Chapter 27: Reproductive System

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testes</td>
<td>Gonads</td>
</tr>
<tr>
<td>Epididymis</td>
<td>Ducts (Internal Genitalia)</td>
</tr>
<tr>
<td>Vas Deferens</td>
<td></td>
</tr>
<tr>
<td>Ejaculatory Duct</td>
<td>Fallopian Tube (Uterine Tube or Oviduct)</td>
</tr>
<tr>
<td>Penile Urethra</td>
<td>Uterus</td>
</tr>
<tr>
<td></td>
<td>Vagina</td>
</tr>
<tr>
<td>Glans Penis (head)</td>
<td>External Genitalia</td>
</tr>
<tr>
<td>Penis (body or shaft)</td>
<td></td>
</tr>
<tr>
<td>Scrotum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glans Clitoris</td>
</tr>
<tr>
<td></td>
<td>Labia Majora</td>
</tr>
<tr>
<td></td>
<td>Labia Minora</td>
</tr>
</tbody>
</table>

Function of Gonads
1. Make germ cells or gamete cells
   a. Testes > Sperm
   b. Ovaries > Eggs
2. Make hormones
   a. Testes > Testosterone and Dihydrotestosterone (DHT)
   b. Ovaries > Estrogen(E2) and Progesterone(P4)

Accessory Glands
- Males (pg. 710)
  o Prostate
  o Seminal Vesicles
  o Bulbouretheral Glands (Cowper’s Glands)
- Females (pg. 725)
  o Bartholin Glands (Greater Vestibular Glands)
  o Mammary Gland

If you notice, there is some correlation between these things, some homologies between them. Gonads make germ cells and hormones in both cases. Ducts carry the germ cells and external genitalia used for copulation.

Development of Urinary System (pg. 702)

3 types of kidneys
1. Pronephros
2. Mesonephros
3. Metanephros – becomes the real kidneys

Kidneys develop in pelvic cavity known as the metanephros. Gonads develop in abdominal cavity and descend

Pronephos and mesonephros degenerates, but the kidney duct from the mesonephros stays.
Metanephros continues to grow and becomes the real kidney within the 12th week and develops its own duct.

**Embryology of Reproductive System (pg. 721)**

Mesonephric Duct becomes Wolfian Duct

Wolfian Duct develops into the epididymis, vas deferens, and the ejaculatory duct.

At 4 months, the mesonephric duct becomes the ductos deferens and gives rise to the Epididymis, seminal vesicles, the prostate glands, and the ejaculatory duct.

**Structures that derive from the mesonephric duct**

- Epididymis
- Vas Deferens
- Ejaculatory Duct
- Prostate Gland
- Seminal Vesicles

Meso = between 
Nephros = Kidney

Paramesonephric duct runs parallel to mesonephric duct. In males, it degenerates.

In females (pg. 723), paramesonephric duct (Mullerian duct) gives rise to female structures; the uterus, the fallopian tube, and upper half of vagina. The mesonephric duct degenerates in females.

**Dogma of Sexual Differentiation**

This means that we have an indifferent gonad within the first six weeks. We also have indifferent ducts and external genitalia within the first six weeks. It all depends if we have a ‘Y’ chromosome.

<table>
<thead>
<tr>
<th>Y Chromosome</th>
<th>Within 6 weeks</th>
<th>No Y Chromosome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testes</td>
<td>Indifferent Gonads</td>
<td>Ovaries (happens within 6 – 10 weeks of development)</td>
</tr>
<tr>
<td>Mullerian Inhibiting</td>
<td>Indifferent Ducts</td>
<td>Mullerian</td>
</tr>
<tr>
<td></td>
<td>Paramesonephric = Mullerian</td>
<td>Mesonephric = Wolfian</td>
</tr>
<tr>
<td>Glans Penis</td>
<td>Genital Tubercle</td>
<td>Glans Clitoris</td>
</tr>
<tr>
<td>Body or Shaft</td>
<td>Urogenital Folds</td>
<td>Labia Minora</td>
</tr>
<tr>
<td>Penile Urethra</td>
<td>Urogenital Groove</td>
<td>Vestibule</td>
</tr>
<tr>
<td>Scrotum</td>
<td>Labia/Scrotal Swelling</td>
<td>Labia Majora</td>
</tr>
</tbody>
</table>

