Chapter 2
Human Reproductive Anatomy and Physiology

This chapter addresses the male and female reproductive systems

Puberty

A period of rapid change in the lives of boys and girls during which the reproductive systems mature and become capable of reproduction. Secondary sexual characteristics appear (pubic hair). Ends when mature sperm are formed or when regular menstrual cycles occur.

Male

Male hormonal changes normally begin between 10 and 16 years of age. Outward changes become apparent when the size of the penis and testes increases and there is a general growth spurt. Testosterone, the primary male sex hormone, causes the boy to grow taller, become more muscular, and develop secondary sex characteristics such as public hair, facial hair, and a deeper voice. The voice deepens but is often characterized by squeaks or cracks before reaching its final pitch. Testosterone levels are constant, not cyclical as are female hormones, although levels may decrease with age to 50% of peak levels by age 80. Nocturnal emissions (wet dreams) may occur without sexual stimulation, however these emissions do not contain sperm.

Female

The first outward change of puberty in females is development of the breasts. The first menstrual period (menarche) occurs 2 to 2 ½ years later (age 11 to 15). Female reproductive organs mature to prepare for sexual activity and childbearing. The female experiences a growth spurt, but her growth spurt ends earlier than the male's. Here hips broaden as her pelvis assumes the wide basin shape needed for birth. Pubic and axillary hair appear. The quantity varies, as it does in males.

Reproductive Systems

Male

Consists of external and internal organs (figure 2-1, page 21)

External Genitalia

Penis and the scrotum, which contains the testes.

Penis

Consists of the glans and the body. The glans is the rounded , distal end of The penis. It is visible on a circumcised penis but is hidden by the foreskin on An uncircumcised one. Smegma is a cheese like sebaceous substance that Collects under the foreskin and is easily removed with basic hygiene. At the Tip of thee glans is an opening called the urethral meatus. Th body of the Penis contains the urethra (the passageway for sperm and urine) and Erectile tissue (the corpus spongiosum and the corpora cavernosa). The Usually flaccid penis becomes erect during sexual stimulation when blood Is trapped within the spongy erectile tissues. The erection allows the male to Penetrate the female's vagina during sexual intercourse. The penis has two Functions: 1). Provides a duct to expel urine from the bladder 2). Deposits Sperm in the female's vagina to fertilize an ovum.

Scrotum

A sac that contains the testes. It is suspended from the perineum, keeping The testes away from the body and thereby lowering their temperature, Which is necessary for normal sperm production (spermatogenesis).

Internal Genitalia

Includes the testes, vas deferents, prostate, seminal vesicles, ejaculatory ducts, Urethra, and accessory glands

Testes (testicles)

A pair of oval glands housed in the scrotum. They have two functions:

1. Manufacture male germ cells (spermatozoa or sperm)
2. Secrete male hormones (androgens)

Sperm are made in the convoluted seminiferous tubules that are contained Within the testes. Sperm production begins at puberty and continues Throughout the life span of the male.

The production of testosterone begins with the anterior pituitary gland. Under the direction of the hypothalamus, the anterior pituitary gland Secretes follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Both initiate the production of testosterone in the Leydig cells of the testes. Testosterone has the following effects not directly related to sexual Reproduction:

1. Increases muscle mass and strength
2. Promotes growth of long bones
3. Increases basal metabolic rate (BMR)
4. Enhances production of red blood cells
5. Produces enlargement of vocal cords
6. Affects the distribution of body hair

These effects result in the greater strength and stature and a higher Hematocrit level in males than in females. Testosterone also increases The production of sebum, a fatty secretion of the sebaceous glands of the Skin, and it may contribute to the development of acne during early Adolescence. As the skin adapts to the higher levels of testosterone, acne Generally recedes.

Ducts

Each epididymis, one from each testicle, stores and carries the sperm to the Penis. The sperm may remain in the epididymis for 2 to 10 days, during Which time they mature and then move on to the vas deferents. Each vas Deferents passes upward into the body, goes around the symphysis pubis, Circles the bladder, and passes downward to form (with the ducts from the Seminal vesicles) the ejaculatory ducts. The ejaculatory ducts then enter the Back of the prostate gland and connect to the upper part of the urethra, Which is in the penis. The urethra transports both urine from the bladder And semen from the prostate gland to the outside of the body, although Not at the same time.

Accessory Glands

Seminal vesicles, the prostate gland, and the bulbourethral glands, also Called Cowper's glands.
The accessory glands produce secretions (seminal plasma). The secretions of These glands have three functions:

1. Nourish the sperm
2. Protect the sperm from the acidic environment of the woman's vagina
3. Enhance the motility (movement) of the sperm

The combined seminal plasma and sperm are called semen.Semen may be Secreted during sexual intercourse before ejaculation. Therefore pregnancy May occur even if ejaculation occurs outside the vagina. Increased heat in the environment around the sperm(testes) increases the motility but shortens the lifespan of the sperm. A constant increase in temperature around the testes can prevent spermatogenesis and lead to permanent sterility.

