UNIVERSITY OF BASRAH
AL-ZAHRAA MEDICAL COLLEGE

Ministry of higher Education
and Scientific Research

REPRODUVTIVE SYSTEM MODULE

Academic year 2025-2026/ S5

SESSION: 3, LECTURE: 1

DURATION: 2 hrs

puberty and menopause

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John E. Hall and Michael E. Hall. Guyton and Hall Textbook of Medical Physiology, 14th Edition, Elsevier, Philadelphia, 2021, ISBN978-0-323-67280-1.

Learning Objectives (LO) :

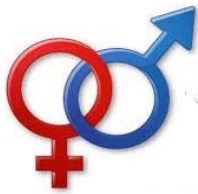
At the end of this lecture you should be able to:

1. Describe the sequence of physiological and anatomical changes that occur in the male and female at puberty.
2. Describe the mechanism underlying such changes at puberty.
3. Describe the hormonal changes which lead to the features of the menopause.
4. List the advantages and disadvantages of hormone replacement therapy in the post- menopausal woman.

The physiological and anatomical changes that occur in the male and female at puberty: (LO1)

- Primary sexual characteristics are established before birth, but the reproductive system is inactive until puberty.

- The age at which puberty takes place varies, but girls begin and end puberty before boys.



Changes In Male At Puberty (Begins 9-14 Years)

(LO1)

Genital development

↓

Adrenarche

↓

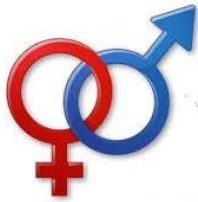
Spermatogenesis

↓

Growth spurt

↓

Adult shape of genitelia and pubic hair



Changes in Female at Puberty (Begins 8-13 Years)

(LO1)

Thelarche

↓

Adrenarche

↓

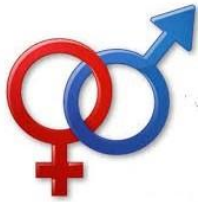
Growth spurt

↓

Menarche

↓

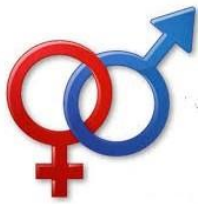
Adult shape



menarche: is the first menstrual bleed in girls at puberty.

Adrenarche: is the Pubic and Axillary hair.

Thelarche: the breast development.



(LO2)

What Are The Mechanism Underlying The Changes At Puberty?

- Puberty is under hormonal control. **(LO2)**
- The start of puberty is associated with a steady rise in FSH and LH secretion.
- In girls, plasma levels of FSH and LH rise gradually from about 7 years of age to reach adult levels at or soon after menarche.
- Plasma oestrogen levels rise steadily, until at the beginning of menstrual cycles,with regular cyclical it will rise and fall.

(LO2)

*In boys, FSH and LH levels rise later, to reach adult levels around 16 years of age, associated with steady rises in testosterone levels.

**In both males and females, weak androgens are secreted from the adrenal cortex.

***The brain initiates puberty.

****Pulsatile GnRH secretion leads to rise in FSH and LH.

Body Weight (LO2)

- **Body weight is the most important factor in the timing of puberty.**

Critical weight is **47kg for menarche.**

* If the body weight falls significantly below this, the reproductive cycle will cease (may be signalled to the brain by Leptins).

Growth spurt start weight is **30kg for girls and 55kg for boys**

Adrenarche Depends on androgens in bothsexes.

Thelarche : Dependant on oestrogen.

Male Genital Development : Dependant on testosterone.

