

Morphology and histology of the penis



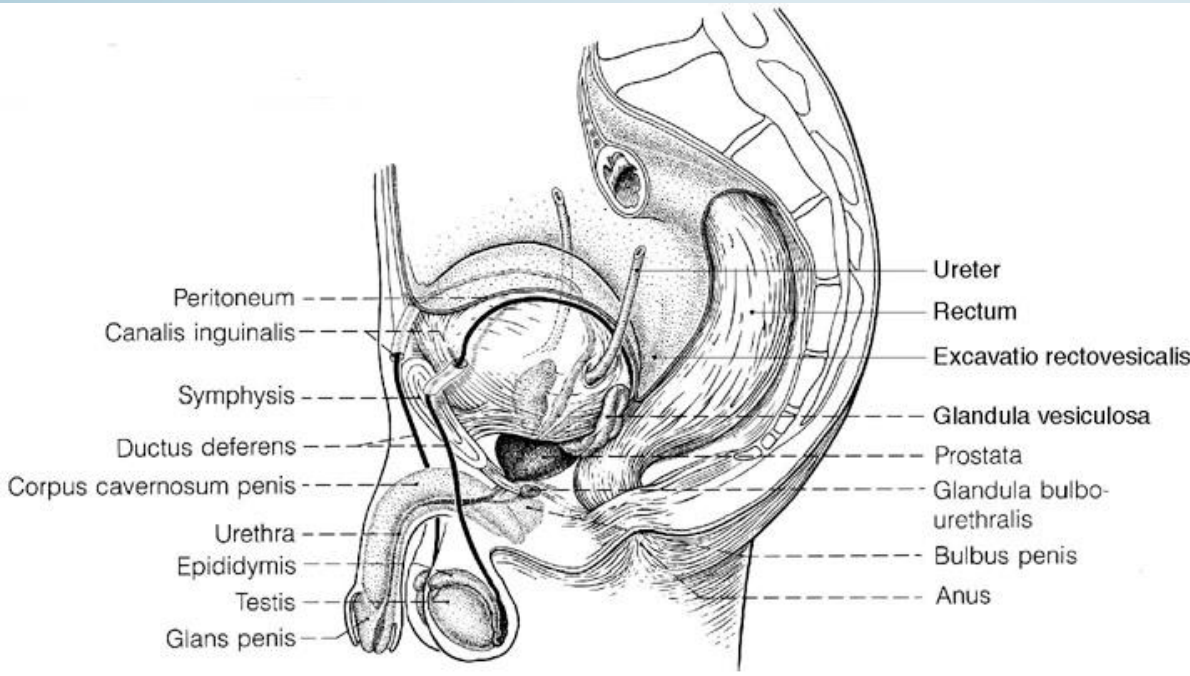
Michelangelo Buonarroti: David, 1501.

Ph.D, M.D. Dávid Lendvai
Anatomy, Histology and Embryology Institute
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"See the problem is, God gave man a brain and another important organ, and only enough blood to run one at a time..."

- R. W

MALE GENITAL SYSTEM - SUMMERY



male genital gland= testis

- spermio/spermatogenesis
- hormone production

male genital tracts:

epididymis

vas deference (ductus deferens)

ejaculatory duct

- sperm transport
- secretion

3 additional genital glands:

seminal vesicles

prostate

Cowper-glands (bulbourethral gl.)

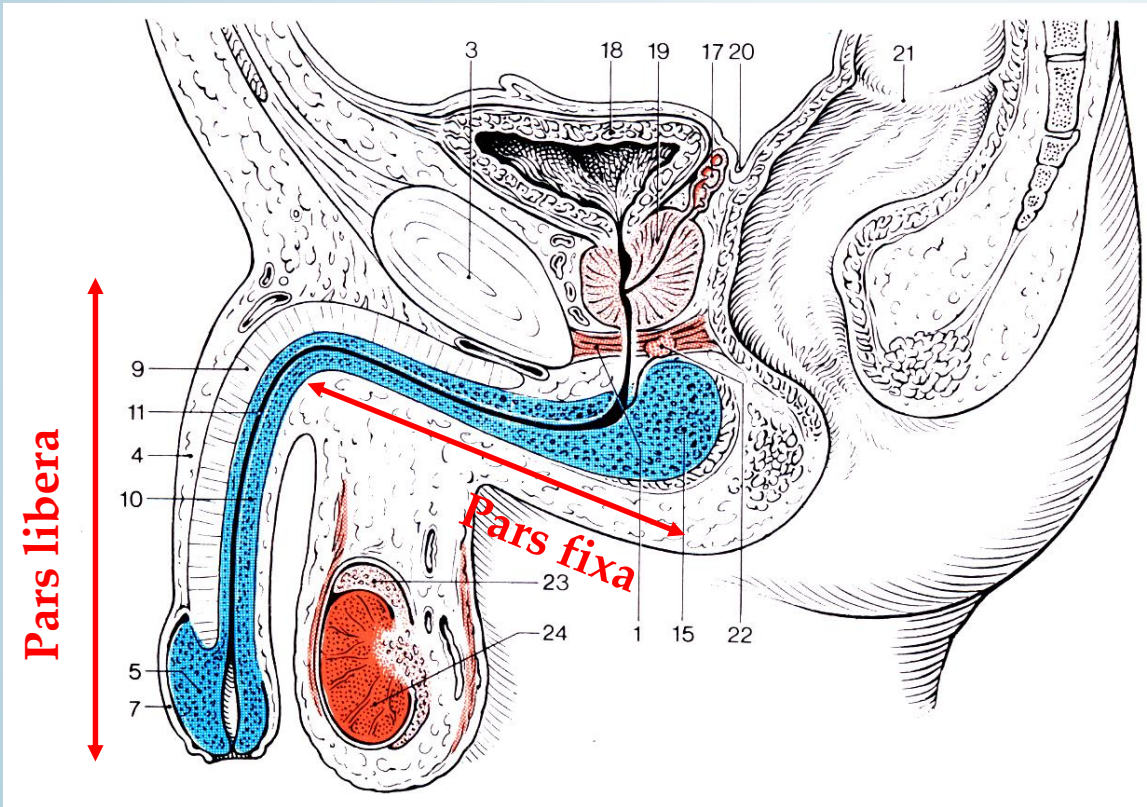
- secretion

4 Penis:

•copulating organ

•male urethra

PENIS



Pars fixa (perineal) penis:

Attached to the pubic bone
Bulb and crura penis

Pars libera (pendula) penis:

Corpus + glans of penis
resting ~ 10 cm
erection ~ 16 cm

Pars fixa penis

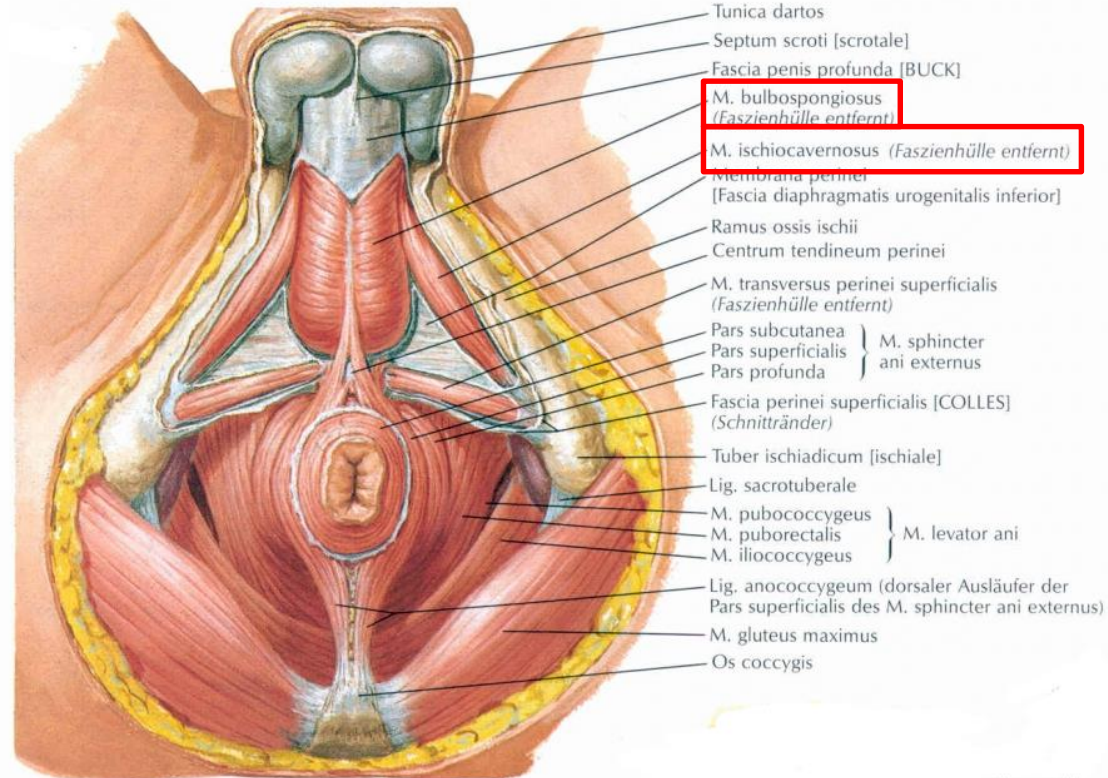
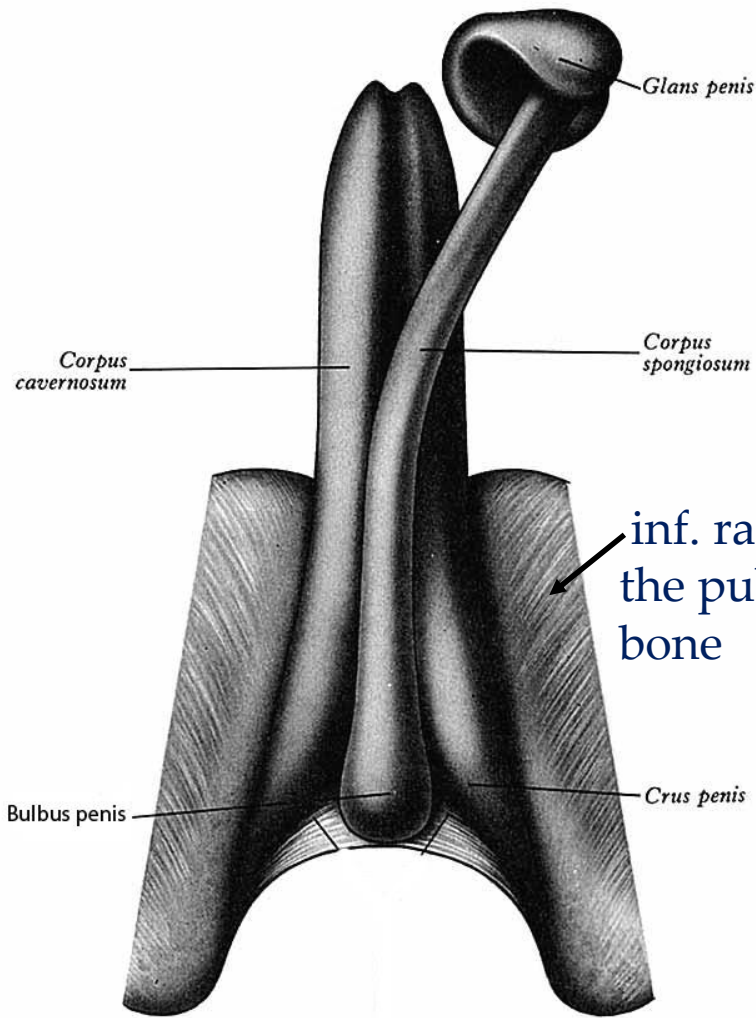
Radix penis:

