

# **Autonomic nervous system**

**Inervation of**

**smooth muscle**

**myocardium**

**glands**

**relative independence on CNS  
neurons in both CNS and PNS**

**functionally is divided into:**

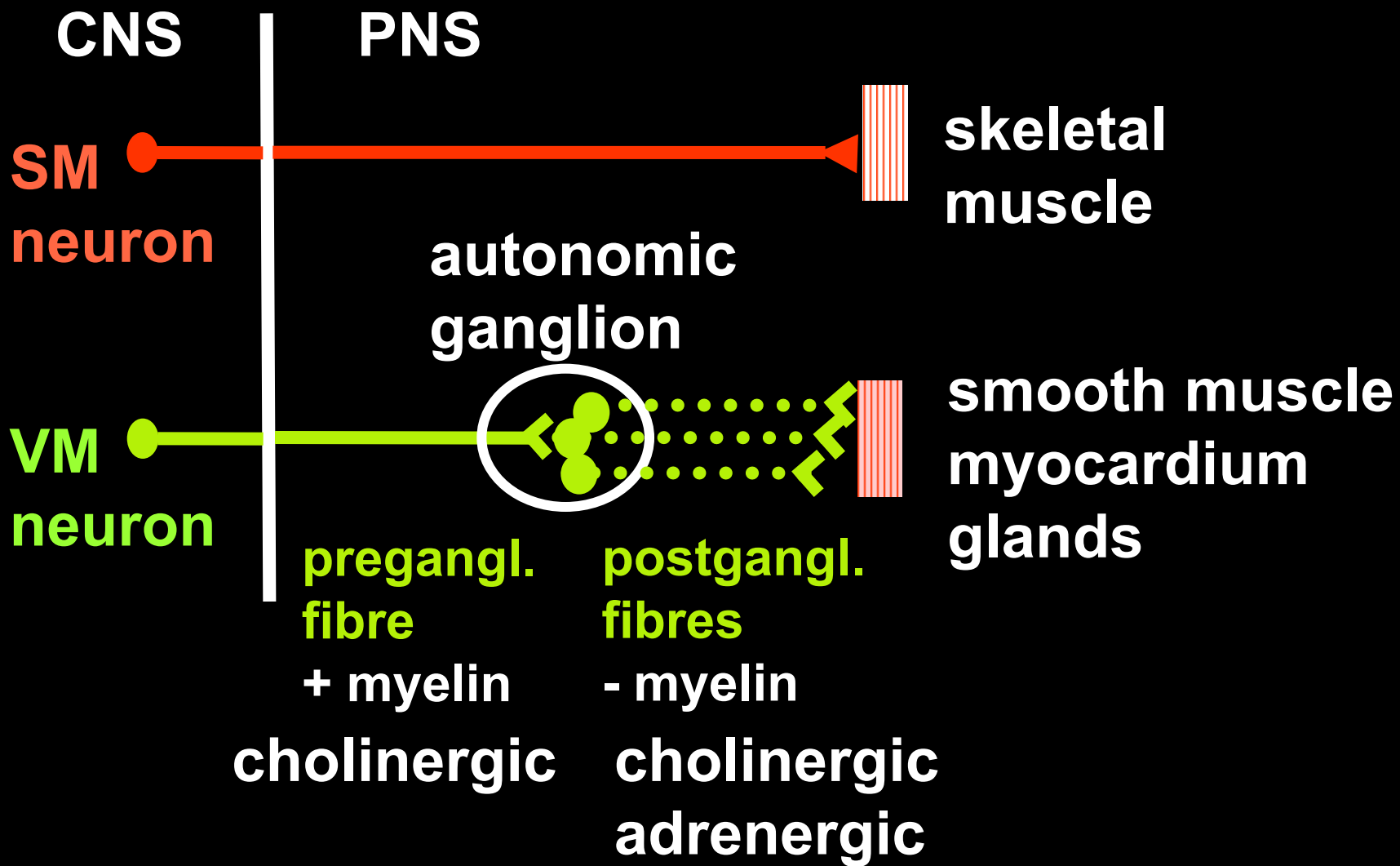
**sympathetic system**

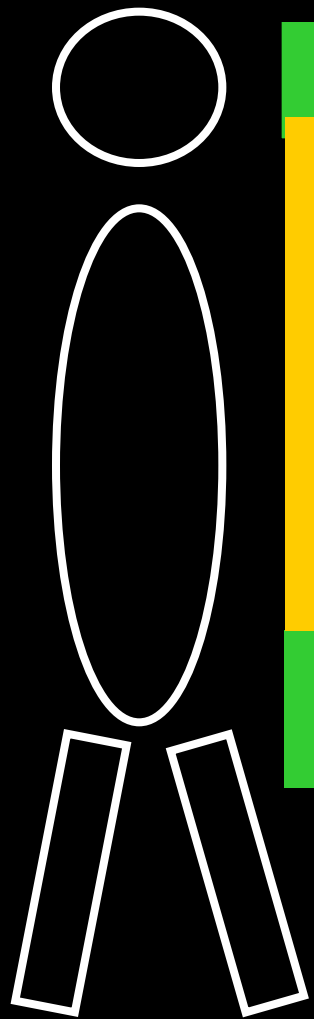
**parasympathetic system**

**enteric system**

**afferentní ( viscerosensory) fibers**

**accompany efferent fibers**





**cranial  
parasympathetic  
system**

**sympathetic  
thoracic-lumbar  
system**

**sacral  
parasympathetic  
system**

# Sympathetic system

Catabolic reaction (corresponds with arousal and energy generation)

dilates coronary arteries

increases heart rate

increases cardiac output

dilates bronchioles

decreases GIT motility

causes mydriasis

stimulates sweat glands

secretion

stimulates secretion of

viscous saliva



## **Parasympathetic system**

**Anabolic reactions (promotes calming of the nerves return to regular function, and enhances digestion)**

**decreases heart rate**

**decreases cardiac output**

**constricts coronary arterie**

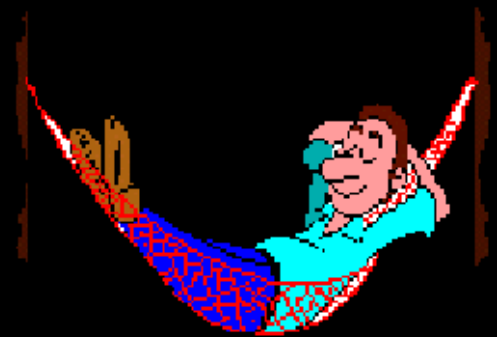
**relaxes bronchioles**

**causes miosis**

**increases GIT motility**

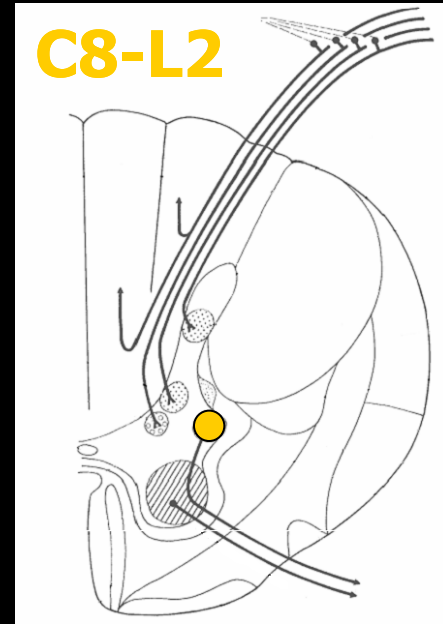
**stimulates secretion of watery**

**saliva**

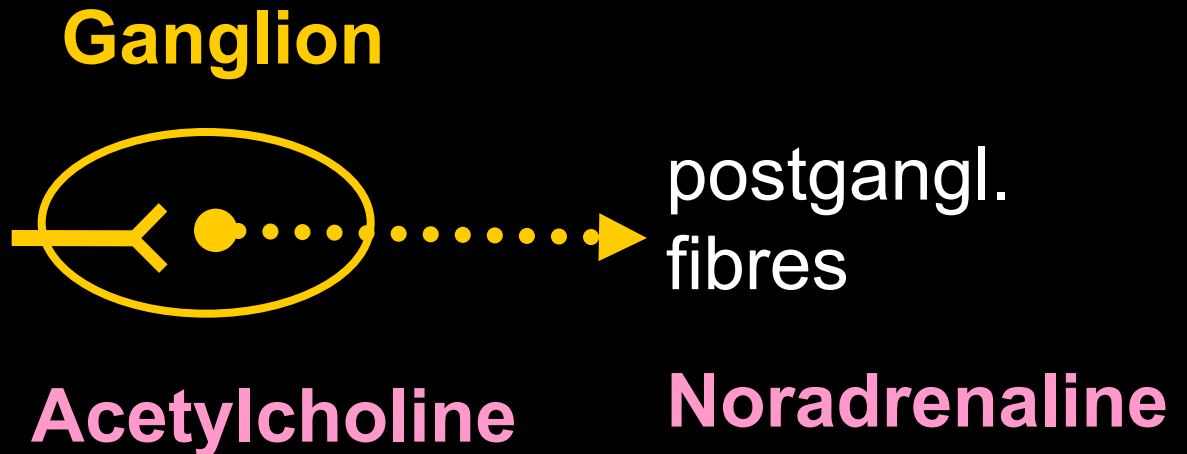


# Sympathetic system

Central part:  
**ncl.**  
**intermediolateralis**

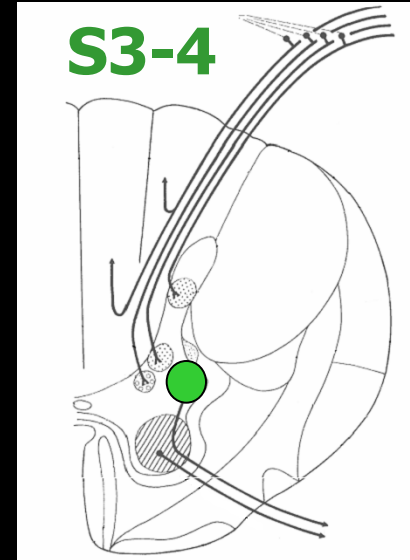
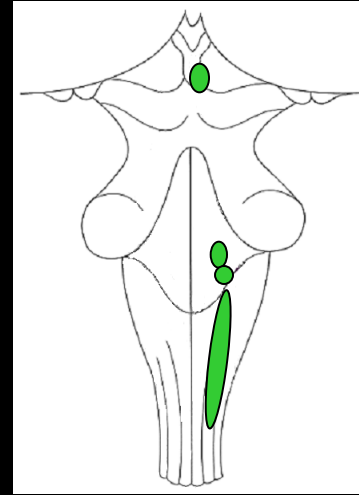


Peripheral part:  
pregangl. fibres  
**rr.com. albi**



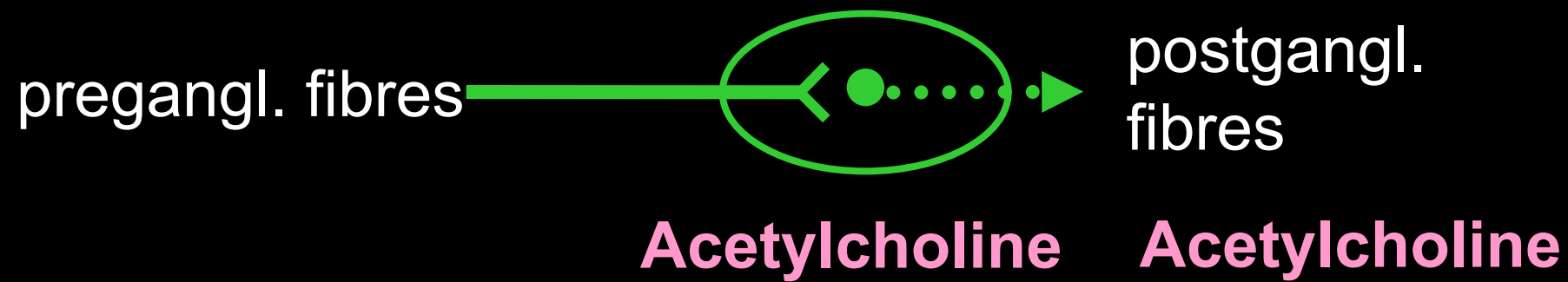
# Parasympathetic system

Central part:  
CN III, VII, IX, X  
ncl. intermediolat.



