

Sympathetic trunk

The central part is formed by the nuclei of the lateral horns of the spinal cord: *nc. intermediomedialis* and *intermediolateralis* within T1-L2.

The superior sympathetic centers in the central nervous system are the formation reticularis, the hypothalamus and the limbic system.

Adrenal medulla can also be classified as sympathetic.

The sympathetic trunk (**Truncus sympathicus**) forms two types of sympathetic ganglia:

1. **paravertebral** – paired *truncus sympathicus* (*dx. et sin.*) – a chain of ganglia on the sides of the spine from the cranial base to the sacral bone (*os sacrum*),
2. **prevertebral** – ganglia as part of the abdominal aortic plexus (*plexus aorticus abdominalis*) (in front of the aorta at the distance of the large vessels – *ggl. coeliaca*, *ggl. aorticorenalia*, *ggl. mesentericum superius et inferius*)

Unlike the sympathetic ganglia, the **parasympathetic ganglia** are stored either in plexuses very close to target organs or directly in their wall (intramural ganglia).

Cervical sympathetic trunk

The 3 types of sympathetic fibres:

a) Rami communicantes grisei - they return back into the spinal nerve, usually preganglionic fibers

b) Rami viscerales et vasculares - emerge from the ganglia and lead along the vessels to the periphery

c) Fibres going into autonomous plexi and ganglions of internal organs - they come into contact with parasympathetic fibres
The cervical sympathetic system is a **visceromotoric** system originating in the CNS. The pars sympathetica has its nuclei in the CNS, which form the *nucleus intermediolateralis* of the lateral columns of the spinal cord. Preganglionic fibers emerge from the spinal cord together with the fibers of the anterior spinal roots, they separate from the spinal nerves as *rr. communicantes albi*. Afterwards they enter the *ganglia trunci sympathici* are connected to postganglionic neurons there.

Cervical ganglia

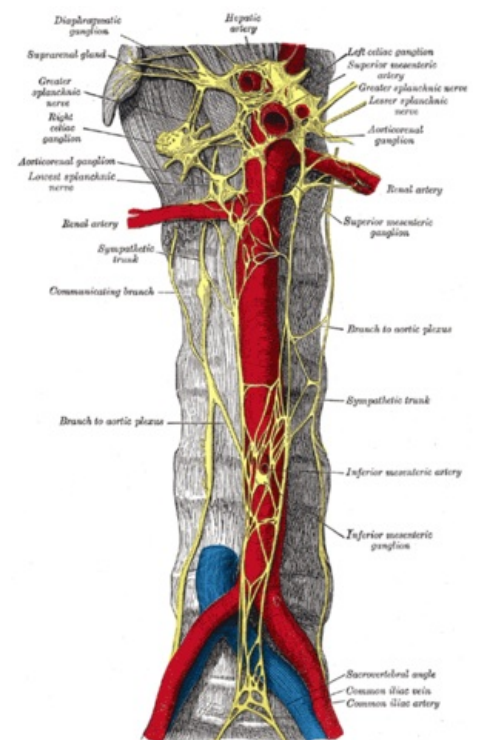
There are **3 ganglia** in the neck: *ggl. cervicale superius*, *medium* et *inferius*. *Ganglion cervicale inferius* usually merges with the 1st thoracic *ggl.* into the common *ggl. cervicothoracicum* (***ggl. stellatum***).

Ganglion cervicale superius

It is deposited anterior to the transverse processes of C2–C4. Preganglionic fibers come via *truncus sympathicus* from the junction of the cervical and thoracic spinal cord. The ganglion sends postganglionic fibers (*rr. communicantes grisei*) to 4 cervical nerves:

- **N. jugularis** – branch going into *ggl. inferius nervi glossopharyngei* and into *ggl. superius n. vagi*, sympathetic fibers go further with the branching of n. IX and n. X.
- **N. caroticus internus** – to *a. carotis interna* and forms the *plexus caroticus internus*, on it, from which other nerves branch off along the branches of the *a. carotis interna* in the skull:
 - *nn. caroticotympanici*;
 - *n. petrosus profundus*.
- **Nn. carotici externi** – form a periarterial plexus on the *a. carotis externa*. The plexus continues along all branches of the artery (*plexus facialis*, *plexus lingualis*, *plexus temporalis superficialis*, *plexus maxillaris*, atd.). Separate sympathetic branches depart from the plexus: *radix sympathica ggl. otici* a *radix sympathica ggl. submandibulares*.
- **N. cardiacus cervicalis superius** - descends into plexus cardiacus.