Bulb of the penis:

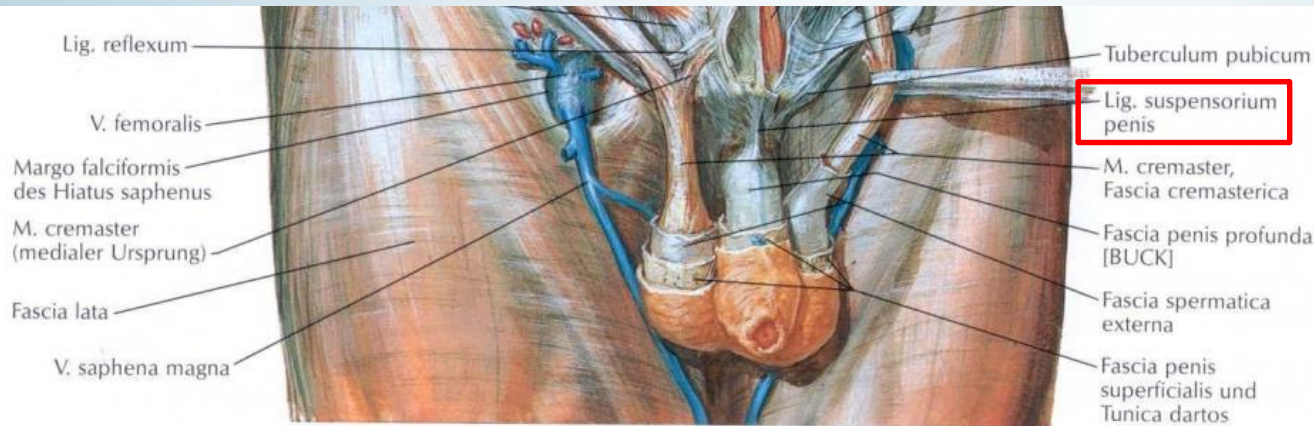
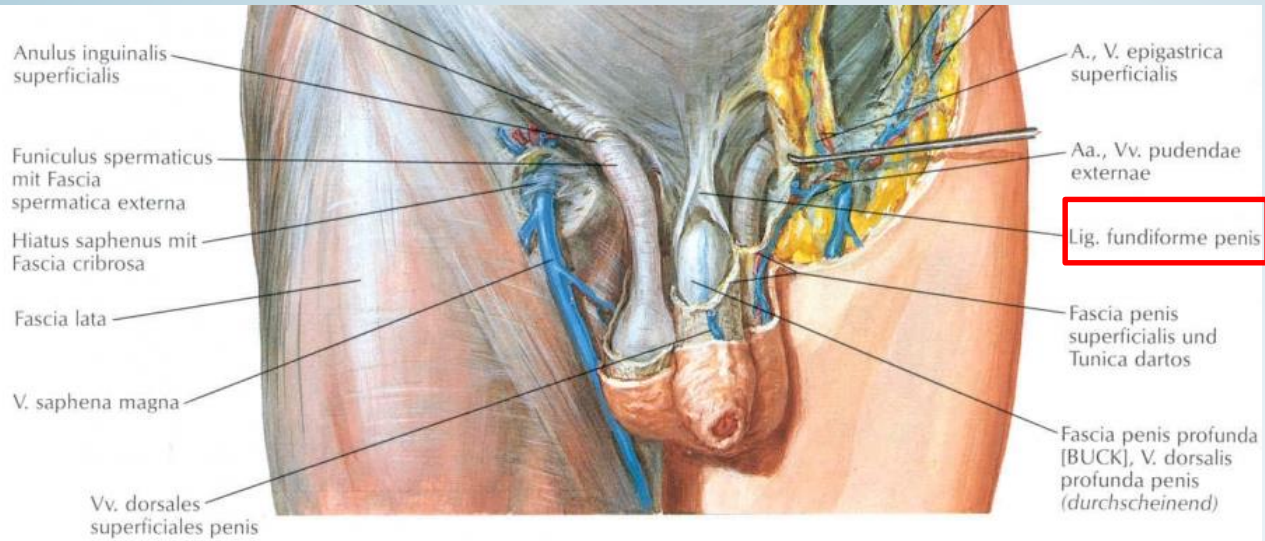
- pierced by the urethra
- covered by the bulbospongiosus m.

Crura penis:

- fixed on the inf. ramus of the pubic bone
- covered by the ischiocavernosus m.



Penis – connective tissue

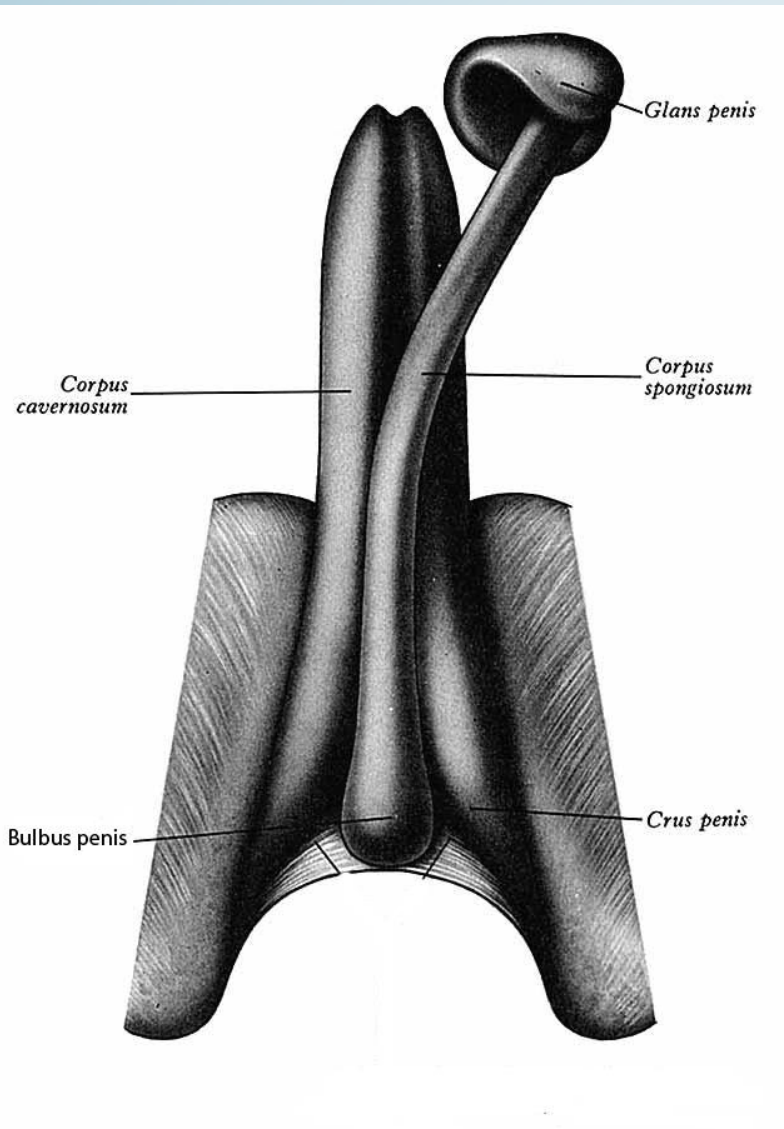


At the fixa p. and libera p. transition

fundiforme lig. penis: superficial, to the linea alba, to the spf. abdominal fascia