Female

Female reproductive system consists of external genitalia, internal genitalia, And accessory structures such as the mammary glands (breasts).

External Genitalia

External genitalia are collectively called the vulva. They include the mons pubis, Labia Majorca, labia minor a, four heat, clitoris, vaginal vestibule, and Perineum.

Mons Pubis (mons Veneris) is a pad or fatty tissue covered by coarse hair and Skin.It protects the symphysis pubis and contributes to the rounded contour Of the female body.

Labia Majora are two folds of fatty tissue on each side of the vaginal vestibule. Many small glands are located on the moist interior surface.

Labia Minora are two thin, soft folds of tissue that are seen when the labia Majora are separated. Secretions from sebaceous glands in the labia are Bactericidal to reduce infection and also lubricate and protect the skin of the Vulva.

Fourchette is a fold of tissues just below the vagina, where the labia Majora And the labia minora meet. It is also known as the obstetrical perineum. Lacerations in this area often occur during childbirth.

Clitoric is a a small, erectile body in the most anterior portion of the labia Minora. It is similar in structure to the penis. Functionally, it is the most erotic Sensitive part of the female genitalia, and it produces smegma. Smegma is a Cheese like secretion of the sebaceous glands.

Vaginal Vestibule is the area seen when the labia minora are separated and Includes five structures:

1. Urethral meatus- lies approximately 2 cm below the clitoris. It has a Foldlike appearance with a slit type opening, and it serves as the exit for urine.
2. Skene's ducts-(paraurethral ducts) are located on each side of the urethra and provide lubrication for the urethra and the vaginal orifice.
3. The vaginal introitus is the division between the external and internal female genitalia.
4. The hymen is a thin elastic membrane that closes the vagina from the Vestibule to various degrees.
5. The ducts of the Bartholin glands provide lubrication for the vaginal introitus during sexual arousal and are normall not visible.

Perineum is a strong, muscular are between the vaginal opening and the anus.The elastic fibers and connective tissue of the perineum allow stretching to permit the birth of a full-term infant. The perineum is the site of the episiotomy (incision) if performed or potential tears during childbirth. Pelvic weakness or painful intercourse (dyspareunia) may result if the tissue does not heal properly.

Internal Genitalia

Are the vagina,uterus fallopian tubes, and ovaries.

Vagina- is a tubular structure made of muscle and membranous tissue that Connects the external genitalia to the uterus. The marked stretching of the Vagina during delivery is made possible by the rugged, or transverse ridges of The mucous membrane lining. The vagina is self cleansing and during the Reproductive years maintains a normal acidic PH of 4 to 5. Antibiotic Therapy, frequent douching, and excessive use of vaginal sprays, deodorant Sanitary pads, or deodorant tampons may alter the self cleansing activity. The Vagina has three functions:

1. Provides passageway for sperm to enter the uterus
2. Allows drainage of menstrual fluids and other secretions
3. Provides a passageway for the infant's birth

Strong pelvic floor muscles stabilize and support the internal and external Reproductive organs. The most important of these muscles is the lavatory ani, Which supports the three structures that penetrate it: urethra, vagina, and Rectum.

Uterus- is a hollow muscular organ in which a fertilized ovum is implanted, an Embryo forms, and a fetus develops. It is shaped like an upside-down pear or Light bulb. The uterus lies between the bladder and the rectum above the vagina. Several ligaments support the uterus. Sensations for uterine contractions are carried to the CNS via the eleventh and twelfth thoracic nerve roots.
Anatomy- the uterus is separated into three parts: fundus, corpus, and cervix. The fundus (upper part) is broad and flat. The Fallopian tubes enter the uterus on each side of the fundus. The corpus (body) is the middle portion, and it plays an active role in menstruation and pregnancy. The fundus and the corpus have three distinct layers: Perimetrium (outermost), myometrium (middle layer that functions during pregnancy and birth, and endometrium (inner).

Cervix (lower part) is narrow and tubular and opens into the upper vagina. It has four functions:

1. Lubricates the vagina
2. Acts as a bacteriostatic agent
3. Provides an alkaline environment to shelter deposited sperm from the acidic PH of the vagina
4. Produces a mucous plug in the cervical canal during pregnancy

Fallopian Tubes: Four functions

1. A passageway in which sperm meet the ovum
2. The site of fertilization
3. A safe, nourishing environment for the ovum or zygote(fertilized ovum)
4. The means of transporting the ovum or zygote to the corpus of the uterus

Cells within the tubes have cilia (hairlike projections) that beat rhythmically to propel the ovum toward the uterus.

Ovaries- are two almond shaped glands, each about the size of a walnut. They are located in the lower abdominal cavity, one on each side of the uterus, and are held in place by ovarian and uterine ligaments. They have two functions:

1. Production of hormones, chiefly estrogen and progesterone
2. Stimulation of an ovum's maturation during each menstrual cycle

At birth every female infant has all the ova(oocytes) that will be available during her reproductive years (approximately 2 million cells). These degenerate significantly so that by adulthood the remaining oocytes number only in the thousands. Every month, one ovum matures and is released from the ovary. Any ova that remain after the climacteric no longer respond to hormonal stimulation to mature.

