Reproductive Physiology

Abnormalities in the reproductive system

Chapter 81, 82, 83

Abnormal Spermatogenesis and Male Fertility

Chapter 81

Sterility

- The seminiferous tubular epithelium can be destroyed by several diseases:
- Bilateral orchitis (mumps) → risk of sterility.
- Born with degenerate tubular epithelia.
- Excessive temperature of testes (usually temporary).

NOTES

When the germinal epithelium of the testes is destroyed by **x-ray treatment or excessive heat, the **Leydig cell**s, which are less easily destroyed, often continue **to produce testosterone.**

Cryptorchidism

- **Failure of a testis to descend** from the abdomen into the scrotum at or near the time of birth of a fetus.
- A testis that remains in the abdominal cavity throughout life is **incapable of forming sperm**. The tubular epithelium becomes degenerate, leaving only the interstitial structures of the testis.
- Causes:
- abnormally formed testes that are unable to secrete enough testosterone.
- Treatment:
- surgical correction.

NOTES

**Testosterone secretion by the fetal testes is the normal stimulus that causes the testes to descend into the scrotum from the abdomen.

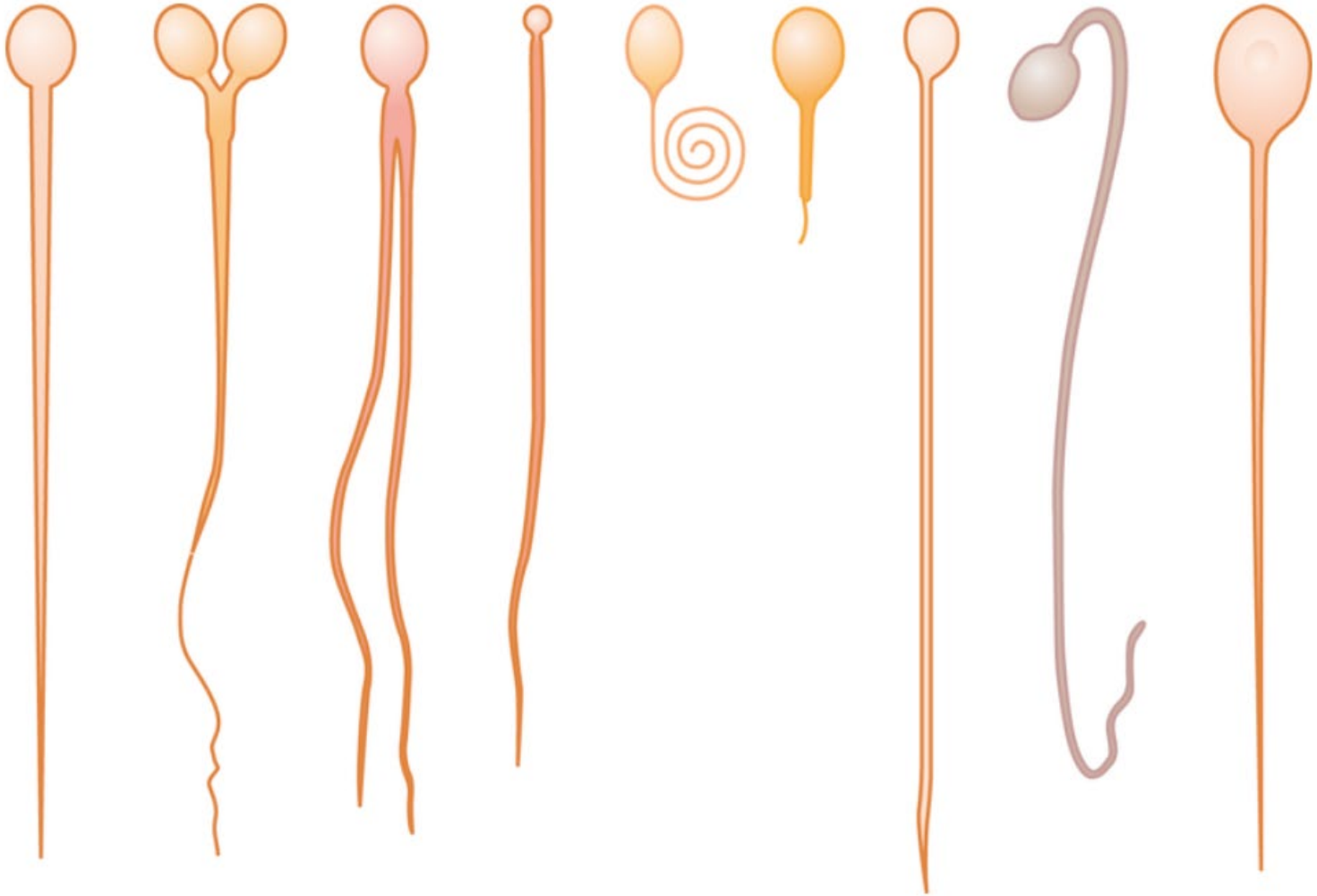
Effect of Sperm Count on Fertility

- The usual quantity of semen ejaculated bout 3.5 ml.
- Each ml of semen contains 120 million sperm (35 million to 200 million).
- When the number of sperm is less than 20 million/ml, the person is likely to be infertile.

NOTES

**average total of about 400 million sperm are usually present in each ejaculate.

Effect of Sperm Morphology and Motility on Fertility



NOTES

Occasionally a man has a normal number of sperm but is still infertile. When this occurs, sometimes as many as onehalf the sperm are found to be abnormal physically, having two heads, abnormally shaped heads, or abnormal tails, as shown in Figure 80-5. At other times, the sperm appear to be structurally normal, but for reasons not understood, they are either entirely nonmotile or relatively nonmotile. Whenever the majority of the sperm are morphologically
abnormal or are nonmotile, the person is likely to be infertile, even though the remainder of the sperm appear to be normal.

Effect of Sperm Morphology and Motility on Fertility

- A man has a normal number of sperm can still be infertile.
- Abnormal physically, having two heads, abnormally shaped heads, or abnormal tails.
- Or the sperm appear to be structurally normal, but they are either entirely nonmotile or relatively nonmotile.

Abnormalities of Male Sexual Function

