Autonomic nervous system (ANS)

Central and peripheral compartments

Sympathetic part (pars sympathica)

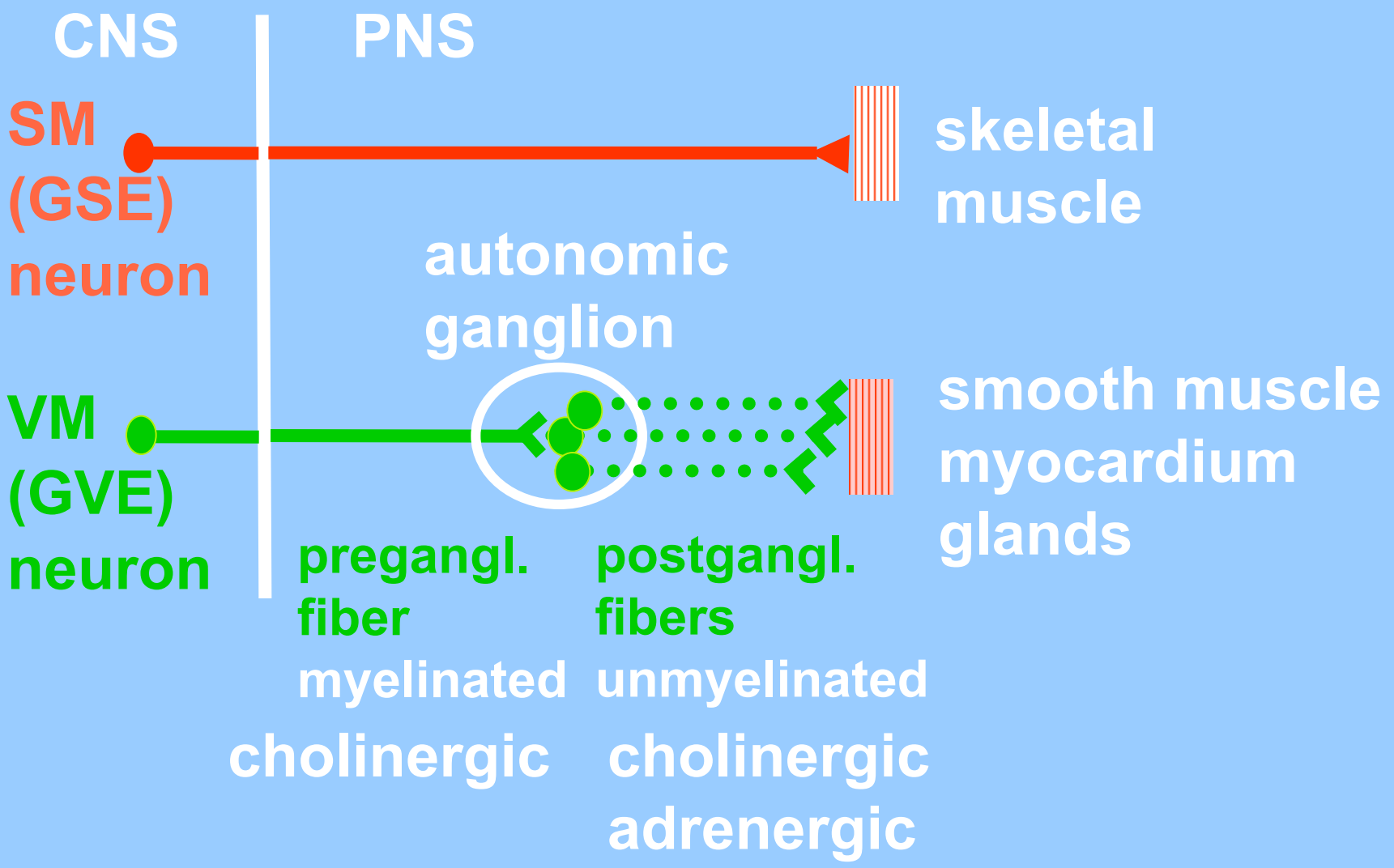
Parasympathetic part (pars parasympathica)

Enteric system

Innervation of

non-striated muscles

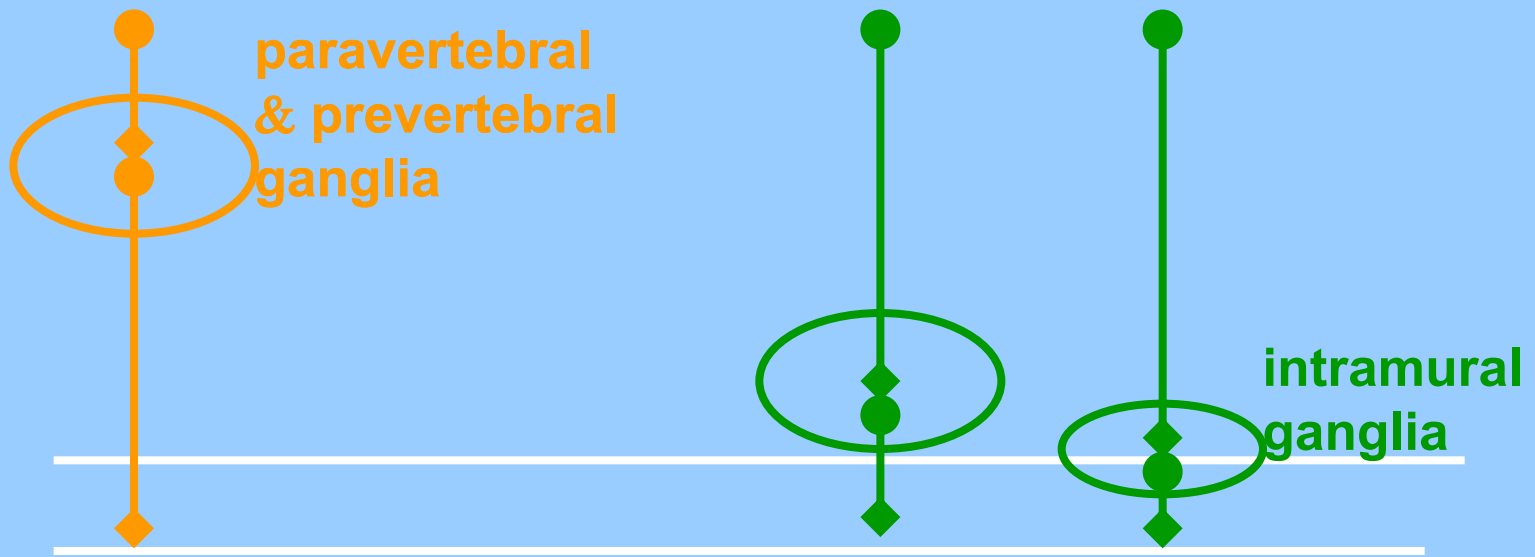
- myocardium
- glands


CNS
PNS
SM
(GSE)
neuron
skeletal
muscle
autonomic
ganglion
VM
(GVE)
neuron
smooth muscle
myocardium
glands
pregangl.
fiber
myelinated
postgangl.
fibers
unmyelinated
cholinergic
cholinergic
adrenergic

cranial parasympathetic part

thoraco-lumbal (sympathetic) system

sacral parasympathetic part



Sympathetic system

Catabolic reaction (activities that are mobilized during emergency and stress situations, “fight, fright and flight” responses)

- dilates coronary arteries
  increases heart rate
- increases cardiac output
- dilates bronchi
- inhibits GIT motility
- dilates pupil (mydriasis)
- stimulates sweat glands secretion
- stimulates secretion of viscous saliva

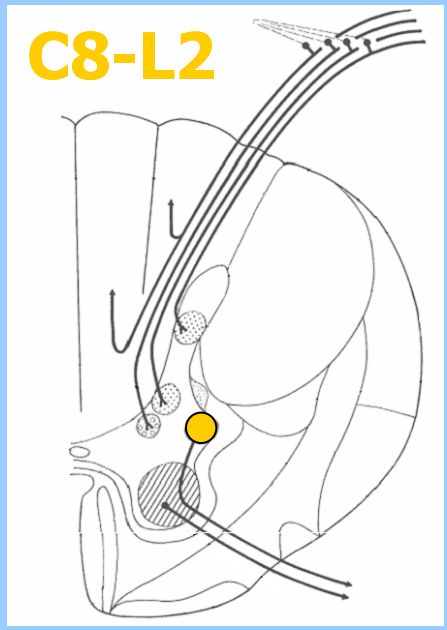
Parasympathetic system

Anabolic reactions (activities associated with conservation and restoration of body resources)

- decreases heart rate
- decreases cardiac output
- constricts coronary arteries
- constricts bronchi
- constricts pupil (miosis)
- accommodation (near vision)
- increases GIT motility
- stimulates secretion of watery saliva

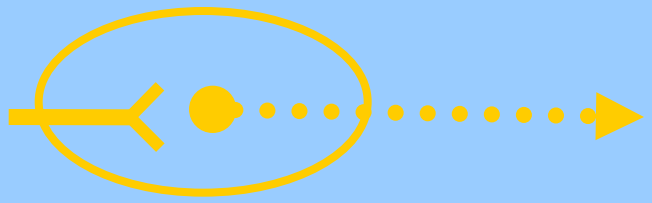
Sympathetic system

Central part:
ncl. intermediolateralis



Peripheral part:
pregangl. fibres
rr.com. albi

Ganglion



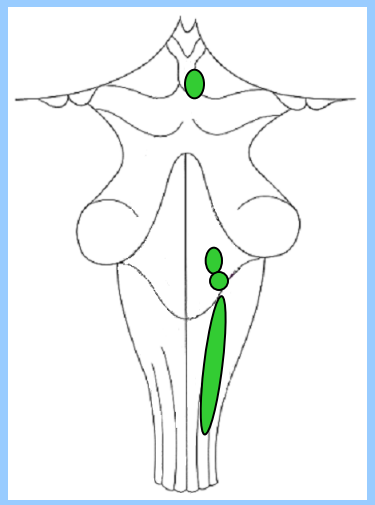
postgangl. fibres

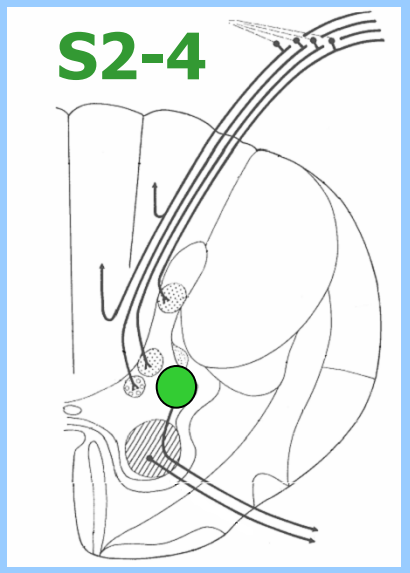
Acetylcholine

Noradrenalin

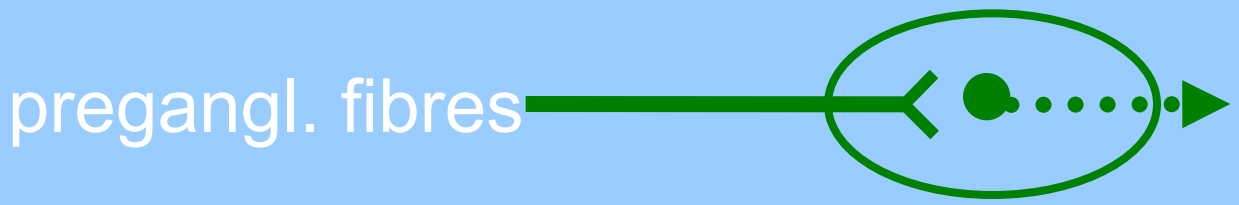
Parasympathetic system

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



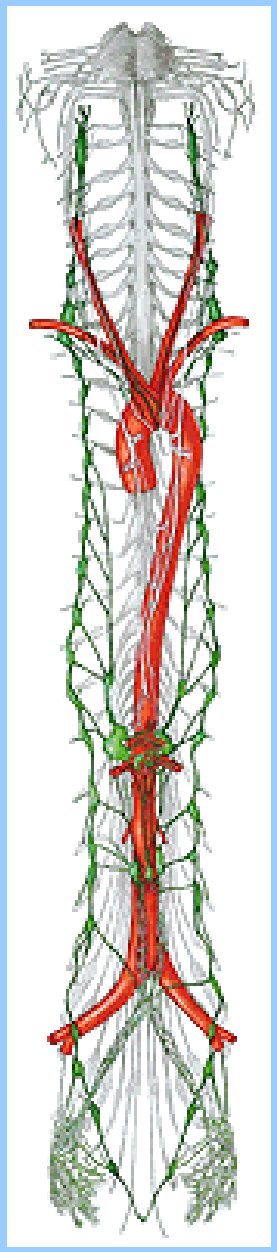


Peripheral part: **Ganglion**



Acetylcholine **Acetylcholine**

I. Pars sympathica



Paravertebral ganglia

(ggl. trunci sympathici)