Ganglion cervicale medium



Truncus sympathicus (view of the ventral side of the spine)

It is at the level of the transverse process of C5, usually at the level where the truncus sympathicus crosses with *a. thyroidea inf.* Preganglionic fibers go to the ggl. via the sympathetic trunk from the junction of the cervical and thoracic spinal cord. Ganglion sends out postganglionic fibers:

- **rr. communicantes grisei** into the C4 a C5 nerves;
- branches into **plexus thyroideus inferior** for the thyroid gland and parathyroid glands;
- **n. cardiacus cervicalis medius** - descends behind the a. carotis communis a afterwards before the a. subclavia into plexus cardiacus.

Ganglion stellatum

It is located in front of the transverse process of C7, behind the distance of the *a. vertebralis* from *a. subclavia*. Preganglionic fibers pass from the C8 and Th1–Th3 nerves. Postganglionic fibers go as **rr. communicantes grisei** to spinal nerves C7, C8 and Th1–Th3, both as:

- branches to the **plexus subclavius** - they form a periarterial plexus, which then passes to all the connecting arteries of the upper limb;
- **n. vertebralis** - goes forward to *a. vertebralis* where it forms the **plexus vertebralis**;
- **n. cardiacus cervicalis inferior** - descends behind *a. subclavia* into **plexus cardiacus**.

Thoracic sympathetic trunk

- 10 to 12 pairs of ganglia connected by rami interganglionares, paravertebral to the posterior inner surface of the thorax
- it lies on the sides of the spine before the heads of the ribs, covered by parietal pleura, the splanchnic nerves (*nervi splanchnici (major, minor, imus)*) come from it, which then go through the diaphragm and enter the abdominal aortic plexus (*plexus aorticus abdominalis*)
- **rr. communicantes grisei** for the thoracic spinal nerves
- **rr. pulmonales thoracici, rr. oesophageales, r. renalis**
- **n. splanchnicus major** - by connecting 5.-9. ganglion thoracicum, contains preganglionic fibers - axons of perikarya from the spinal cord
- **n. splanchnicus minor** - by connecting 10.-11. ganglion and reaches the celiac plexus
- **n. splanchnicus imus** - from the 11th (12th) ganglia to the renal plexus

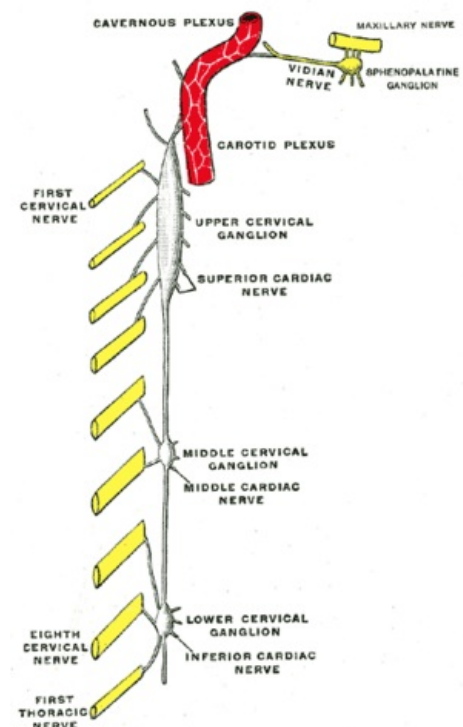


Diagram of the cervical ganglia

Lumbar sympathetic trunk

- 4 ganglia connected by rami interganglionares
- preganglionic fibers from sympathetic perikarya 2.-3. lumbar segment
- postganglionic continue as:
- **rr. communicantes grisei**
- **rr. vasculares** into the aortic plexus
- **nn. splanchnici lumbales** connected with the aortic plexus, mesentericus inferior and hypogastricus from where they go to the inside of the pelvis
- Lies inside of the *psaos major muscle* (left - between the muscle and the aorta, right - behind the *vena cava inferior*), The *nn. splanchnici pelvici* come from it into the *abdominal aortic plexus*