The Prostate Gland and Its Abnormalities

- Grow at puberty (testosterone).
- Stationary size (20 -50 yrs).
- After 50, it begins to involute (low testosterone).
- Abnormal overgrowth of prostate tissue (hypertophy), BPH frequently develops in older men and can cause **urinary obstruction**.

- Cancer of the prostate gland accounts for about 2% to 3% of all male deaths.

NOTES

Once cancer of the prostate gland does occur, the cancerous cells are usually stimulated to more rapid growth by testosterone
and are inhibited by removal of both testes so that testosterone cannot be formed. Prostatic cancer usually can be inhibited by administration of estrogens. Even some patients who have prostatic cancer that has already metastasized to almost all the bones of the body can be successfully treated for a few
months to years by removal of the testes, by estrogen therapy, or by both; after this therapy the metastases usually diminish in size and the bones partially heal. This treatment does not stop the cancer but does slow it

Hypogonadism in the Male

- When the testes of a male fetus are **nonfunctional** during **fetal life → none** of the **male sexual characteristics** develop in the fetus →female organs are formed

- When a boy loses his testes **before puberty** → State of eunuchism:
- → Infantile sex organs and infantile sexual characteristics throughout life.
- → The height of an adult eunuch is slightly greater than that of a normal man.
- → weak muscle
- → childlike voice
- → no loss of hair on the head
- → no masculine hair distribution on the face

NOTES

**The reason for this is that the basic genetic characteristic of the fetus, whether male or female, is to form female sexual organs if there are no sex hormones. However, in the presence of testosterone, formation of female sexual organs is suppressed and male organs are induced instead.
**because the bone epiphyses are slow to unite, although the bones are quite thin and the muscles are considerably weaker than those of a normal man.

Hypogonadism in the Male

- When a man is castrated **after puberty** →
- →The sexual organs **regress slightly** in size but not to a childlike state
- →**voice regression**
- → loss of masculine hair production
- → loss of the thick masculine bones
- → loss of the musculature
- → decreased sexual desires (not lost), erection can still occur, but it is rare that ejaculation can take place.

NOTES

**primarily because the semen-forming organs degenerate and there has been a loss of the testosterone-driven psychic desire.