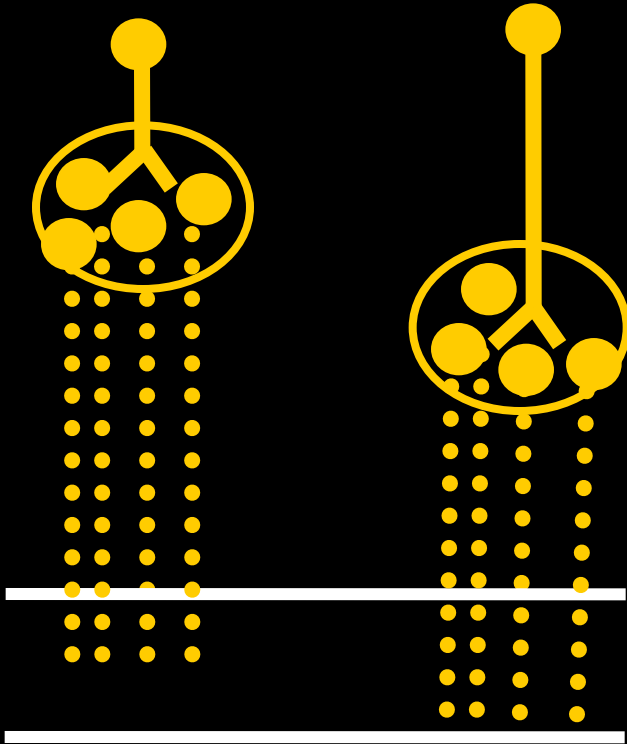
Peripheral part:

Ganglion





# Ganglia

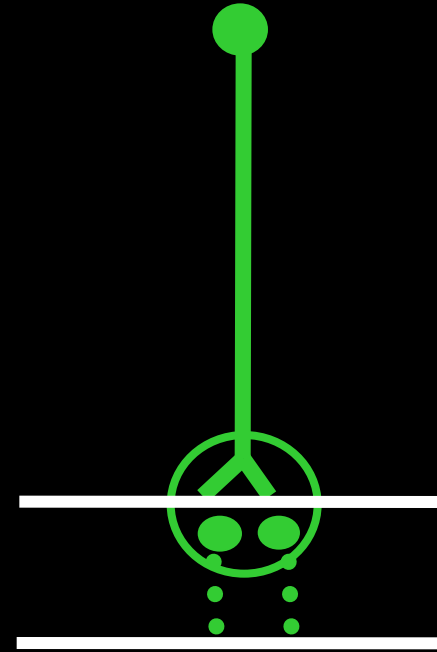


para  
vertebral

pre  
vertebral

Symp.  
trunk

Aortic plexuses



Ciliare, oticum,  
submand., pterygop.  
Ggll. in organs



**heart rate**

**increase**

**decrease**

**coronary  
arteries**

**dilation**

**constriction**

**bronchioles**

**relaxation**

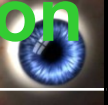
**constriction**

**pupil**

**dilation**



**constriction**



**gall bladder**

**contraction**

**relaxation**

**salivary  
secretion**

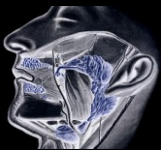
**viscous**

**watery**

**GIT**

**inhibition of  
peristalsis**

**acceleratio  
n of  
peristalsis**



# I. Pars sympat.

## Paravertebral ganglia

truncus sympathicus

cervical 3

thoracic 10 - 11

lumbar 4 - 5

sacral 4 - 5

ganglion impar

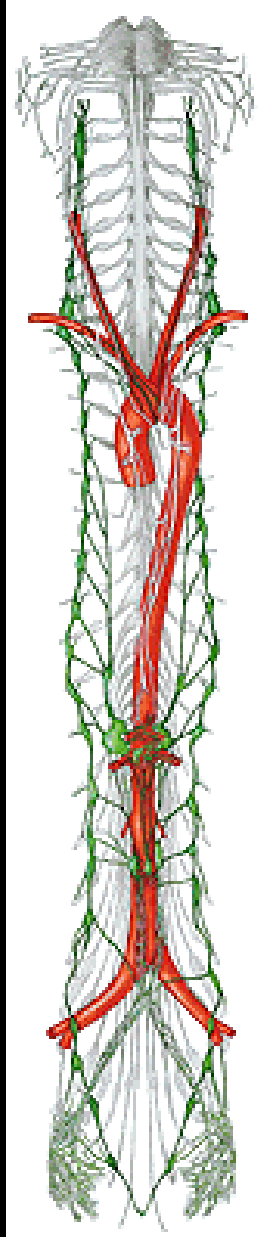
## Prevertebral ganglia

coeliacum

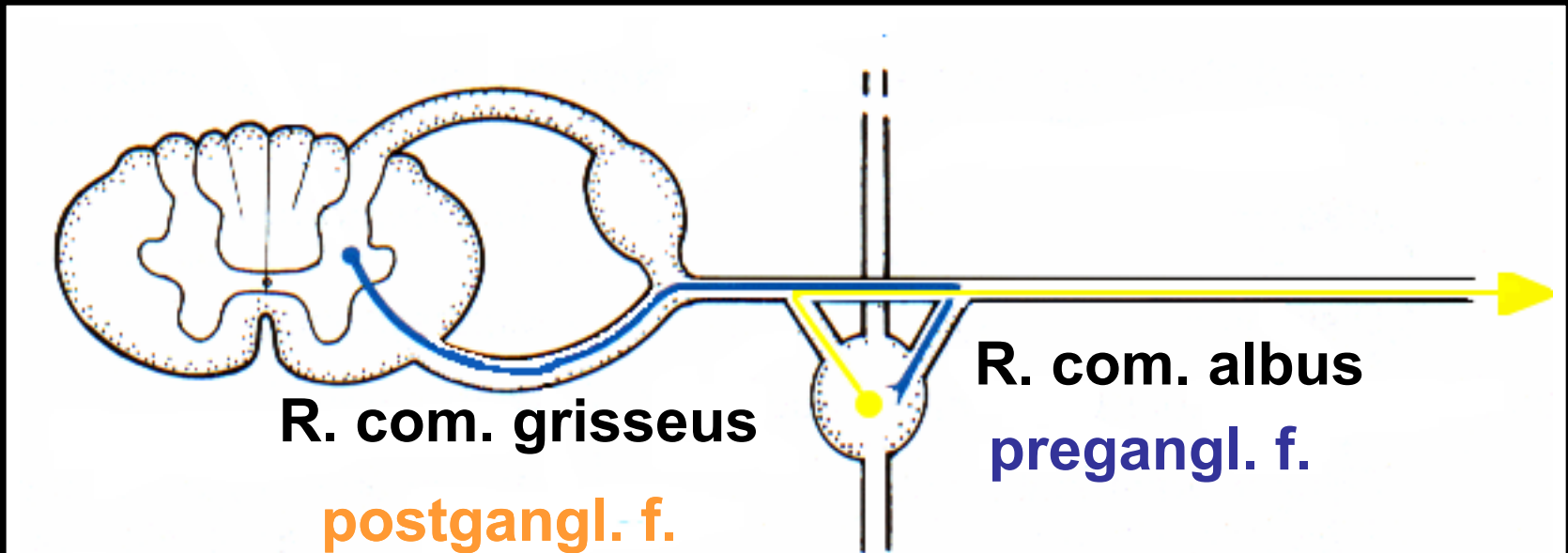
mesentericum sup.

aorticorenale

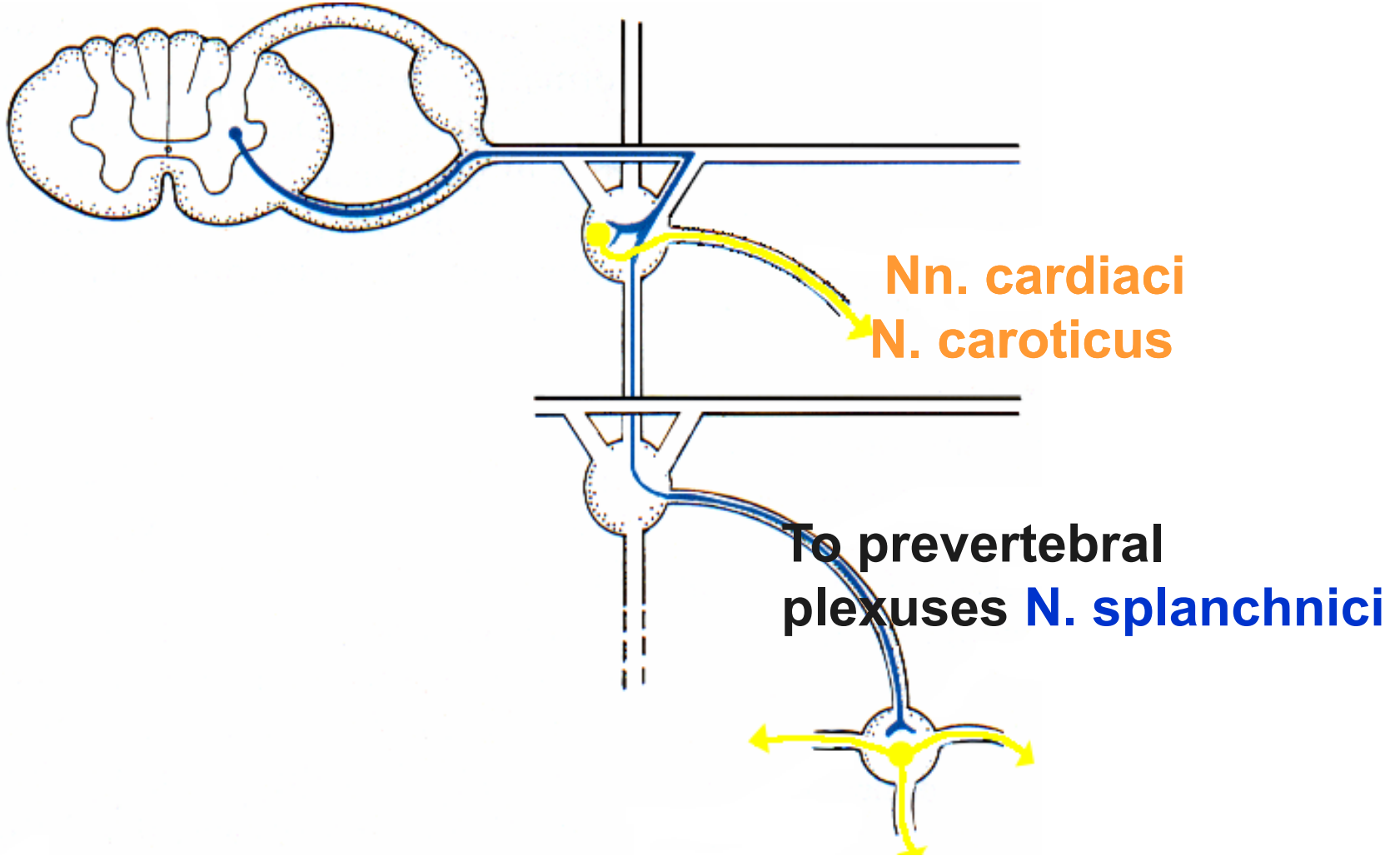
mesentericum inf.