suspensorium lig. penis: deep, triangular, to the symphysis

PENIS – ERECTILE BODIES

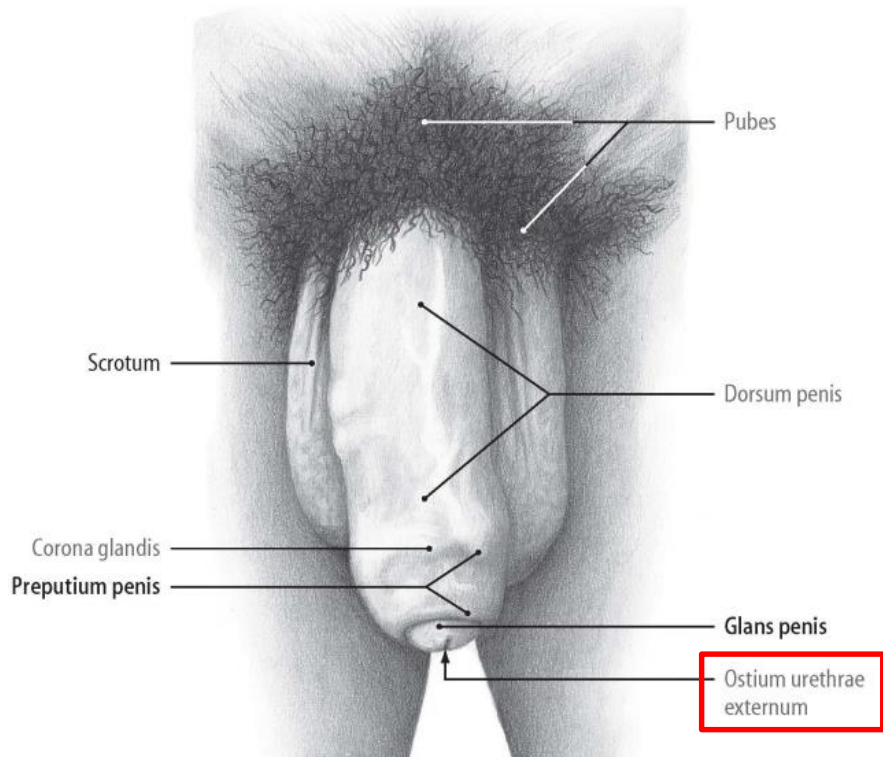


2 corpora cavernosa penis

1 corpus spongiosum penis (urethrae) → ends with the glans penis

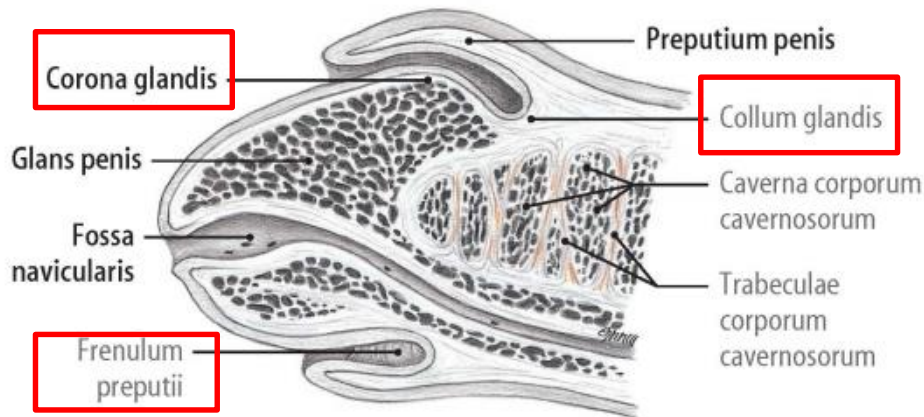
Libera part pendula = corpus penis + glans penis

PENIS



Ostium urethrae ext.:

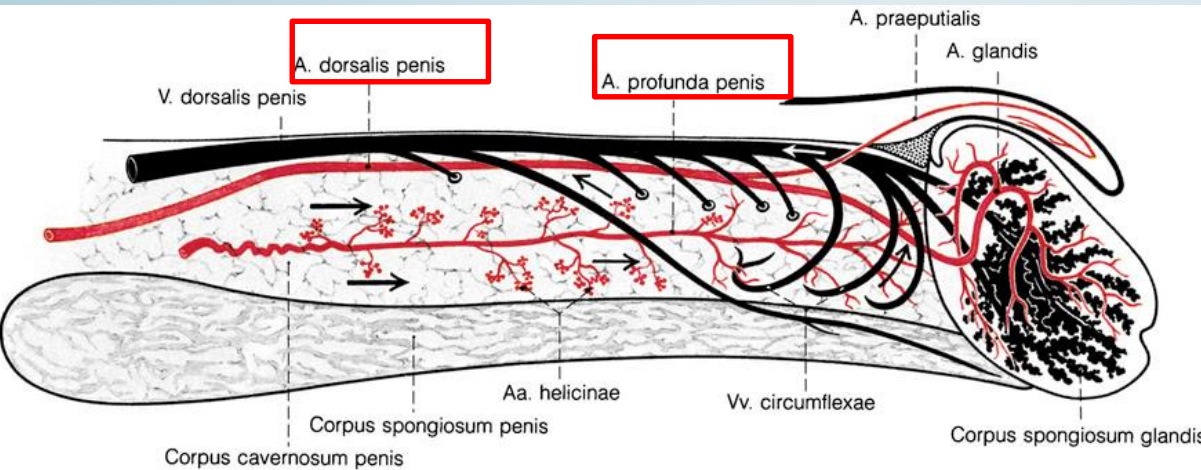
- at the glans penis
- Vertical, fissure-like opening



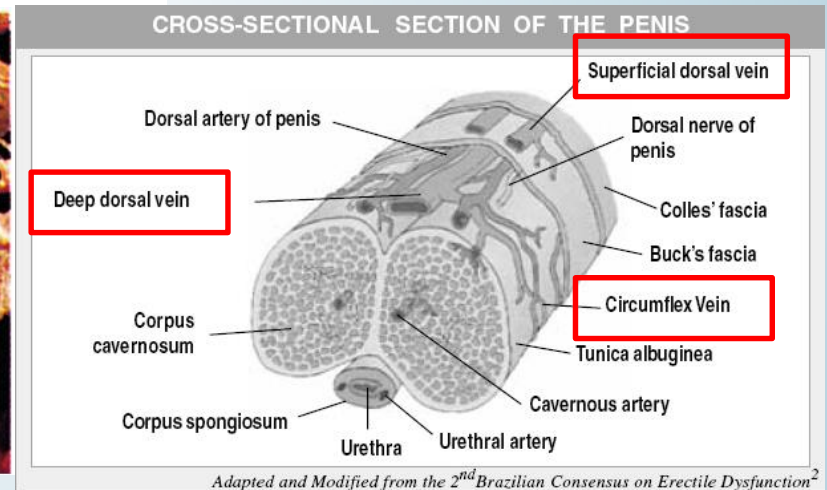
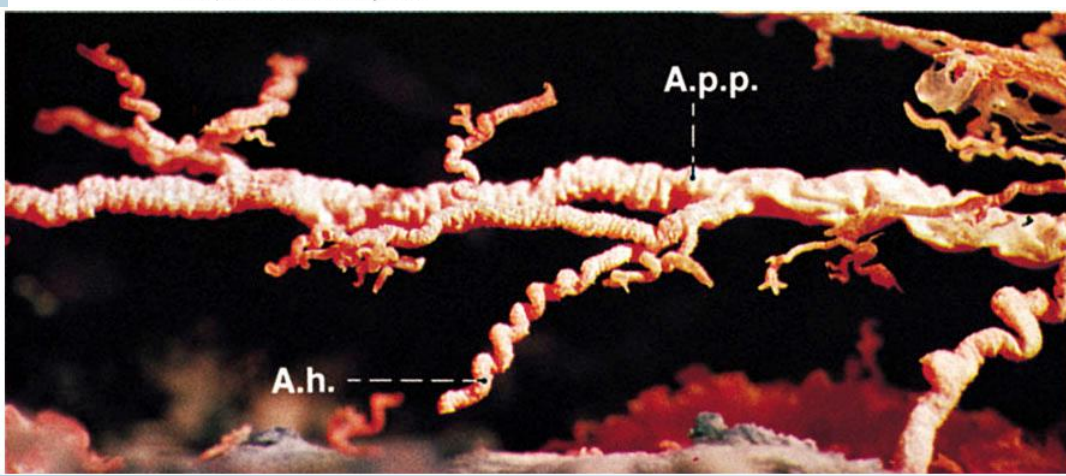
foreskin (Preputium):

- glans > 2/3 covered during the ejaculation it's a reserve plate
- fixed by the frenulum and around the coronal groove of the glans

BLOOD SUPPLY OF THE PENIS



int. pudendal A. → dorsal penis A.
 bulbos penis A.
 profunda penis A. (A. p. p.)
 ↓
 helicinae Aa. (A. h.), smooth m. cushions!
 ↓
 Cavernous erectile bodies



Adapted and Modified from the 2nd Brazilian Consensus on Erectile Dysfunction²

Veins: lot of valves
 dors. sup. V. → Ext. pudendal V., femoral V.
 dors. prof. V.
 Bulb Of penis V.
 Deep vv. Of penis } → Int. pundental V.