Testicular Tumors and Hypergonadism in the Male

- Interstitial Leydig cell tumors (100x of testosterone)
- In young children→
- **Rapid growth** of the musculature and bones but also **early uniting** of the epiphyses.
- Excessive development of the male sexual organs, all skeletal muscles, and other male sexual characteristics.

Testicular Tumors and Hypergonadism in the Male

- Tumors of the germinal epithelium (more common than interstitial Leydig cell tumors)
- Contain multiple tissues, such as placental tissue, hair, teeth, bone, skin, and so forth, all found together in the same tumorous mass called a teratoma.
- Often secrete few hormones (hCG, estrogen)

NOTES

**because germinal cells are capable of differentiating into almost any type of cell

Erectile Dysfunction in the Male (impotence)

- Inability of the man to develop or maintain an erection of sufficient rigidity for satisfactory sexual intercourse.
- **Neurological problems**, such as **trauma to the parasympathetic** nerves from **prostate surgery**.
- **Low** levels **of testosterone**
- Some drugs (e.g., **nicotine, alcohol, and antidepressants**)
- **Vascular disease** (hypertension, diabetes, and atherosclerosis) **. (**In men older than 40 years **)**

Erectile Dysfunction in the Male (impotence)

- Adequate blood flow and nitric oxide formation are essential for penile erection.

- Erectile dysfunction caused by vascular disease can often be successfully treated with **phosphodiesterase-5 (PDE-5) inhibitors** such as sildenafil (Viagra), vardenafil (Levitra), or tadalafil (Cialis).

- These drugs **increase and prolong the effect of cyclic GMP** in the erectile tissue → vasodilation → cause erection.

Abnormalities of Secretion by the Ovaries

Chapter 82

Hypogonadism—Reduced Secretion by the Ovaries

- When ovaries are absent from birth or when they become nonfunctional before puberty → Female eunuchism occurs
- No secondary sexual characteristics
- Sexual organs remain infantile
- Prolonged growth of the long bones

- When the ovaries of a fully developed woman are removed → the sexual organs regress to some extent.

NOTES

** so that the uterus becomes almost infantile in size, the vagina becomes smaller, and the vaginal epithelium becomes thin and easily damaged. The breasts atrophy and become pendulous, and the pubic hair becomes thinner. The same changes occur in women after menopause..

Female Sterility

- Either abnormal physiological function of the genital system or abnormal genetic development of the ova.
- The most common cause of female sterility **is failure to ovulate**.
- This failure can result from **hyposecretion of gonadotropic hormones**, or it can result from **abnormal ovaries** that do not allow ovulation.

Anovulatory Cycles–Sexual Cycles at Puberty

- Insufficient preovulatory surge of LH → No ovulation "anovulatory."

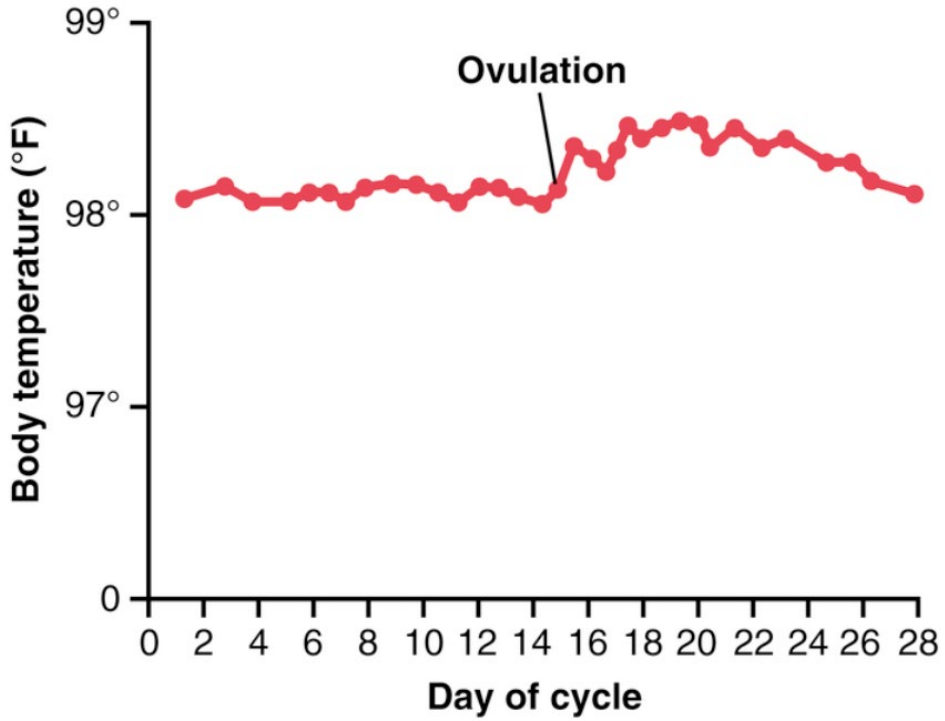
- The phases of the sexual cycle continue, but they are altered in the following ways:
- 1. No corpus luteum → No progesterone.
- 2. The cycle is shortened by several days.