Sacral sympathetic trunk

- 4-6 small ganglia
- at the height of the coccygeum axis, they connect into **ansa sacralis**, where an unpaired ganglion impar occurs
- innervation of the pelvic viscera from the *inferior and superior hypogastric plexuses*

Prevertebral plexus

- It is divided into 3 contiguous strands located in the retroperitoneum in front of the aorta and continuing into the small pelvis:
1. **plexus aorticus abdominalis** - in front of the abdominal aorta, it is divided into two plexuses (they contain the prevertebral ganglia - coeliaca, aorticorenalia, mesentericum superius et inferius):
 - *plexus coeliacus* - around the *truncus coeliacus* - the so called *plexus solaris*,
 - *plexus mesentericus* - between *a. mesenterica sup. et inf.*
 2. **plexus hypogastricus superior** - it goes from the bifurcation of the aorta to the pelvis in front of the "sacral bone", it has two parts:
 - *n. praesacralis* - a strip of fibers going from the bifurcation of the aorta in front of the promontory to the

pelvis where it divides into:

- *n. hypogastricus dx. et sin.* – streaks of fibers arising from the division of *n. praesacralis*.
3. **plexus hypogastricus inferior** – the continuation of the *nn. hypogastrici* on the sides of the rectum and further forward, externally from the pelvic organs (they form plexes around them – *plexus rectalis, uterovaginalis, vesicalis...*)

Types of fibers in individual plexes

- The above-mentioned plexes contain a **sympathetic** component coming from the spinal sympathetic nuclei (level C8–L3), **parasympathetic** it comes through conjunctions from *n. vagus* (nucleus of the *n. vagus* in the brainstem) – into the *plexus aorticus abdominalis*, as well as from the sacral parasympathetic system (spinal parasympathetic nuclei at the S2–S4 level) – into the *plexus hypogastricus inferior*, meaning:
 - *plexus aorticus abdominalis* and *hypogastricus inferior* – Mixed plexes (sympathetic and parasympathetic);
 - *plexus hypogastricus superior* – only sympathetic.

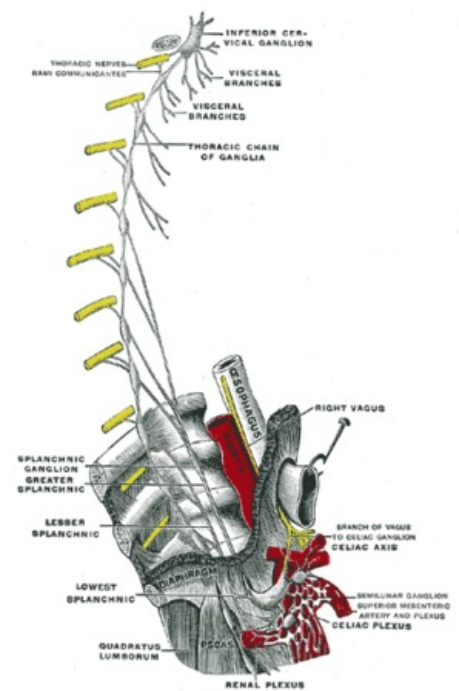
Sources

Connected articles

- Paraganglia
- Head parasympathetic trunk
- Sacral parasympathetic trunk

Sources

- PASTOR, Jan. *Langenbeck's medical web page* [online]. ©2nd edition. [cit. 08.04.2009]. <<https://langenbeck.webs.com/>>.



Ganglion stellatum