cervical 3

thoracic 10 - 11

lumbar 4 - 5

sacral 4 - 5

ganglion impar

Prevertebral ganglia

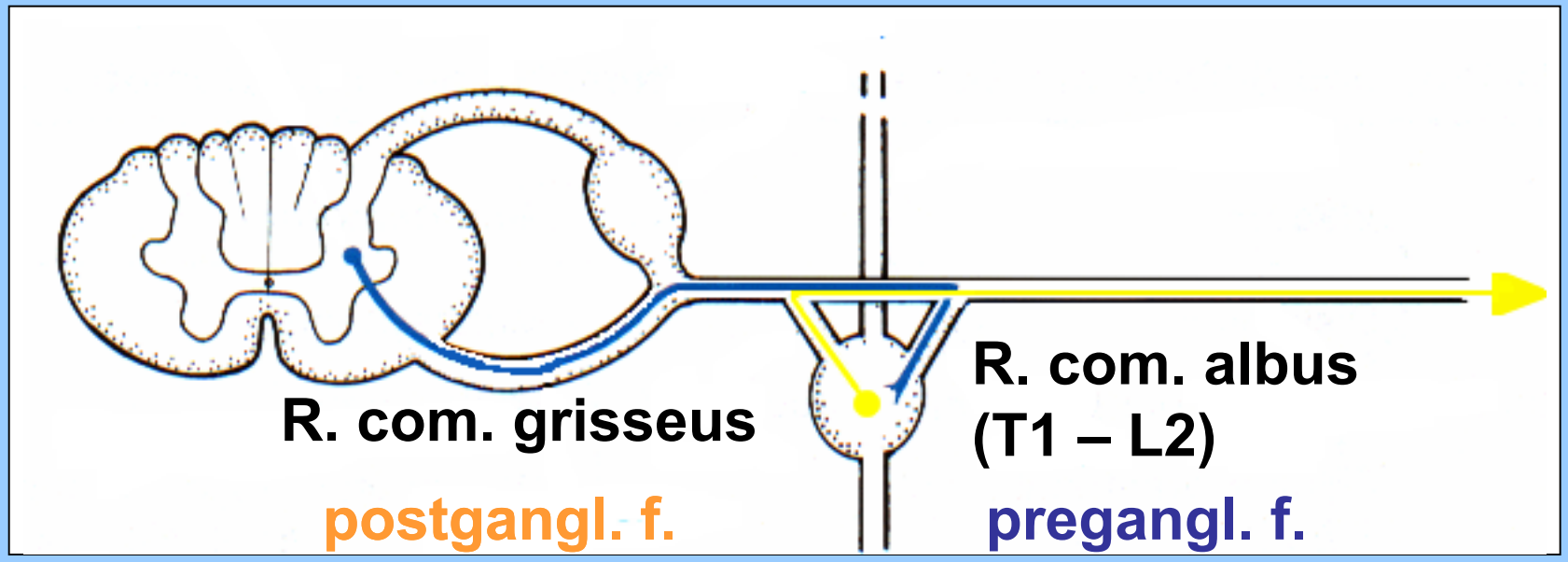
coeliacum

mesentericum sup.

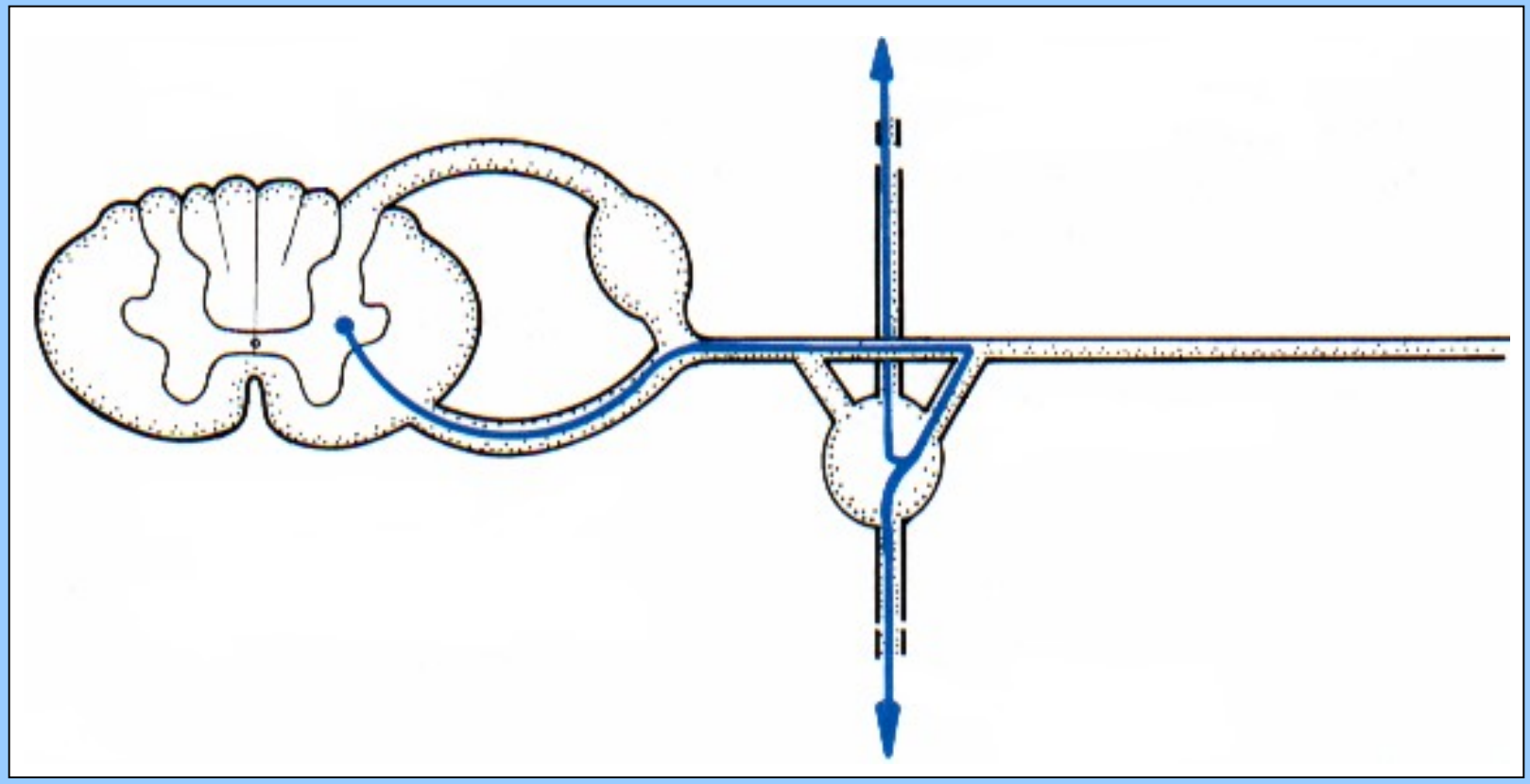
aorticorenale

mesentericum inf.