Sex is given at the time of fertilization.
3 Hormones of Testes
1. Mullerian Inhibiting Hormone – Inhibits paramesonephric duct from developing.
2. Testosterone – Stimulates Wolfian duct and forms epididymis, vas deferens, ejaculatory duct, prostate gland, and seminal vesicles.
3. (in the 12th week) Dihydrotestosterone (DHT) – stimulates indifferent external genitalia to develop

We have a genital tubercle and urogenital folds. The urogenital folds guard urogenital groove. We also have a labial/scrotal swelling.

In 6 weeks, DHT has not yet been secreted. In 10 weeks, DHT is secreted. By the 12th week, DHT will take genital tubercle and make it a glans penis. The urogenital folds will grow and make the body or shaft of penis. The groove will become the penile urethra. The labia/scrotal swelling is going to enlarge and form a bag to hold the testes known as the scrotum.

If a female, there is no Y chromosome so Mullerian inhibiting hormone is not being made. Mullerian duct will make all of the female structures (fallopian tube, uterus, and upper 1/2 of vagina).

If for some reason there is an adrenal cortex hyper secretion of testosterone, then the female structures can differentiate into male structures. This would be a case of a pseudo-hermaphrodite, because there are no testes. For a true hermaphrodite, you need to have both sexes. It could only happen in males. Testes may not produce Mullerian inhibiting hormone, there is no hormone to inhibit the Mullerian duct derivative. It would have all the male parts and female parts, however will not have ovaries. The male can father a child since he has a uterus. In cases like this, doctors and parents sway the child to become a female since it would be an infertile male.

Tomboy = Adrenal Cortex is secreting more testosterone than normal

**Male Reproductive System (pg. 710)**

Epididymis – Where maturation occurs.

**Sperm pathway**
Vas Deferens > go back from the outside from scrotum through the inguinal canal > posterior to the urinary bladder > ampulla of the vas deferens > duct of vas deferens > joins with duct of seminal vesicle > forms a Y known as the Ejaculatory Duct > empties into the prostatic urethra > membranous urethra > penile urethra > out

Bulbourethral Gland = Cowper’s Gland

Cowper’s gland is important because it releases a mucous secretion. Releases an emission or precum which neutralizes the pH in the urethra because males have an acidic pH.
Testes (pg. 713)

The testes are held within a scrotal sac. There is one bag per teste, separated by a scrotal septum, which is a fibrous connective tissue that separates one side from the other.

Layers to the Scrotum

<table>
<thead>
<tr>
<th>Abdomen</th>
<th>Scrotum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>Skin</td>
</tr>
<tr>
<td>Camper’s fascia (fatty layer)</td>
<td>Dartos Muscle (came from Camper’s fascia)</td>
</tr>
<tr>
<td>Scarpa’s fascia (fibrous layer)</td>
<td>Colles Fascia (Superficial Scrotal Fascia)</td>
</tr>
<tr>
<td>External Oblique / aponeurosis &amp; muscle</td>
<td>External Spermatic Fascia</td>
</tr>
<tr>
<td>Internal Oblique / aponeurosis &amp; muscle</td>
<td>Cremaster muscle and fascia (innervated by genitofemoral nerve)</td>
</tr>
<tr>
<td>Transverse Abdominis / aponeurosis &amp; muscle</td>
<td></td>
</tr>
<tr>
<td>Transversalis fascia</td>
<td>Internal Spermatic Fascia</td>
</tr>
<tr>
<td>Peritoneum</td>
<td>Tunica Vaginalis (peritoneum that forms around testes.)</td>
</tr>
</tbody>
</table>

*In the abdomen, you are a C.S (Chiropractic Student), by the end of chiropractic school you become a D.C (Doctor in Chiropractic). You have the balls to become a D.C.

Cremasteric Reflex – When genitofemoral nerve is stimulated and causes the testes to rise.

Testes are retroperitoneal.