Pelvis- occupies the lower oration of the trunk of the body. Four bones attaché to the lower spine form it: Two innominate bones, sacrum, coccyx
Each innominate bone is made up of an ilium , pubis, and ischium. The iiium is the lateral, flaring portion of the hip bone; the pubis is the anterior hip bone. These two bones join together to form the symphysis pubis. The ischium is below the ilium and supports the seated body. The bony pelvis has three functions:

1. Supports and distributes body weight
2. Supports and protects pelvic organs
3. Forms the birth passageway

There are four types of pelvis:

1. Gynecoid- is the classic female pelvis, with rounded anterior and posterior segments. This is most favorable for vaginal birth
2. Android- has a wedge shaped inlet with a narrow anterior segment; it is typical of the male anatomy
3. Anthropoid- shape is long, narrow oval. Can deliver vaginally but their infant is more likely to be born in the occipital posterior(back of the fetal head toward the mother's sacrum) position

4. Platypelloid- flat transverse oval shape. Unfavorable for vaginal birth

The pelvis is divided into a false pelvis above the linea terminalis and the true pelvis below this line. The true pelvis is most important in the childbirth process. The true pelvis is further divided into the pelvic inlet, the pelvic cavity, and the pelvic outlet.

Breasts

Female breasts are accessory organs of reproduction. They produce milk after birth to provide nourishment and maternal antibodies for the infant. The nipple, in the center of each breast is surrounded by a pigmented areola. Montgomery's glands are small sebaceous glands in the areola that secrete a substance to lubricate and protect the breasts during lactation. Each breast is made of 15 to 24 lobes arranged like the spokes of a wheel. Adipose tissue affects size and firmness and gives the breasts a smooth outline. Alveoli are the glands that secrete milk. The size of a woman's breasts is determined by the amount of fatty tissue and does not influence her ability to secrete milk.

Reproductive Cycle and Menstruation

The female reproductive cycle consists of regular changes in secretions of the anterior pituitary gland, the ovary, and the endometrial lining of the uterus. The anterior pituitary gland, in response to the hypothalamus, secretes follicle stimulating hormone (FSH) and luteinizing hormone (LH). FSH stimulates maturation of a follicle in the ovary that contains a single ovum. Several follicles start maturing during each cycle, but usually only one reaches final maturity. The maturing ovum and the corpus luteum produce increasing amounts of estrogen and progesterone, which leads to enlargement of the endometrium. A surge in LH stimulates final maturation and the release of an ovum. Approximately 2 days before ovulation, the vaginal secretions increase noticeably.

Ovulation occurs when a mature ovum is released from the follicle about 14 days before the onset of the next menstrual period. The corpus luteum turns yellow immediately after ovulation and secretes increasing quantities of progesterone to prepare the uterus lining for a fertilized ovum. Approximately

12 days after ovulation, the corpus luteum degenerates if fertilization has not occurred, and progesterone and estrogen levels decrease. The drop in these levels causes the endometrium to break down, resulting in menstruation. The anterior pituitary gland secretes more FSH and LH beginning a new cycle.

The beginning of menstruation , called menarche, occurs at about 11 to 15 years. Early cycles are often irregular. Regular cycles are usually established within six months to 2 years of the menarche. In an average cycle, the flow (menses) occurs every 28 days, plus or minus 5 to 10 days. The flow itself lasts from 2 to 5 days, with a blood loss of 30 to 40 ml and an additional loss of 30 to 50 ml of serous fluid. Fibrinolysin is contained in the necrotic endometrium being expelled, and therefore clots are not normally seen in the menstrual discharge.

The climacteric is a period of years during which the woman's ability to reproduce gradually declines. Menopause refers to the final menstrual period, although in casual use the terms menopause and climacteric are often used interchangeably.

The Human Sexual Response

Four Phases:

1. Excitement: Heart rate and blood pressure increase; nipples become erect
2. Plateau: Skin flushes; erection occurs; semen appears on tip of penis
3. Orgasmic: Involuntary muscle spasms of the rectum, the vagina, and the uterus occur; ejaculation occurs
4. Resolution: engorgement resolves; vital signs return to normal

Physiology of the Male Sex Act

The male psyche can initiate or inhibit the sexual response. After erection the sperm can reach the woman's Fallopian tube within 5 minutes and can remain viable in the female reproductive tract for 4 to 5 days. Of the millions of sperm contained in the ejaculate, a few thousand reach each Fallopian tube, but only one fertilizes the ovum. The sphincter at the base of the bladder closes during ejaculation so that sperm does not enter the bladder and urine cannot be expelled.

Physiology of the Female Sex Act

The female psyche can initiate or inhibit the sexual responses. The posterior pituitary gland secretes oxytocin which stimulates contraction of the uterus and dilation of the cervical canal. Following orgasm, the muscles relax and this is usually accompanied by a sense of relaxed satisfaction. The egg lives for only 24 hours after ovulation; sperm must be available during that time if fertilization is to occur.