

# Prostate

# Topography of the Pelvis

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# Chapters:

- 1) Topography the pelvis
- 2) Associated structures
- 3) Prostate

# 1) TOPOGRAPHY - Basic terms <sup>(1)</sup>

- **Pelvis** = caudal part of the trunk. The substrate is created by the osseous pelvis.
- **Osseous pelvis** = bony ring created by the unpaired sacrum and the paired hip bone (os coxae). The hip bone itself creates a girdle of the lower limb and it is fused from the ilium, the ischium and the pubic bone.
- **Greater pelvis** – space within the most cranial parts of the osseous pelvis – the paired wings of the ilium.
- **Lesser pelvis** – narrowed caudal space of the osseous pelvis limited by the following structures:
  - cranially: pelvic inlet (see below),
  - caudally: pelvic outlet,
  - ventrally: pubic symphysis,
  - laterally: bones around obturate foramen,
  - dorsally: sacrum and coccyx.

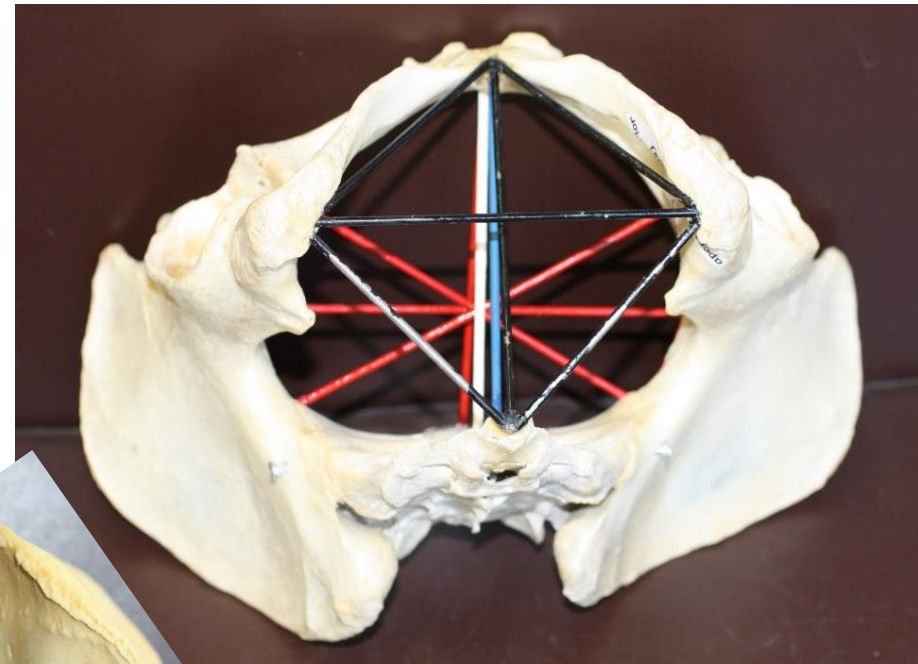
# Pelvis - photo

## Pelvic inlet

terminal line = promontory + arcuate line..

## Pelvic outlet

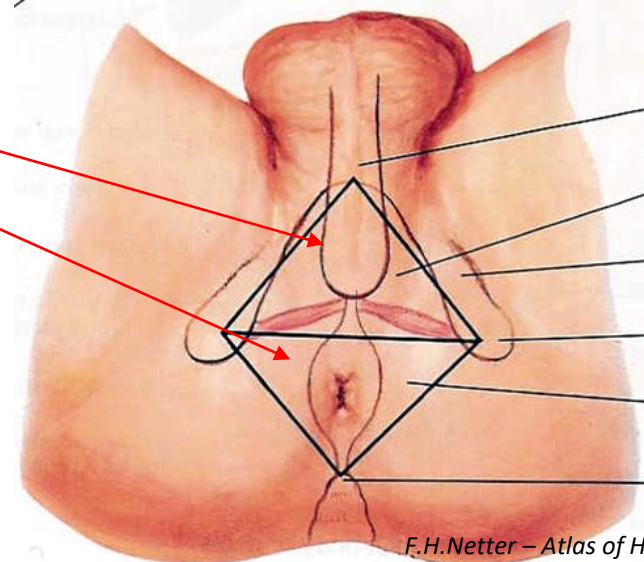
anal triangle, urogenital triangle

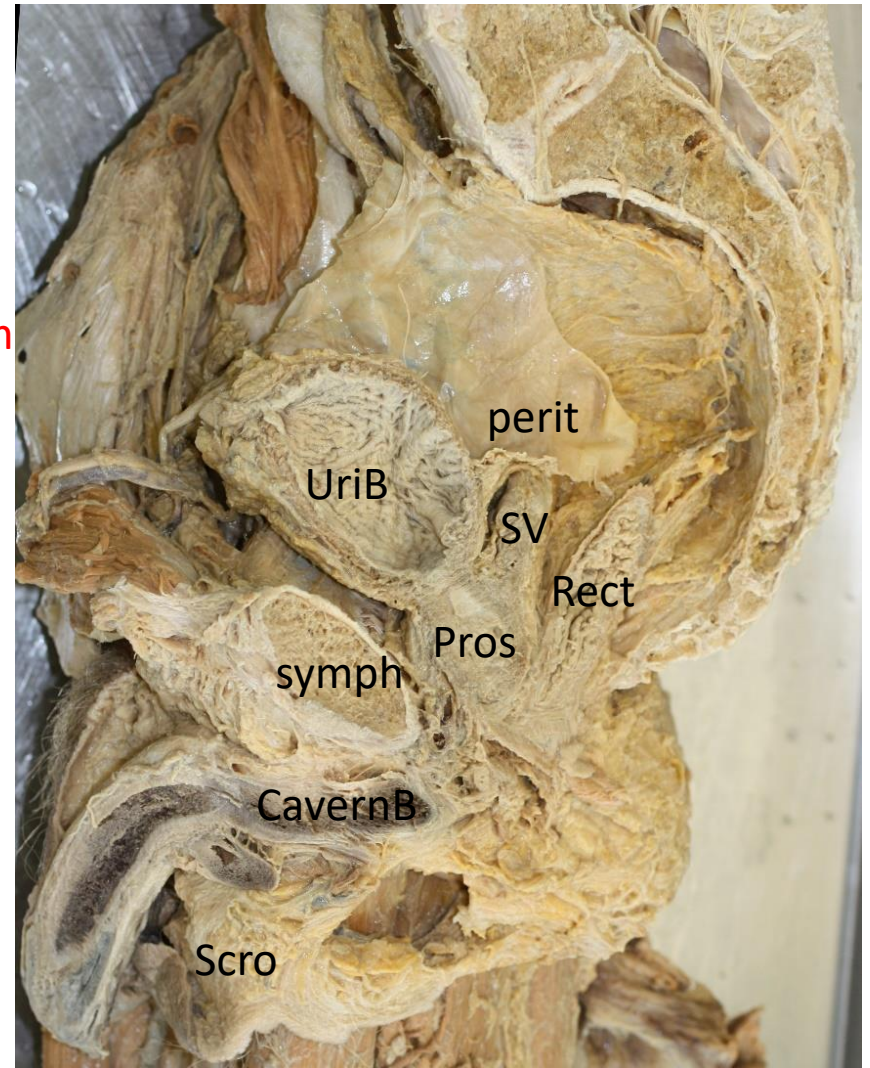
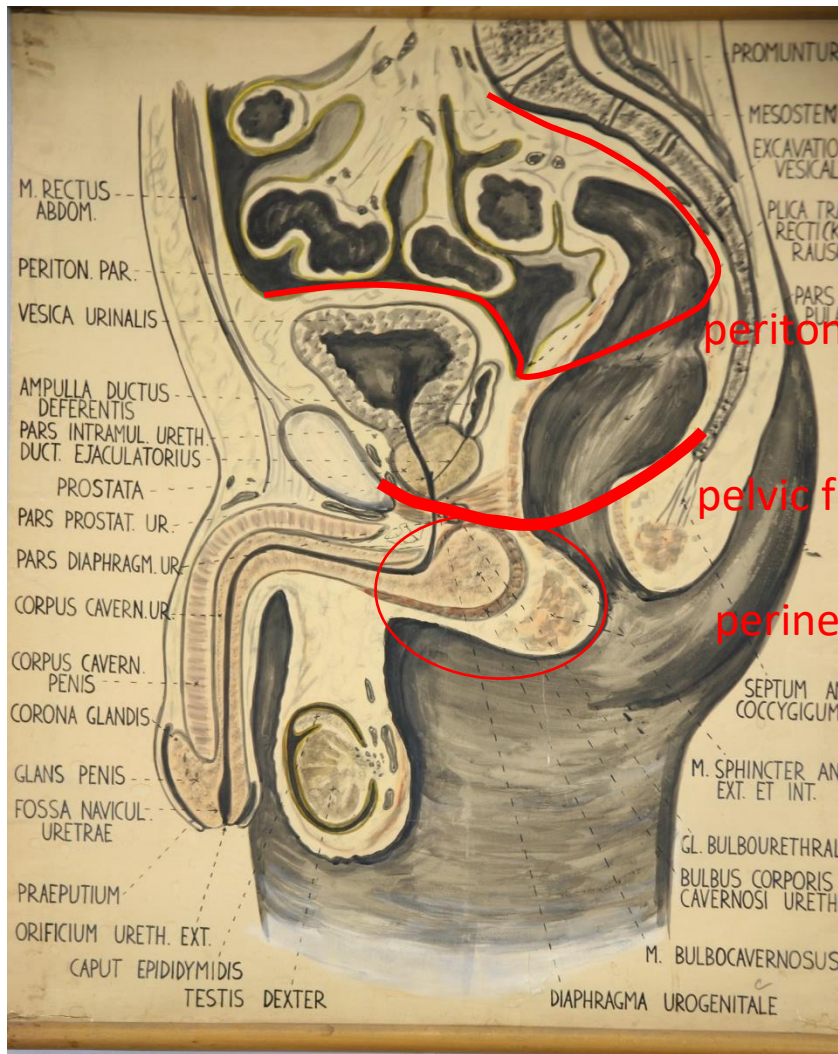