# Ganglia tr. sympathici

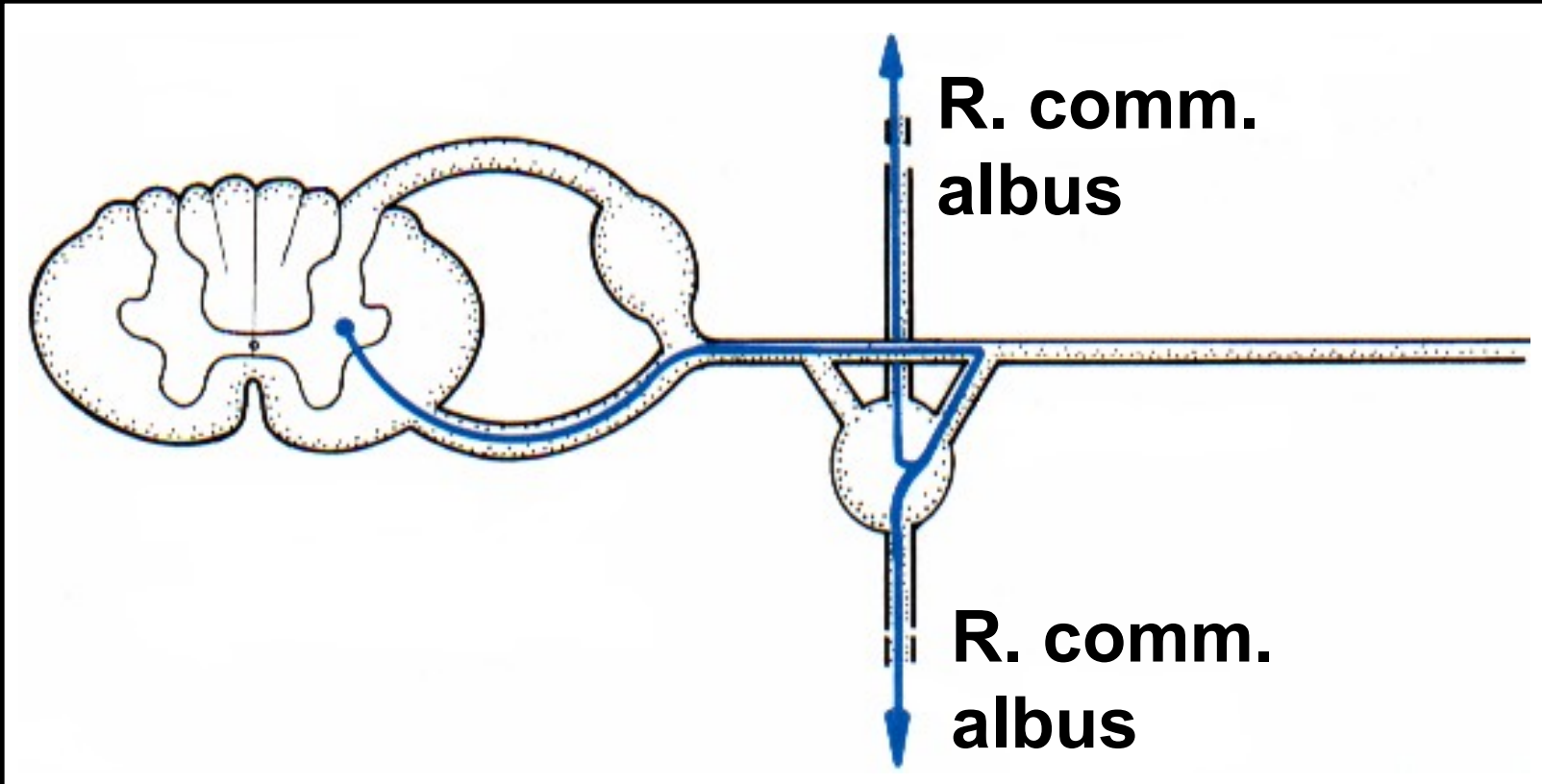


**rr. viscerales**  
**rr. vasculares**

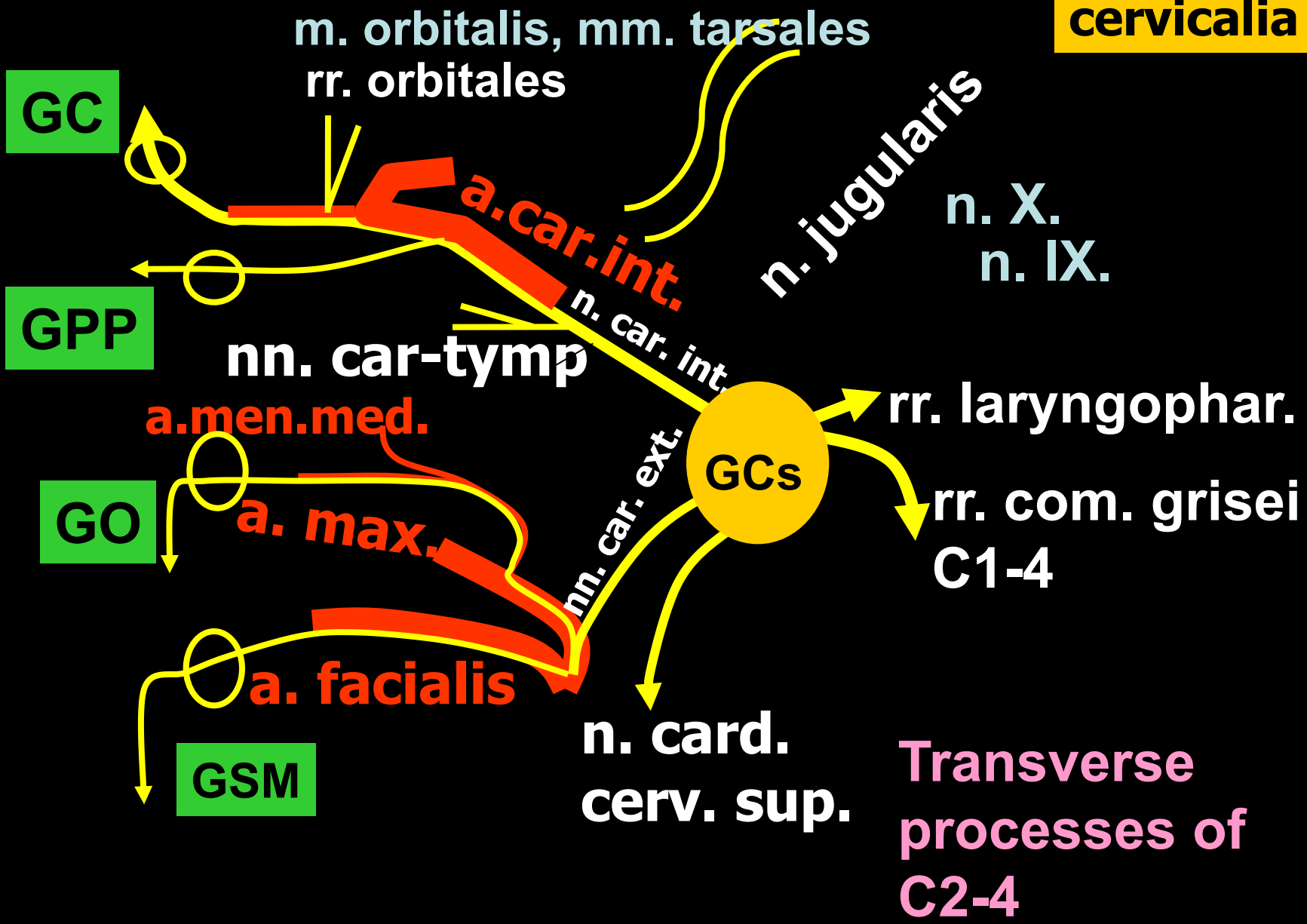


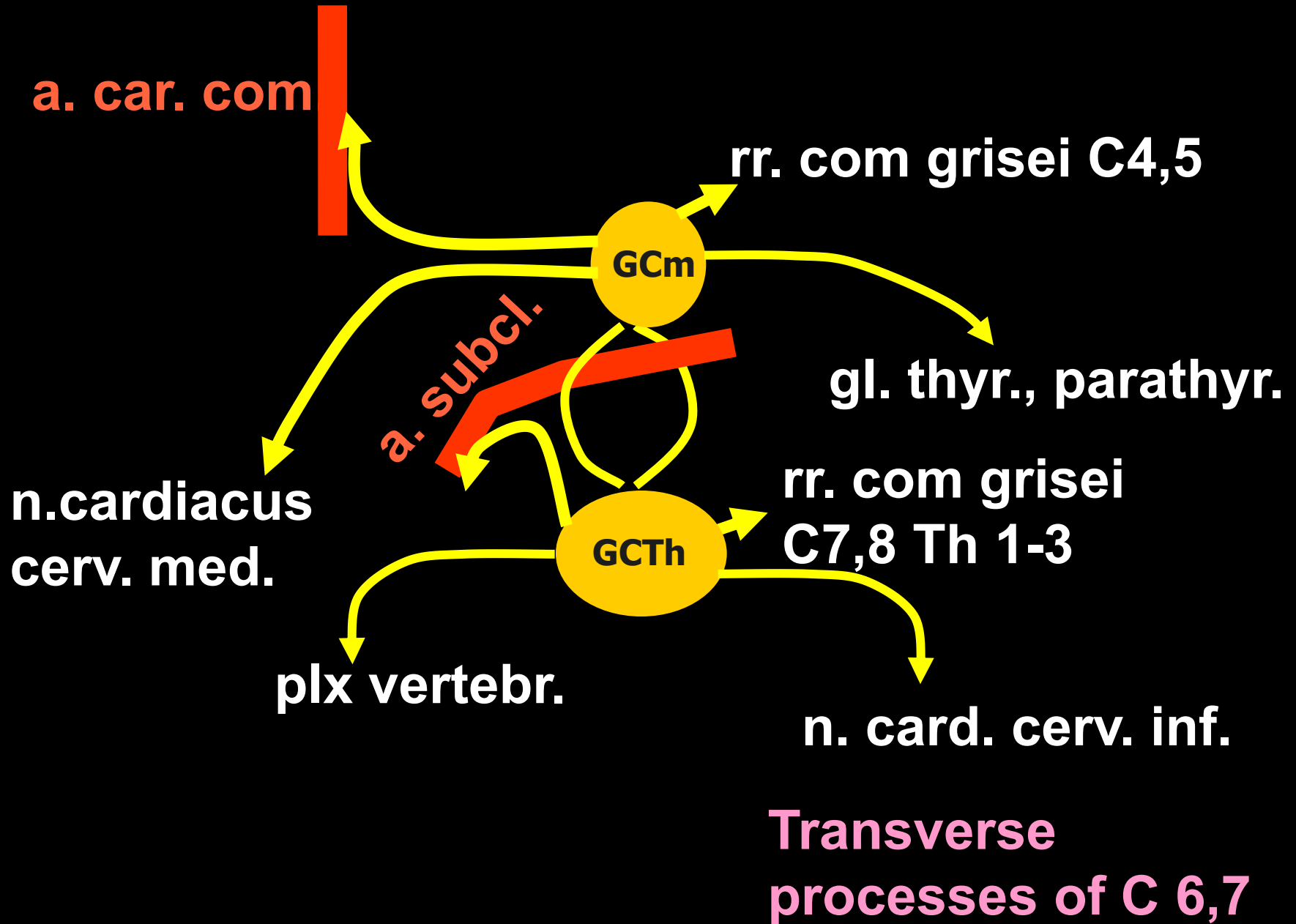
**nn. splanchnici**

# rr. interganglionares



**Ganglia cervicalia**

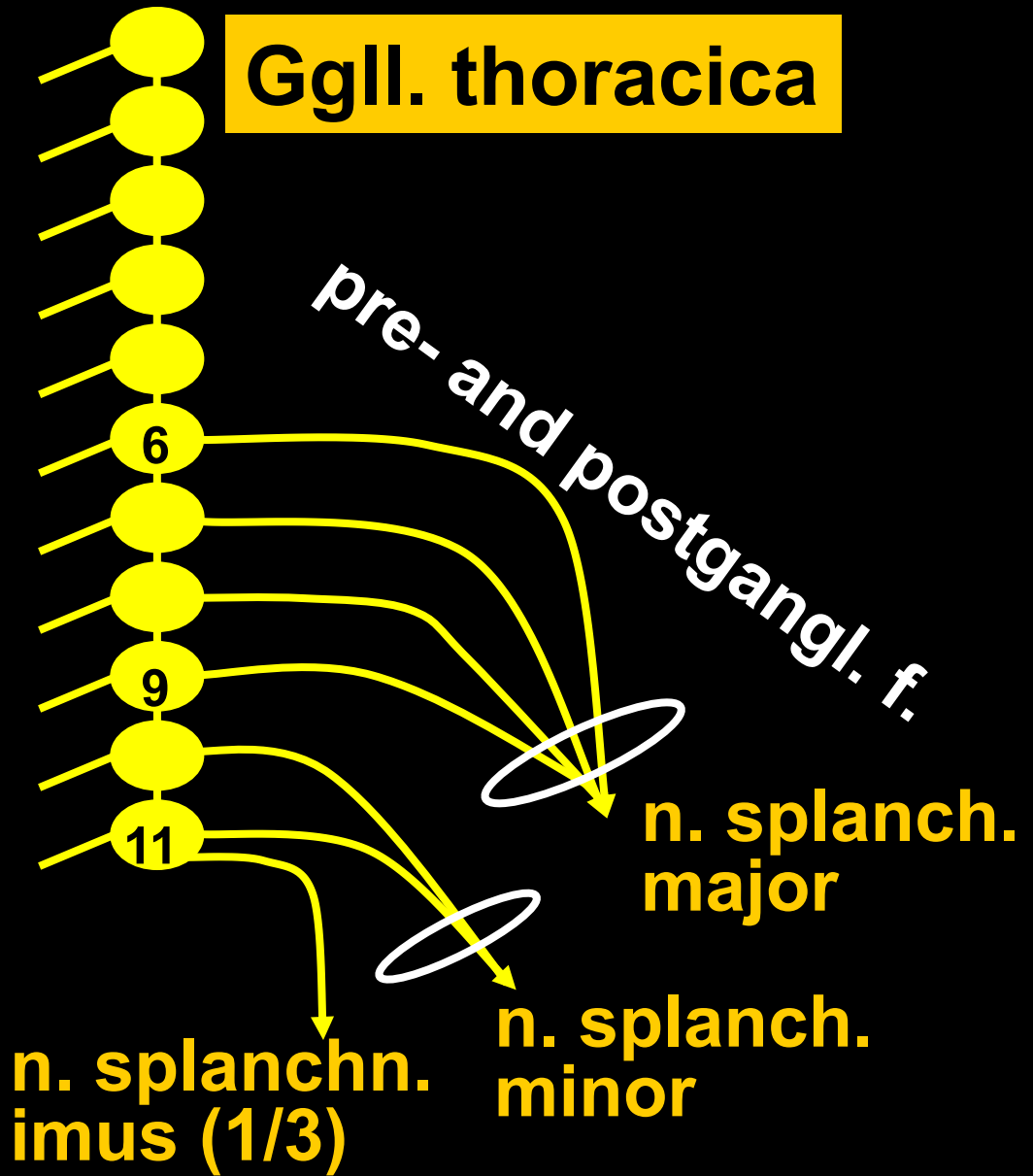