VESSELS OF THE PENIS - ANGIOGRAM

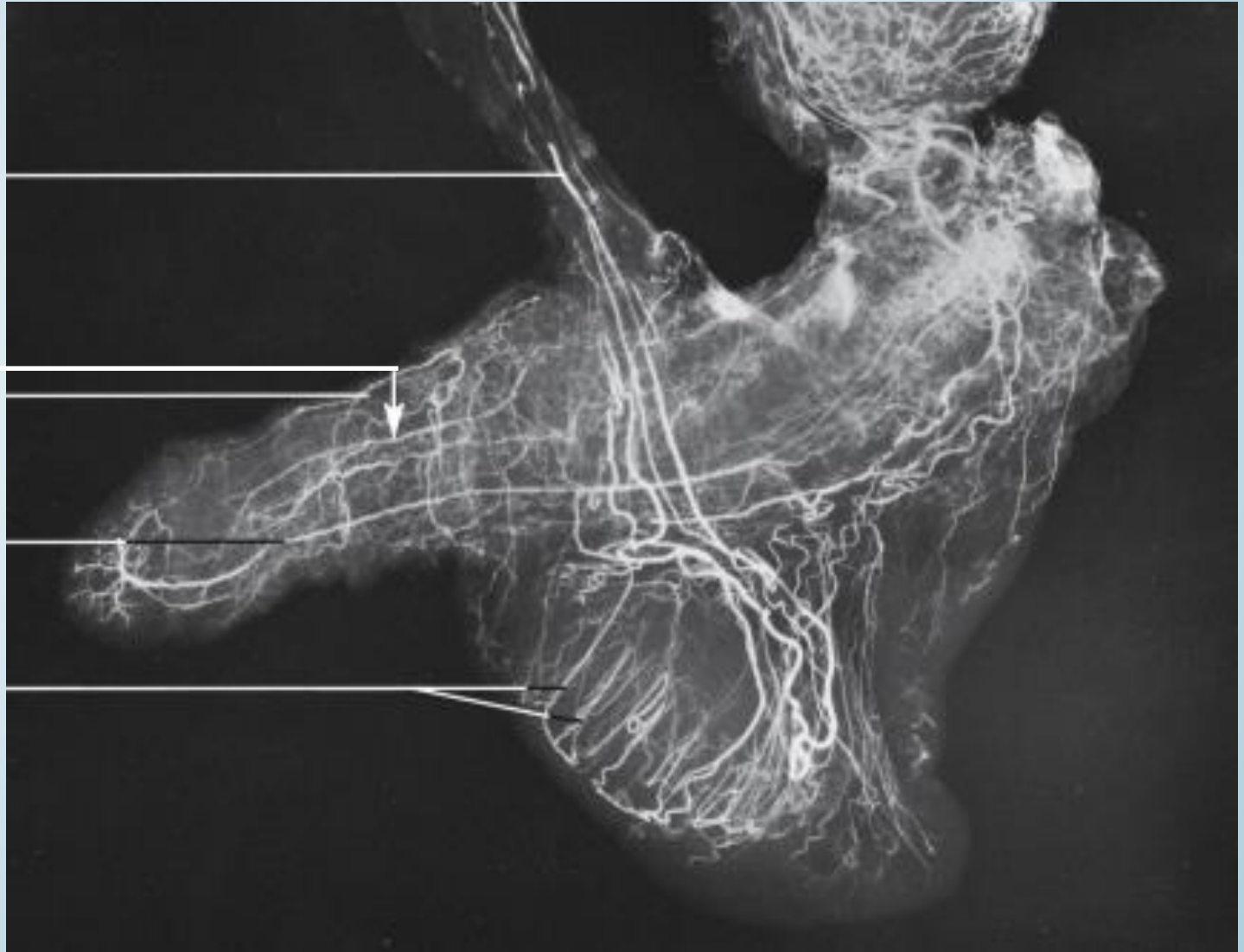
Testicular A.

Deep A. of the
penis

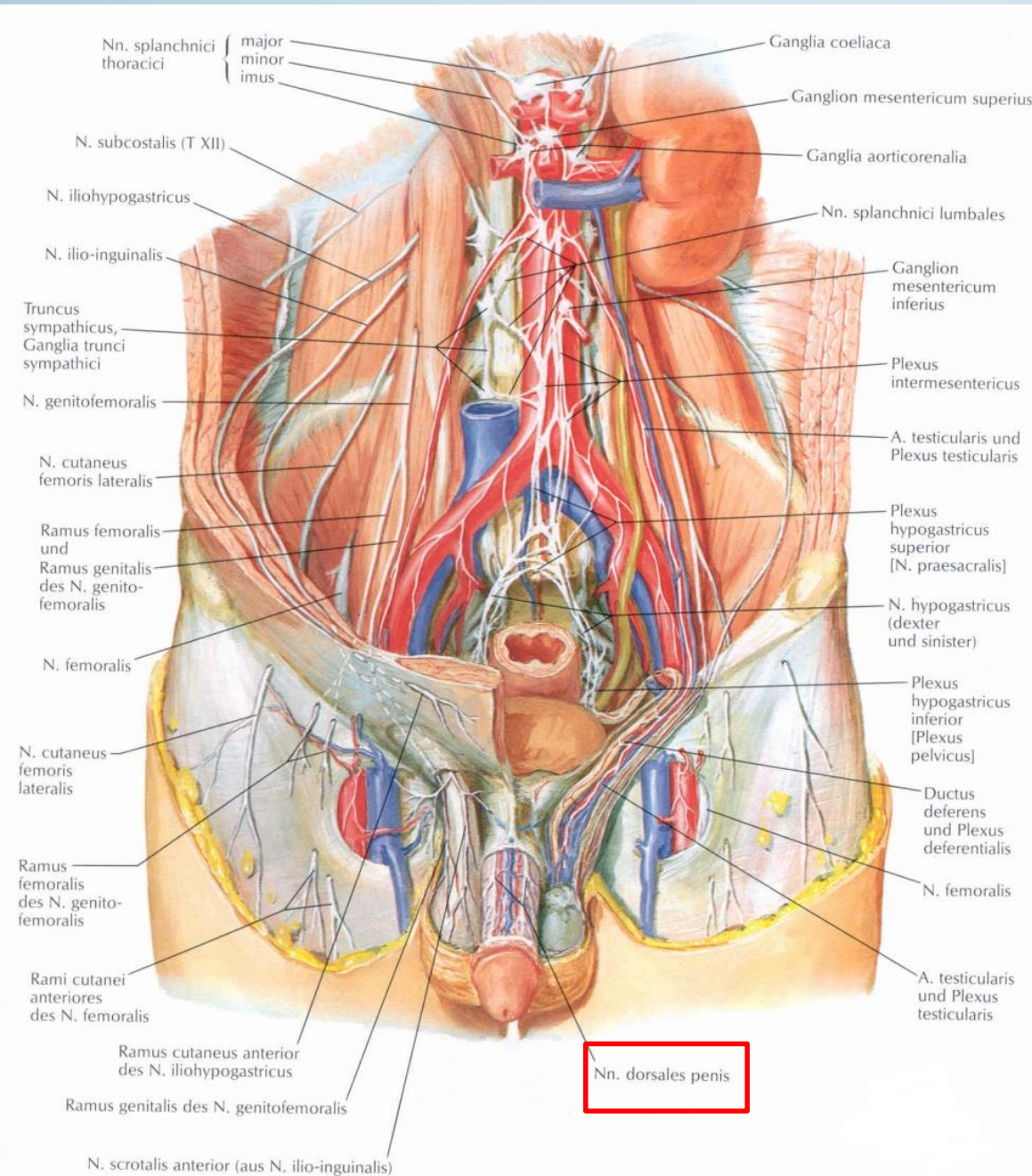
dorsalis penis A.

Bulbar A. of the
penis

Loops in the
septum of the
testis



NERVES OF THE PENIS



Sensory innervation:

pudendal n. → dors. penis n.

Free nerve endings

Ruffini-bodies

Autonomic innervation (vessels):