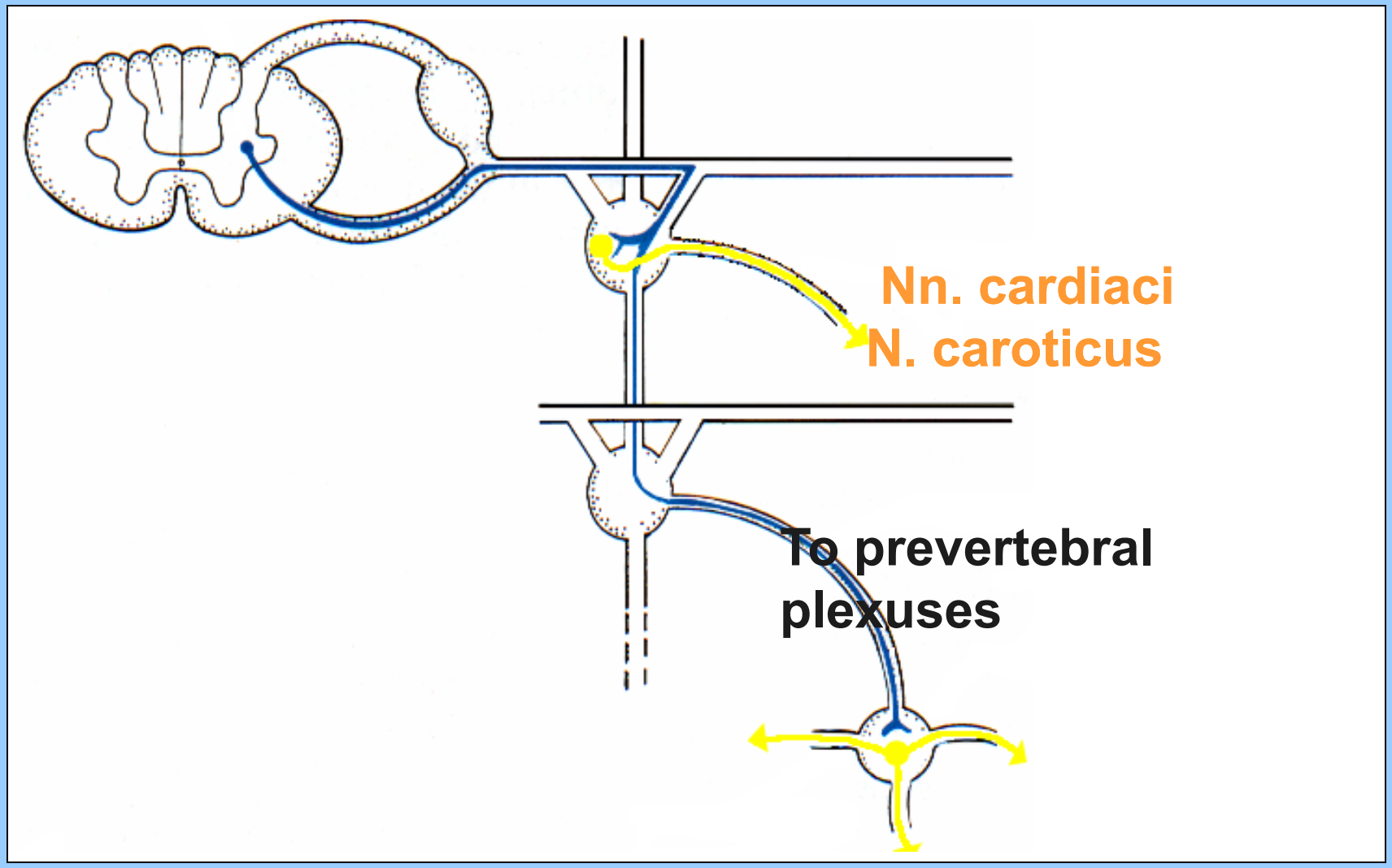
Ganglia tr. sympathici



rr. interganglionares



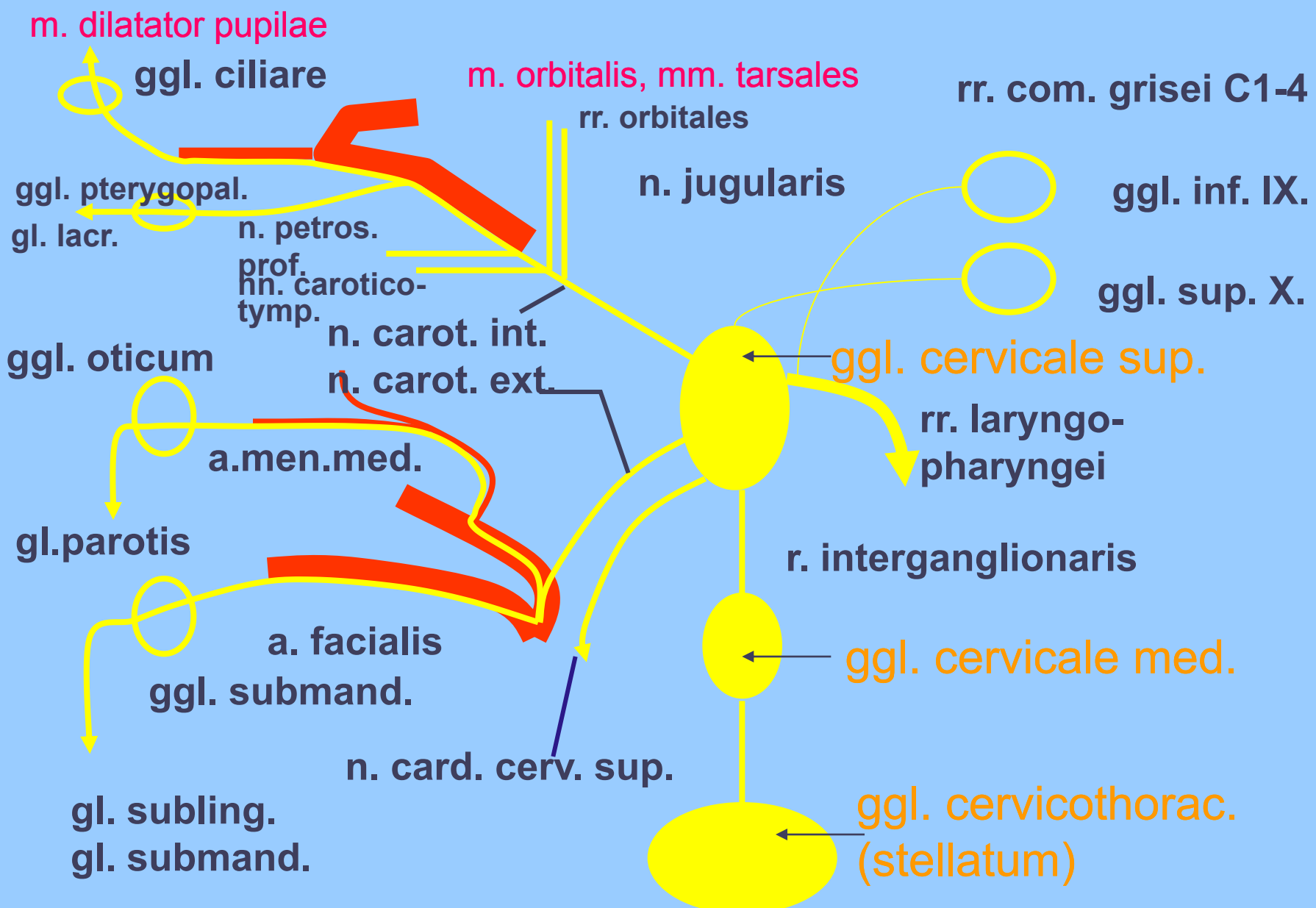
rr. viscerales
rr. vasculares



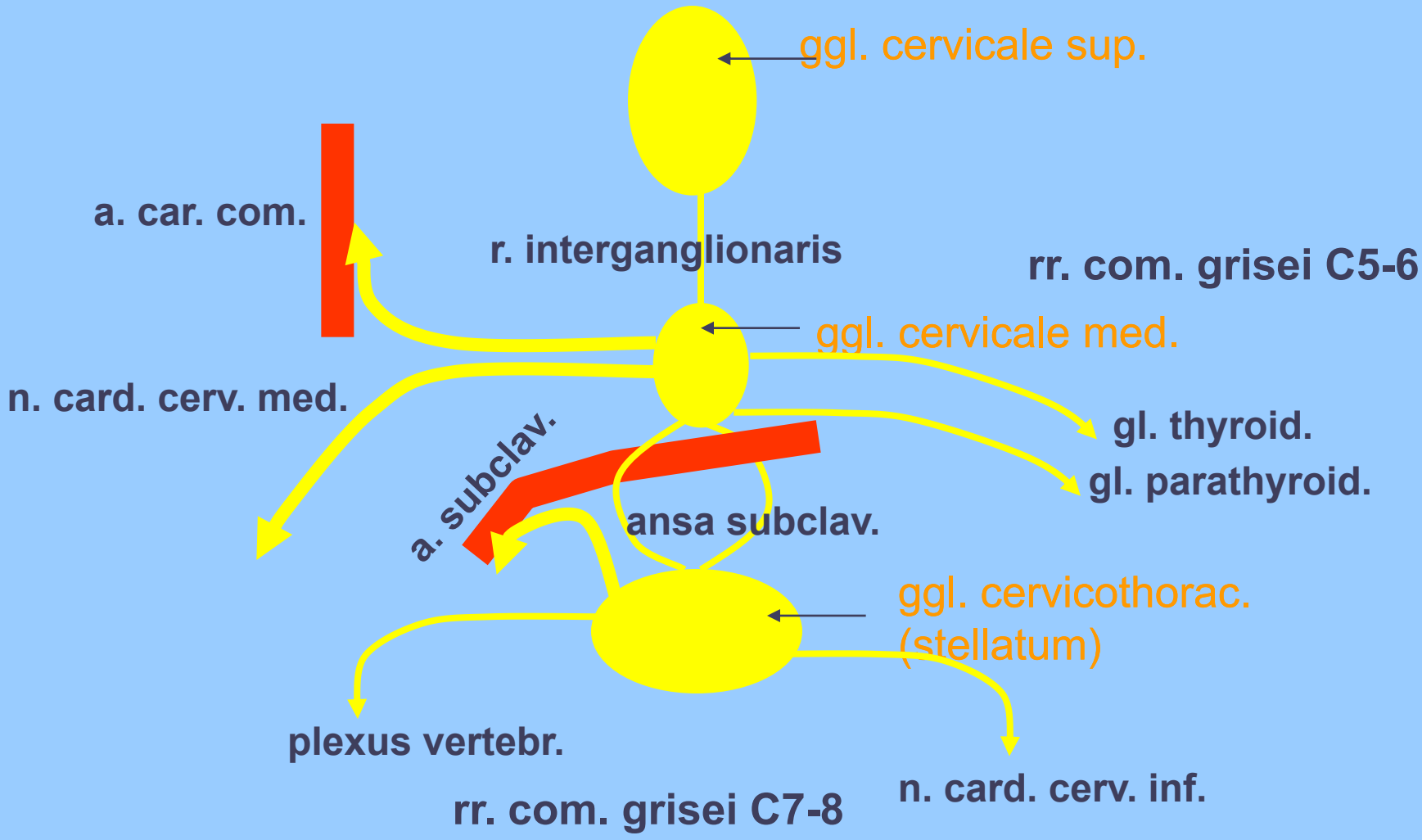
nn. splanchnici

Ggl. cervicale sup.