**rr. com grisei**  
- nn. intercost.  
**nn. cardiaci th.**  
**rr. pulmonales**  
**rr. oesophagei**

**rr. vasculares**  
- aa. intercost.  
- aorta > plx.  
aorticus thorac.



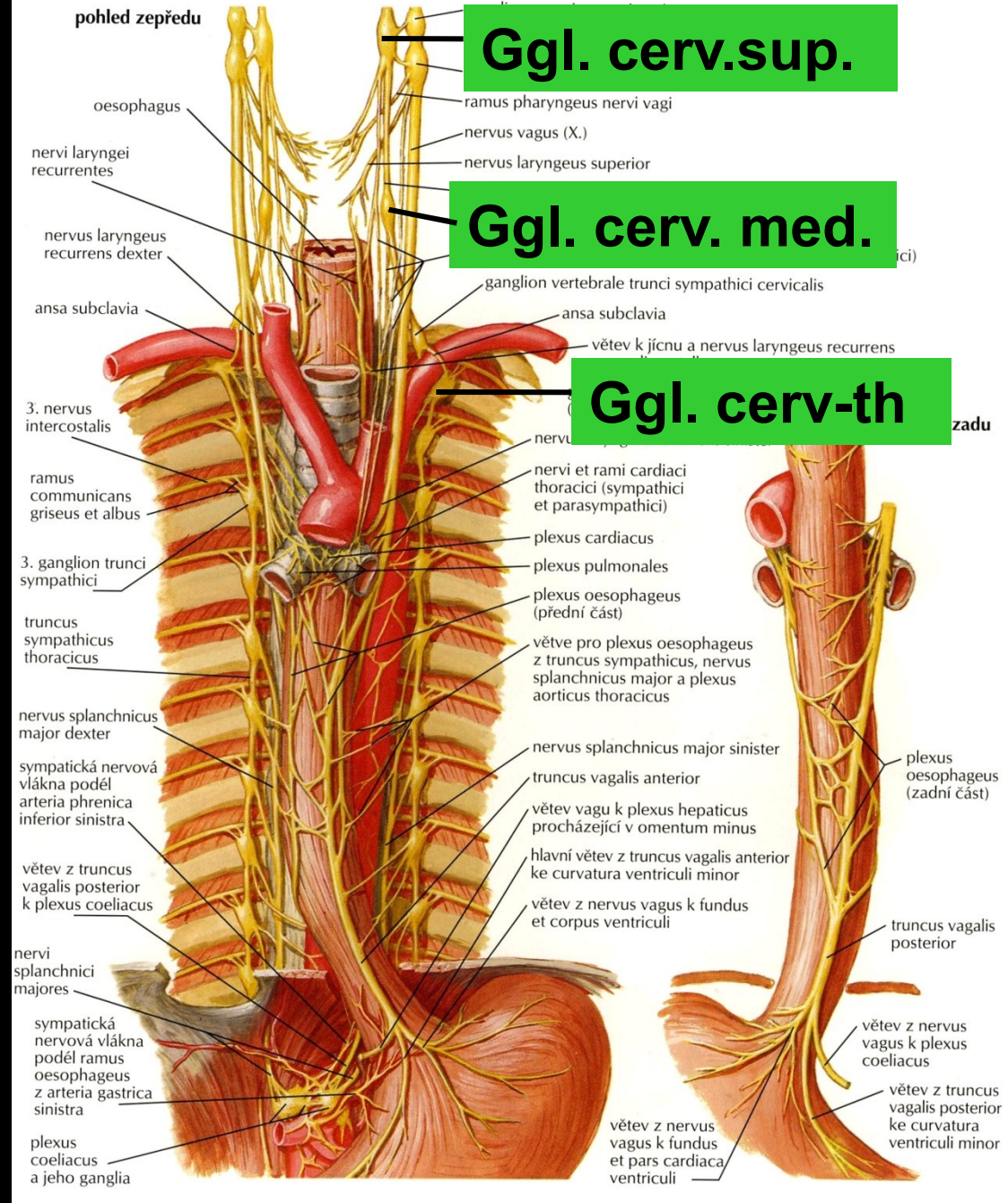
pohled zepředu

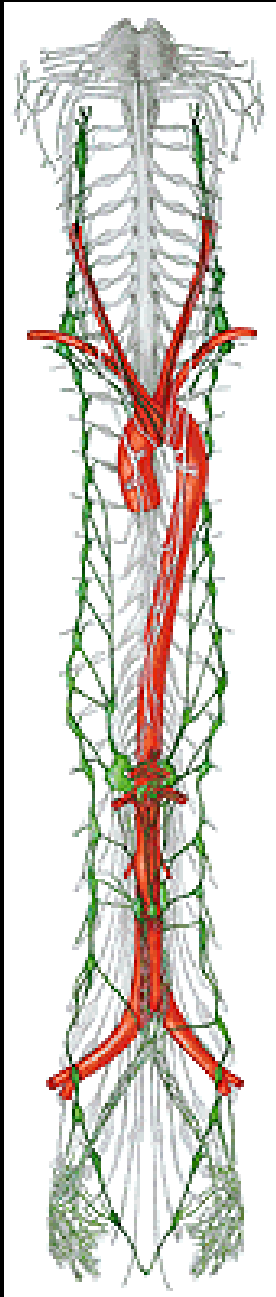
# Ggl. cerv.sup.

