest in the cervix and then pushed gradually into the uterus.
  - **Investigations which can be done:**
    - ✓ Quality of cervical mucus.
    - ✓ Post-coital test.
    - ✓ Sperm penetration test.
    - ✓ Culture and sensitivity.
- **Uterine factors:**
  - **Causes include:**
    - ✓ Uterine aplasia/ hypoplasia.
    - ✓ Congenital anomalies:



    - ✓ Asherman's syndrome:
      - ❖ Acquired uterine condition, characterized by the formation of adhesions (scar tissue) inside the uterus and/or the cervix. In many cases the front and back walls of the uterus stick to one another. In other cases, adhesions only occur in a small portion of the uterus.
      - ❖ The extent of the adhesions defines whether the case is mild, moderate, or severe.
      - ❖ Asherman's syndrome occurs when trauma to the endometrial lining triggers the normal wound-healing process, which causes the damaged areas to fuse together. Most commonly, intrauterine adhesions occur after a dilation and curettage that was performed because of a missed or incomplete miscarriage, retained placenta with or without hemorrhage after a delivery, or elective abortion.
    - ✓ TB endometritis.
- **Male factors:**
  - **Defects in spermatogenesis:**
    - ✓ Congenital (e.g. undescended testis).
    - ✓ Thermal: increased temperature (e.g. varicocele).
    - ✓ Radiation.
    - ✓ Infection (e.g. mumps).
    - ✓ Chromosomal (e.g. Kleinfelter syndrome 47,XXY).
    - ✓ Hormonal: ↓ thyroxine; ↑ prolactin.

- **Bilateral obstruction of the vas:**
  - ✓ Congenital.
  - ✓ Bilateral ligation during repair of inguinal hernia.
- **Failure of sperm deposition in vagina:**
  - ✓ Severe hypospadius.
  - ✓ Impotence.
  - ✓ Retrograde ejaculation.

- **Normal shape of the sperm:**



- **Normal values of semen analysis:**

Semen characteristics	WHO 1980	WHO 1987	WHO 1992	WHO 1999	WHO 2010
Volume (mL)	ND	≥ 2	≥ 2	≥ 2	≥ 1.5
Sperm count (10^6/mL)	20-200	≥ 20	≥ 20	≥ 20	≥ 15
Total sperm count (10^6)	ND	≥ 40	≥ 40	≥ 40	≥ 39
Total motility (%)	≥ 60	≥ 50	≥ 50	≥ 50	≥ 40
Progressive motility	≥ 2	≥ 25%	≥ 25% (a)	≥ 25% (a)	≥ 32% (a+b)
Vitality (%)	ND	≥ 50	≥ 75	≥ 75	≥ 58
Morphology (%)	80.5	≥ 50	≥ 30	(14)*	≥ 4*
Leukocyte count (10^6/mL)	< 4.7	< 1.0	< 1.0	< 1.0	< 1.0

- **Important terminologies:**
  - **Azoospermia**: it is a medical condition of a male who is not having any measurable level of sperm in his semen.
  - **Oligospermia**: refers to semen with a low concentration of sperm.
  - **Asthenozoospermia**: reduced sperm motility.
  - **Necrozoospermia**: spermatozoa in semen are either immobile or dead.
  - **Teratozoospermia**: presence of sperm with abnormal morphology that affects fertility in males.
- **Assisted reproduction:**
  - **In-Vitro Fertilization and Embryo Transfer (IVF-ET).**
  - **Gamete-Intra-Fallopian Transfer (GIFT).**
  - **Intra-Cytoplasmic Sperm Injection (ICSI).**