aortic plexus

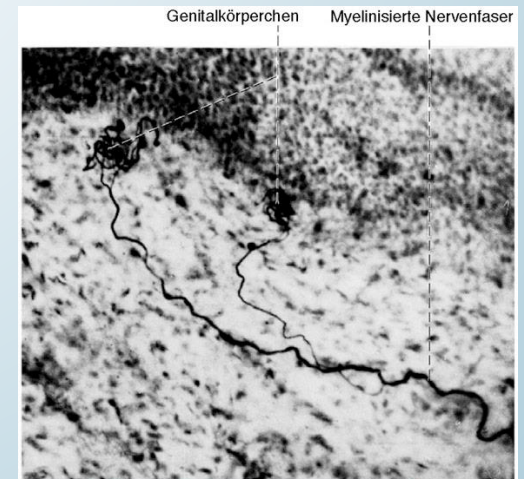
hypogastric plexus

Sympathetic fibers: constriction,

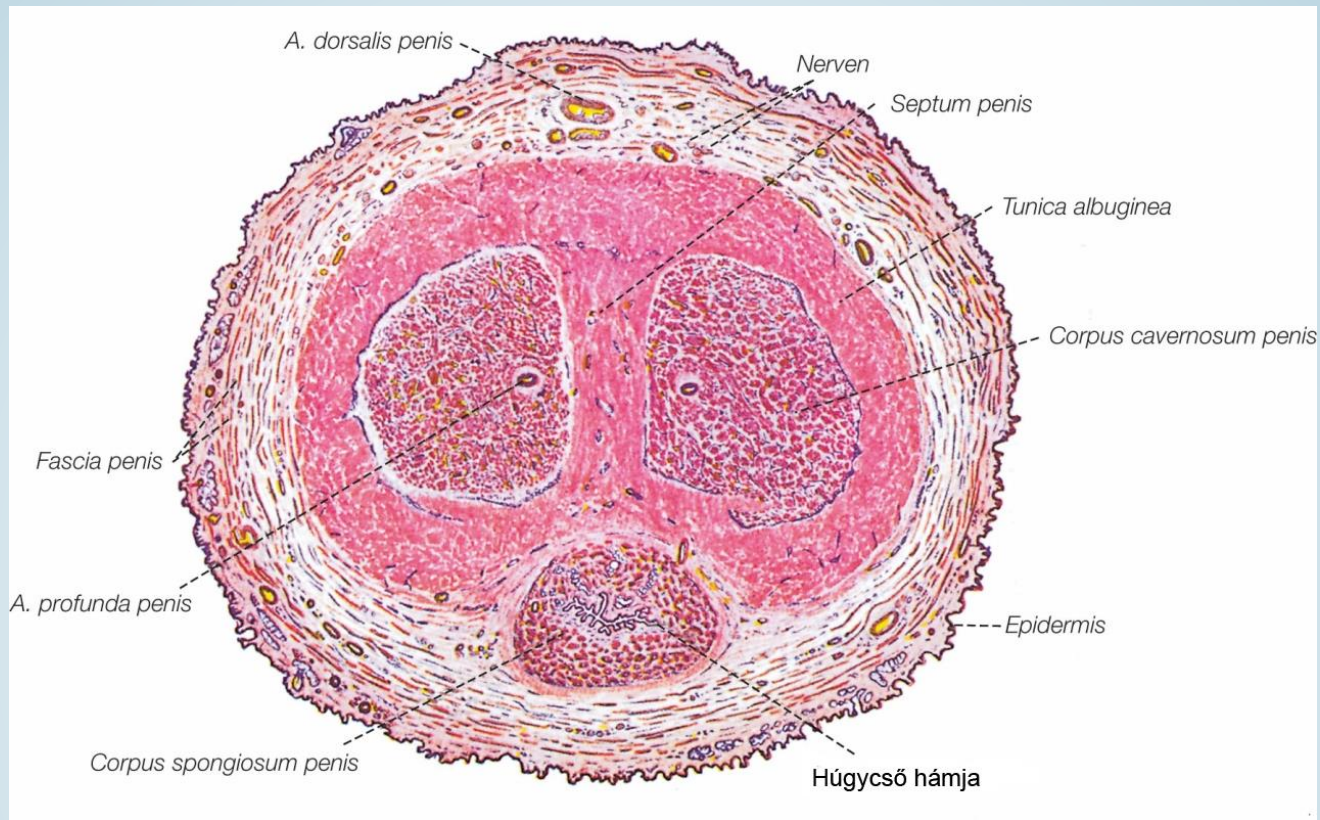
L1-3

Parasympathetic fibers:

vasodilation, S2-4



PENIS - HISTOLOGY



Skin:

Thin, rich innervation, subcutaneous CT doesn't exist

On the preputium, glans: weakly keratinised

Free sebaceous glands → smegma

Tunica dartos: lot of smooth m.

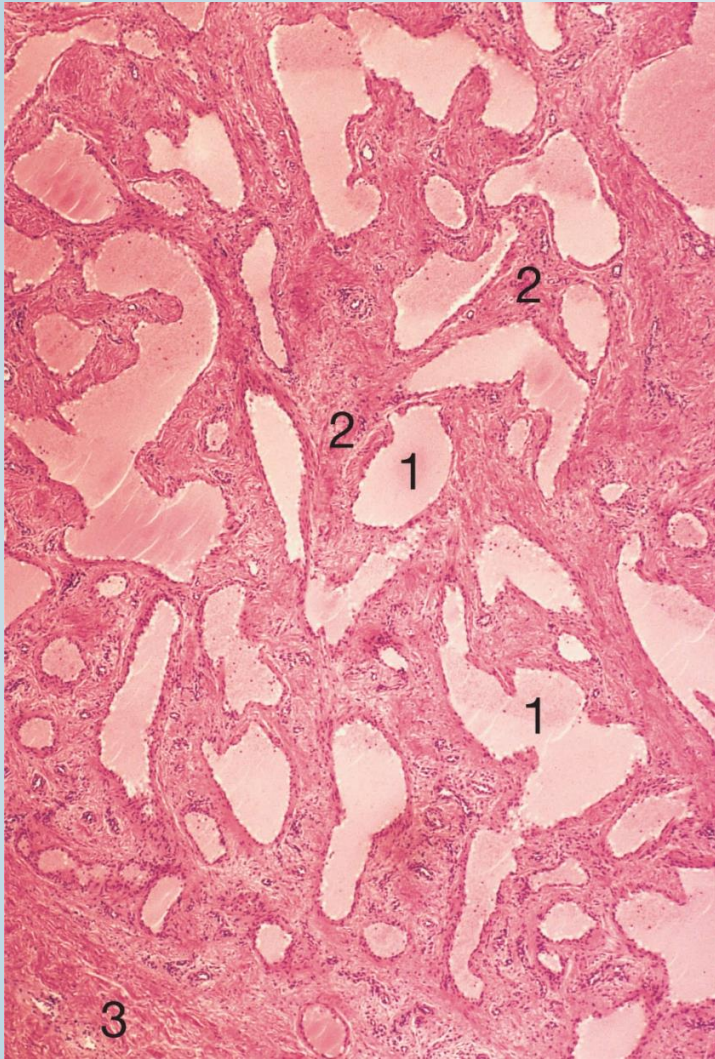
Fascia penis → flexible skin

Tunica albuginea:

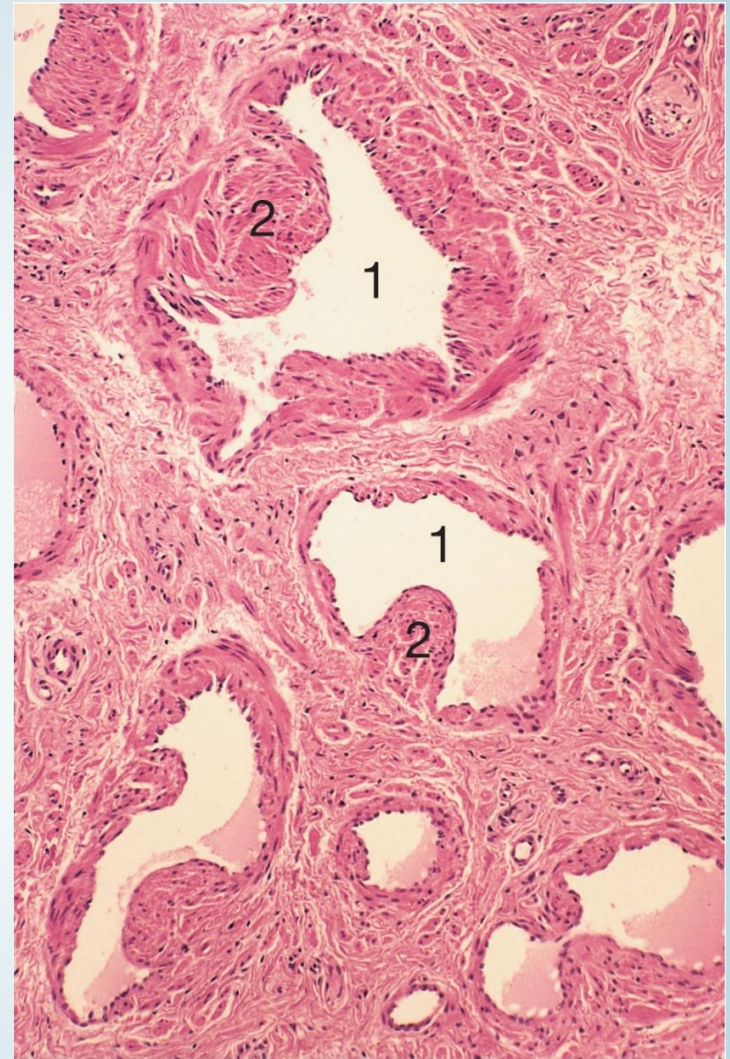
Corpora cavernosa, on the pectiniforme septum tick

Around the C. spongiosum weak

ERECTILE BODIES - HISTOLOGY



C. cavernosum: caverns, veins are passing through the tunica albuginea
smooth m., intima cushions in the helicine
Aa. are closed, in resting condition