# Ggl. cerv. med.

# Ggl. cerv-th

zadu



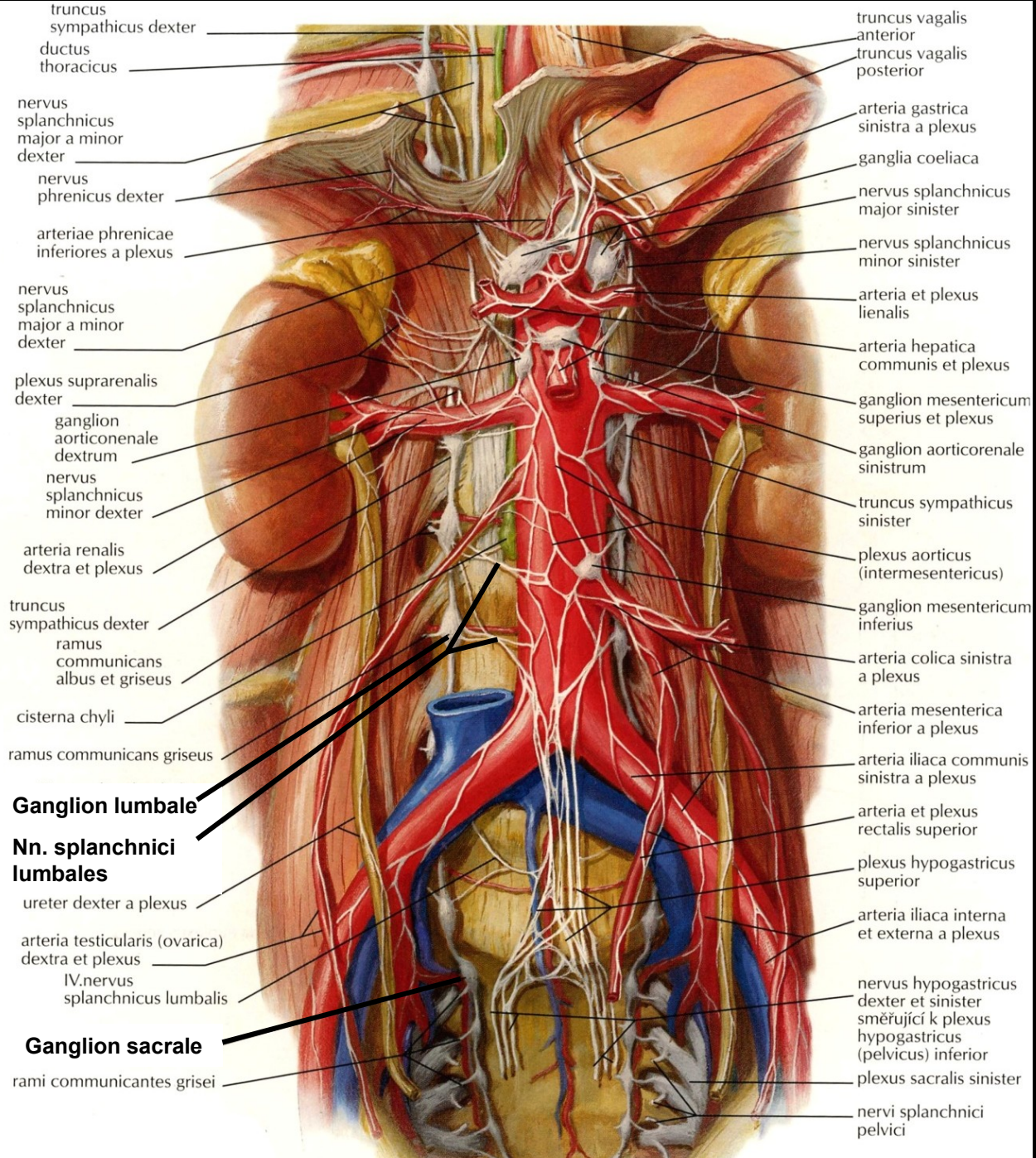


<b>Ganglia lumbalia</b>	<b>4-5</b>
<b>Ganglia sacralia</b>	<b>4-5</b>
<b>Ganglion impar</b>	<b>1</b>

**Rr. com. grisei** (L1 – Co)

**Nn. splanchn. lumb.** (plx. aorticus abd.)

**Nn. splanchn. sacrales** (plx. hypogastr.)



truncus sympathicus dexter  
 ductus thoracicus  
 nervus splanchnicus major a minor dexter  
 nervus phrenicus dexter  
 arteriae phrenicae inferiores a plexus  
 nervus splanchnicus major a minor dexter  
 plexus suprarenalis dexter  
 ganglion aorticorenale dextrum  
 nervus splanchnicus minor dexter  
 arteria renalis dextra et plexus  
 truncus sympathicus dexter  
 ramus communicans albus et griseus  
 cisterna chyli  
 ramus communicans griseus

**Ganglion lumbale**

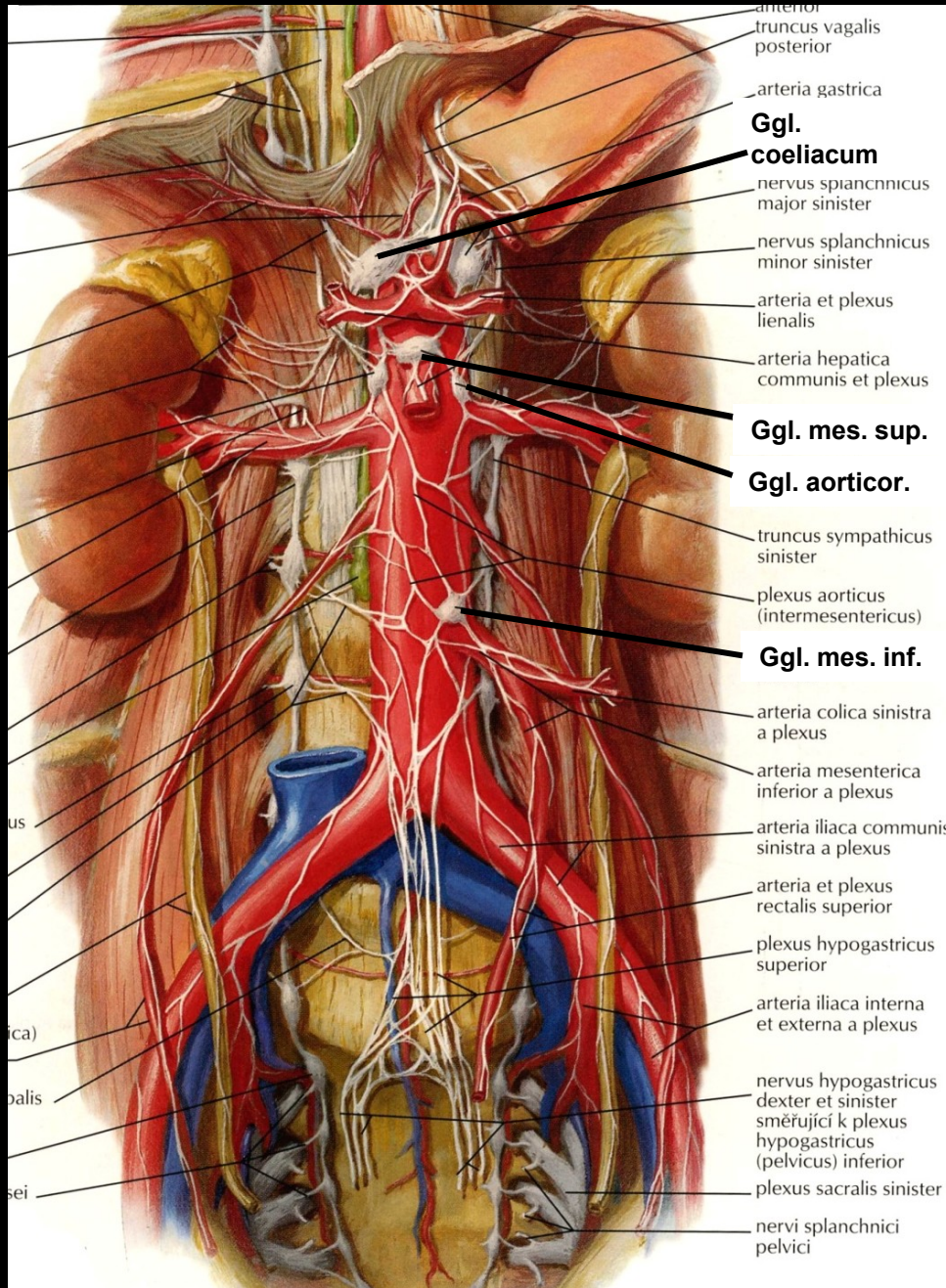
**Nn. splanchnici lumbales**

ureter dexter a plexus  
 arteria testicularis (ovarica) dextra et plexus  
 IV.nervus splanchnicus lumbalis

**Ganglion sacrale**

rami communicantes grisei

truncus vagalis anterior  
 truncus vagalis posterior  
 arteria gastrica sinistra a plexus  
 ganglia coeliaca  
 nervus splanchnicus major sinister  
 nervus splanchnicus minor sinister  
 arteria et plexus lienalis  
 arteria hepatica communis et plexus  
 ganglion mesentericum superius et plexus  
 ganglion aorticorenale sinistrum  
 truncus sympathicus sinister  
 plexus aorticus (intermesentericus)  
 ganglion mesentericum inferius  
 arteria colica sinistra a plexus  
 arteria mesenterica inferior a plexus  
 arteria iliaca communis sinistra a plexus  
 arteria et plexus rectalis superior  
 plexus hypogastricus superior  
 arteria iliaca interna et externa a plexus  
 nervus hypogastricus dexter et sinister směřující k plexus hypogastricus (pelvicus) inferior  
 plexus sacralis sinister  
 nervi splanchnici pelvici



# Prevertebral ganglia

**Coeliacum**  
**Mesentericum sup.**  
**Aorticorenale**  
**Mesentericum inf.**

# Ggl. ciliare

N. nasociliaris

Ggl. cervic. sup.