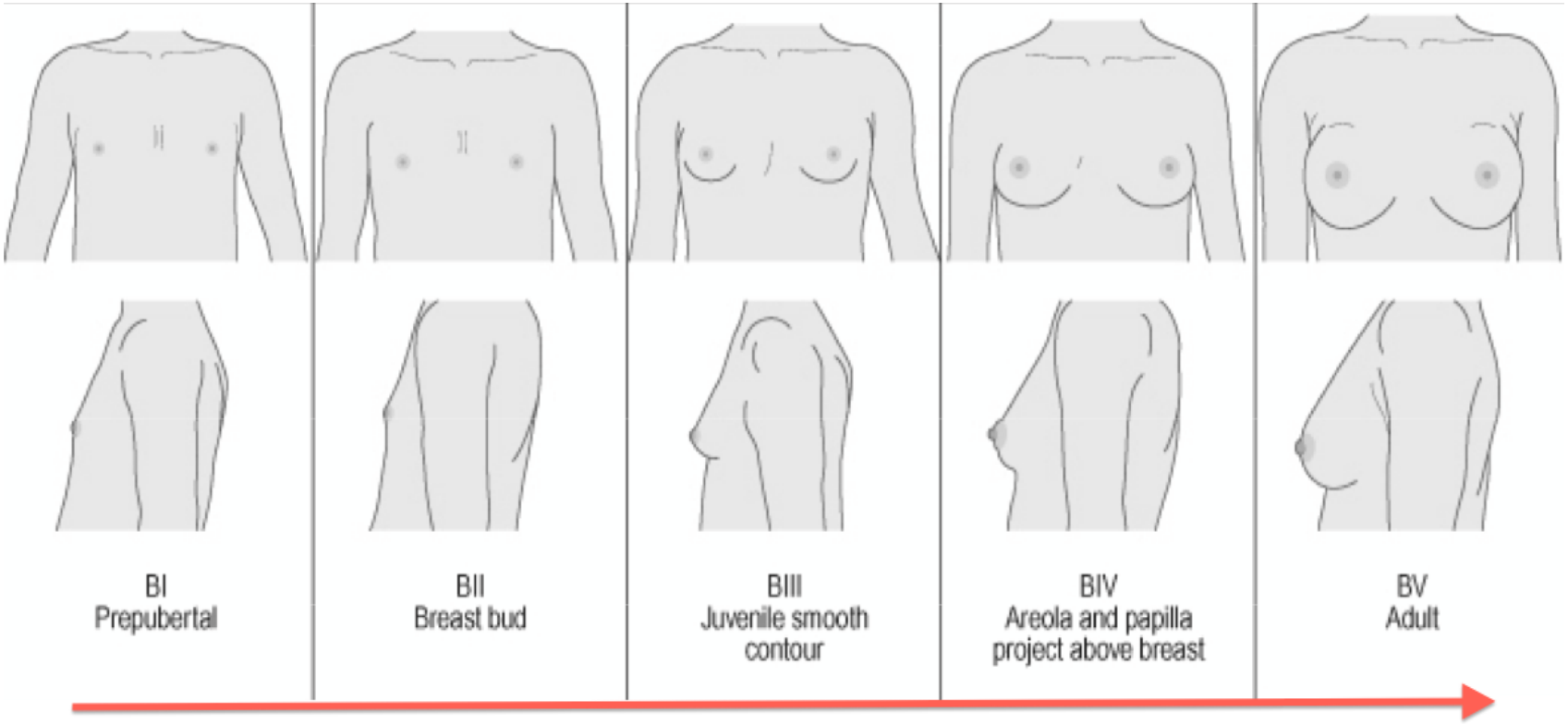
Growth Spurt (LO2)

- Occurs in both sexes, but is earlier and shorter in girls
- Men are larger as growth spurt is longer and slightly faster.
- It Depends on **Growth Hormone** and **Steroids** in both sexes.
- It Ended in both sexes by **epiphyseal fusion.**
- **Oestrogen** closes epiphyses earlier in girls.

** Oestrogen is needed to initiate the growth spurt, but once levels reach a certain point it causes the epiphyses to fuse.