C. spongiosum: venous plexus around the urethra
intima cushions in the veins
Rich blood supply in resting condition

MALE URETHRA

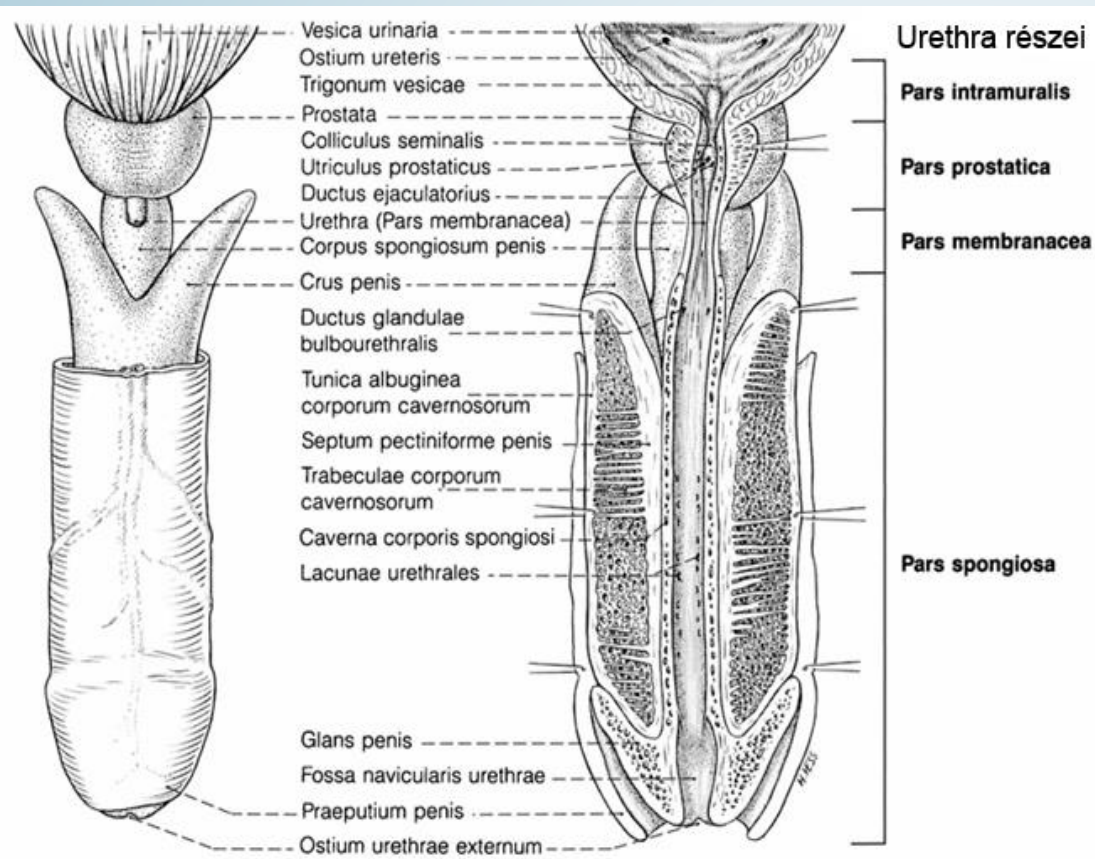
20 cm

1 intramural p.: urethral crest
here: int. sphincter m. of the urethra
(Smooth m.)

2 prostatic p.: 3,5 cm
seminal colliculus
prostatic utricle (Müllerian - duct)
ejaculatory ducts
15-20 prostatic ducts
Horseshoe like lumen

3 membranous p.:
Passes through the urogenital diaphragm
here: ext. sphincter m. of the urethra
(Skeletal m.)

4 spongiosal p.: 15 cm
Ampulla urethrae (wide) ← Cowper-gl.
urethral gl. with lacuna (mucous, Littre)
Fissure like lumen
navicular fossa



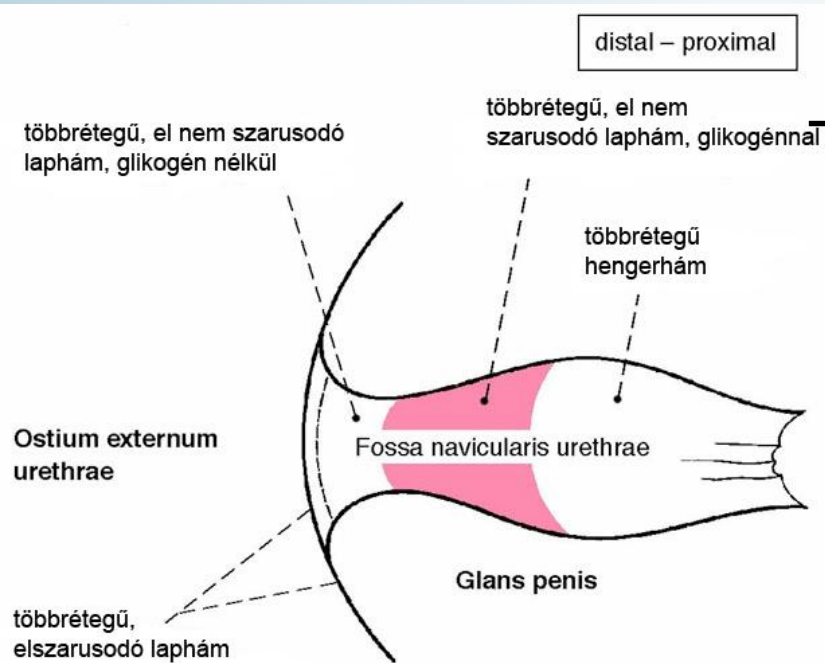
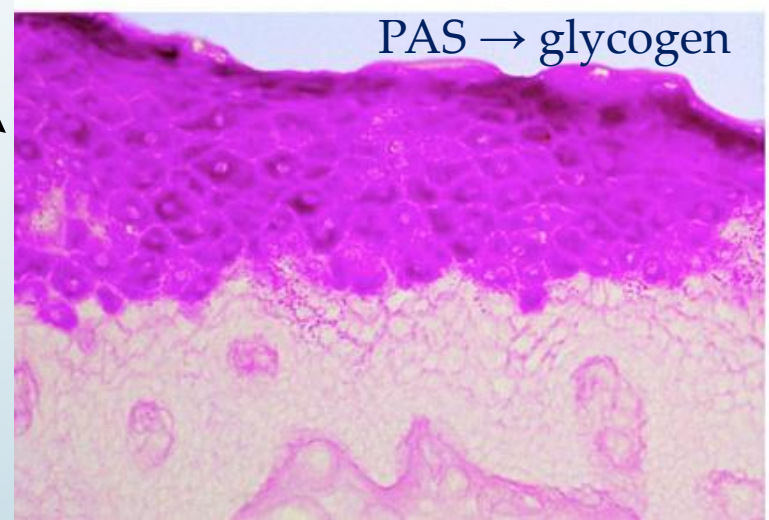
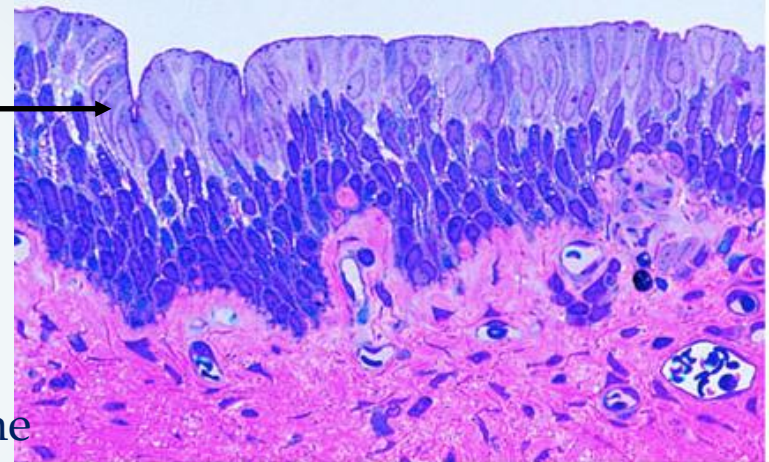
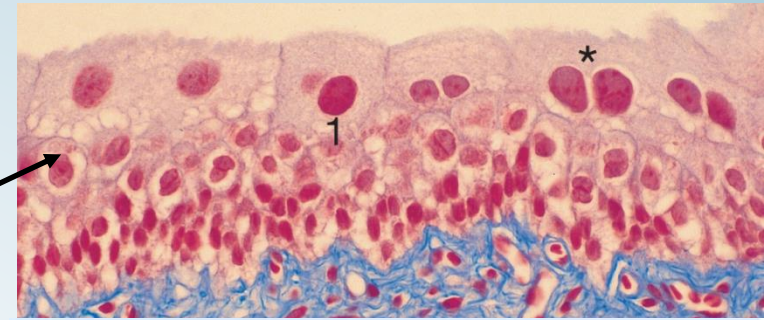
MALE URETHRA – MUCOSA