Inclination =  $60^\circ$

# Basic terms <sup>(2)</sup> in respect with soft tissues

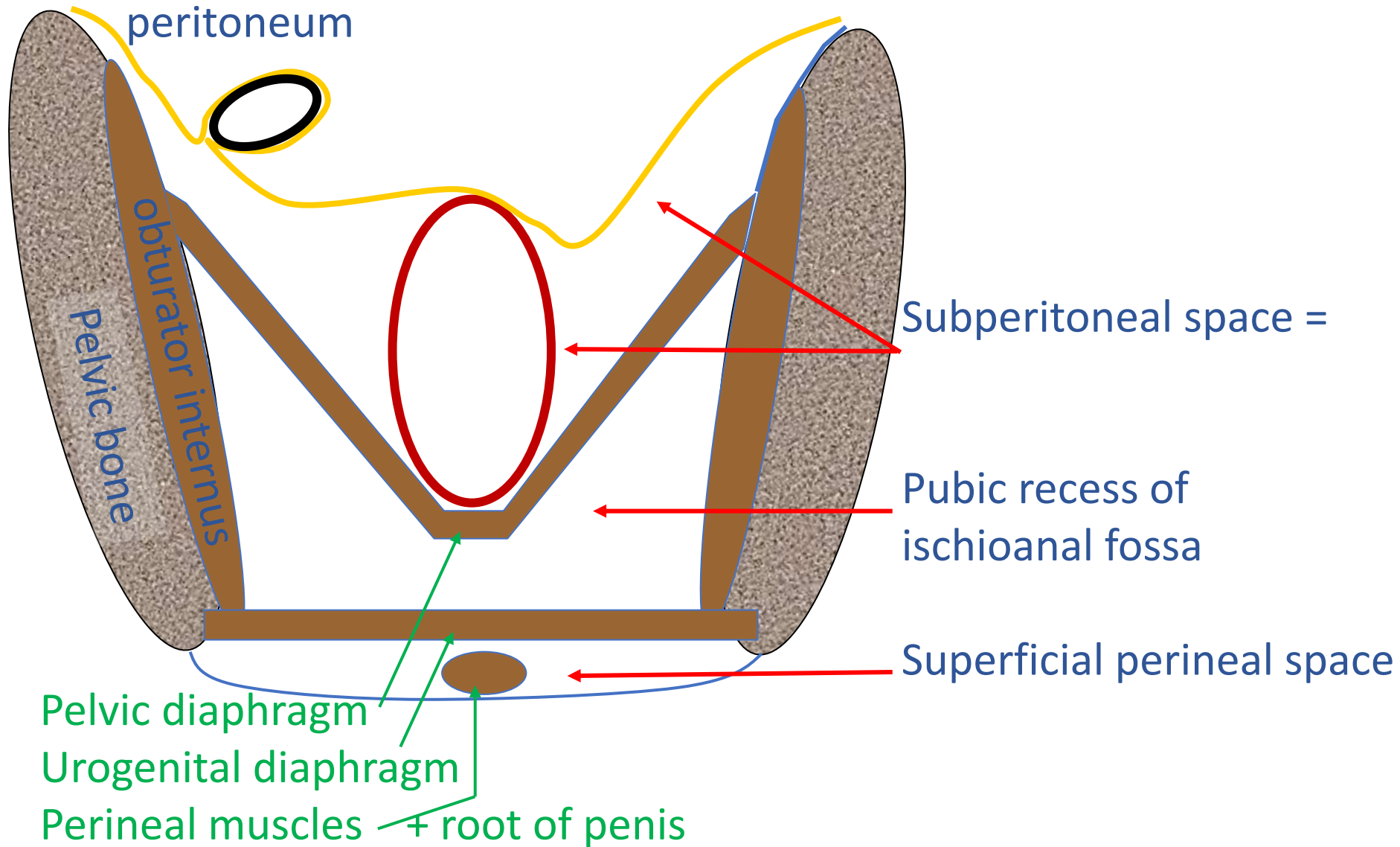
- **Pelvic cavity** = space of the lesser pelvis, its wall is completed with soft tissue. The caudal limit is created by the muscular floor of the pelvis located approximately at the level of the pelvic outlet.
- **Pelvic organs** – organs situated in the pelvic cavity.
- **Perineum** – soft tissue complex including also the skin surface between the genital organs and the end of the digestive tract.