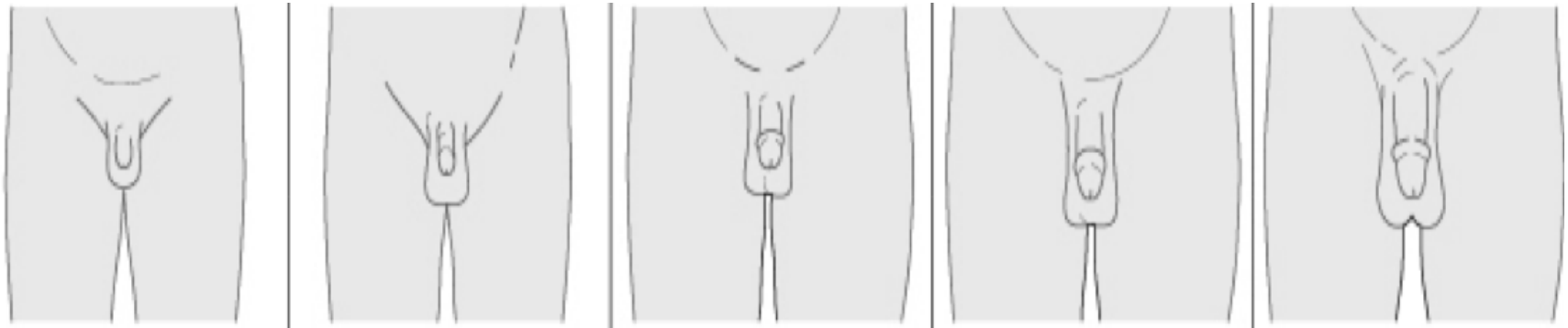
Tanner's staging (LO2)

- Pubertal development was described by Tanner.
- It depends on the stage of breast, genitals and pubic hair development.
- it ranges from 1 to 5.



Breast Development

Female Pubic Hair Development



GI
Preadolescent

GII
Lengthening of penis

GIII
Further growth in length and circumference

GIV
Development of glans penis, darkening of scrotal skin

GV
Adult genitalia

Development of male Genitalia

PHI
Preadolescent
No sexual hair

PHii
Sparse, pigmented, long, straight, mainly along labia and at base of penis

PHiii
Dark, coarser, curlier

PHiV
Filling out towards adult distribution

PHV
Adult in quantity and type with spread to medial thighs in male

Development of Male Pubic Hair

Precocious Puberty

(LO2)

- Most parts of the reproductive system can work **before the normal age of puberty**.
- But they did not do so because **hormone levels are too low**.
- This is a result of **low GnRH secretion**.

- **Precocious Puberty mean** The development of the signs of puberty **before the age of 8 in Girls or 9 in Boys**.

TYPES: (LO2)

1-True (centeral): due to neurological causes.

Early stimulation of central maturation giving early inappropriate GnRH secretion.

The cause of the majority is unknown, but they can be due to neurological causes like **Pineal tumours, meningitis.**

2-psudo (peripheral): uncontrolled Gonadotrophin or steroid secretion like **hormone secreting tumours.**

(LO2)

Diagnosis

1.history &examination

US

GnRH stimulation test

MRI

Hormonal assay

(LO2)

Treatment

Explanation & reassurance in idiopathic causes

- Stop the causative drug
- GnRH agonist
- removal of tumour

Delayed puberty

means the physical signs of puberty don't appear at the expected age.