Till the seminal colliculus: urothelium

Till the navicular fossa: stratified columnar

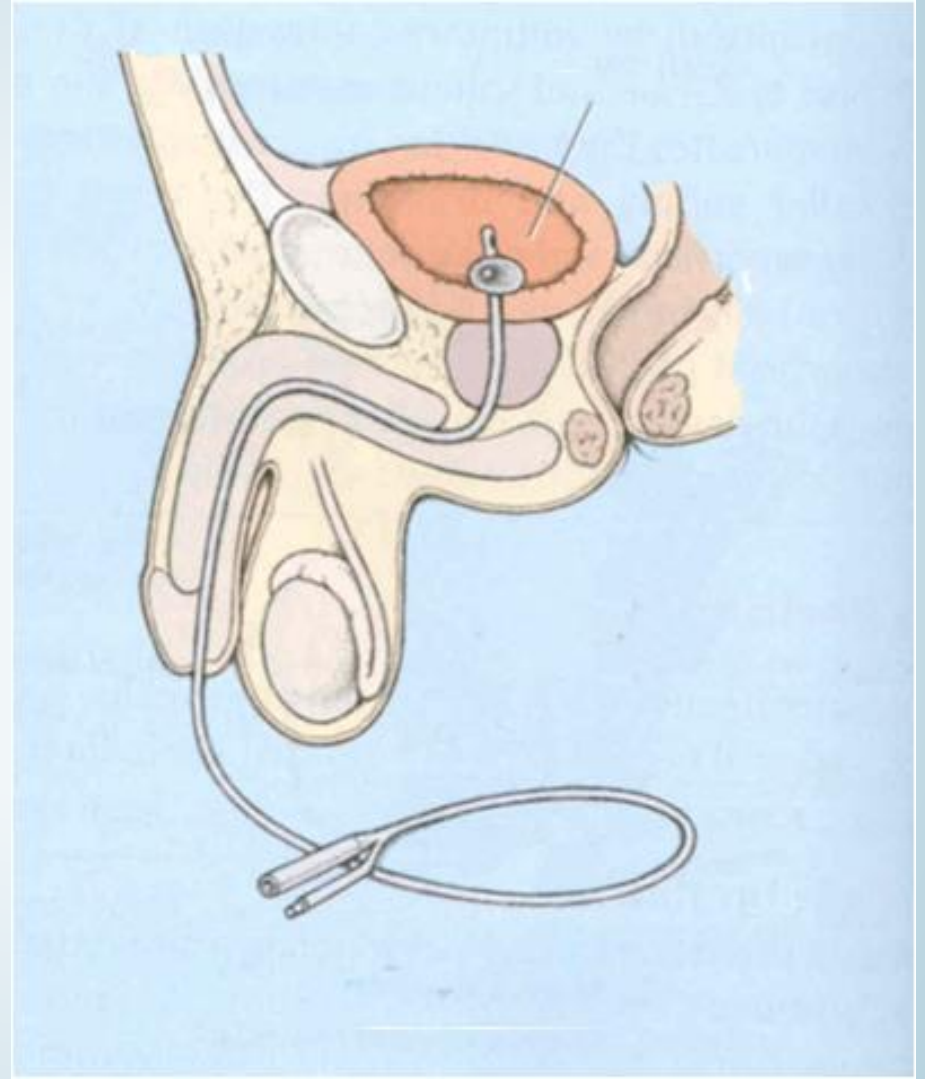
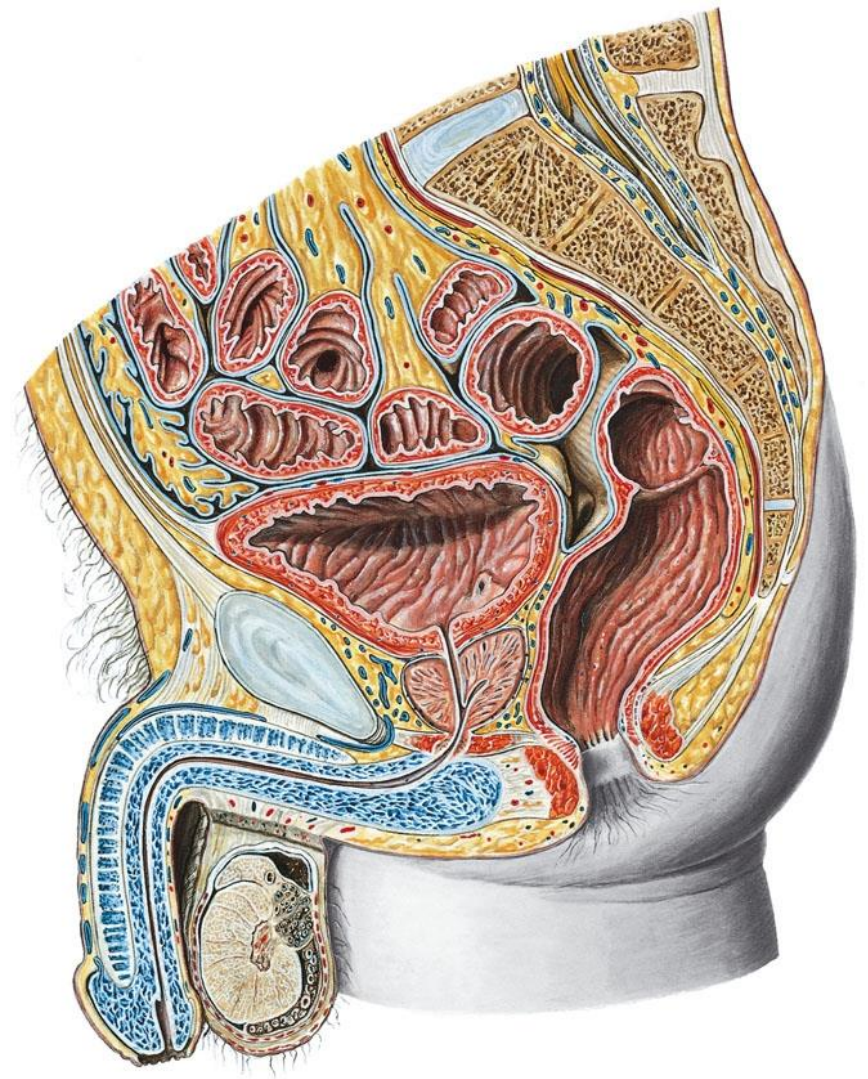
epithelium, from the navicular fossa:
stratified squamous non keratinised →

keratinised squamous



Defending zone

CATHETERIZATION



curvatures of the urethra

2 cm from the ext. urethral ostium: horizontal mucosal plica

MALE SEXUALIS REACTION - ERECTION

Erection: nervous system-controlled hemodynamic episode in which the penis becomes firm, engorged, and enlarged.

Touch, mechanical stimulation of the penis (reflexogenic)

Erotic pictures, sounds, scents

(central or psychogenic)

Sleep in the REM phase (Nocturnal)

Impotence - erectile dysfunction

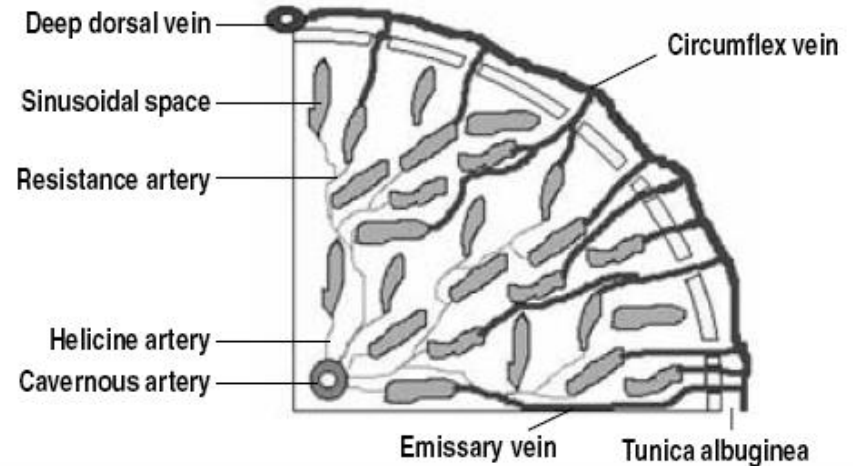
Erection – parasympathetic mechanisms

RESTING: VIA THE CONTRAHATED HELICINE AA. THERE IS A MINIMAL FLOW → VENOUS DRAINAGE IS OPEN, UNINTERRUPTED BLOOD FLOW IN THE VEINS.

DURING THE ERECTION: PHYSIOLOGICALLY, ERECTION IS TRIGGERED BY THE PARASYMPATHETIC DIVISION OF THE AUTONOMIC NERVOUS SYSTEM (ANS), CAUSING **HIGH NITRIC OXIDE** (A VASODILATOR) LEVELS TO RISE IN THE TRABECULAR ARTERIES AND SMOOTH MUSCLE OF THE PENIS. THE ARTERIES DILATE CAUSING THE CORPORA CAVERNOSA OF THE PENIS (AND TO A LESSER EXTENT THE CORPORA SPONGIOSUM) TO FILL WITH BLOOD; SIMULTANEOUSLY THE ISCHIOCAVERNOSUS AND BULBOSPONGIOSUS MUSCLES COMPRESS THE VEINS OF THE CORPORA CAVERNOSA RESTRICTING THE CIRCULATION OF THIS BLOOD. ERECTION SUBSIDES WHEN PARASYMPATHETIC ACTIVITY REDUCES TO BASELINE.