Horner's sy



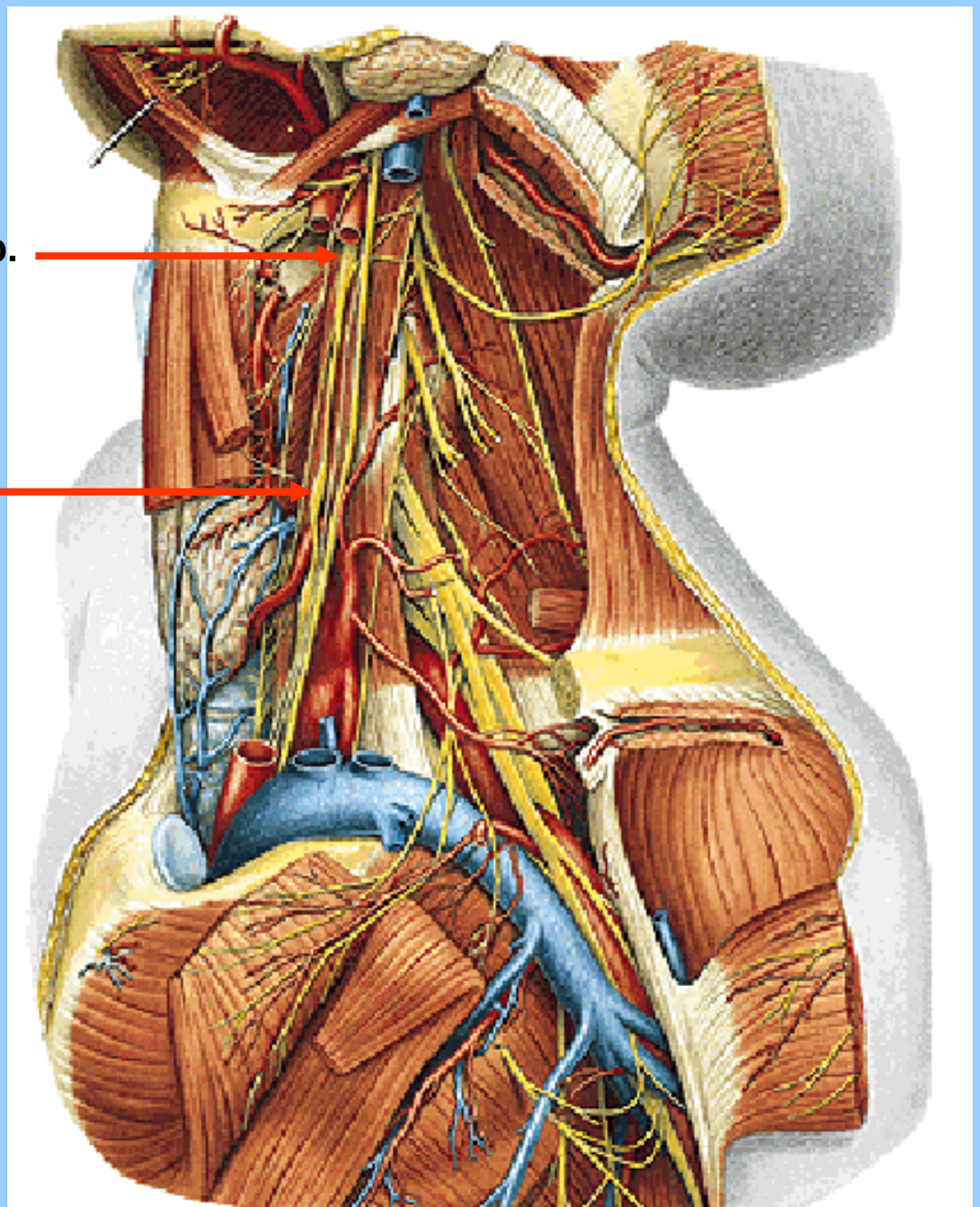
Ggl. cervicale med. et stellatum



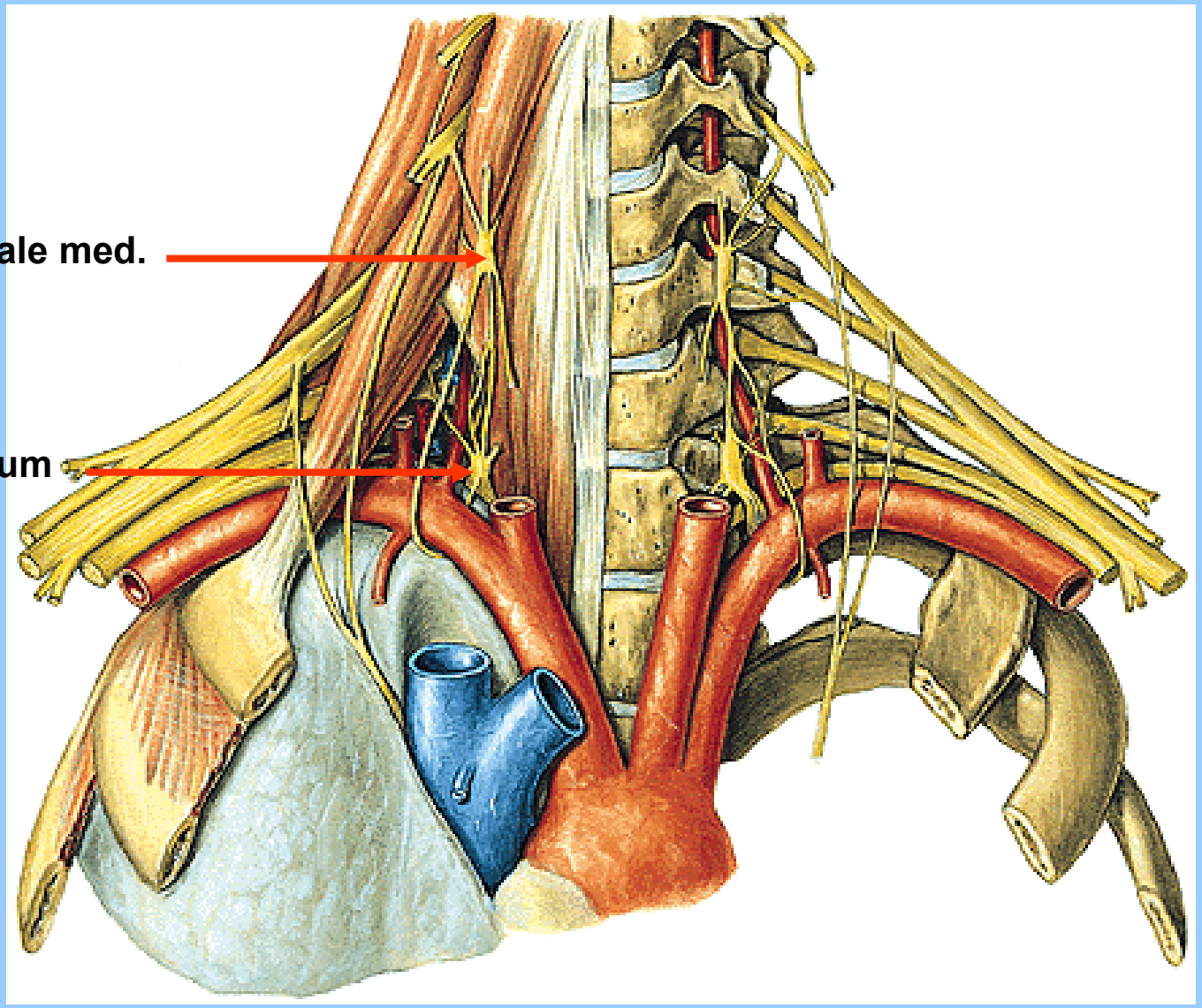
Ganglion cervicale sup. et med.

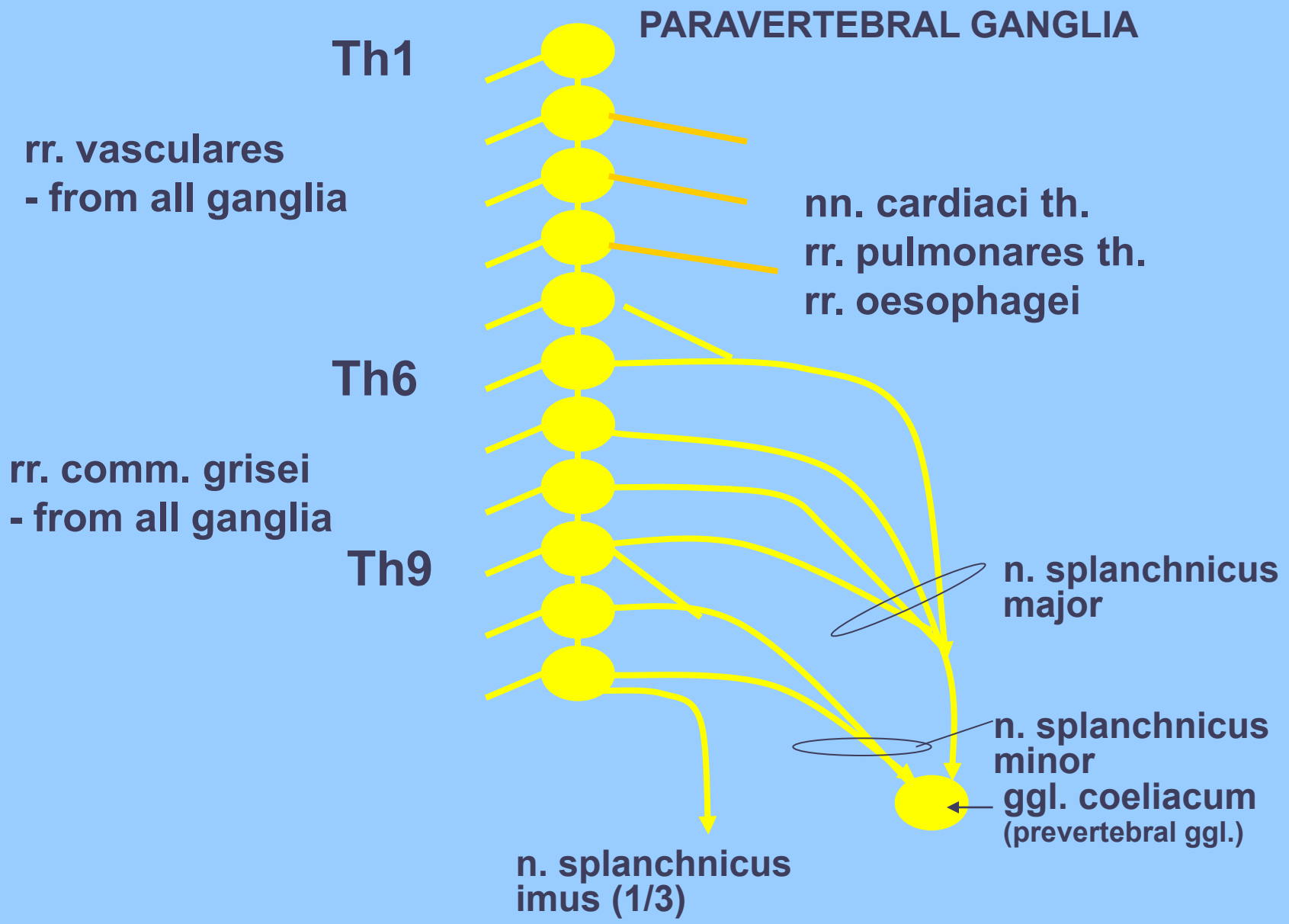
ggl. cervicale sup.

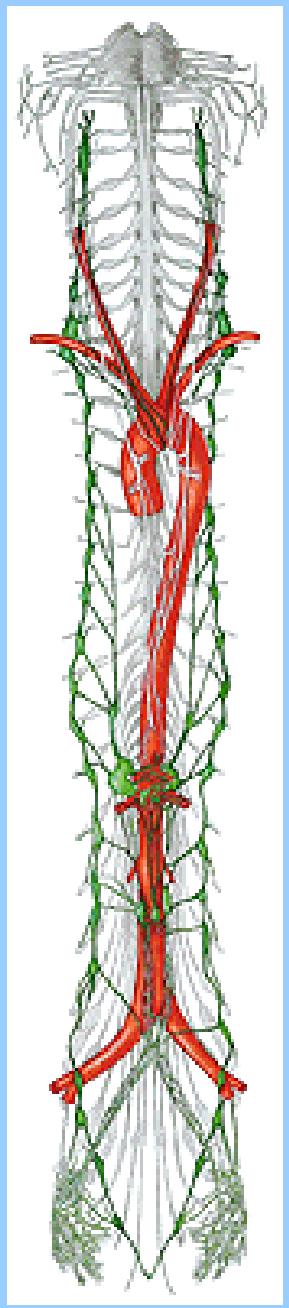
ggl. cervicale med.