The testes are formed behind the peritoneum in the abdominal cavity. It is connected to a ligament called the Gubernaculum testes, which is anchored down in the scrotum, which when shortened, pulls the testes down with it. (pg. 711)

If at the time of birth, the testes have not yet descended, give it a couple of days. If after a couple of days, the testes has not yet descended, the processus vaginalis, which is the space between the 2 tunica vaginalis, can fill with peritoneal fluid causing a condition known as hydrocele.

Hydrocele – water in the testes.

If a child is 1 year old and the testes have not yet descended, it could mean that the inguinal canal has closed which would mean surgery needs to be performed.

2 types of muscles
Dartos muscle causes the wrinkling of the scrotum.
Cremasteric muscle pulls the testes up.
The testes

- **Tunica Albugenia** – dense fibrous layer of connective tissue that supports the epithelium surrounding it. It creates a septum that takes the inner structure of the testes and divides it into lobules.

- **Seminiferous tubule** – Location where spermatogenesis occurs.

- **GnRH (Gonadotropin releasing hormone)** goes to pituitary gland to stimulate the release of FSH and LH. They are tropic hormones that stimulate the gonads.

- **FSH (Follicle Stimulating Hormone)** targets the Seminiferous tubules. Seminiferous tubules are made of Sertoli cells or Sustentacular cells. Sustentacular cells are nurse cells that are going to nurse the process of Spermatogenesis. (pg. 714)

  - Spermatogonium are housed between Sertoli cells or Sustentacular cells.

  - Spermatogonium are future sperm cells.

  - **Spermatogenesis** – The process by which sperm is generated or made. (pg. 714)

2 basic cell division processes

1. **Mitosis** – The process in which cell divides and makes 2 identical daughter cells. The DNA replicates, forms a copy of itself, the number of chromosomes are doubled so that when it divides it has the same number of chromosomes (46 XY). Spermatogonium is a diploid cell which means it has 46 XY.

2. **Meiosis** – The process in which a cell divides and makes gamete cells with half the number of chromosomes (23 XY).
**Spermatogenesis**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitosis</td>
<td>Sperm cell divides and makes an 2 indentical daughter cells, with 46 XY (23 paired chromosomes) &gt; Primary Spermatocyte</td>
</tr>
<tr>
<td>Primary Spermatocyte</td>
<td>Forms a tetrad and divides</td>
</tr>
<tr>
<td>Meiosis I</td>
<td>Secondary Spermatocyte (46 XY)</td>
</tr>
<tr>
<td>Meiosis II</td>
<td>Spermatids (23 XY) or 23X and 23Y (immature cell which is only a ball with no tail)</td>
</tr>
<tr>
<td>Spermiogenesis (pg. 715)</td>
<td>Physical maturation; cytoplasm gets reduced, cell membrane pulls over and nucleus pulls into it, forming the head. The mitochondria is going to concentrate in the middle piece. The rest of the membrane with the microtubules is going to form the tail.</td>
</tr>
</tbody>
</table>

Spermiogenesis – process in which sperm matures; which begins in the seminiferous tubule and is completed in the epididymis.

Sperm is stored in epididymis until it is needed to be ejaculated. If there is no ejaculation for some time, the sperm will degenerate and all the parts will be recycled.

Sperm is alive for 72 hours (3 days)

**Accessory Glands (pg. 718)**

- **Prostate Gland** – secretes prostatic juices
  - Prostaglandins
  - Enzymes – helps fight bacteria
- **Seminal Vesicles**
  - Seminal Fluid
  - Prostaglandins
  - Enzymes
  - Fructose – sugar needed for energy
- **Bulbourethral Gland (Cowper’s Gland)** – opens in the bulb of the urethra
  - Mucous – used to stabilize acidic pH in penile urethra
  - Enzymes
The Penis

- Bulb (part of corpora spongiosis)
  - Corpus Spongiosum (in the middle)
- Crura (root)
  - Corpora Cavernosa (on both sides)