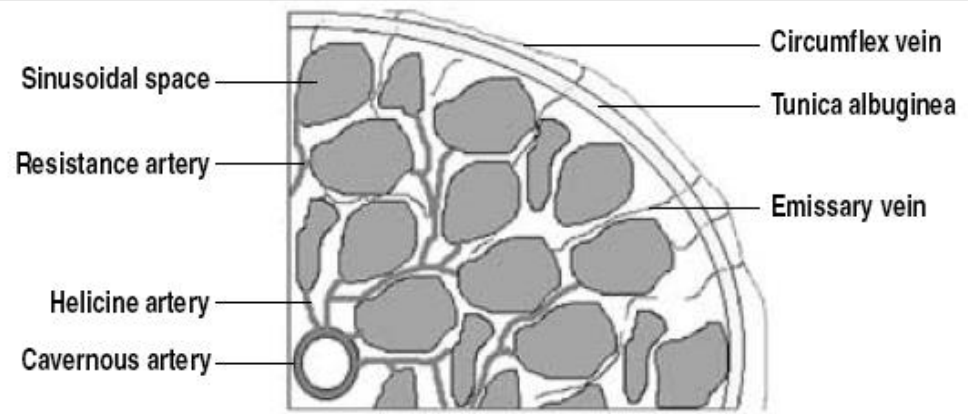
ERECTION CENTRE : S3

CORPUS CAVERNOSUM WITH PENIS IN FLACCID STATE



Sympathetic tone

CORPUS CAVERNOSUM WITH PENIS IN ERECTILE STATE



Adjusted and modified from Valdivia P. Fisiologia da ereção – www.med.net⁸

Parasympathetic tone



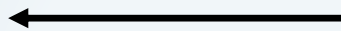
Sexual stimuli



Cavernosal aa. are relaxing



Blood flows into the caverns



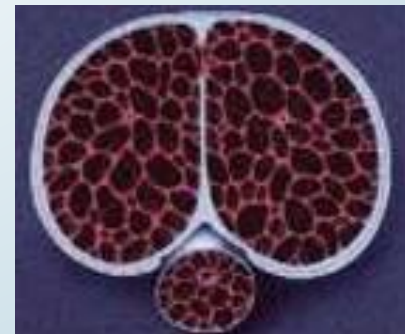
venous drainage decrease



Intracavernosal pressure \geq systemic blood pressure



ERECTION



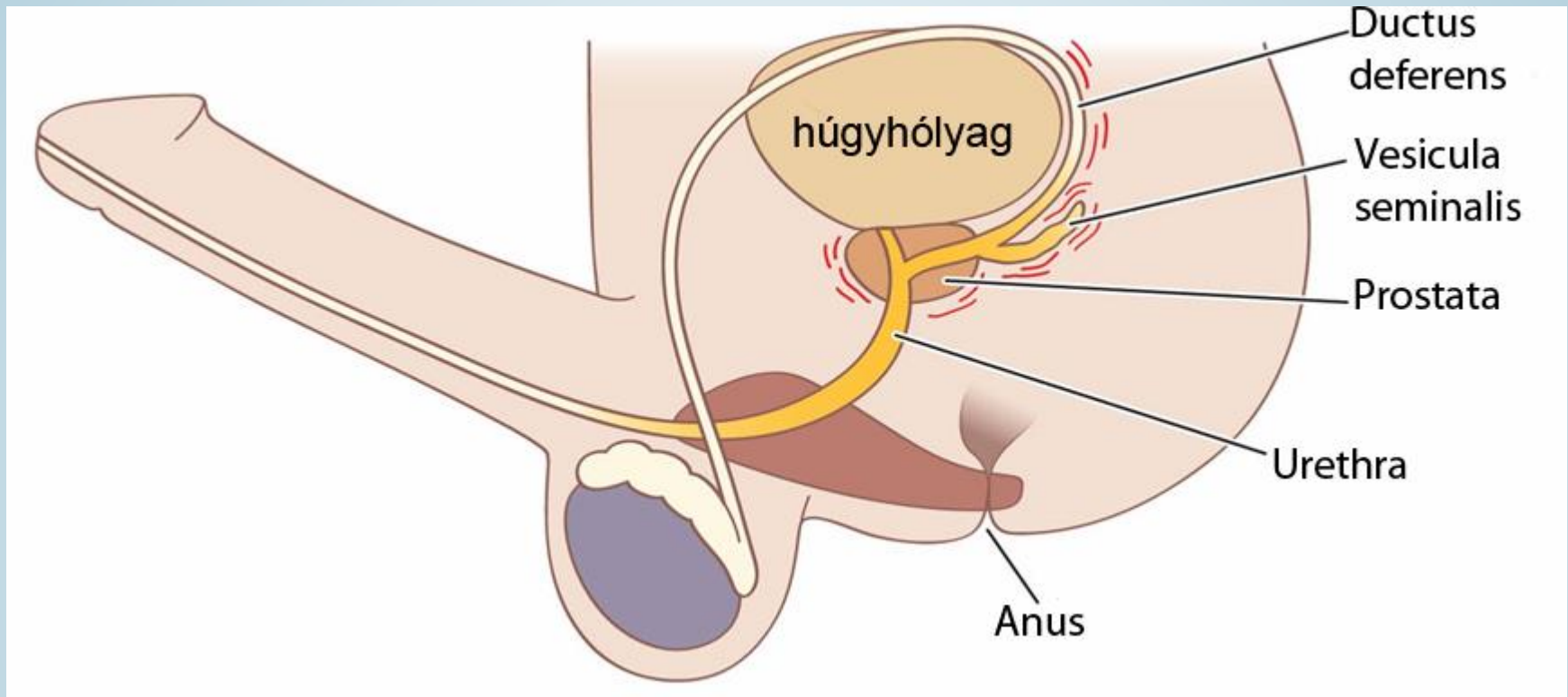
EJACULATION – SYMPATHETIC MECHANISMS

Ejaculatory center: L2-3

Ejaculation = Emission + Propulsion (expulsion)

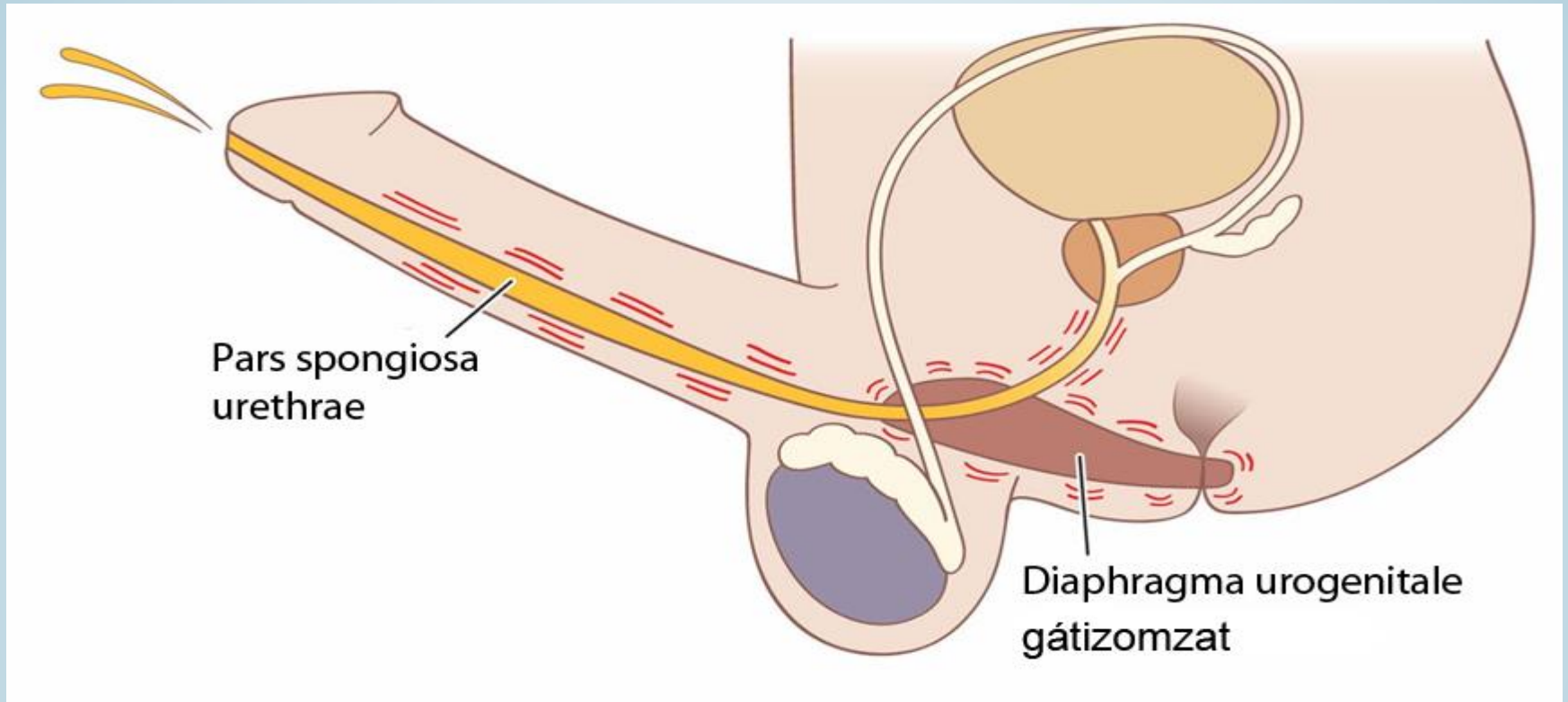
- Gonadal ducts, smooth mm. of the additional gll. are contracting, secretion
- Contraction of the sphincter vesicae m. → semen can't be able to flow into the bladder, urine can't flow into the semen
- rhythmic contractions of the bulbospongiosus m., ischiocavernosus m.
- Semen blows out from the penis
- It starts around at age 11-12

EMISSION



- Additional glands are excreted
- Semen is in the urethral ampulla
- Orgasm, with autonomic reaction: blood pressure \uparrow , pulse \uparrow , breath frequency \uparrow , sweating

EMISSION



- Contraction of the sphincter vesicae m.
- rhythmic constriction of the perineal mm.
- semen blows out

THANK YOU FOR YOUR ATTENTION!

Sources:

Benninghoff-Drenckhahn: Anatomie

Gray's Anatomy

Netter: Atlas der Anatomie des Menschen

Rohen-Yokochi: Anatomie des Menschen

Sobotta Atlas

Tillmann: Atlas der Anatomie

Waldeyer: Anatomie des Menschen

Welsch: Lehrbuch Histologie