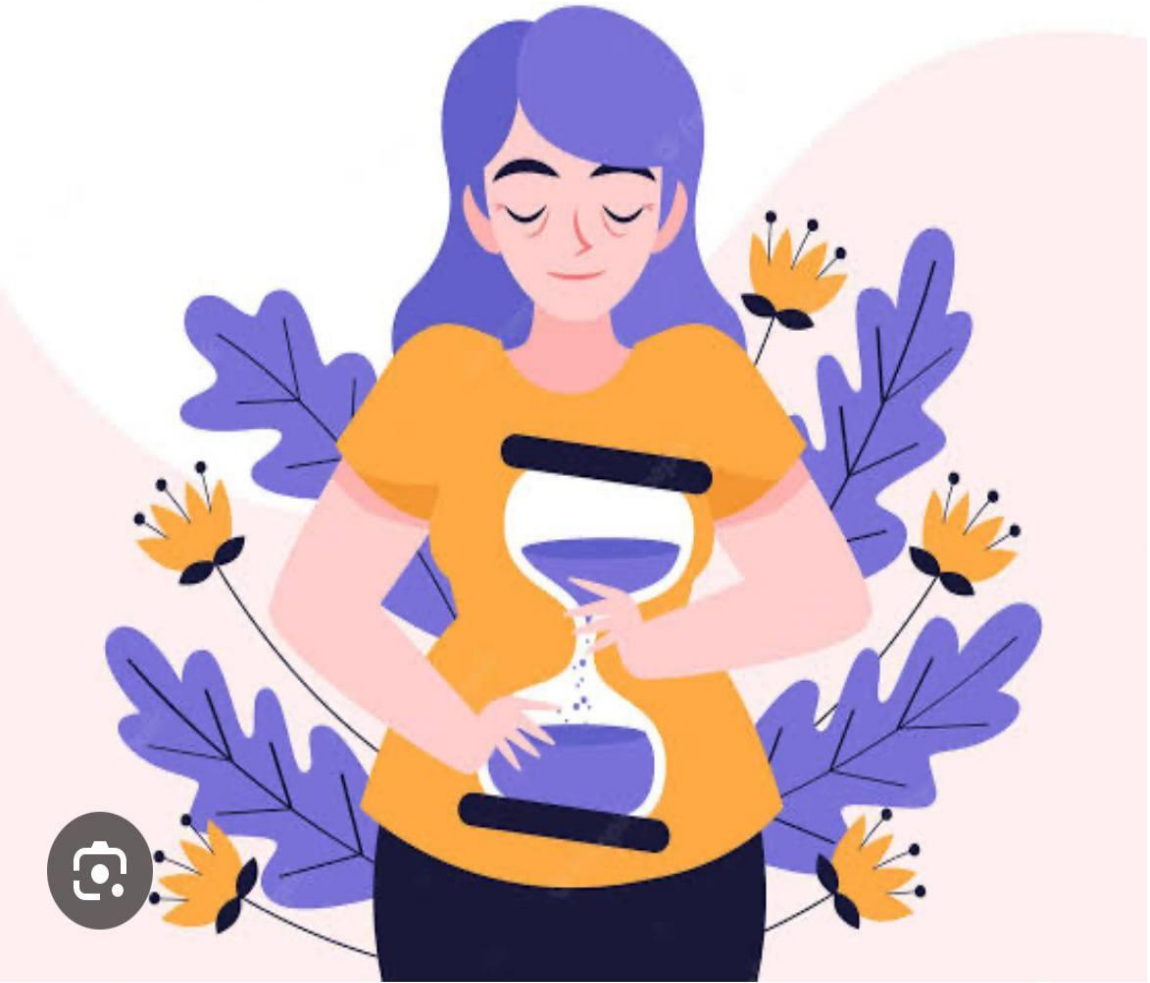
- **In boys:** No testicular enlargement by **age 14**.

- **In girls:** No breast development (Tanner stage 2) by **age 13**.

  Or no menarche (first period) by **age 16**.