Ganglion cervicale med. et stellatum

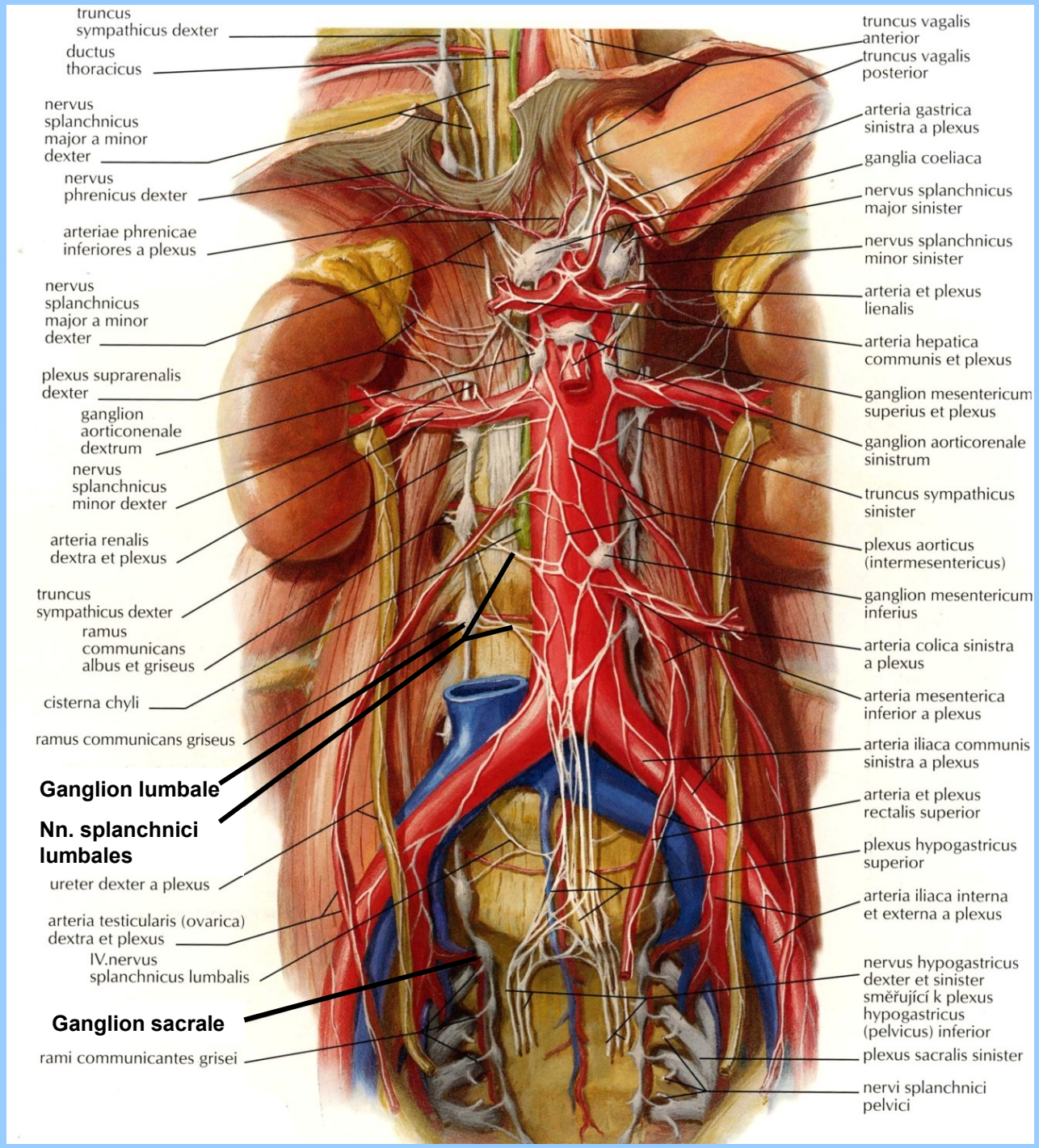


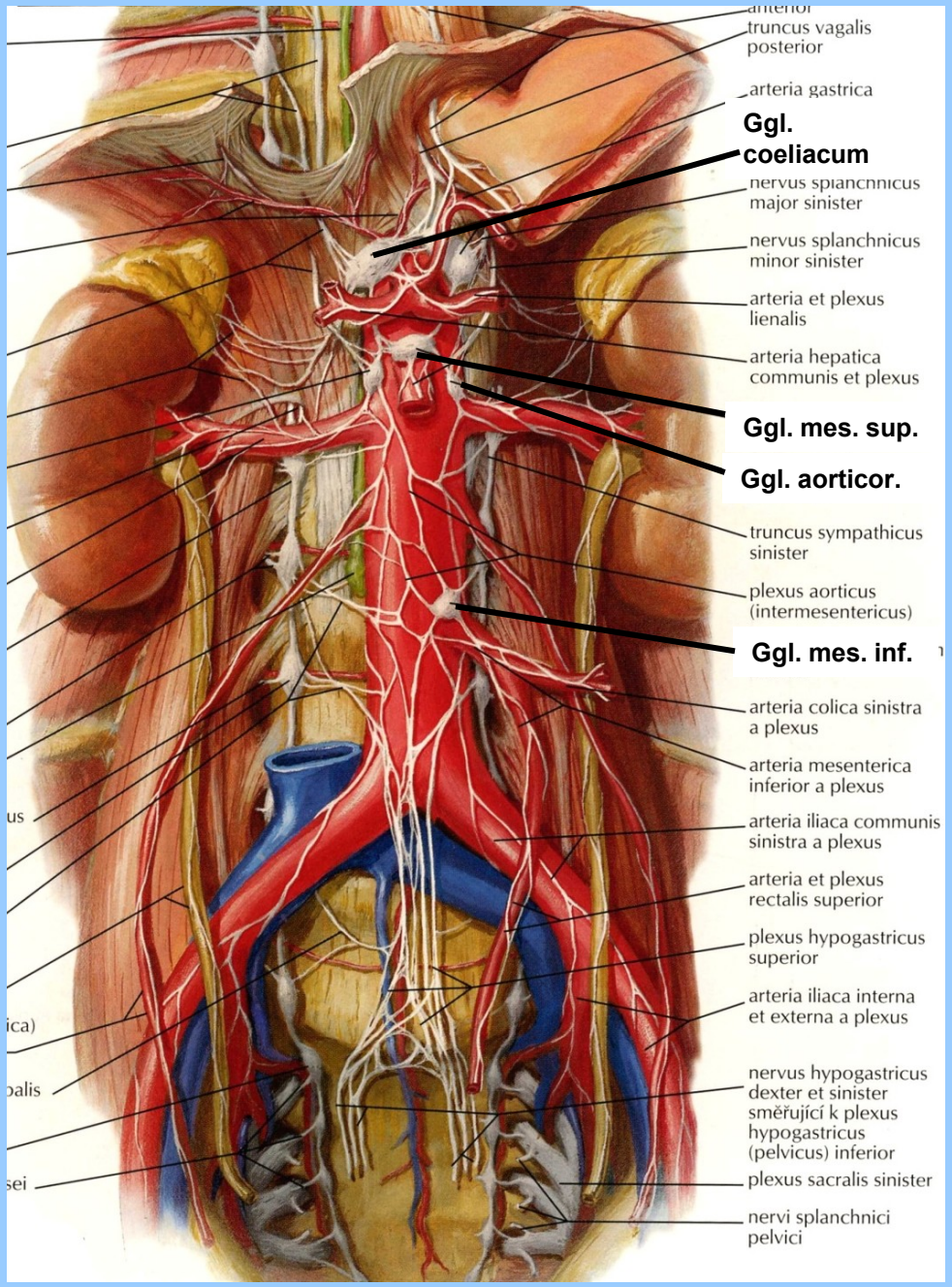

PARAVERTEBRAL GANGLIA
Th1
rr. vasculares
- from all ganglia
nn. cardiaci th.
rr. pulmonares th.
rr. oesophagei
Th6
rr. comm. grisei
- from all ganglia
Th9
n. splanchnicus major
n. splanchnicus minor
ggl. coeliacum
(prevertebral ggl.)
n. splanchnicus imus (1/3)



Ganglia lumbalia	**4-5**
Ganglia sacralia	**4-5**
Ganglion impar	**1**

Rr. com. grisei (L1 – Co)
Rr. vasculares (parietal aa.)
Nn. splanch. lumb. (plx. aorticus abd.)
Nn. splanch. 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 aorticonenale 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

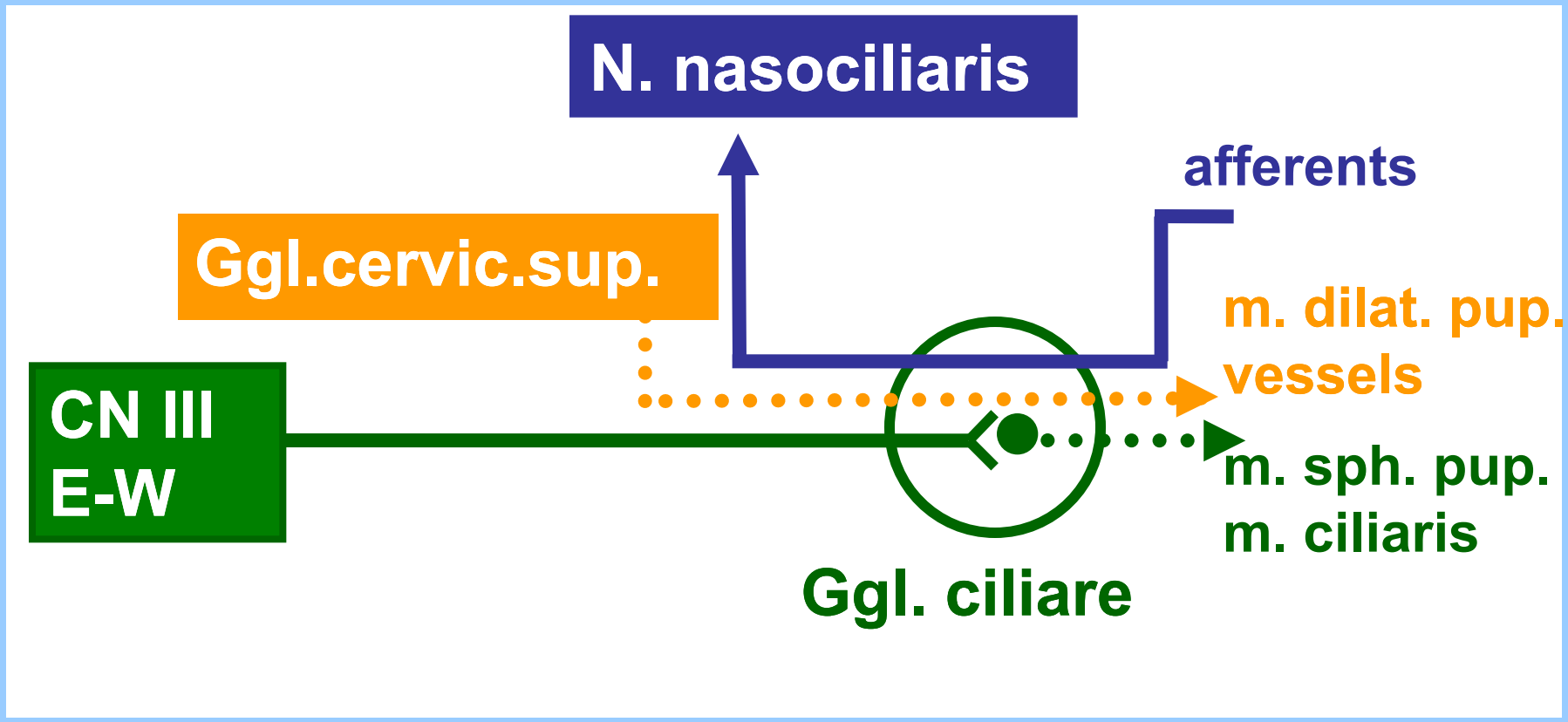


Prevertebral ganglia

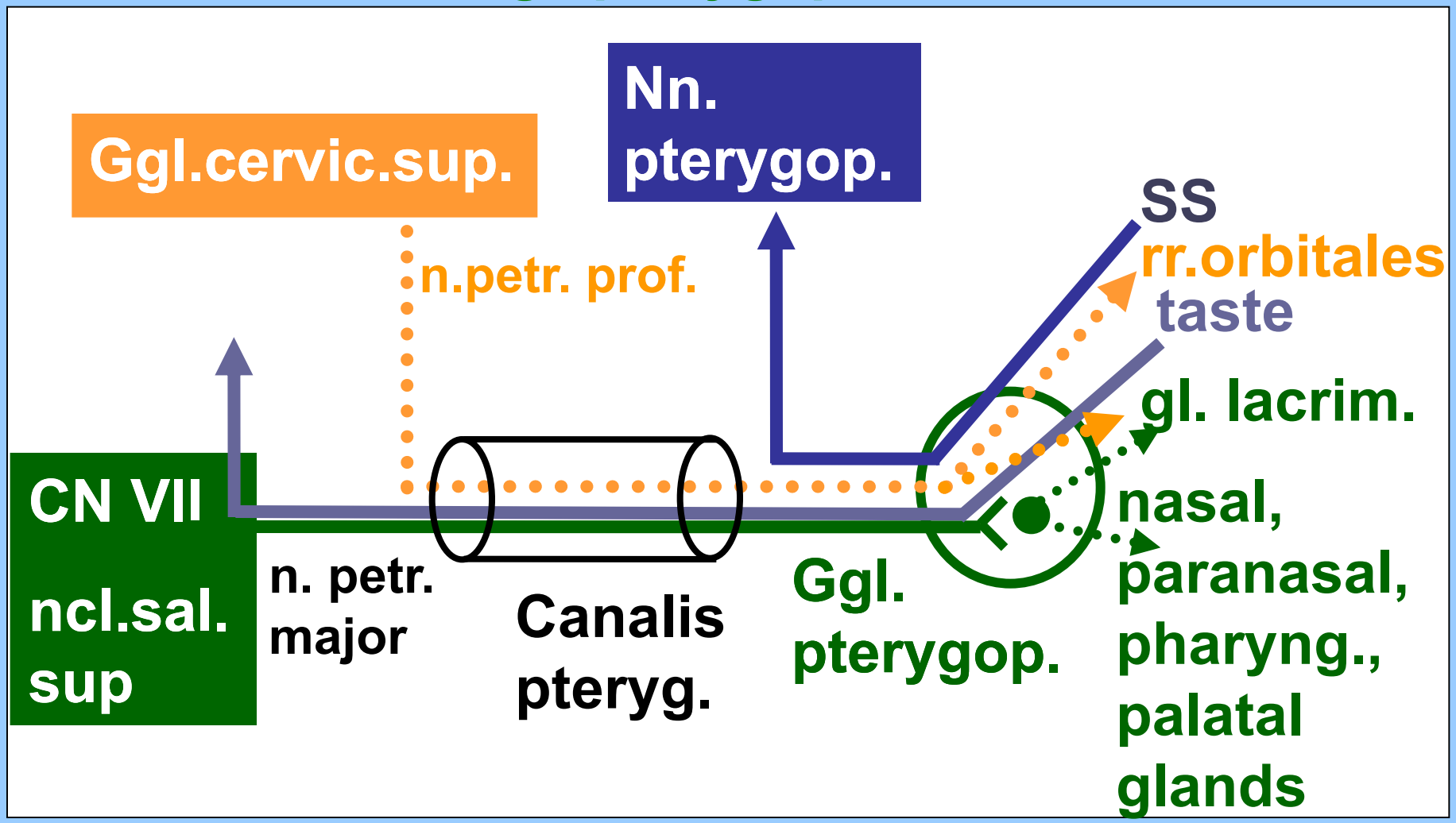
Coeliacum
Mesentericum sup.
Aorticorenale
Mesentericum inf.

