Bases of Neuropathology

lecture 2

Spinal Cord: Structure & Function

SPINAL CORD
general data

- **length 45 cm *(male)*, 41-42 cm *(female)***
- **diameter 1 cm**
- **weight 30 g**
- **surrounded by three sheaths *(dura mater, meningea & pia mater)***
- **front nerve roots *(axons of motor neurons)***
- **back nerve roots *(axons of sensitive neurons)***
- **31 pair of spinal nerves**

CEREBROSPINAL FLUID
(liquor)

- volume 120-150 ml
- regenerates 6 times a day
- supplies nutrients to the spinal cord
- removes metabolites
- makes antibacterial effect
- acts as a shock-absorber

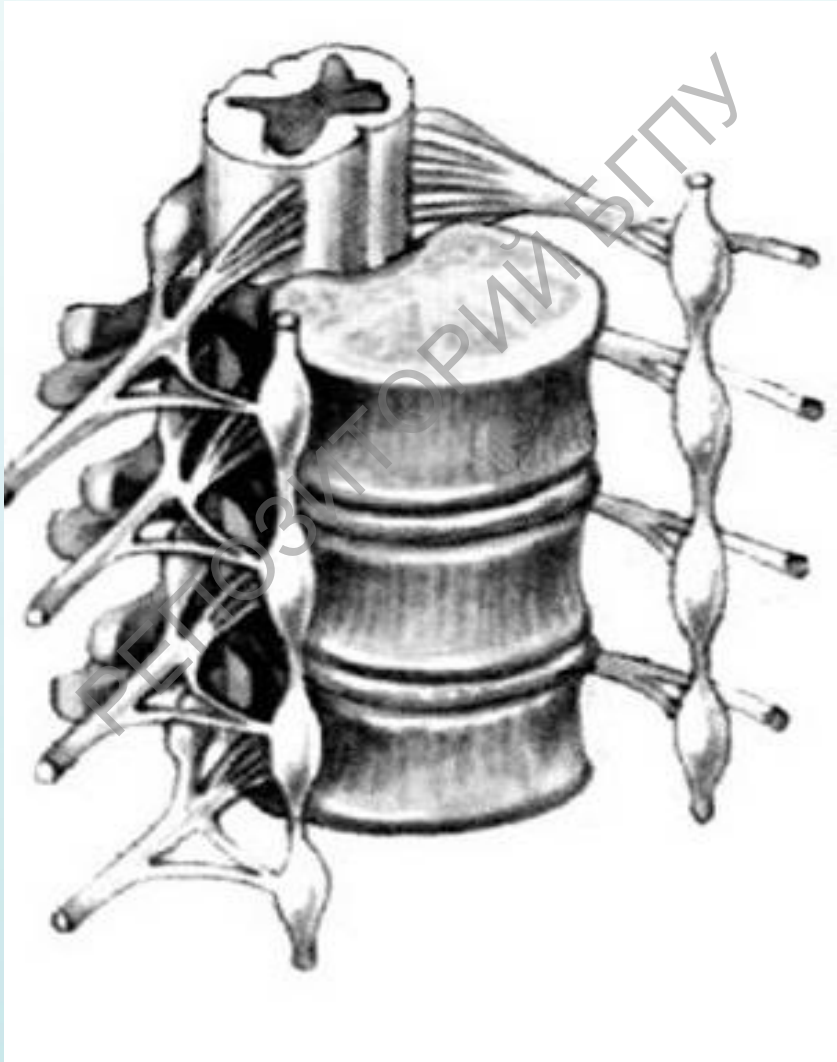
SEGMENTS OF THE SPINAL CORD

Segment is a section of the spinal cord giving the origin to a pair of spinal nerves

The spinal cord consists of 31 segments and divides into five parts:

- **cervical** (***C*** - *cervicalis*) **– 8 segments**
- **thoracic** (***Th*** - *thoracica*) **– 12 segments**
- **lumbar** (***L*** - *lumbalis*) **– 5 segments**
- **sacral** (***S*** - *sacralis*) **– 5 segments**
- **coccygeal** (***Co*** - *coccygea*) **– one segment**

SPINAL CORD
(front-side view)