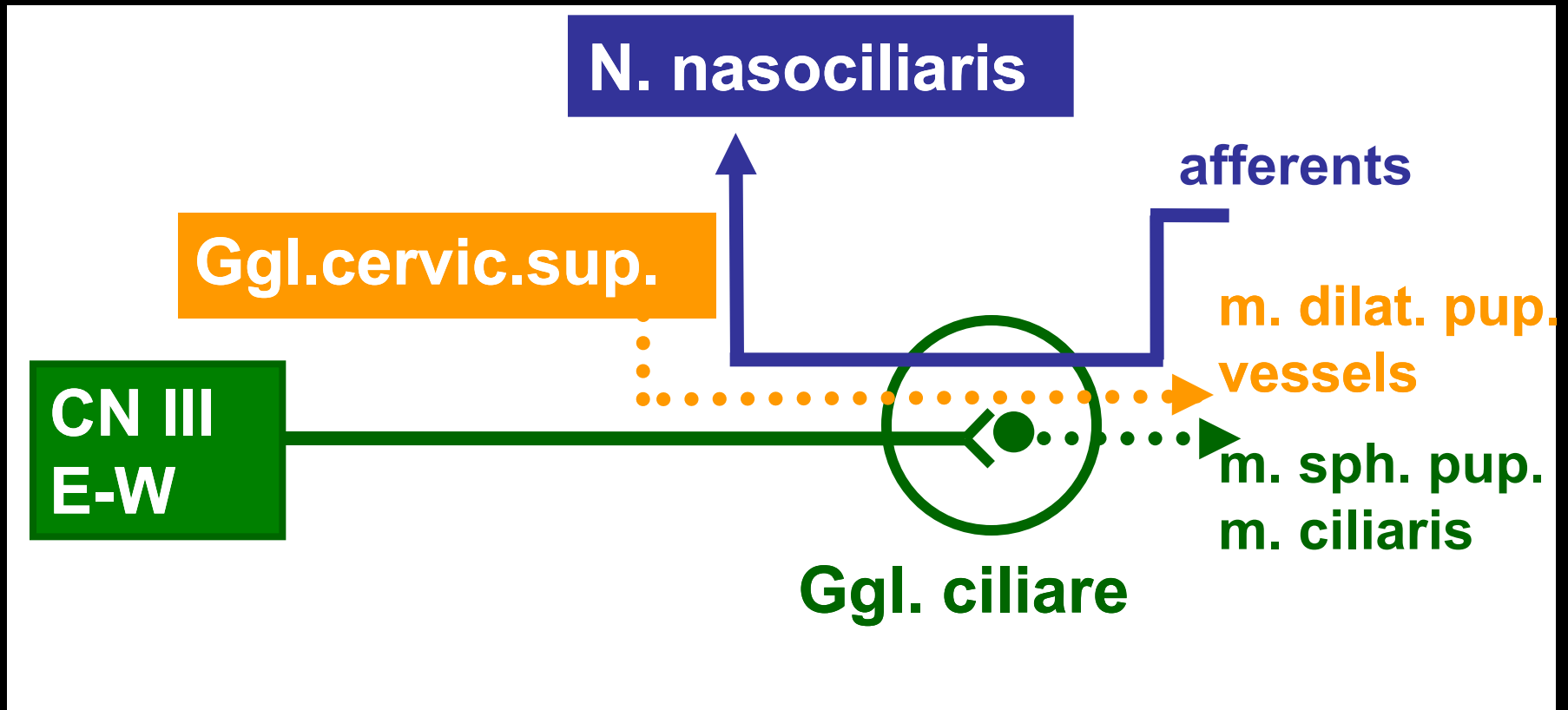
CN III  
E-W

afferents

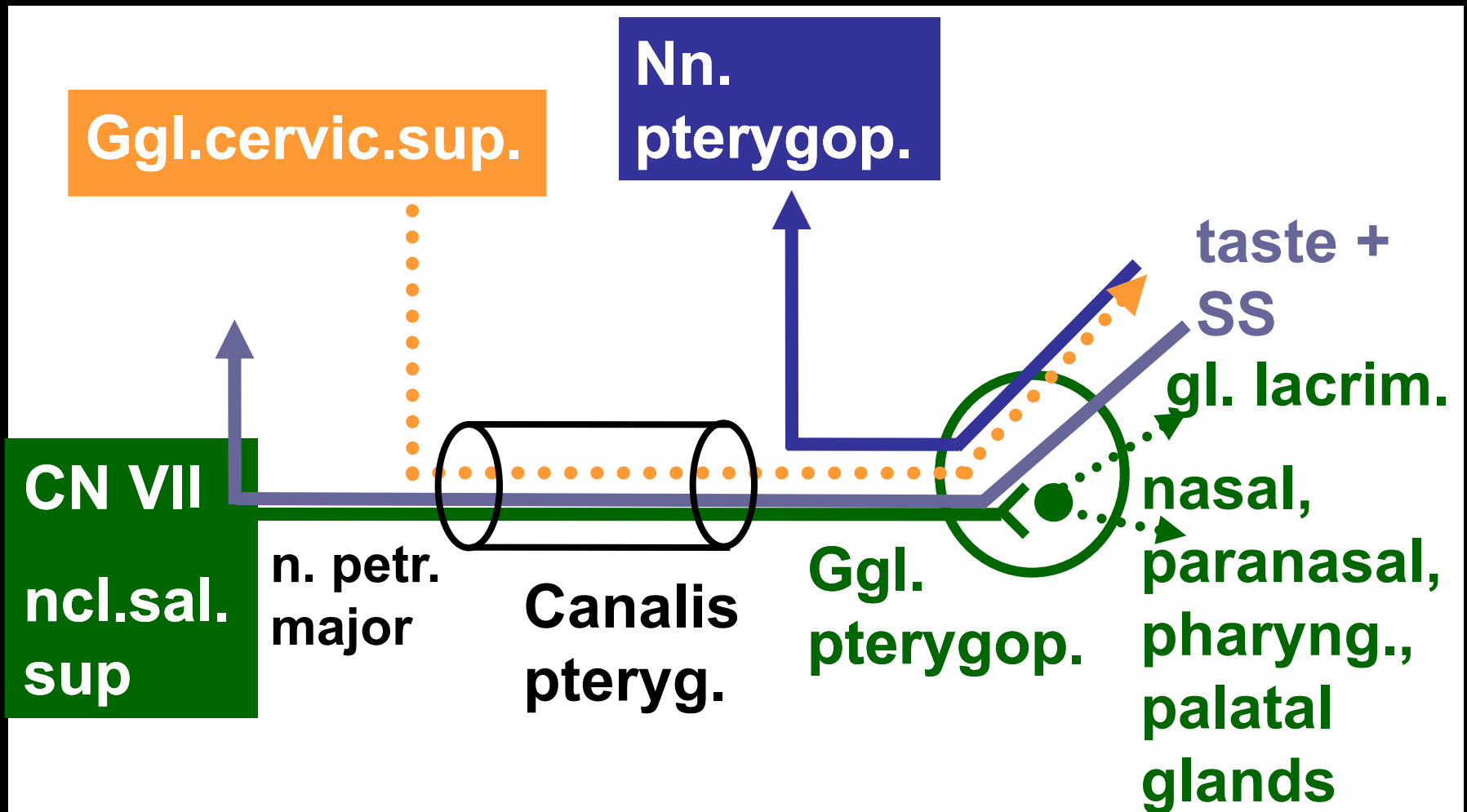
m. dilat. pup.  
vessels

m. sph. pup.  
m. ciliaris

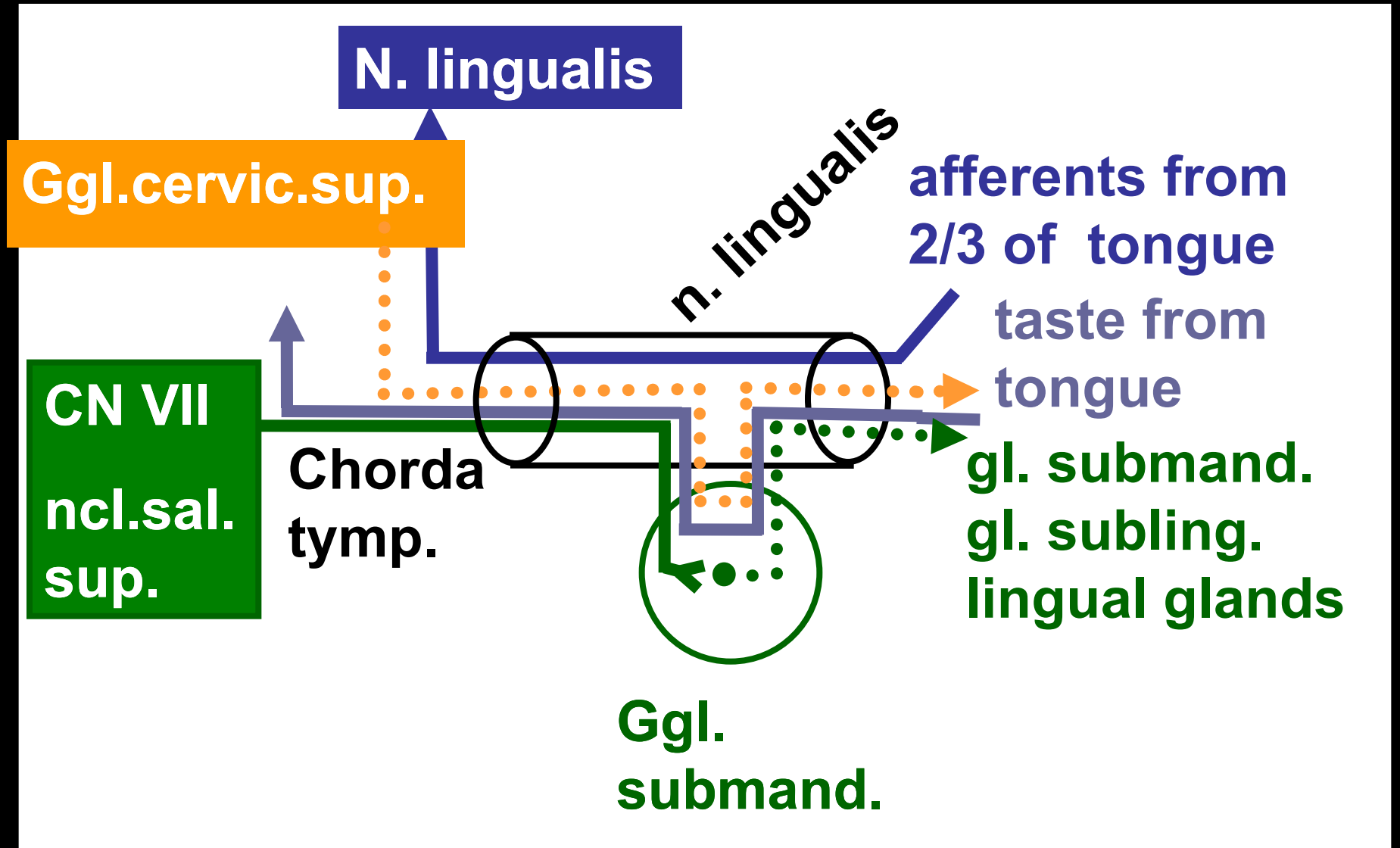
Ggl. ciliare



# Ggl. pterygopalat.

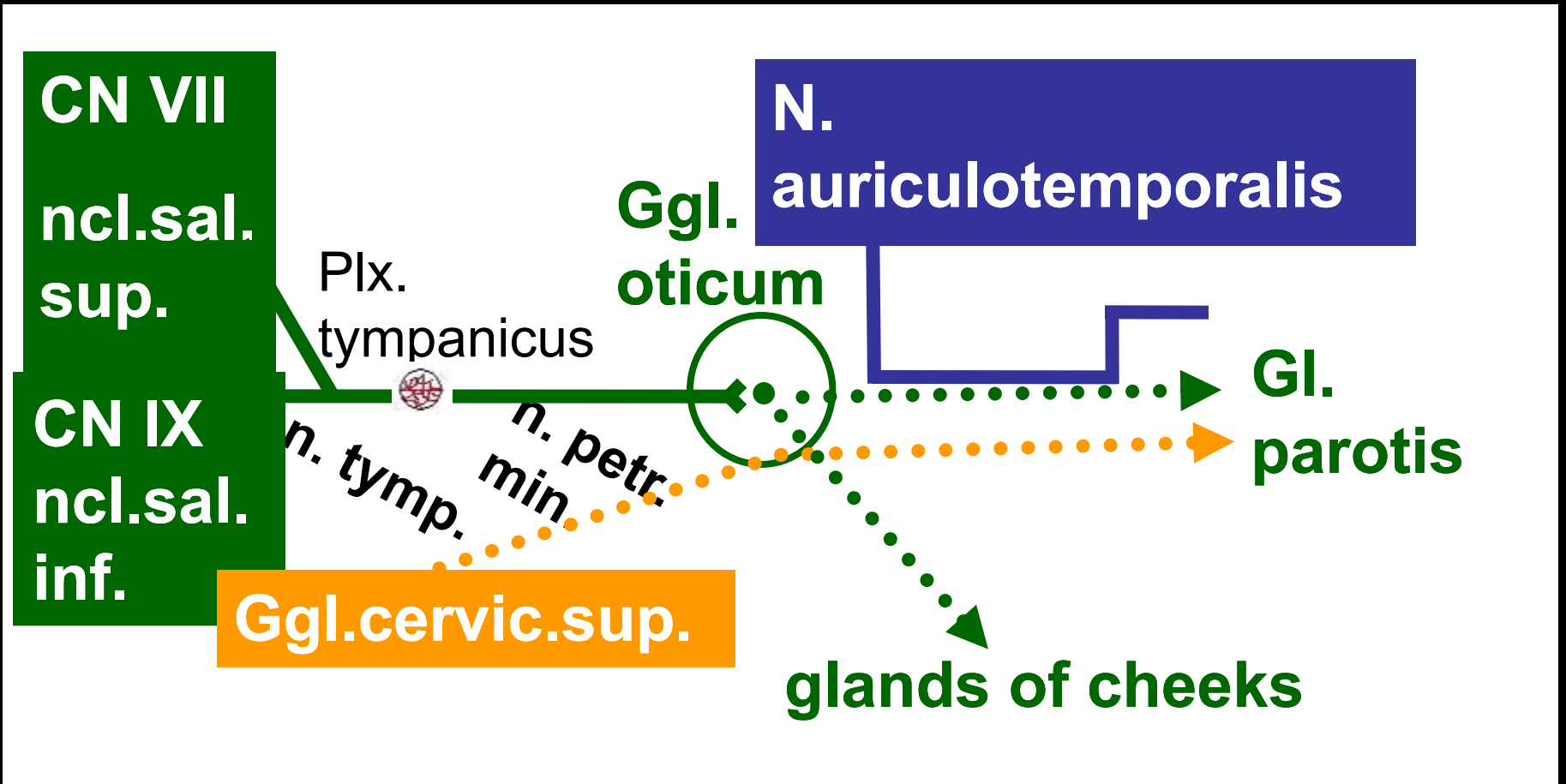


# Ggl. submand.



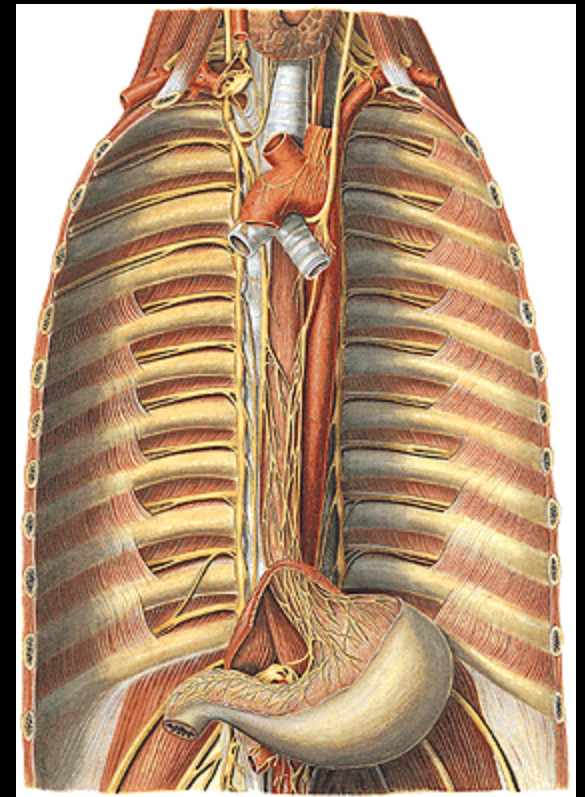
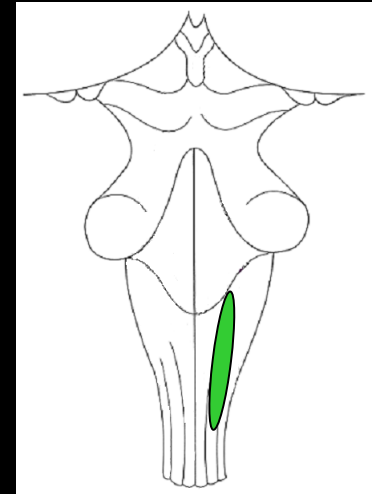


# Ggl. oticum



# Ncl. p. CN X

pharynx, oesophagus, trachea,  