Pars parasympathica

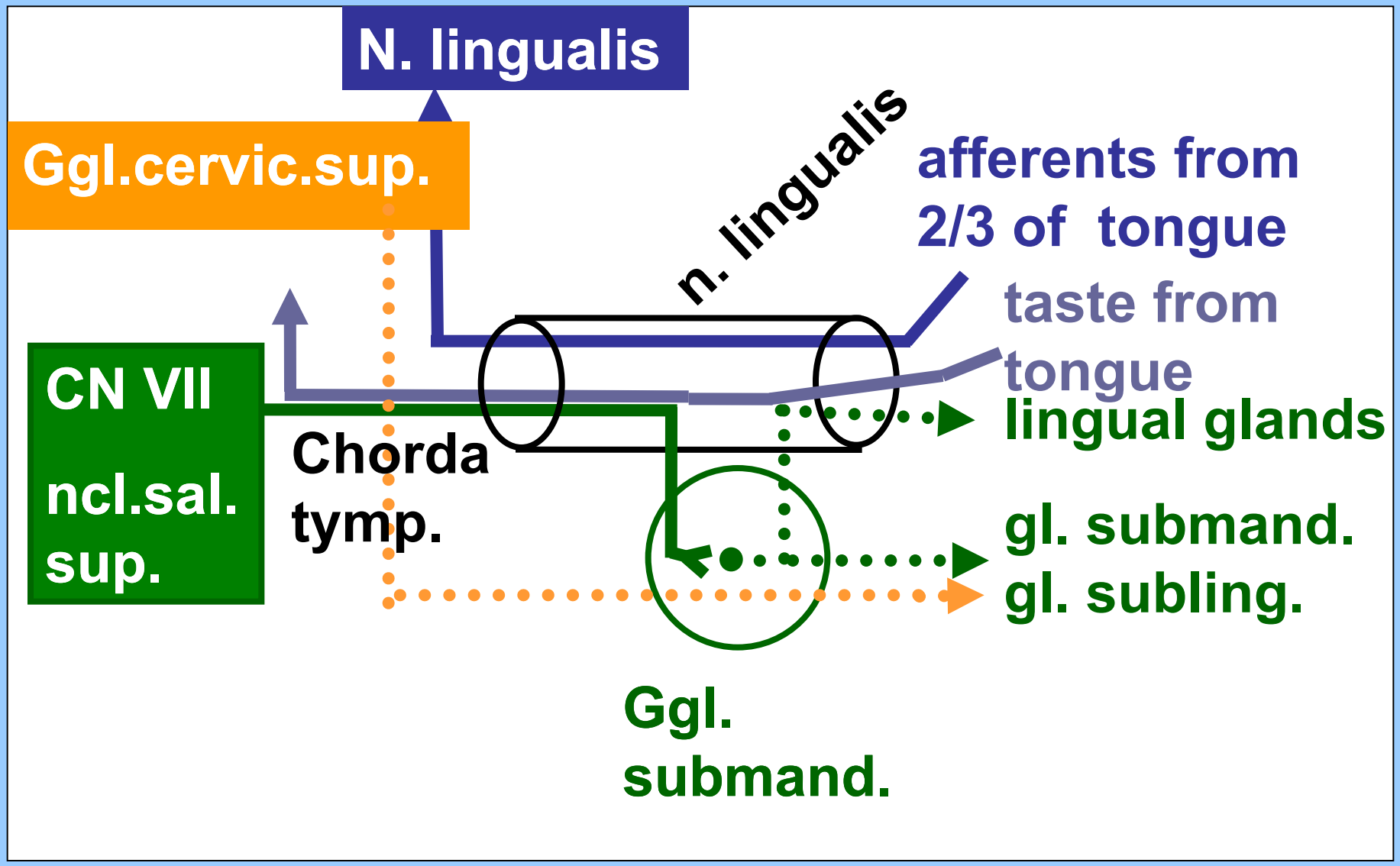
Ggl. ciliare


N. nasociliaris
afferents
Ggl.cervic.sup.
m. dilat. pup.
vessels
CN III
E-W
m. sph. pup.
m. ciliaris
Ggl. ciliare

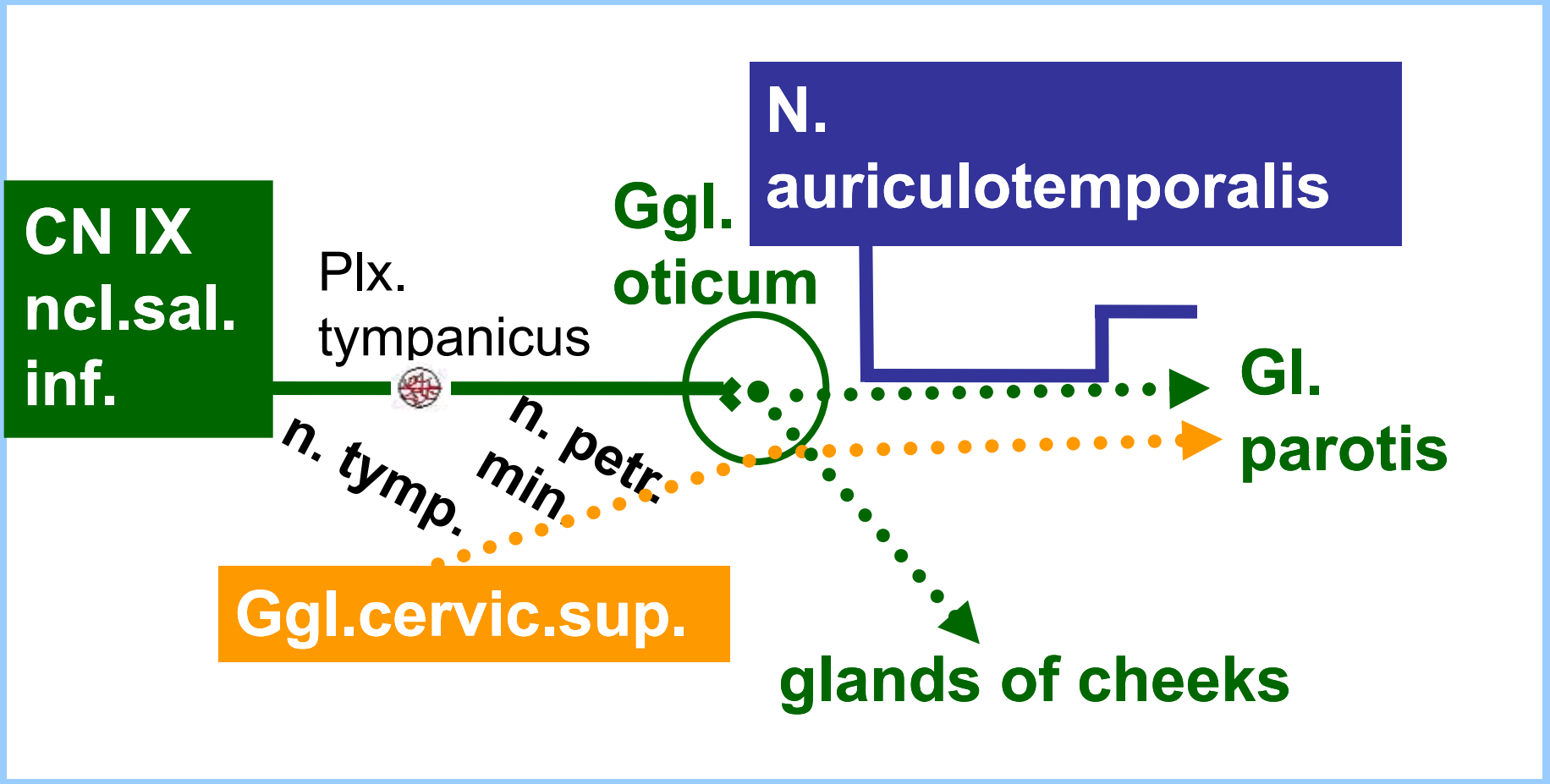
Ggl. pterygopalat.



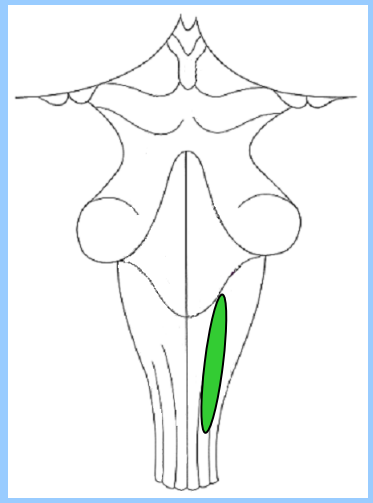
Ggl. submand.


N. lingualis
Ggl.cervic.sup.
n. lingualis
afferents from
2/3 of tongue
taste from
tongue
CN VII
ncl.sal.
sup.
Chorda
tymp.
lingual glands
gl. submand.
gl. subling.
Ggl.
submand.

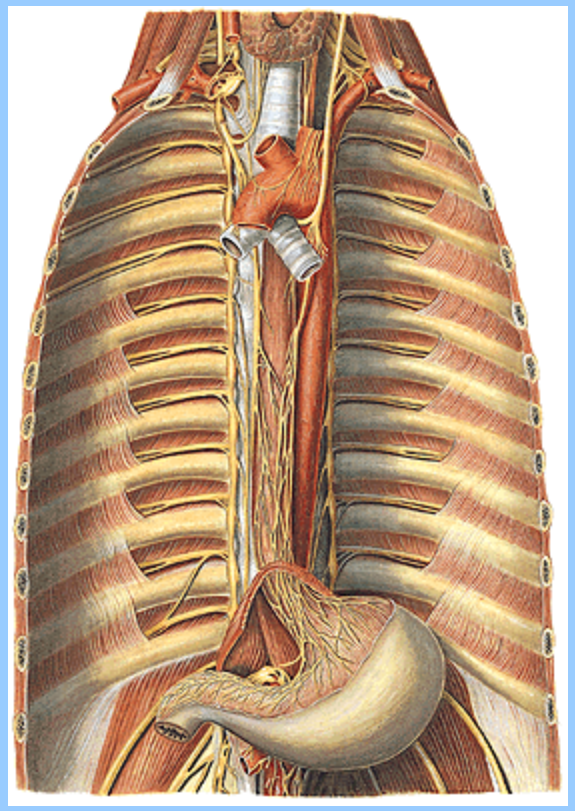
Ggl. oticum


N. auriculotemporalis
CN IX ncl.sal. inf.
Plx. tympanicus
Ggl. oticum
Gl. parotis
n. tymp.
n. petr. min
Ggl.cervic.sup.
glands of cheeks

Ncl. p. CN X



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



Sacral parasympathetic s.