SPINAL SHEATHS & ROOTS

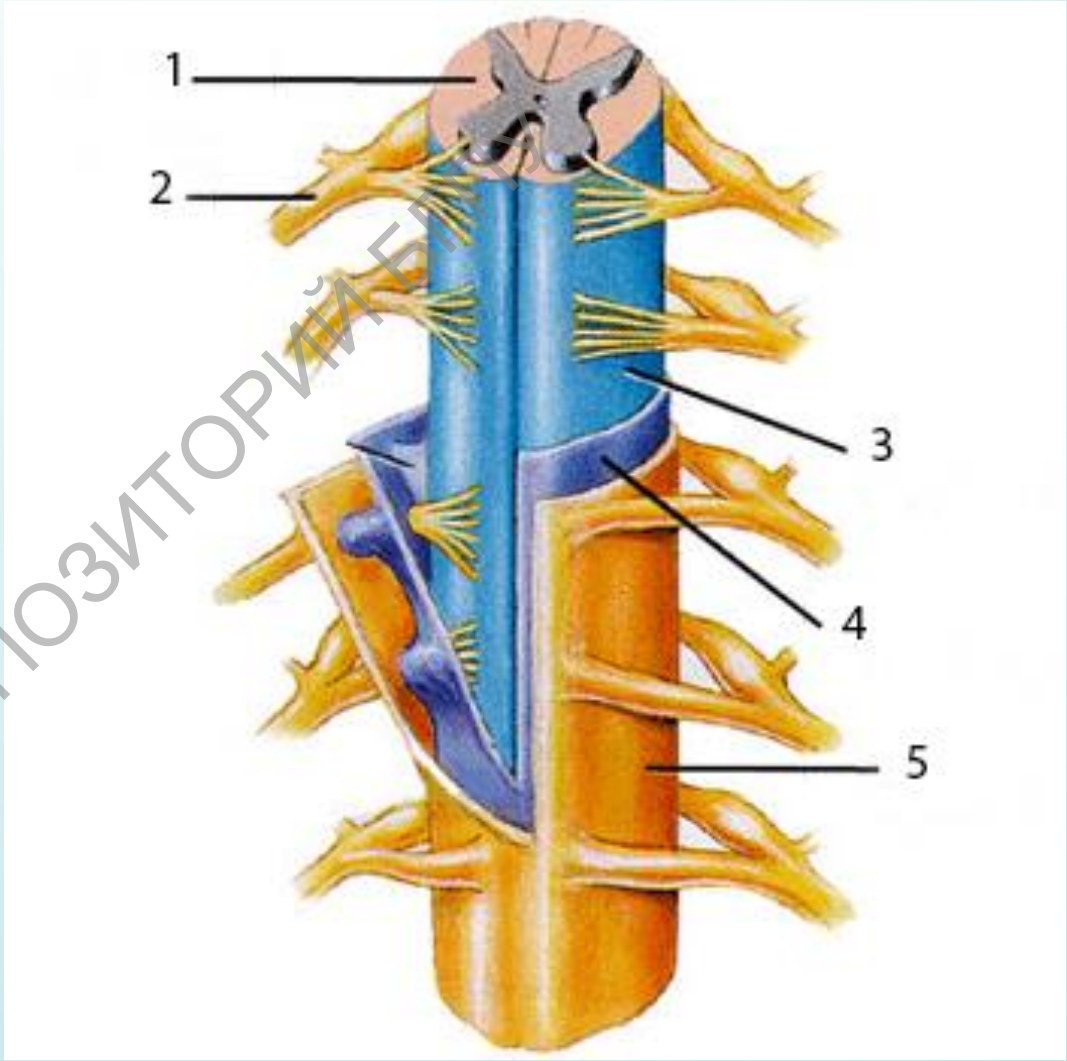
1 – spinal cord

2 – spinal nerve

3 – pia mater

4 – meningea

5 – dura mater



INNER STRUCTURE OF THE SPINAL CORD

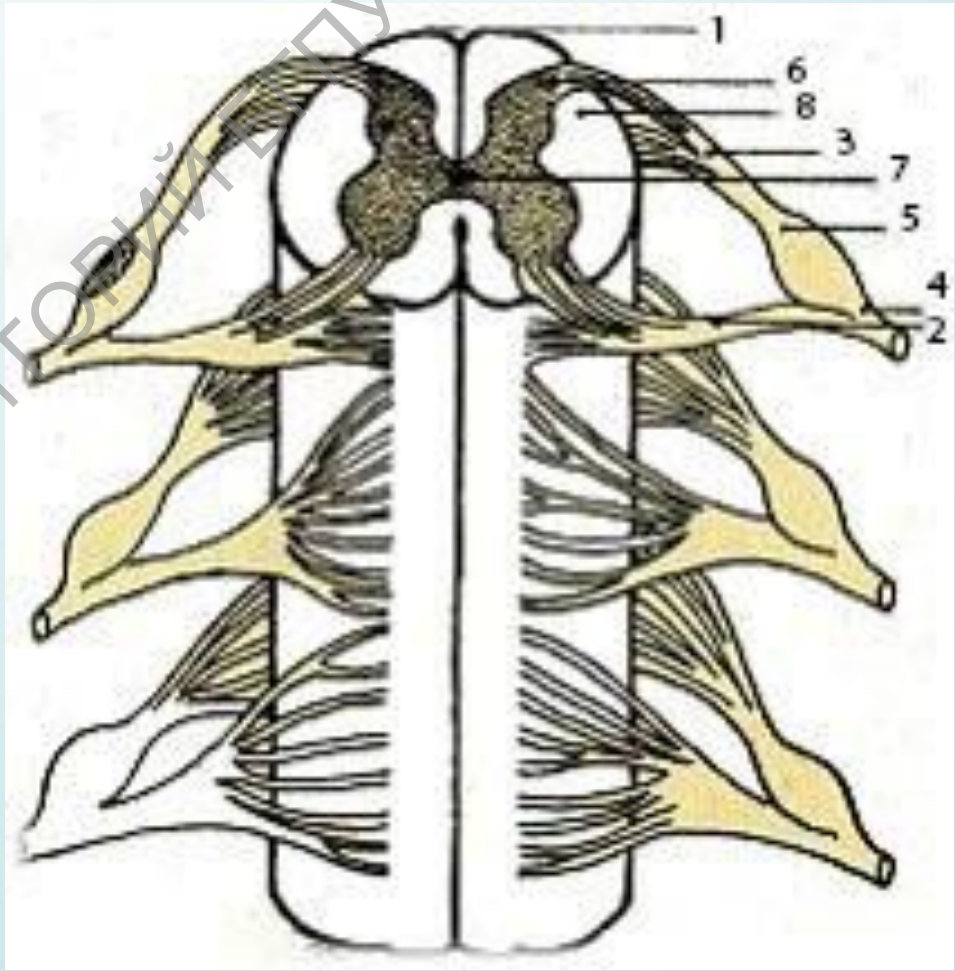
- **grey matter**
  locates inside the spinal cord;
  has the shape of a butterfly (or letter “H”);
  contains ventral, dorsal & lateral horns