*Sagittal section through the male pelvis – historic picture and dissection*

# Spaces in the lesser pelvis (the urogenital region, frontal section)



# Photo – pelvic floor (upper aspect)

urogenital hiatus

position of prostate

obturator canal

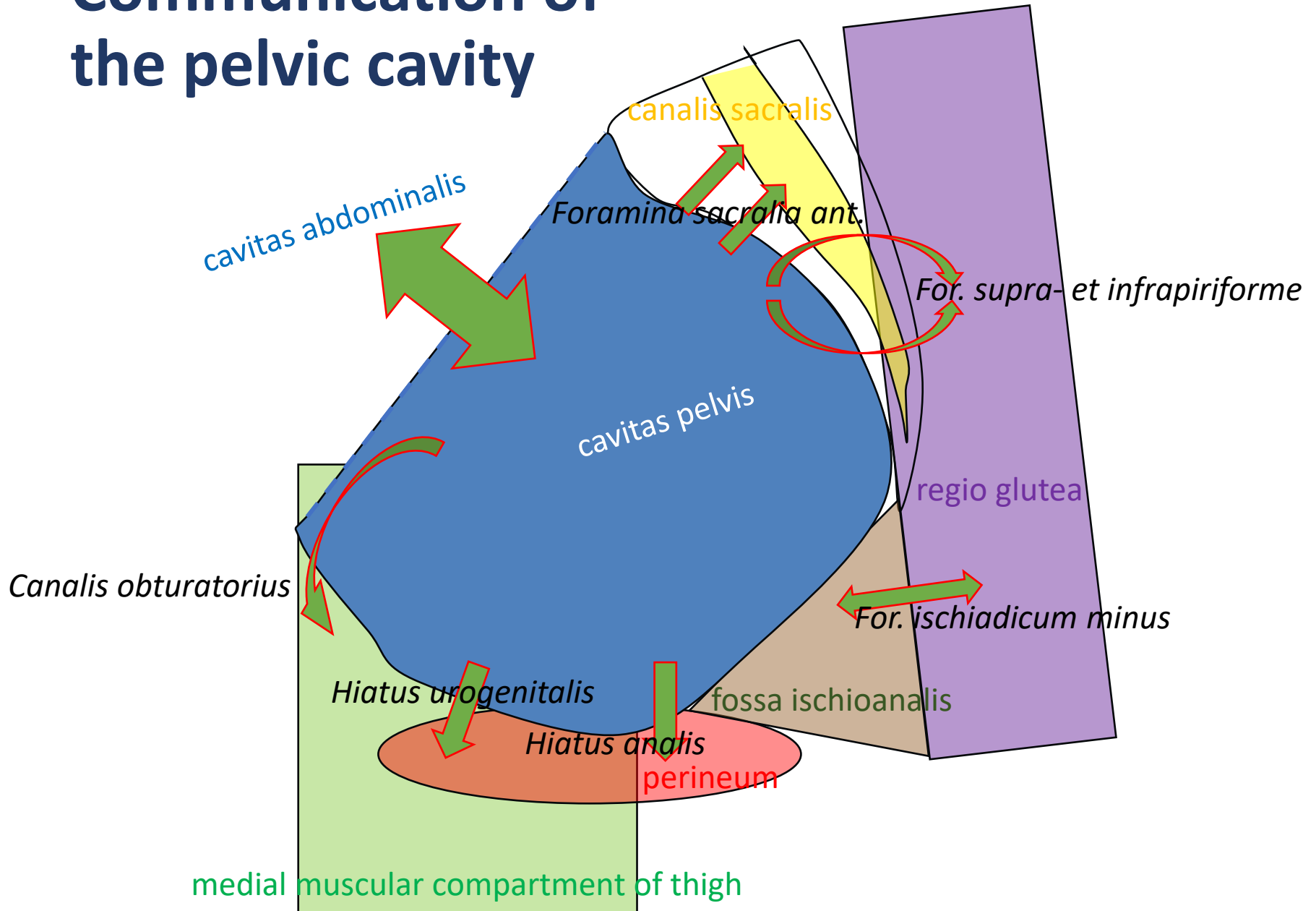


obturator int. m.  
**levator ani m.**  
**coccygeus m.**  
sacrotuberous lig.  
piriformis m.

anal hiatus

supra- et infrapiriform for.

# Communication of the pelvic cavity



# 2) ASSOCIATED PELVIC STRUCTURES

## Fibrous structures

### a) LIGAMENTS

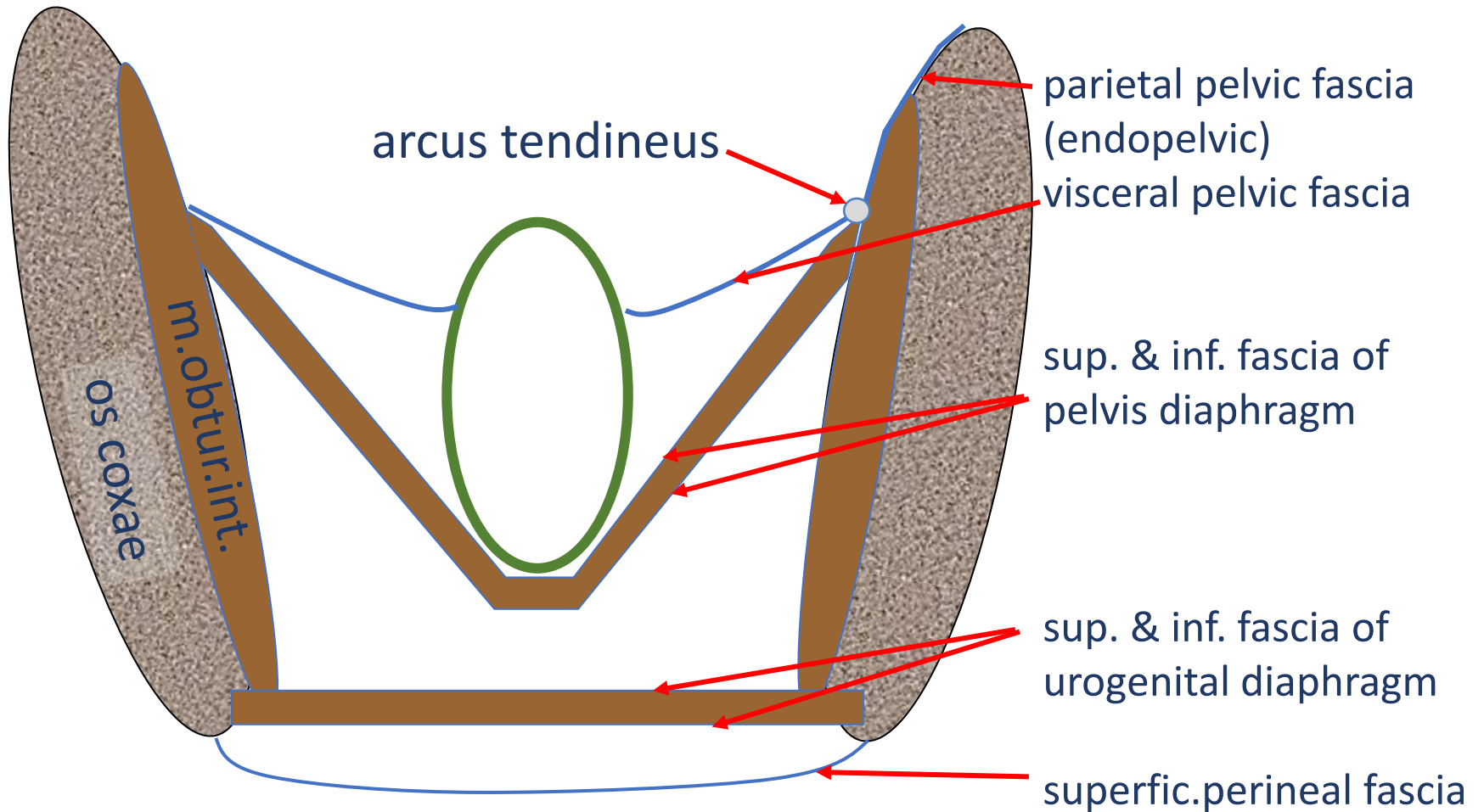
- Ligaments of osseous pelvis:  
obturator membrane, sacrotuberal lig....
- Ligaments connecting bones with organs:  
pubovesical lig. and puboprostatic lig. ♂, connective tissue between urinary bladder and symphysis, combined with smooth muscle cells.