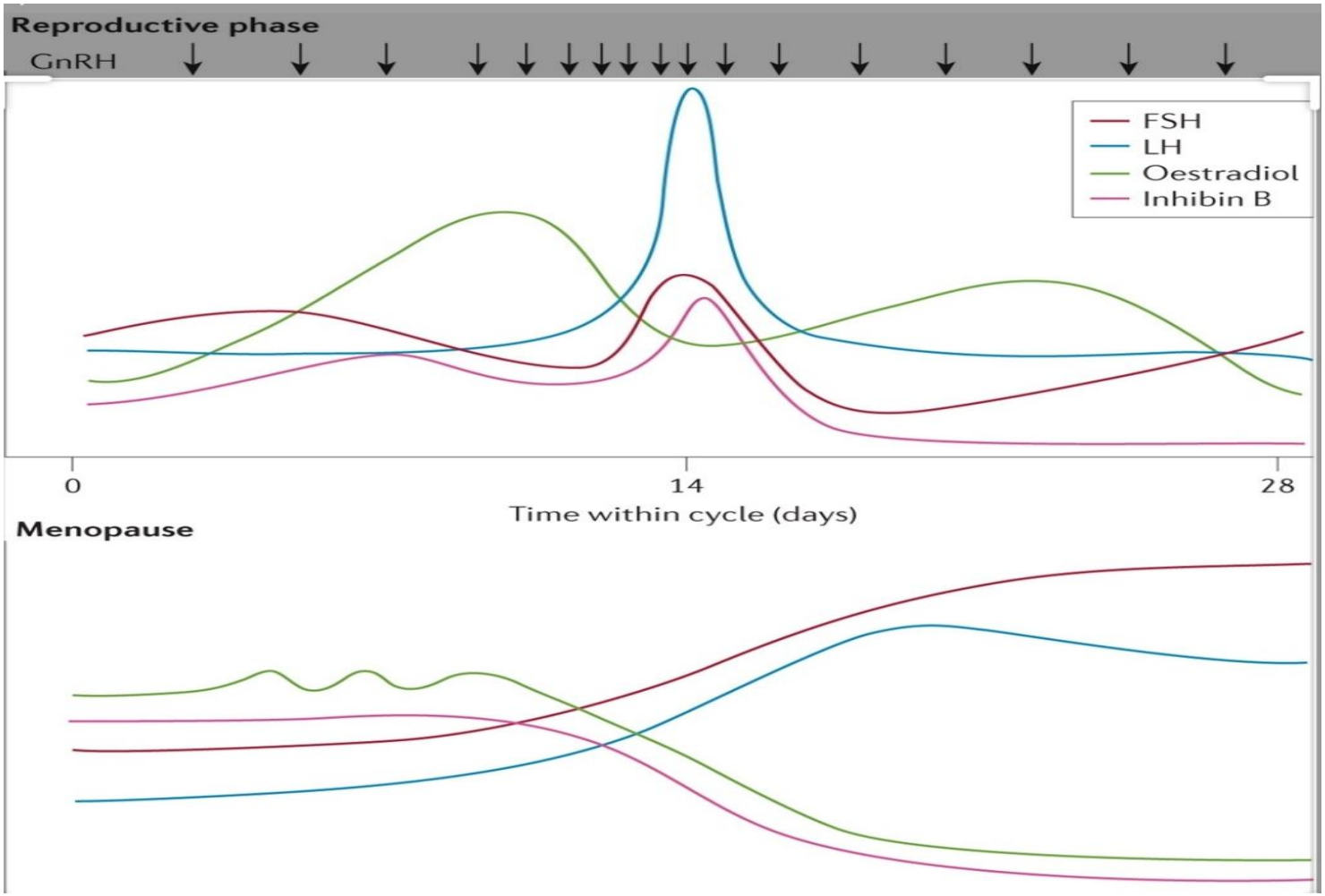
MENOPAUSE

(LO3)



End of Reproductive Life in Females (Climacteric)

Hormonal Changes that lead to the features of the menopause



Pre-Menopause

(LO3)

- > 40 years
- Changes in the menstrual cycle, Follicular phase shortens, with ovulation early or absent.
- **Less oestrogen secreted**, Less negative feedback, so **LH and FSH levels rise.**

  FSH rises more due to loss of Inhibin too.
- Reduced fertility, though still possible to get pregnant.

Menopause

(LO3)

Cessation of menstrual cycles.

Average age 51, but varies.