Penile Urethra = Spongy Urethra

Called spongy urethra because it runs through the corpus spongiosum

Since Corpus Spongiosum starts at a bulb region, the gland is called Bulbourethral Gland.
Corpus Spongiosum is going to have the spongy urethra. Inside each Corpus Cavernosum, there is an artery called the Central Artery. On the outside, it is covered by skin supported by connective tissue. Surrounding the penis, there is another layer of connective tissue. At the top underneath skin there is a vein called the Dorsal Superficial Vein of Penis. In the tissue underneath it, there is a vein called the Dorsal Deep Vein of Penis. On each side of the Dorsal Deep Vein of the Penis, there is an artery called the Dorsal Deep Artery along with nerves next to them (S2, S3, S4 – Pudendal Nerve, **not shown in picture**)

Since the penis has more arteries than veins, when the arteries bring blood to the penis, it erects the penis and collapses the dorsal veins, which maintains erection since blood does not drain.

Sympathetic > Shooting or Ejaculation
Parasympathetic > Pointing or Erecting

After ejaculation, body goes back to parasympathetic and no more stimulation goes to the penis and it becomes flaccid. Heart slows and not much blood goes to penis. The vein is no longer collapsed and begins to drain the blood.

**Testosterone**

Interstitial cells of Leydig found between Seminiferous tubules. If you take Leutenizing Hormone (LH) or Interstitial Cell Stimulating Hormone (ICSH), it will stimulate the interstitial cell to make testosterone.

LH or ICSH > Interstitial Cells of Leydig > Testosterone
Female Reproductive System (pg. 724)

Female Cycles
- Ovarian Cycle (pg. 726)
  - Make germ cells
  - Make hormones
- Uterine Cycle

Everyone can be a female reproductive cycle. If you stand in an anatomical position and stick your arms out and bend forward, from your hips down could be your vagina. The hips represent the cervix of the uterus. The waist represents the isthmus of the uterus. The torso represents the body of the uterus. The head would represent the fundus of the uterus. The arms would represent the fallopian tube. The ovaries would be sticking to the mid axillary line.

*The Fallopian Tube is not attached to the ovaries. It needs to be able to move to catch the eggs. The ovaries are attached to the body of the uterus by a ligament called a proper ovarian ligament. The ovaries are also attached to the lateral aspect of the pelvic cavity specifically the pelvic bone by a suspensory ligament. If a woman has an ectopic pregnancy in her fallopian tube, and the fallopian tube needs to be cut. They cut the fallopian tube but they leave the ovary. That ovary can still ovulate and make hormones. When ovulation time comes, the other fallopian tube will move and catch the egg.

The Ovarian Cycle (pg. 727)

There are about 100,000 primordial follicles in the woman at birth. Ovulate about 400 times in lifespan over a period of 30 years. If contraceptive pills are taken, ovulation is delayed meaning that you would have late menopause. Women are born with a fixed number of oocytes in follicles.

Menopause = loss of primordial follicles

<table>
<thead>
<tr>
<th>Follicular Phase</th>
<th>The Ovarian Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primordial follicle</td>
<td>FSH stimulates the growth of primordial cell. Stimulates a cohort of about 13-15 follicles.</td>
</tr>
<tr>
<td>Step 1: Formation of primary follicles</td>
<td>Primary oocyte, meiosis has not yet occurred. Some follicles lag behind and do not grow under FSH.</td>
</tr>
<tr>
<td>Step 2: Formation of secondary follicles</td>
<td>More FSH influence and more lag behind, however others get bigger. Still have a primary oocyte, meiosis has not yet occurred.</td>
</tr>
<tr>
<td>Step 3: Formation of tertiary follicles</td>
<td>More FSH influence and follicle becomes bigger and oocyte begins to go through meiosis, causing a space called an Antrum with follicular fluid. Oocyte is still considered primary oocyte.</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Step 4: Ovulation</td>
<td>Under influence of LH, meiosis is going to happen, follicle becomes much larger and ruptures. Oocyte is now called a secondary oocyte, which happens at day 14. <strong>Body Temperature goes up 1 degree</strong> Follicle ruptures and releases the egg. The egg can stay alive for 48 hours.</td>
</tr>
<tr>
<td>Step 5: Formation of corpus luteum</td>
<td>LH stimulates ruptured follicle which becomes a yellow body. It stays present until mother realizes that she is not pregnant, then it will degenerate.</td>
</tr>
<tr>
<td>Step 6: Formation of corpus albicans</td>
<td>White body which degenerates becomes a scar tissue at the 26th day after mother realizes that she is not pregnant.</td>
</tr>
</tbody>
</table>