### b) SEPTA

***Rectovesical septum*** ♂ - frontally located dense fibrous layer between the rectum - and the bladder with prostate and seminal vesicles.

In the upper part is more membranous (rectoprostatic fascia of Denonvilliers), caudally widens and terminates as the perineal body.

## c) FASCIAS



*Scheme of a frontal section*

The visceral pelvic fascia is connected with more loose connective tissue surrounding the organs: paracystium, etc.

The visceral fascia brings the main visceral arteries too.

# Subperitoneal organs <sup>(1)</sup>

- **Urinary bladder** – hollow organ, size and shape depend on the content. The shape of an empty bladder is drop-like with the apex superior-anteriorly. On a sagittal section, it is triangle-shaped – the anterior surface adjoins the symphysis, the posterior surface (dorso-cranially), and the fundus oriented dorso-caudally. The peritoneum descends from the abdominal wall to the posterior surface of the bladder and then continues dorsally to other organs. The wall of an empty bladder can be as thick as the wall of the uterus.
- **Ureter** - its pelvic part descends in the vertical line, laterally from the promontory and it archly flows to the inferior part of the bladder. It crosses several structures: over crosses the iliac A.+V., obturator N., sacral plexus, but goes under the ductus deferens.
- Part of the **rectum** – approximately the distal half of the ampulla, caudally from the Kohlrausch's fold.




# Subperitoneal organs <sup>(2)</sup>

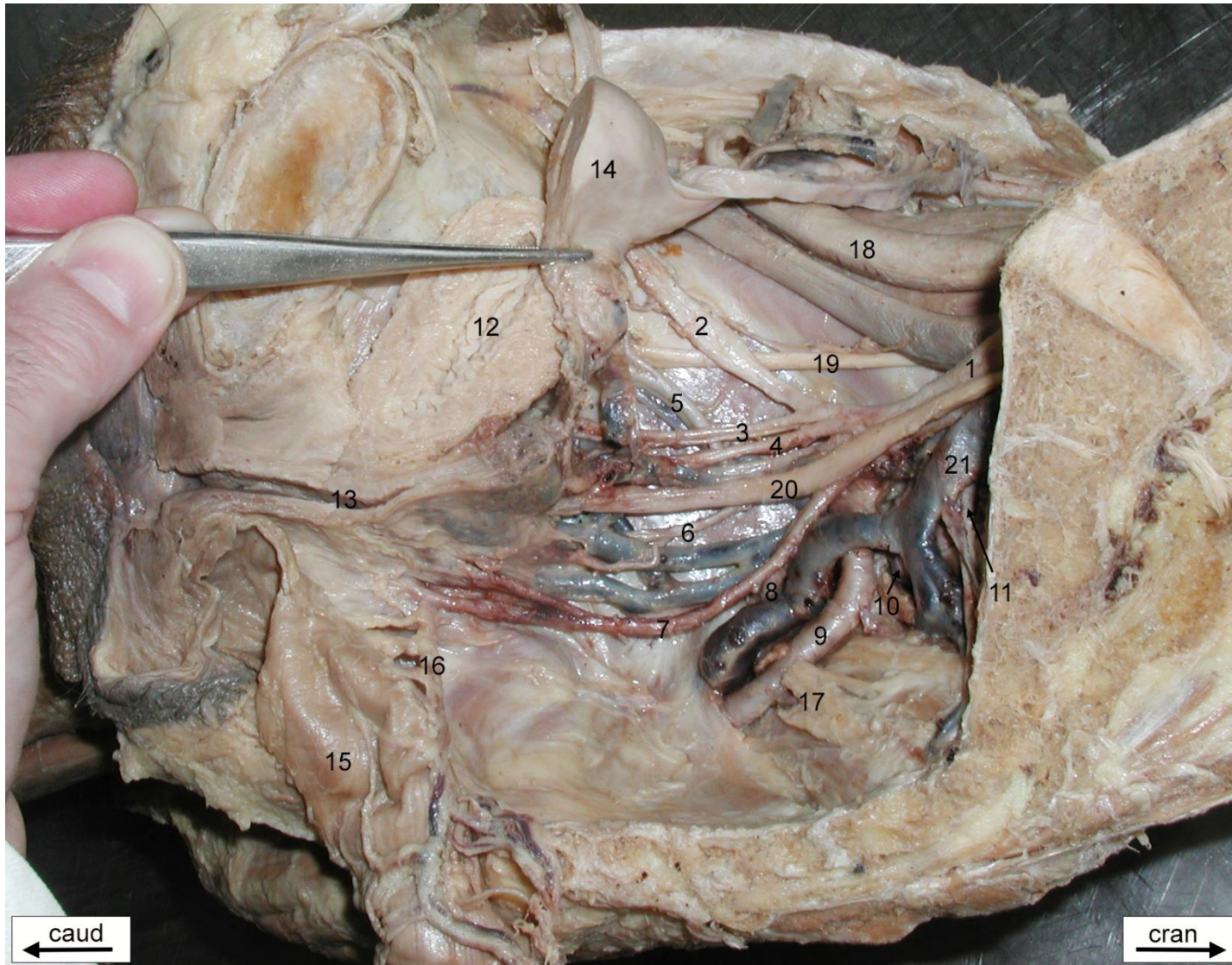
- **Prostate** – unpaired round-shaped gland under the bladder, it lays on the pelvic diaphragm and adjoins the pubic symphysis. It surrounds the male urethra . Details will follow.
- **Ductus deferens (vas deferens)** – after it leaves the deep inguinal ring it turns medio-caudally to the pelvis and goes behind the bottom of the bladder, where it gets broader (**ampulla of ductus deferens**) and it flows into the prostate from the back. The ductus deferens crosses many structures in the abdominopelvic cavity:
  - behind - inferior epigastric A.+V.,
  - external iliac A.+V., obturator N., obturator A.+V.;
  - in front – ureter; above - seminal vesicles.
- **Seminal vesicle** – paired gland approximately 4cm long, adjoining the bottom of the bladder



# Branches of the internal iliac artery

- **Int. iliac artery** – (diameter 1cm) main artery supplying lesser pelvis. Division to two trunks is the most typical arrangement:
  - 5 parietal branches, the first three forming the posterior trunk
  - 5 visceral branches successively leaving the anterior trunk, however detailed ramification is variable. They are, as follows:
- **Umbilical a.** – first ventral branch, remains of a fetal artery keeping blood supply for the urinary bladder (sup. vesical aa.)
- **Artery of ductus deferens** – analogical with the uterine artery 
- **Inf. vesical a.** – parallel with the former, more caudally
- **Int. pudendal a.** – dorsocaudally to the infrapiriform foramen
- **Middle rectal a.** – descends on the pelvis floor medially to two distal half of the rectal ampulla.