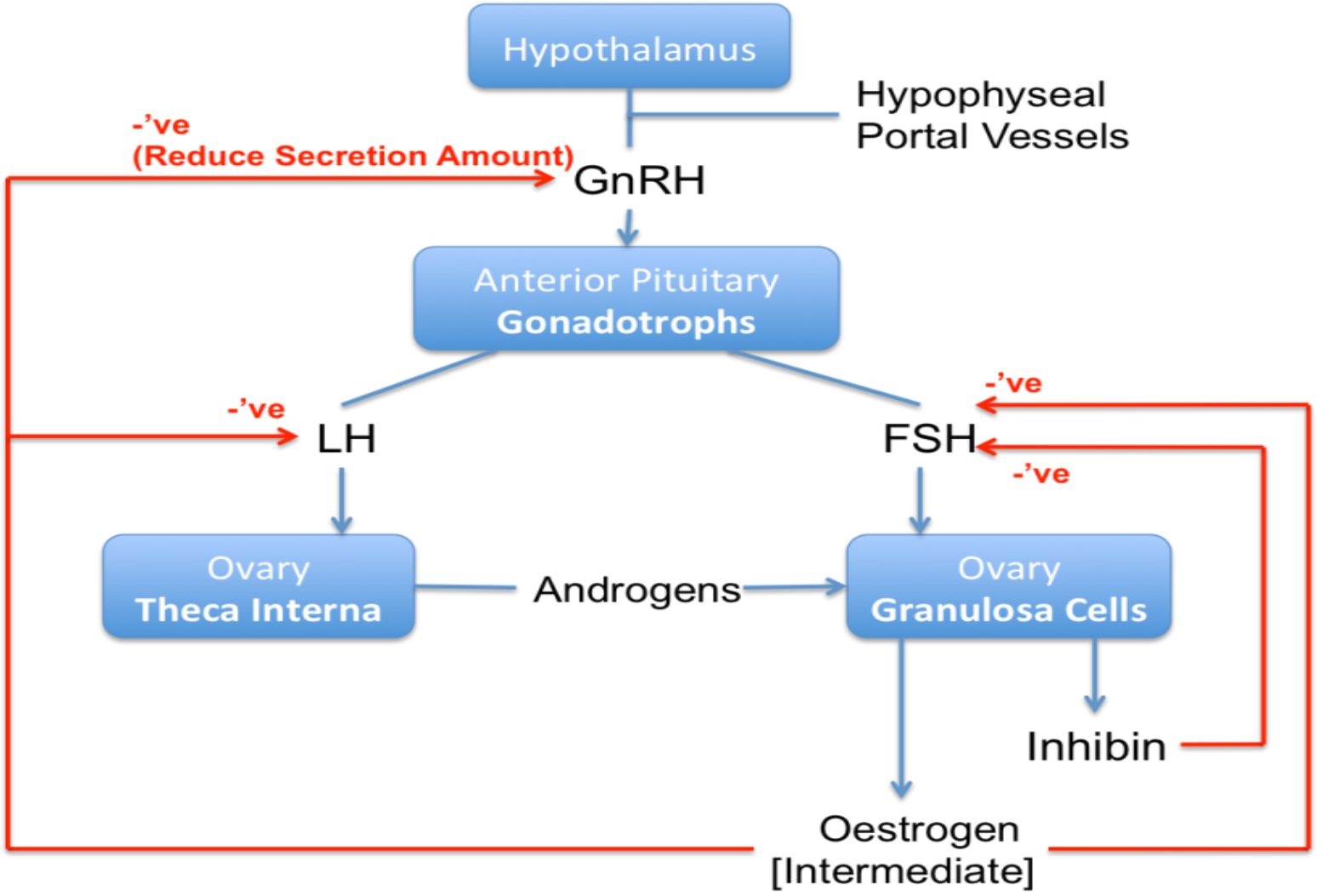
Female has run out of follicles.

Oestrogen levels fall dramatically, Less negative feedback, so LH and FSH levels rise.

FSH rises dramatically due to loss of Inhibin too.