If older, some of the chromosomes stick together since they have been stagnant for a number of years. When the secondary meiosis occurs and it goes from a 46XX to a 23X cell, some of them are going to be sticking causing more congenital malformations of their children, such as down-syndrome. For instance chromosome 21 does not split resulting in 21XX (nondisjunction) along with an additional X chromosome from the male resulting in 21XXX (trisomy 21). The longer a woman waits, the higher the chance of a congenital malformation due to age. It can also happen to younger women due to the exposure of radiation.

Nondisjunction – Failure of chromosome pairs to separate properly during cell division.¹

Gonadotropins (GnRH) - hormones that were made in the pituitary gland that influences the gonads.
- FSH – Stimulates the follicles
  - Under condition of FSH, primordial follicles start to grow
- LH – Stimulates ovulation

Atresia – When follicles that did not ovulate degenerate.

About 99,600 follicles die through atresia

Hormone Formation

Follicular cells are going to make Estrogen (E2), When there are tiny little follicles, there are going to be lower amounts of Estrogen. The bigger follicular cells, the greater Estrogen production.

The Hormonal Regulation of Female Reproductive Function (pg. 734)

<table>
<thead>
<tr>
<th>Phases of the Ovarian Cycle</th>
<th>Follicular Phase</th>
<th>Luteal Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonadotropic hormone levels (IU/L)</td>
<td>FSH</td>
<td>LH</td>
</tr>
<tr>
<td>Follicular stages during the ovarian cycle</td>
<td>Follicle development</td>
<td>Ovulation</td>
</tr>
<tr>
<td>Ovarian hormone levels</td>
<td>Estrogens</td>
<td>Inhibins</td>
</tr>
<tr>
<td>Endometrial changes during the uterine cycle</td>
<td>Destruction of functional zone</td>
<td>Repair and regeneration of functional zone</td>
</tr>
<tr>
<td>Phases of the Uterine Cycle</td>
<td>MENSES</td>
<td>PROLIFERATIVE PHASE</td>
</tr>
</tbody>
</table>

Gonadotropic hormone levels
Follicular phase – FSH stimulates the follicle
Luteal phase – LH stimulates the follicle

LH stimulates the follicle right before ovulation then decreases due to the follicles that go through atresion.

Progesterone is low during follicular phase. Progesterone is being made by the luteal cells of the corpus luteum.
Luteal phase is when ovaries make progesterone.

Follicular phase is when the ovaries make estrogen.

Contraceptive pill have a ratio of estrogen and progesterone. Hormonal levels at the end are different from hormonal levels at the beginning.

**Uterine Cycle (Menstrual Cycle)**
The uterine cycle has 28 days, although some women vary. The first day of the uterine cycle is when women begin their period.

4 Phases
- **Menses**
  - Shedding of endometrium
  - Usually last for 3-5 days
- **Proliferative Phase**
  - Endometrium is going to be repaired and starts growing
  - Estrogen stimulates endometrium to grow
- **Secretory**
  - Endometrial glands secrete mucous or glycoprotein so blastocyst can stick to the uterus. Implantation occurs at day 5-10 after fertilization occurs.
  - Progesterone influences endometrial glands to secrete glycoprotein.
  - Secretory phase goes all the way to day 26. If woman is pregnant, progesterone level would stay up to keep uterus layer sticky. If woman is not pregnant, progesterone level goes down.
- **Ischemic (Day 26-28)**
  - When progesterone goes down, it stimulates the arterioles in endometrium to shut down and constrict, closing their lumen and decreasing the vascular supply to the endometrium. Endometrium dies due to lack of oxygen.

Ischemic = Lack of oxygen

**Bartholin’s glands (Greater Vestibular Gland)**
Estrogen stimulates Bartholin’s glands to secrete a watery vaginal secretion.
Progesterone stimulates Bartholin’s glands to secrete mucous.