# Photo – vessels of the pelvis (female)



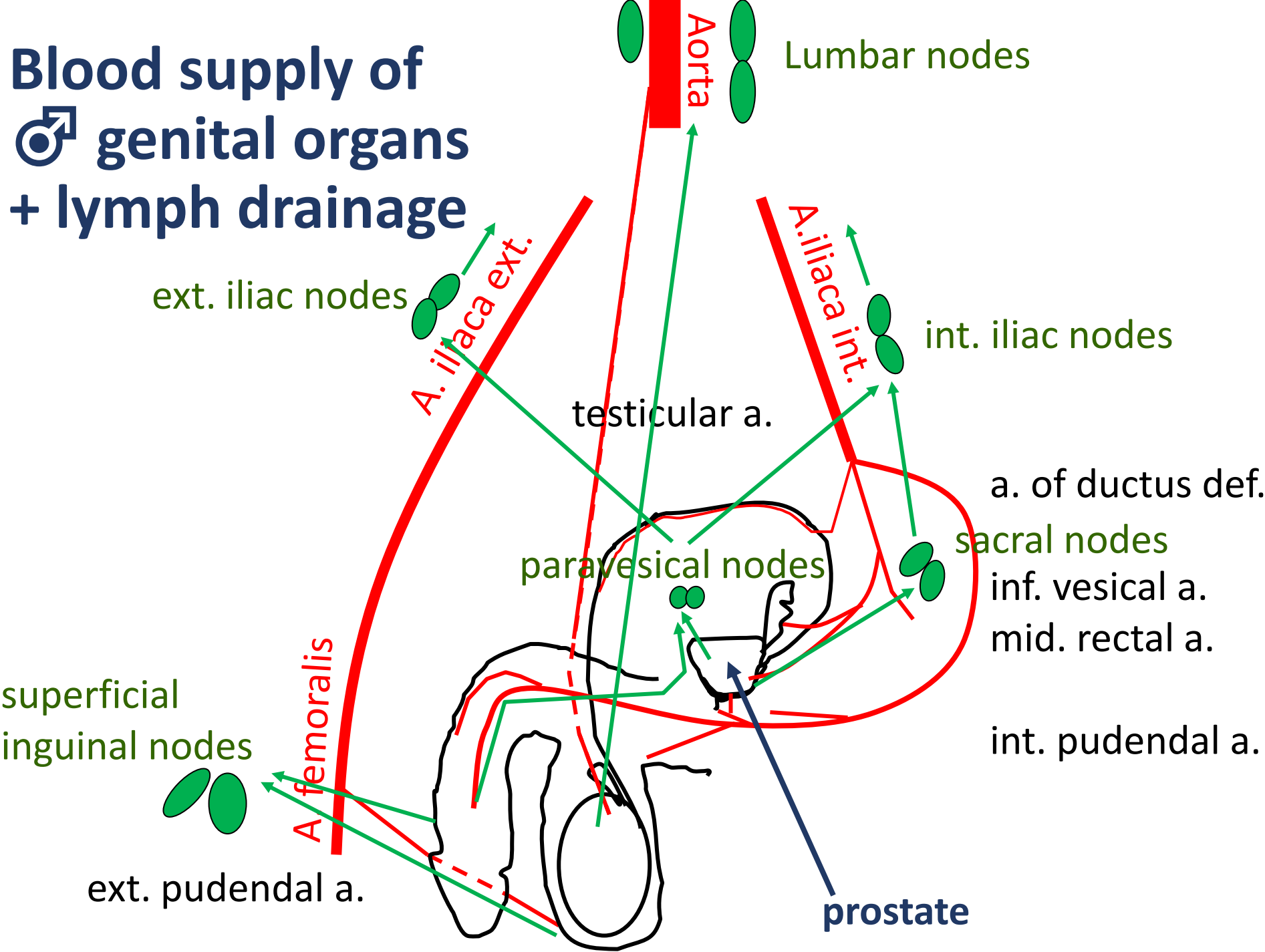
Sagittal section of a ♀ pelvis, peritoneum removed, uterus folded ventrally and rectum dorsally.

- 1) int. iliac A. and its branches (2-11)
- 2) umbilical A.
- 3) sup. vesical Aa.
- 4) uterine A.
- 5) obturator A.
- 6) inf. vesical A.
- 7) medial rectal A.
- 8) int. pudendal A.
- 9) inf. gluteal A.
- 10) sup. gluteal A.
- 11) lateral sacral A.
- 12) urinary bladder
- 13) vagina
- 14) uterus
- 15) rectum
- 16) sup. rectal A. (and its anastomosis with No.7)
- 17) sacral plexus (anterior ramus S3 cut through)
- 18) ext. iliac A.
- 19) obturator N.
- 20) ureter
- 21) int. iliac V.

# Pelvic veins and lymphatic nodes

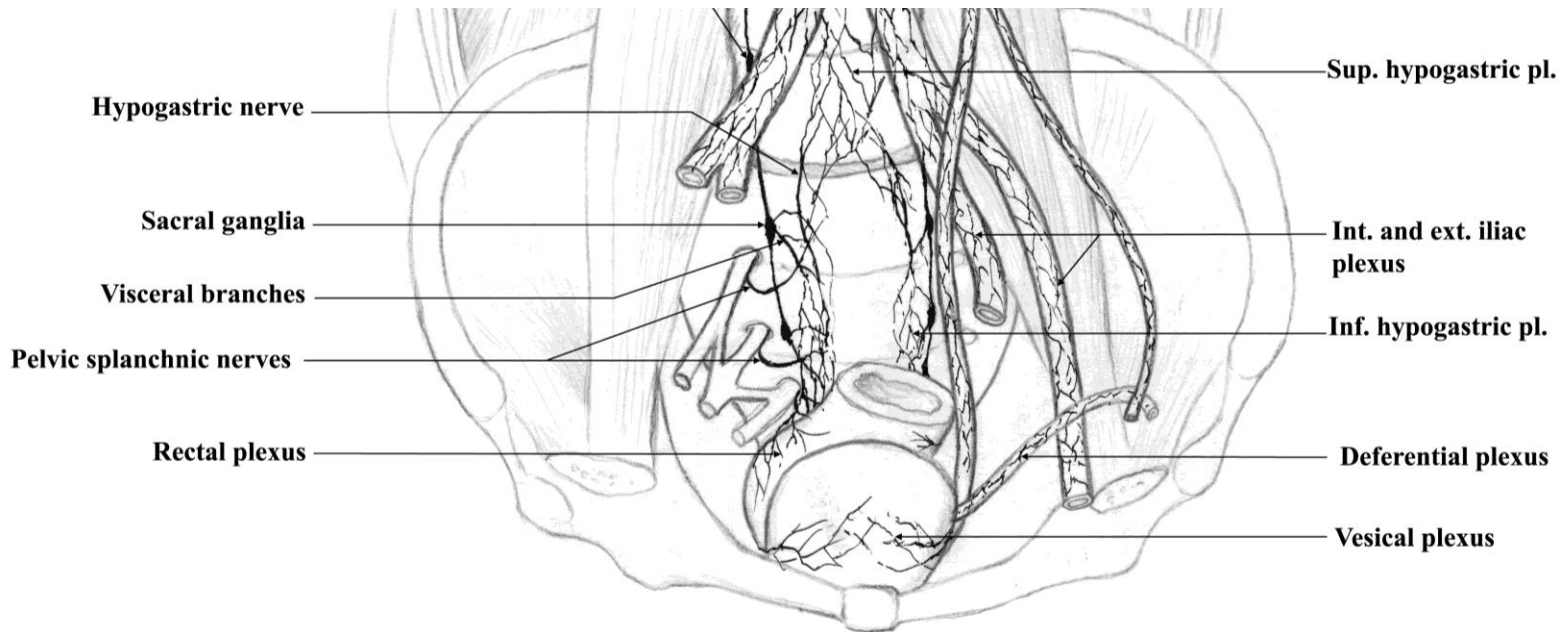
- Veins are equivalent to the arteries. They can be multiple and obstruct the identification of the arteries in the students' dissection. At walls of the organs, the venous system is very complicated, and therefore it is described as plexuses: **vesical plexus, prostatic plexus** and so on. Prostatic venous plexus continues just to the vesical plexus and then empties into the internal iliac vein.  
Some plexuses form porto-caval anastomoses!
- Lymphatic nodes – in the subperitoneal space, situated by the bottom of the organs although without a name equivalent to the arteries – **paravesical nodes, pararectal** etc.  
They give off the lymph to the internal iliac nodes but also the external iliac nodes – it's a difference in the venous and lymphatic pattern