bronchi, lungs, heart, stomach,  
liver, kidneys, intestine to flex.  
coli sin., genital glands



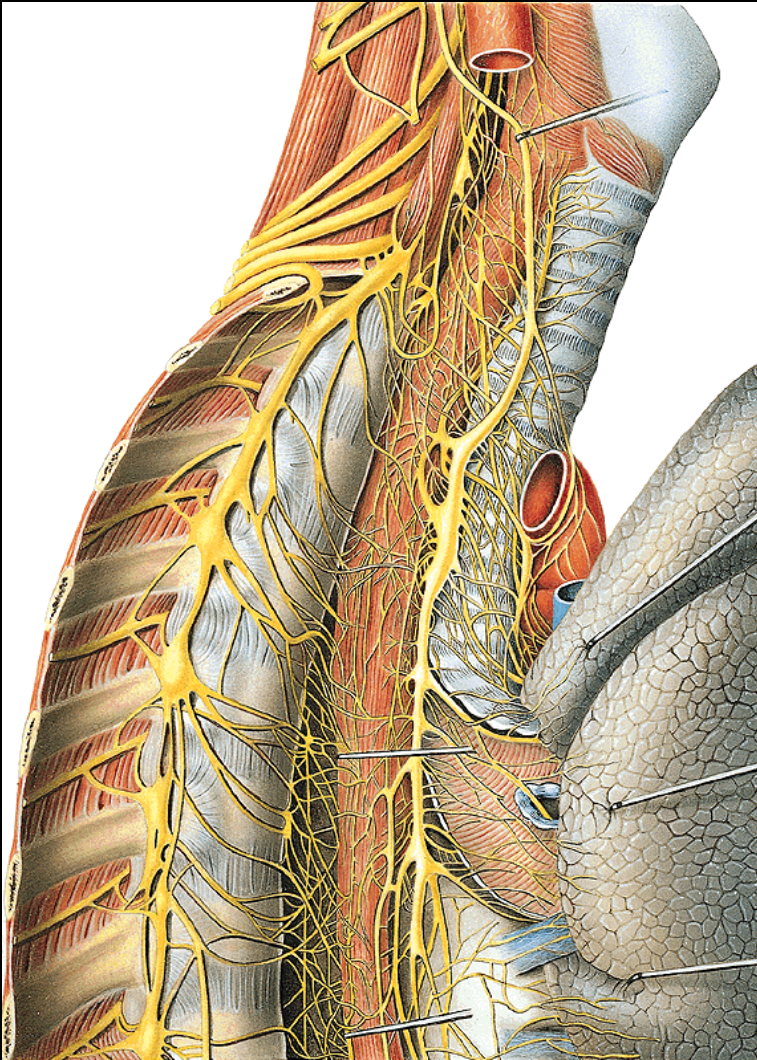
## Sacral parasympathetic s.

**Ncl. intermediolat.**

pregangl. f. - **nn. splanchn. pelvici** to plx. hypog.  
sup. et inf. - **ganglia pelvica**  
> postgangl. f. - effectors

intestine from flexura coli sin.  
organs of pelvis (except genital glands)  
erectile bodies of penis and clitoris