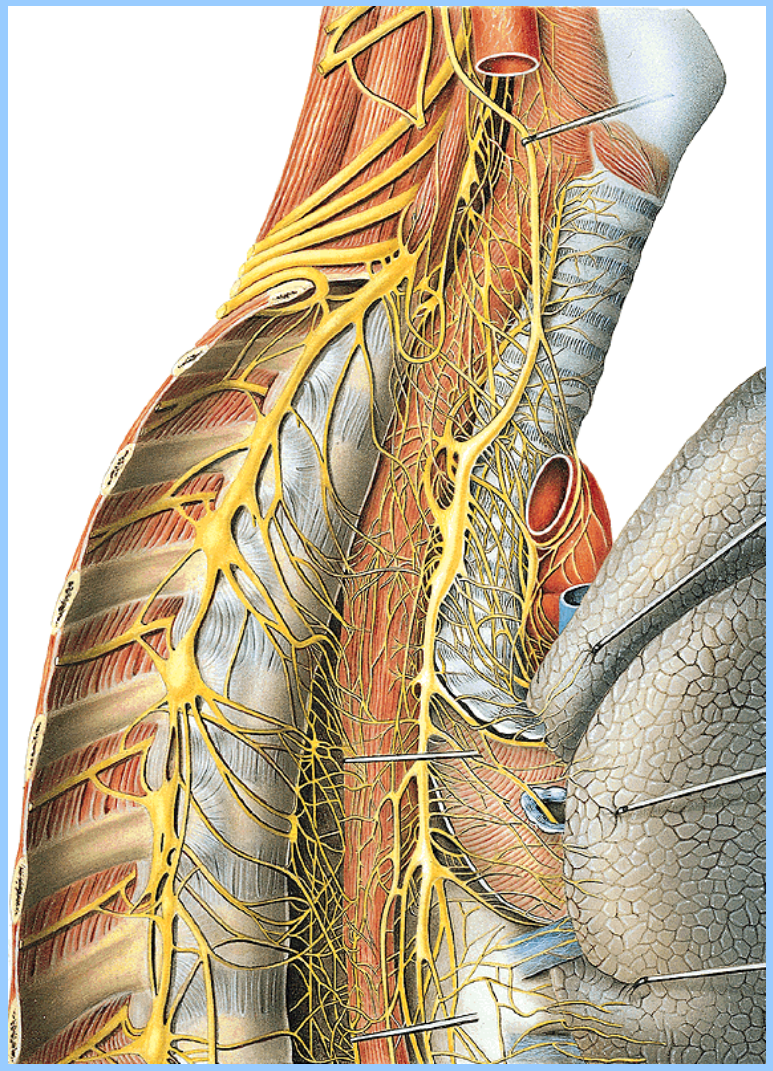
Ncl. intermediolat.

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

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

PREVERTEBRAL (AORTIC) PLEXUSES

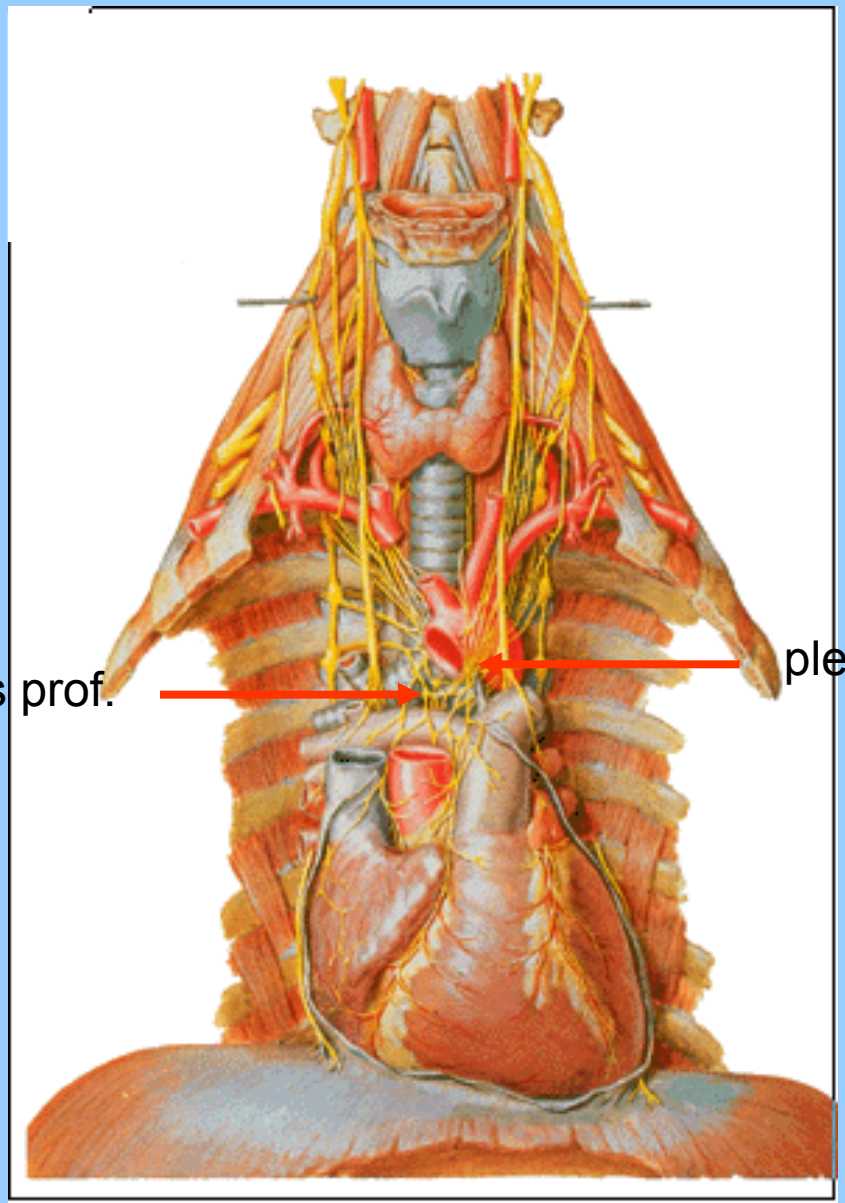
ANS innervates organs of thorax, abdomen and pelvis through mixed autonomic plexuses



Thorax

Plx. card. superf. et prof.
Plx. aorticus thoracicus
Plx. pulmonalis
Plx. eosophageus

INNERVATION OF THE HEART



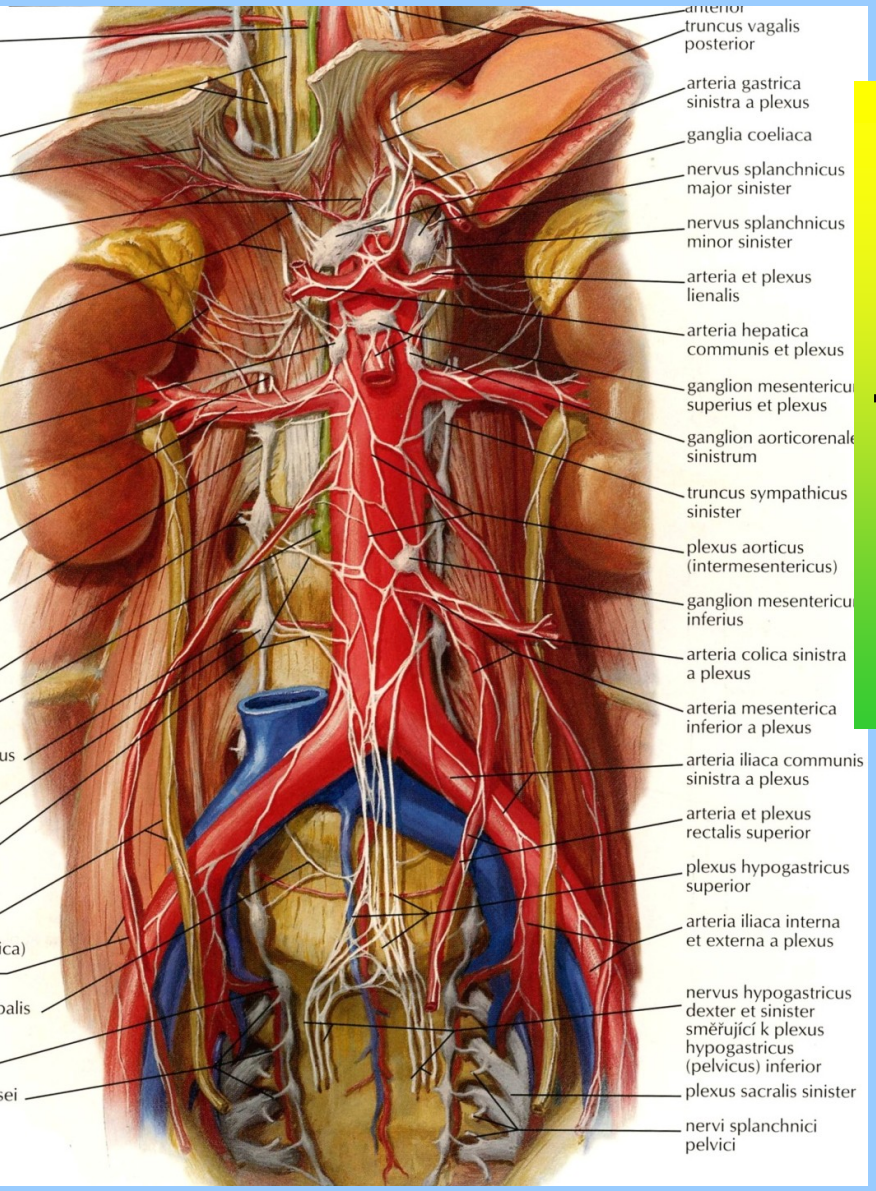
plexus cardiacus prof.

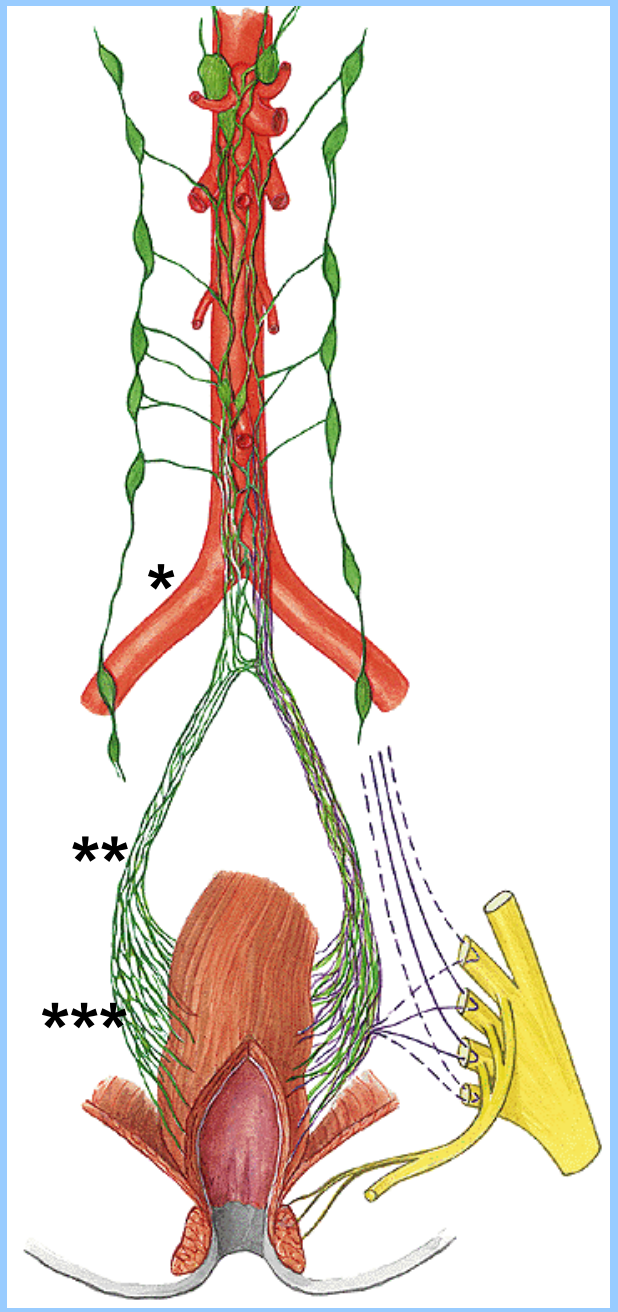
plexus cardiacus superf.