# Blood supply of ♂ genital organs + lymph drainage



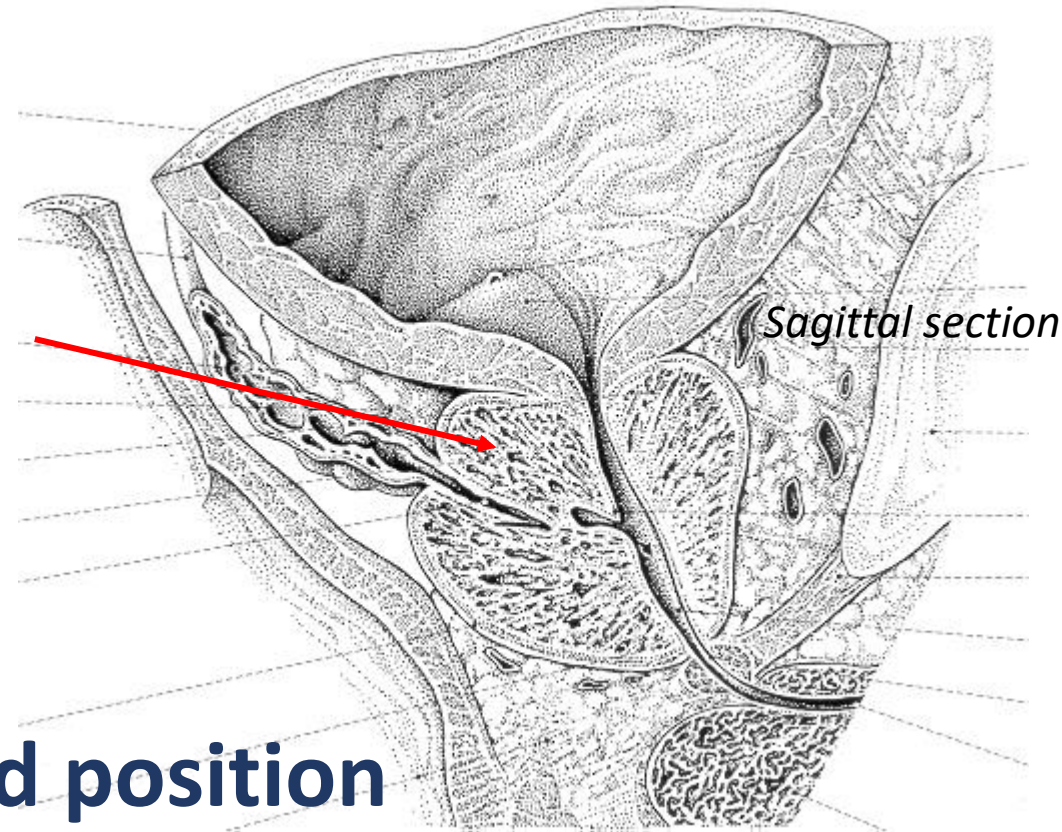
# Autonomic plexuses in the pelvis

- The sup. hypogastric plexus descends into the pelvis in front of the promontory, its connection with the pelvic sources creates the **inf. hypogastric plexus**. The fibers give rise to plexuses located on the surface of arteries (with homonymous names) and visceral plexuses which enter surfaces of organs (named rectal, prostatic plexus, ...).



- The prostatic plexus comes to the prostate, which, in addition to the fibers for the prostate itself, continues laterally along the organ as cavernous nerves of penis. These nerves are responsible for erection and their damage during too radical prostatectomy is undesirable.

# 3) PROSTATE



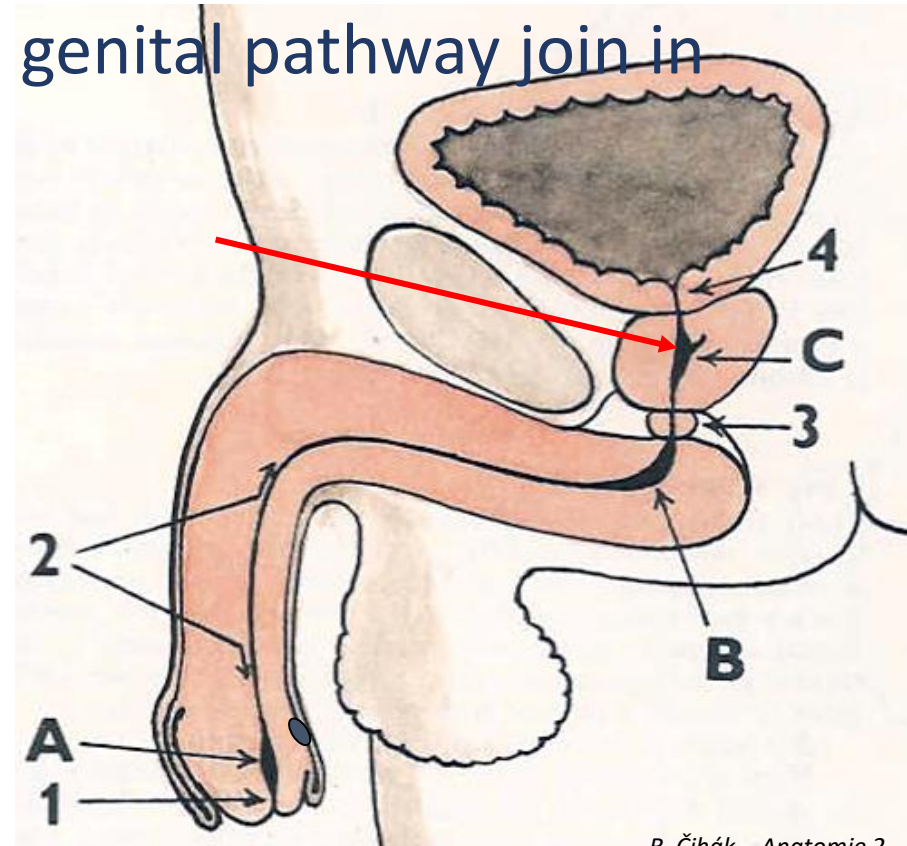
*Wolf-Heidegger's Atlas of Human Anatomy*