Contraceptive pill affects pituitary.
Fallopian Tube (pg. 729)
- Infundibulum – Most distal part from uterus with finger-like structures called fimbriae at its terminal end. The fimbriae move to lure egg to travel towards the fallopian tube.
- Ampulla – Distended part of oviduct where fertilization occurs
- Isthmus – Narrow portion of fallopian tube where lumen or space of fallopian tube is about the size of a strand of hair. If egg grows in fallopian tube, it can rupture due to its size.
- Intramural or uterine portion – Part of fallopian tube that is in between the walls.

Uterus
- Fundus – Top of uterus
- Body of Uterus
- Isthmus – Narrowing of uterus
- Cervix – neck of the uterus

The uterus looks like an inverted pear. It connects to the vagina and has 3 layers. It is a hollow muscular organ. On the inside it has epithelium supported by connective tissue called perimetrium. On the inside it has endometrium. It has muscle called myometrium that is smooth muscle.

Fibroids or myomas – tumors of myometrium.
Peritoneum forms pouches in the front and back.

Rectouterine Pouch (Pouch of Douglas) – Pouch between uterus and rectum. Important because fallopian tube is open to the peritoneal cavity. If a woman has a condition known as endometriosis where endometrium continues to grow at an excessive rate. When she has her period, some of it comes out, but some of it doesn’t. When proliferative phase comes, she builds more. Over time, uterine cavity will be filled with endometrium. When she bleeds, some of it will be old blood that will be coagulated. Laparoscopy will need to be performed. Go through belly button and fill abdominal cavity with gas. Make an incision in pelvic area and suck out endometrium.

Vesicouterine Pouch – Pouch between urinary bladder and uterus.

Myomectomy – Removal of myomas.

Anteverted – when uterus bends anteriorly near its base.

Retroverted – when uterus bends backward toward the sacrum.
Suspensory Ligaments of the Uterus (pg. 726)

- **Broad ligament** – Ligament of uterus that attaches the uterus and fixes it in place. It is made of a mesenteric sheet.
- **Uterosacral ligament** – Connects uterus to the anterior portion of the sacrum.
- **Round ligament** – Comes from the front, through the inguinal canal and ending in the labia majora.

Suspensory Ligaments of Ovary (pg. 726)
- Suspensory ligament of ovary - Suspend ovary from pelvic wall. Where ovarian artery and ovarian vein travel through.
- Proper ovarian ligament – connects medial aspect of ovary to uterus.

Vagina (pg. 736)

The vagina is the copulation device for females. It has vaginal rugae which helps the penis to contract. It also has vaginal arteries and veins.
- Mons pubis – mountain above pubic bone, which has some fat to protect glans clitoris. It is covered with pubic hair.
- Prepuce of clitoris – an extension of tissue.
  - In men, it is cut off by a process called circumcision
- Glans Clitoris
- Labia Minora – grows out of urogenital fold
- Vestibule – space between labia minora
- Urethral opening
- Vaginal entrance
- Labia Majora
Mammary Glands (pg. 737)

- Lobes of mammary glands – where milk production occurs
- Lactiferous duct – where milk travels through
- Areola – dark area of breast
- Nipple – where milk comes out of
- Suspensory Ligaments of Cooper
  - Keep breast in place

Target for Prolactin and Oxytocin along with Estrogen and Progesterone. Estrogen makes mammary glands grow. Progesterone makes breast fuller. The breast is mainly adipose tissue on top of pectoralis muscle that has lactiferous duct. Lactiferous duct carries milk which open into the nipple. There is a darker area called the Areola. Suspensory ligaments of cooper keep breast perky.

After mammary glands go through pregnancy under the influence of prolactin. Prolactin causes milk to develop in mammary glands and lactiferous ducts. It makes the breast bigger because of the milk causing the ligaments of cooper stretch and the breast to sag because of the weight of the breast.

**Erection and Orgasm**

When a woman is reaching orgasm, she is going to have parasympathetic innervation which is going to cause erection of the clitoris. It will also increase blood flow to the labia majora and it will get engorged. Glans clitoris will also get erect, however it is small so it won’t show. Bartholin gland will be stimulated to release mucous for lubrication in the area of the vestibule so penile penetration will become easier. G-spot is located in the anterior aspect of vagina. Ejaculation comes from bartholin gland.