- The first few cycles after the onset of puberty are usually anovulatory, as are the cycles occurring before menopause.

Ovulation detection

- Analyze the urine for a surge in pregnanediol, the end product of progesterone metabolism.

- Chart body temperature throughout the cycle →secretion of **progesterone** during the latter half of the cycle **raises** the body temperature about **0.5**°F, with the temperature rise **coming abruptly** at the **time of ovulation**.



NOTES

**These methods are based mainly on the effects of progesterone on the body because the normal increase in progesterone secretion usually does not occur during the latter half of anovulatory cycles. In the absence of progestational effects, the cycle can be assumed to be anovulatory.

Treatment

- Lack of ovulation caused by hyposecretion of the pituitary gonadotropic hormones

- Can sometimes be treated by appropriately timed administration of human chorionic gonadotropin.

NOTES

This hormone, although secreted by the placenta, has almost the same effects as LH and is therefore a powerful stimulator of ovulation
However, excess use of this hormone can cause ovulation from many follicles simultaneously; this results in multiple births, an effect that has caused as many as eight babies (stillborn in many cases) to be born to mothers treated for infertility with this hormone.

The exact cause of PCOS is unknown.

Polycystic ovarian Syndrome PCOS

- problem with hormones that happens during the reproductive years
- M any small sacs of fluid develop along the outer edge of the ovary. These are called cysts. The small fluid-filled cysts contain immature eggs. These are called follicles. The follicles fail to regularly release eggs.
- The exact cause is not well known, but could be: Hereditery, Insulin resistance, excess androgens, low grade inflammation
- Symptoms: Irregular periods, **Too much androgen. Causes hirsutism, Polycystic ovaries**
- **Treatment: Lifestyle changes, hormones (combination pills and progestins pills), Metformin,**