## Prostate – shape and position

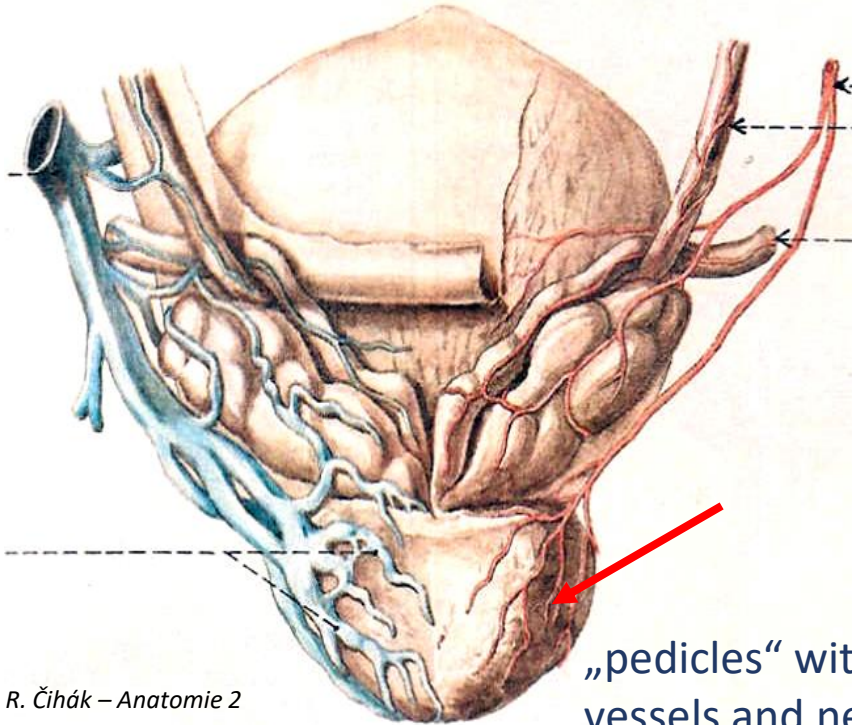
- Unpaired gland, smooth, tough, size of sweet chestnut, wide basis cranially, apex caudally
- Position: below bladder, lies on pelvic diaphragm, behind pubic symphysis, frontally to rectum
- It surrounds prostatic part of male urethra.

# Prostatic part of male urethra

- Male urethra - narrowings: see the numbers
- Urethral widenings : see the capitals (incl. the prostatic part)
- Excretory urinary pathway and genital pathway join in the prostatic part.