**ANS** innervates organs of thorax, abdomen and pelvis through **mixed autonomic plexuses**

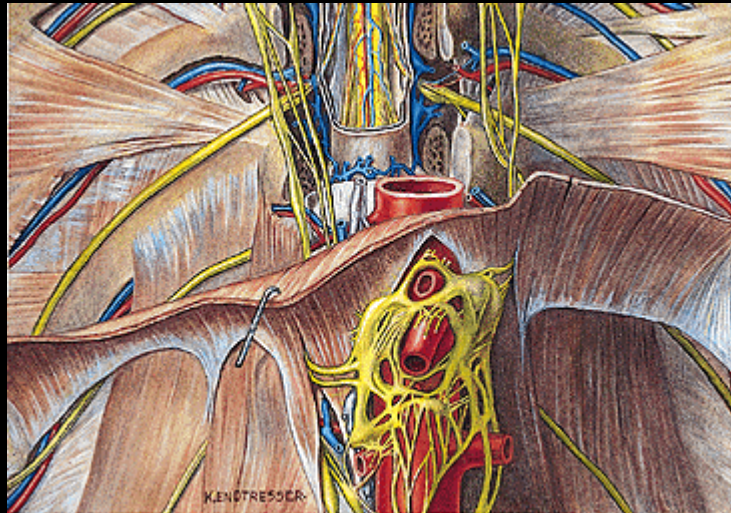


## Thorax

**Plex. card. superf. et prof.**  
**Plex. aorticus thoracicus**  
**Plex. pulmonalis**  
**Plex. eosophageus**

# Abdomen

## Plex. aorticus abdom.



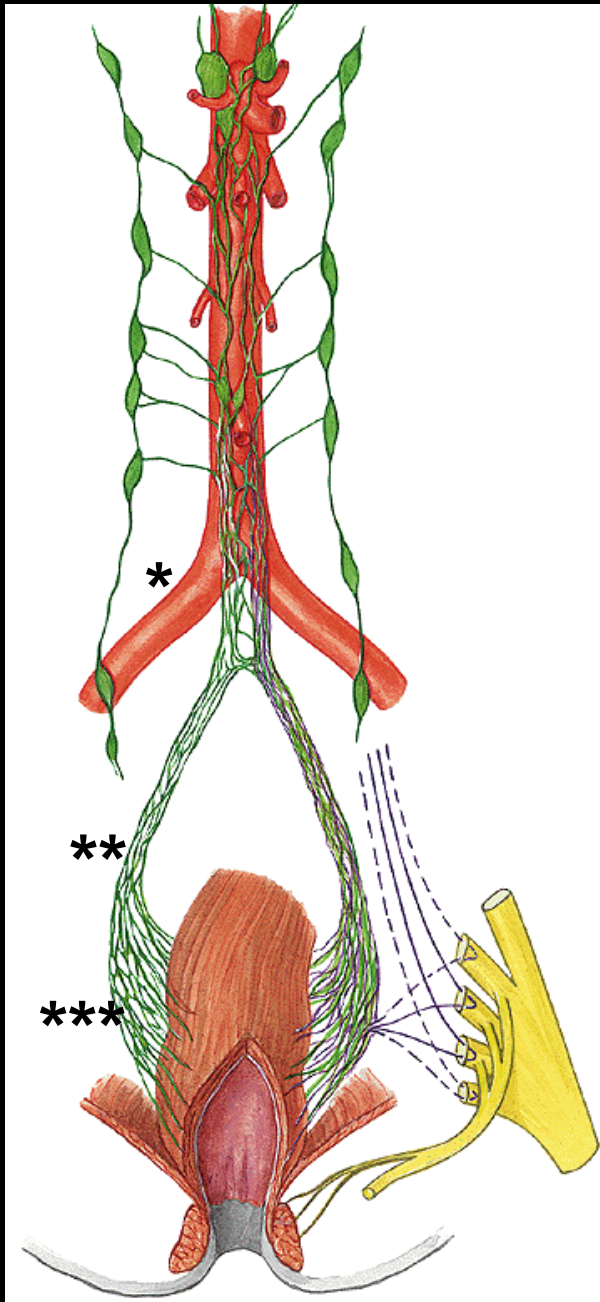
**coeliacus ... hepaticus, gastrici,  
lienalis, pancreaticus  
renalis et suprarenalis  
testicularis / ovaricus  
uretericus  
mesent. sup. (n. vagus)  
mesent. inf. (sacral parasymp.)**

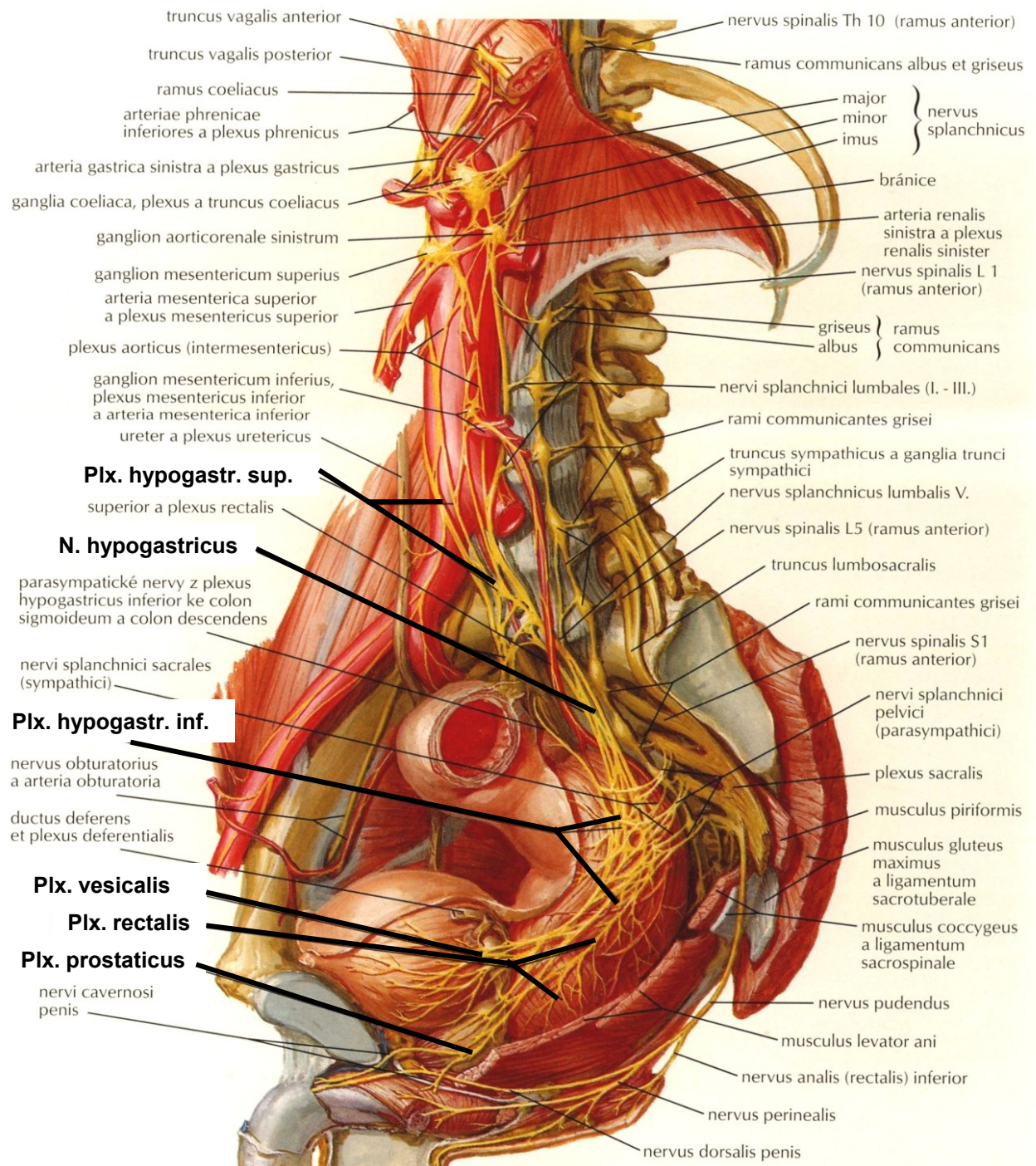
# Pánev

- \* Plx. hypogastr. sup.
- \*\* N. hypogastr. dx. et sin.
- \*\*\* Plx. hypogastr. inf.

> plexus:

rectales medii et inferiores  
vesicales  
prostaticus  
deferentialis  
uterovaginalis  
cavernosi penis / clitoridis





truncus vagalis anterior  
truncus vagalis posterior  
ramus coeliacus  
arteriae phrenicae inferiores a plexus phrenicus  
arteria gastrica sinistra a plexus gastricus  
ganglia coeliaca, plexus a truncus coeliacus  
ganglion aorticorenale sinistrum  
ganglion mesentericum superius  
arteria mesenterica superior a plexus mesentericus superior  
plexus aorticus (intermesentericus)  
ganglion mesentericum inferius, plexus mesentericus inferior a arteria mesenterica inferior  
ureter a plexus uretericus

**Plx. hypogastr. sup.**

superior a plexus rectalis

**N. hypogastricus**

parasympatické nervy z plexus hypogastricus inferior ke colon sigmoideum a colon descendens

nervi splanchnici sacrales (sympathici)

**Plx. hypogastr. inf.**

nervus obturatorius a arteria obturatoria

ductus deferens et plexus deferentialis

**Plx. vesicalis**

**Plex. rectalis**

**Plx. prostaticus**

nervi cavernosi penis

nervus spinalis Th 10 (ramus anterior)  
ramus communicans albus et griseus  
major minor imus } nervus splanchnicus  
bránice  
arteria renalis sinistra a plexus renalis sinister  
nervus spinalis L 1 (ramus anterior)  
griseus } ramus albus } communicans

nervi splanchnici lumbales (I. - III.)  
rami communicantes grisei  
truncus sympathicus a ganglia trunci sympathici  
nervus splanchnicus lumbalis V.  
nervus spinalis L5 (ramus anterior)

truncus lumbosacralis  
rami communicantes grisei  
nervus spinalis S1 (ramus anterior)  
nervi splanchnici pelvici (parasympathici)

plexus sacralis  
musculus piriformis  
musculus gluteus maximus a ligamentum sacrotuberale  
musculus coccygeus a ligamentum sacrospinale

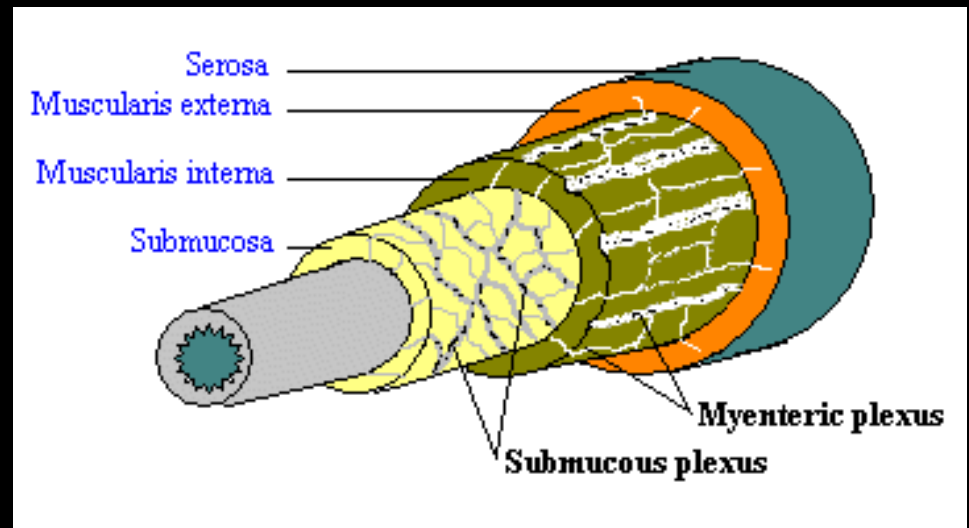
nervus pudendus  
musculus levator ani  
nervus analis (rectalis) inferior  
nervus perinealis  
nervus dorsalis penis

# Enteric system

neurons and interneurons in the wall of digestive tube

**Plx. myentericus**  
**Auerbachii**

**Plx. submucosus**  
**Meissneri**



plexuses contain small ganglia



ganglia receive signals:  
from receptors of GIT  
from CNS via symp. a parasymp. nerves  
through interneurons

**control activity of GIT** through stimulation or inhibition of motoneurons of enteric system  
= **controls tonus and motions of digestive tube and secretion of glands**