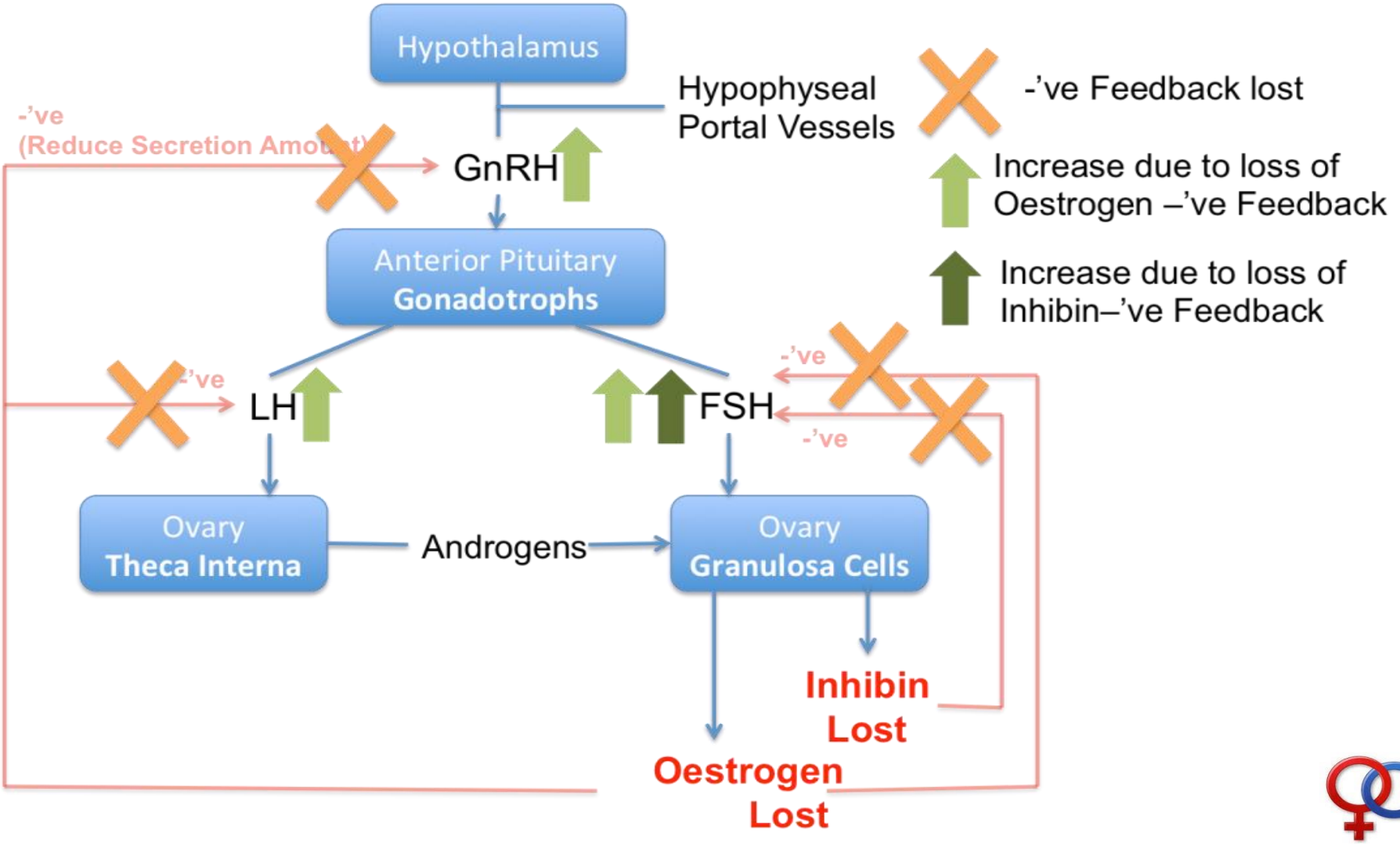
Antral Stage (Early + Middle Folliclar)

(LO3)