Abdomen

Plx. aorticus abdom.

coeliacus ... hepaticus, gastrici
lienalis, pancreaticus
renalis et suprarenalis
testicularis / ovaricus
uretericus
mesent. sup.
mesent. inf.



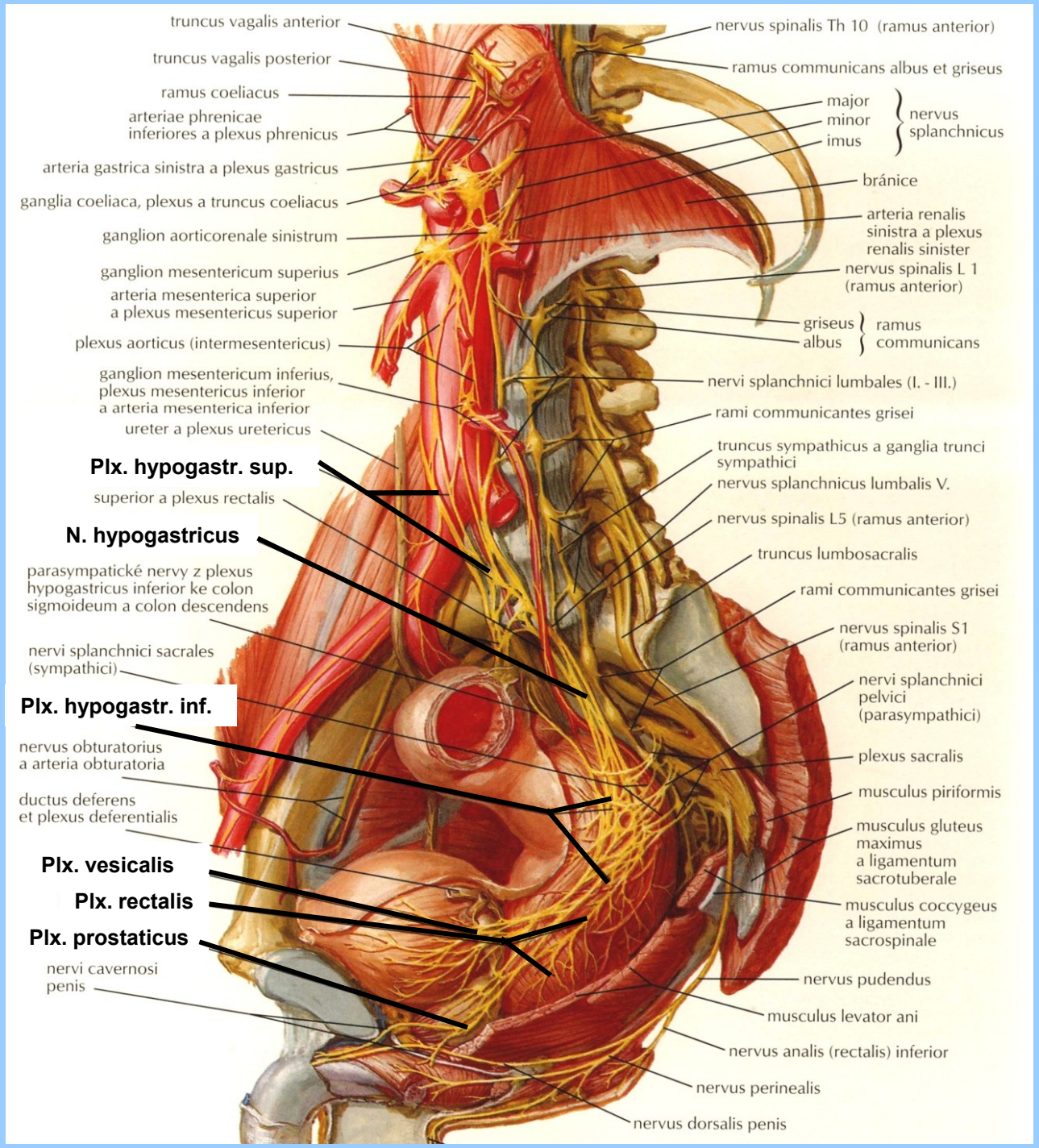


Pelvis

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

> plexus:

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

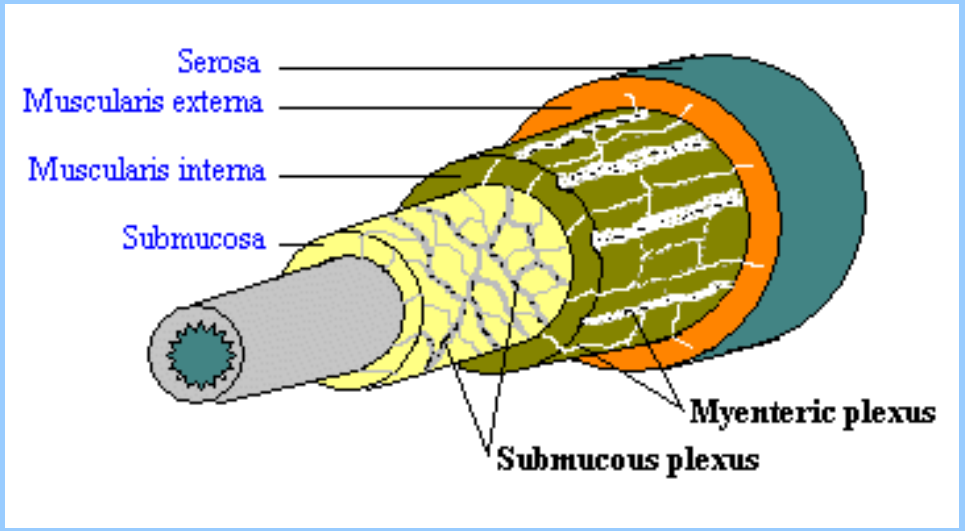

truncus vagalis anterior
truncus vagalis posterior
ramus coeliacus
arteriae phrenicae inferiores a plexus phrenicus
arteria gastrica sinistra a plexus gastricus
ganglia coeliaca, plexus a truncus coeliacus
ganglion aorticorenale sinistrum
ganglion mesentericum superius
arteria mesenterica superior a 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
Plx. 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
albus
ramus 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 Auerbachi

Plx. submucosus Meissneri

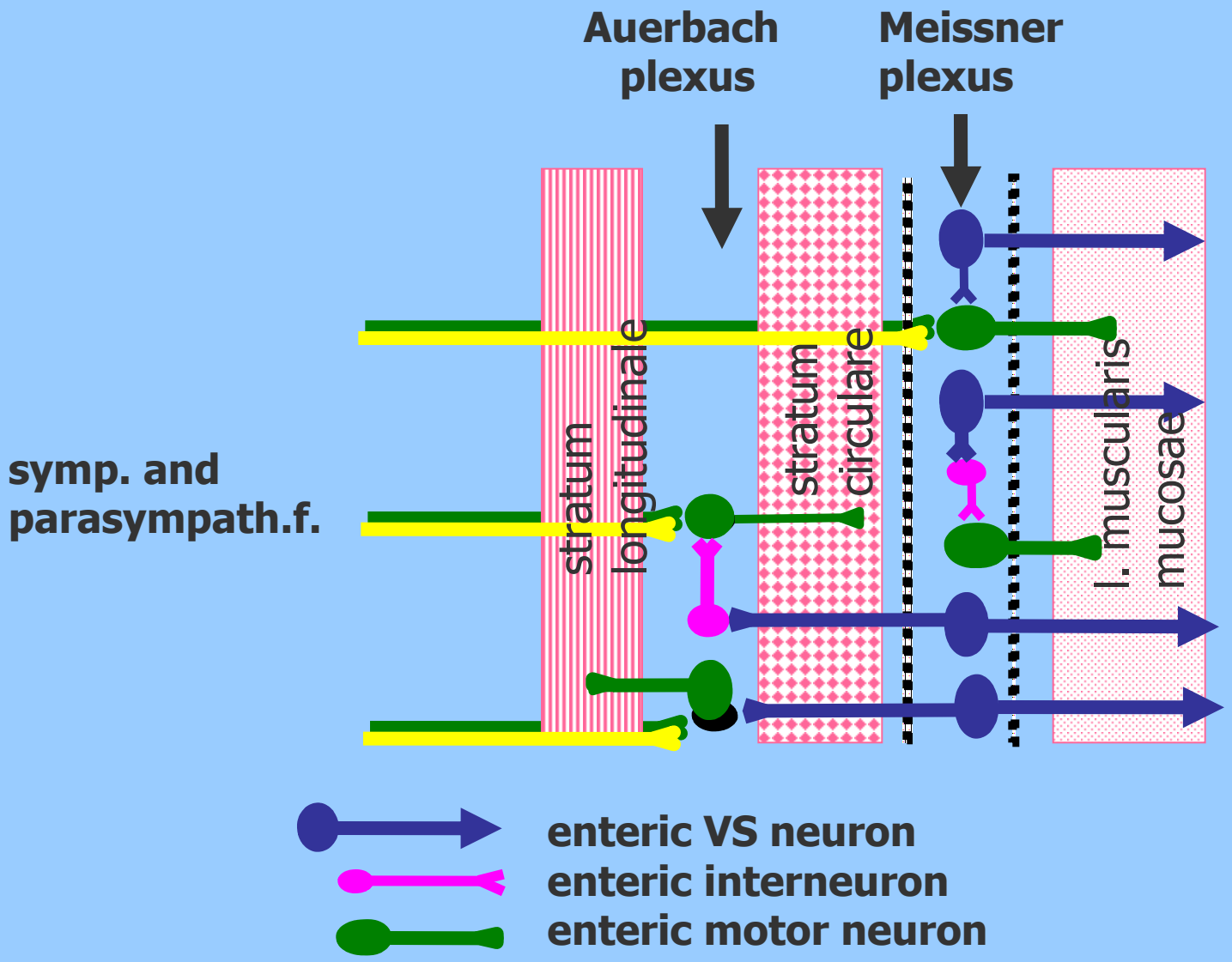


- plexuses contain small ganglia

- 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


Auerbach plexus
Meissner plexus
symp. and parasympath.f.
stratum longitudinale
stratum circulare
l. muscularis mucosae
enteric VS neuron
enteric interneuron
enteric motor neuron

AFFERENT VISCERAL PATHWAYS

- both autonomic divisions
- hunger, nausea, sexual excitement, vesical distension, visceral pain
- referred pain
- CN X – reflexes, hunger, nausea
- CN IX – chemo- and pressoreceptors
- sympathetic - pain