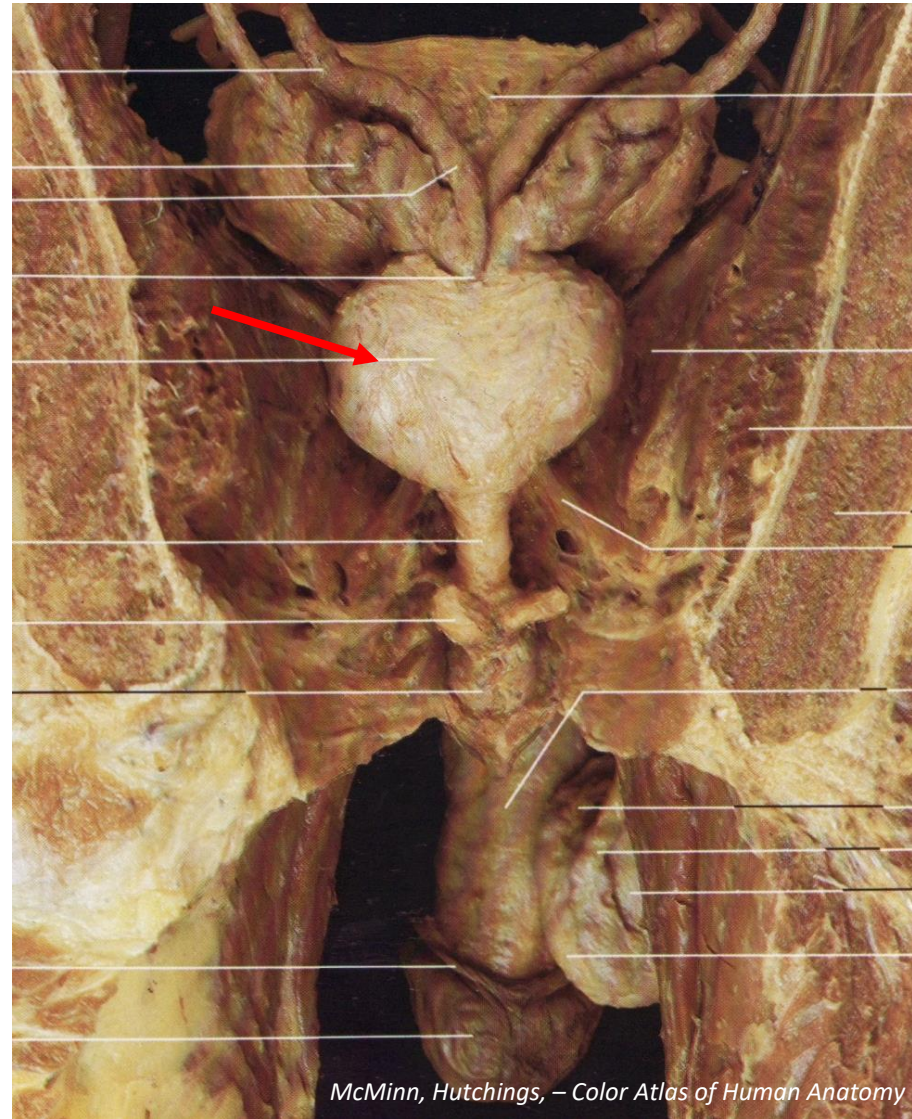
*Dorsal view*



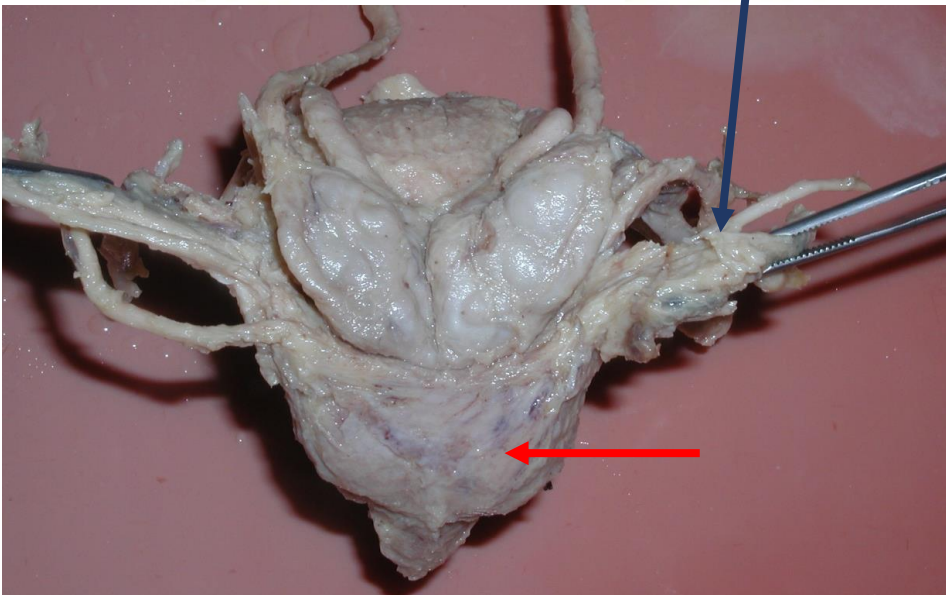
R. Čihák – Anatomie 2

„pedicles“ with  
vessels and nerves

*Dorso-caudal view*

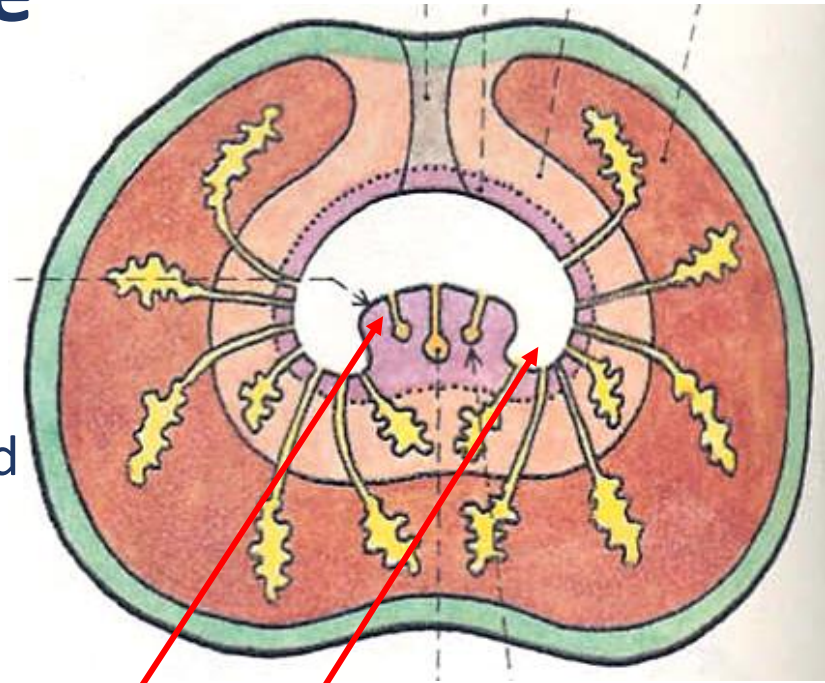


McMinn, Hutchings, – Color Atlas of Human Anatomy



# Prostate – fine structure

- Parts: right, left, and middle lobes, isthmus anteriorly. The lobes are not distinct externally because they grow together during development to form smooth outer surface. In spite of it, in clinical medicine is frequently mentioned „middle lobe“ which is responsible for elevation of bottom of the urinary bladder in case of benign prostatic hyperplasia



R. Čihák – Anatomie 2

- Colliculus seminalis: longitudinal elevation on the posterior wall of the prostatic urethra, the ejaculatory duct (terminal part of the vas deferens) opens there.
- Prostate contains glands emptying into the urethra
- Zones – periurethral, inner (central), outer (peripheral) – they are associated with incidence of some diseases
- Capsule – is not completely continuous at the ventral surface, so the glands may partly grow into the surrounding connective tissue.

# Prostate – clinical significance

## Malignity rate

Incidence of malignant tumors  
– Czech rep., 2016 :

- 1) skin
- 2) prostate
- 3) breast
- 4) colon + rectum
- 5) bronchi + lungs
- 6) uterus
- 7) kidney
- 8) urinary bladder
- 9) lymphoma and leukemia
- 10) pancreas
- 11) ovary
- 12) stomach

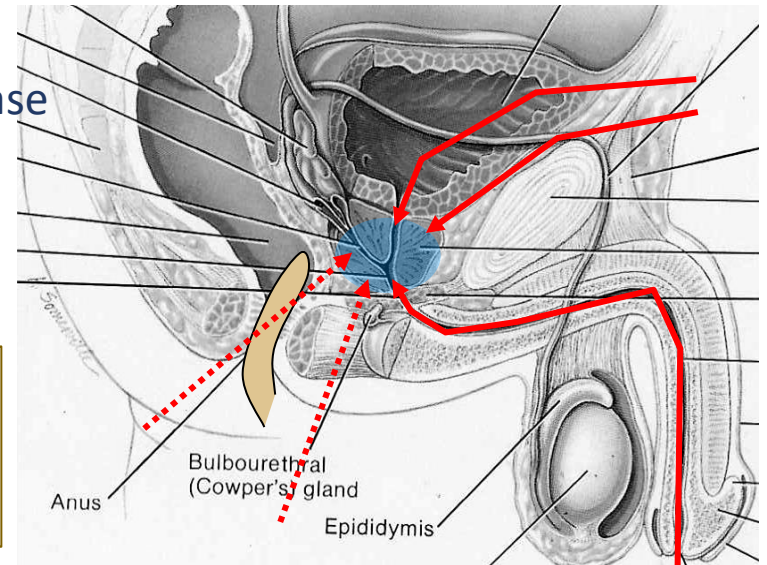
## Hypertrophy

BHP, „adenoma“:  
combination of  
multiplication of cells  
and enlargement of  
the cells. It narrows  
the int. opening of  
urethra and so makes  
urination difficult.  
Very frequent disease  
of senile males.

## Palpation per rectum

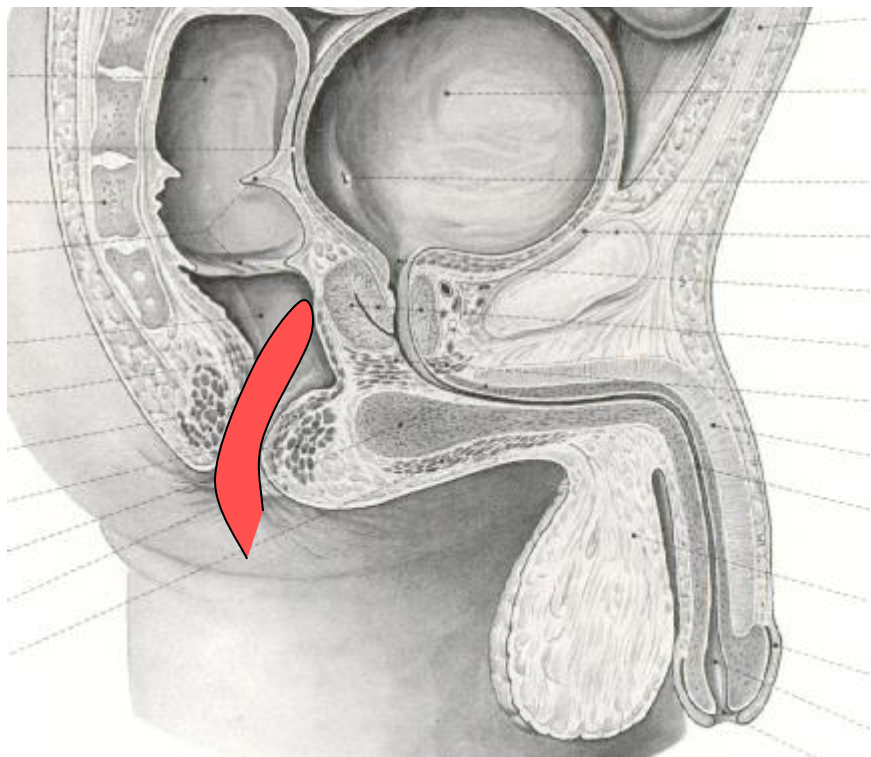
## Possible surg. approaches:

transvesical  
suprapubic  
transurethral  
transperineal  
transrectal



# Per rectum palpation

mucose and sphincter of rectum  
prostate & seminal vesicles  
fundus vesicae (interamp.trig.)  
coccyx  
rectovesical excavation



mucose and sphincter of rectum  
uterine cervix  
coccyx  
Douglas's space