Preeclampsia and Eclampsia

Chapter 83

Preeclampsia

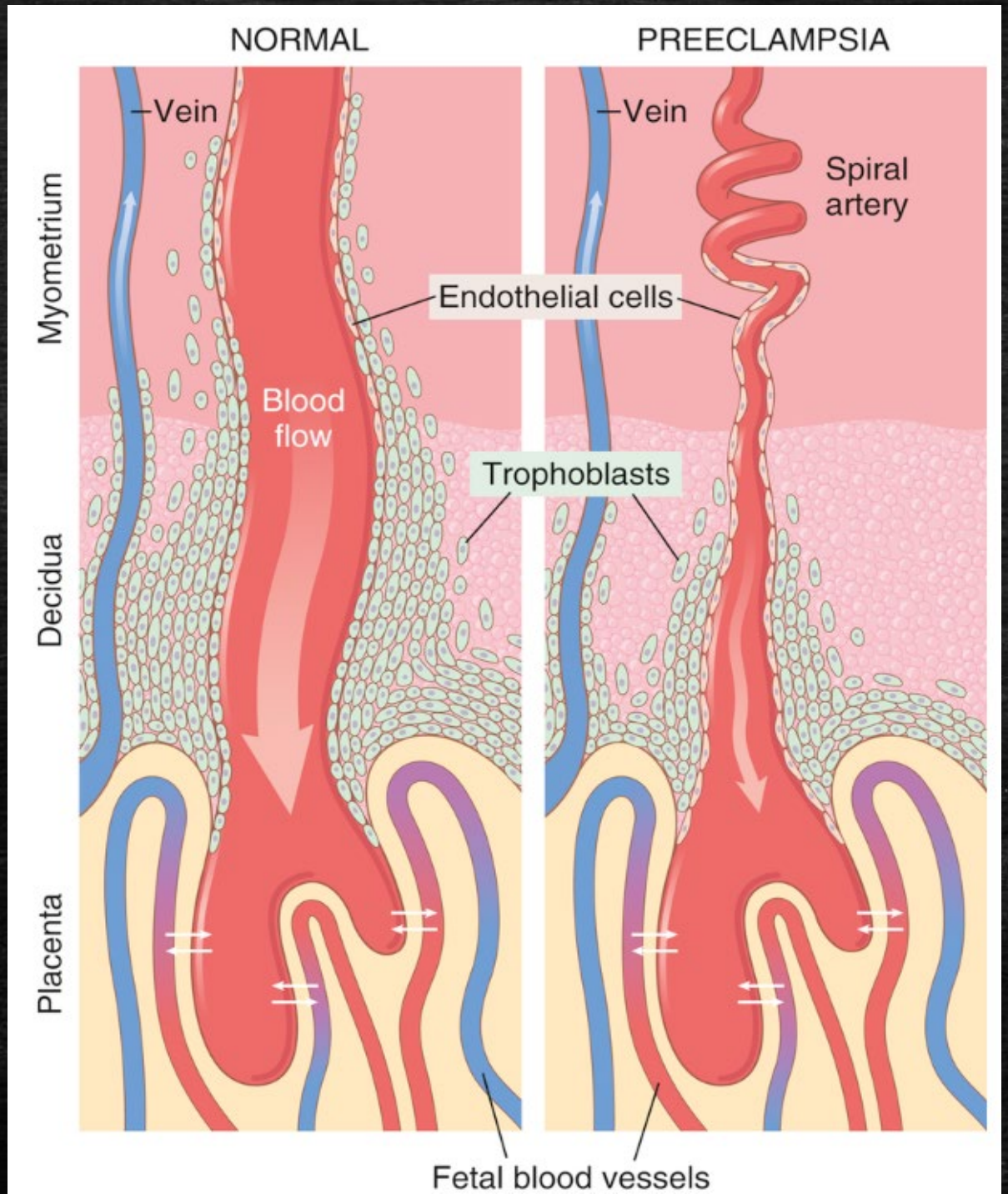
- Preeclampsia/ toxemia: pregnancy-induced hypertension, in the last few months of pregnancy that may also be associated with , proteinuria.
- Characterized by:
- Excess salt and water retention (edema)
- Weight gain
- Impaired vascular endothelium
- Arterial spasm (kidneys, brain, liver).

Preeclampsia causes

- **Excessive** secretion of **placental or adrenal** hormones,(lacking proof).

- Some type of **autoimmunity or allergy** in the mother caused by the presence of the fetus. In support of this theory, the **acute symptoms usually disappear** within a few days **after birth** of the baby

- **Insufficient blood supply to the placenta**, resulting in the placenta's release of **substances** that cause widespread **dysfunction** of the maternal vascular endothelium. (increased levels of inflammatory cytokines such as TNF-α and IL-6)


NORMAL
PREECLAMPSIA
Vein
Vein
Spiral artery
Myometrium
Endothelial cells
Blood flow
Trophoblasts
Decidua
Placenta
Fetal blood vessels

NOTES

During normal placental development, **the trophoblasts invade the spiral arteries of the uterine endometrium and completely **remodel** the maternal arteries into much **larger** blood vessels with **low resistance** to blood flow. In women with **preeclampsia**, the maternal spiral arteries **fail to undergo** these **adaptive changes**, for reasons that are still unclear, and blood supply to the **placenta is insufficient**. This insufficient blood supply, in turn, causes the placenta to release various substances that enter the mother's circulation and cause **impaired vascular endothelial function, decreased blood flow to the kidneys, excess salt and water retention, and increased blood pressure.**

Eclampsia

- Eclampsia is an extreme degree of preeclampsia.
- Characterized by:
- Vascular spasm throughout the body.
- Seizures
- Coma
- Decreased kidney output
- Malfunction of the liver
- Extreme hypertension
- High Mortality.
- Treatment: vasodilating drugs, followed by immediate termination of pregnancy (mortality reduced to 1% or less).