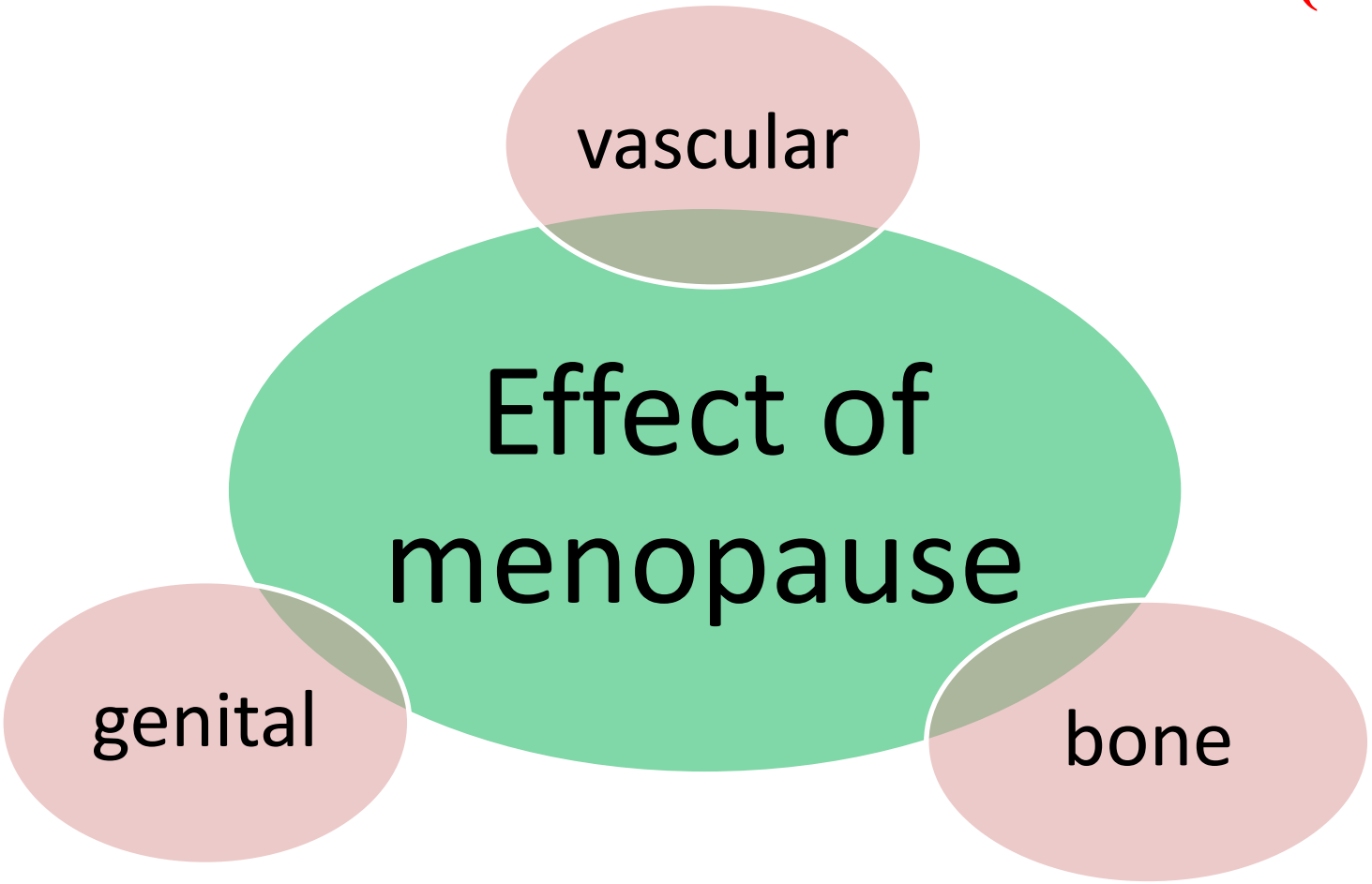


Menopause

(LO3)



(LO3)



Vascular: (LO3)

- Hot flushes affect ~80% to some degree.
- Transient rises in skin temperature and flushes.
- Relieved by **Oestrogen treatment.**

  *So must be due to decrease in oestrogen.

Oestrogen Sensitive Tissues: (LO3)

- **Uterus:** Regression of endometrium
  Shrinkage of myometrium
  Shrinks away into a very small organ
- **cervix:** thinning of cervix
- **Vagina:** rugae loss, Thinner, less distensible
- **Breast:** Involution of some breast tissue
  Changes in skin
- **Bladder:** Reduction in bladder tone

(LO3)

Bone:

- Bone mass reduces by **2.5% per year for several years.**
- Increased resorption relative to production leading to Osteoporosis.
- Much greater in some than others.
- Major reason for fractures in later life.
- Can be limited by **Oestrogen** therapy.

Hormone Replacement Therapy HRT

(LO4)

Advantages:-

- Relieves symptoms of the menopause.
- Easy administration Orally or topically by patch or gel.
- Can limit osteoporosis, but no longer recommended for first line protection (Bisphosphonates now recommended).
- Not advised for cardio-protection .

Hormone Replacement Therapy HRT

(LO4)

Disadvantages:

* HRT increases risk of malignancy due to the effect of estrogen specially endometrial and breast malignancies.

** It has some risk of DVT.


Thank you!