- **white matter**
  locates outside the spinal cord;
  has the shape of funiculi (ventral, dorsal & lateral);
  contains conduction tracts from periphery to the brain (ascending direction) & vice versa (descending direction)

STRUCTURE OF THE SPINAL CORD

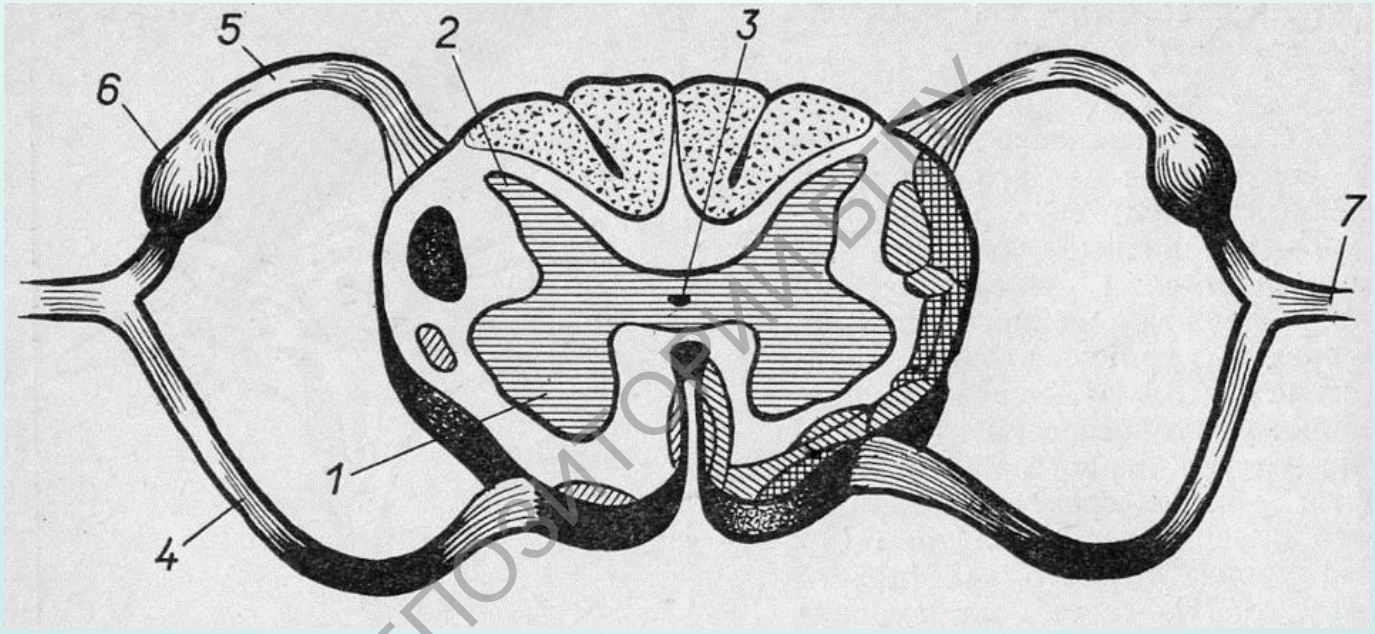
crosscut (1)

1 – spinal cord
2 – front root
3 – back root
4 – spinal nerve
5 – spinal knot (ganglion)
6 – grey matter
7 – spinal canal
8 – white matter



STRUCTURE OF THE SPINAL CORD

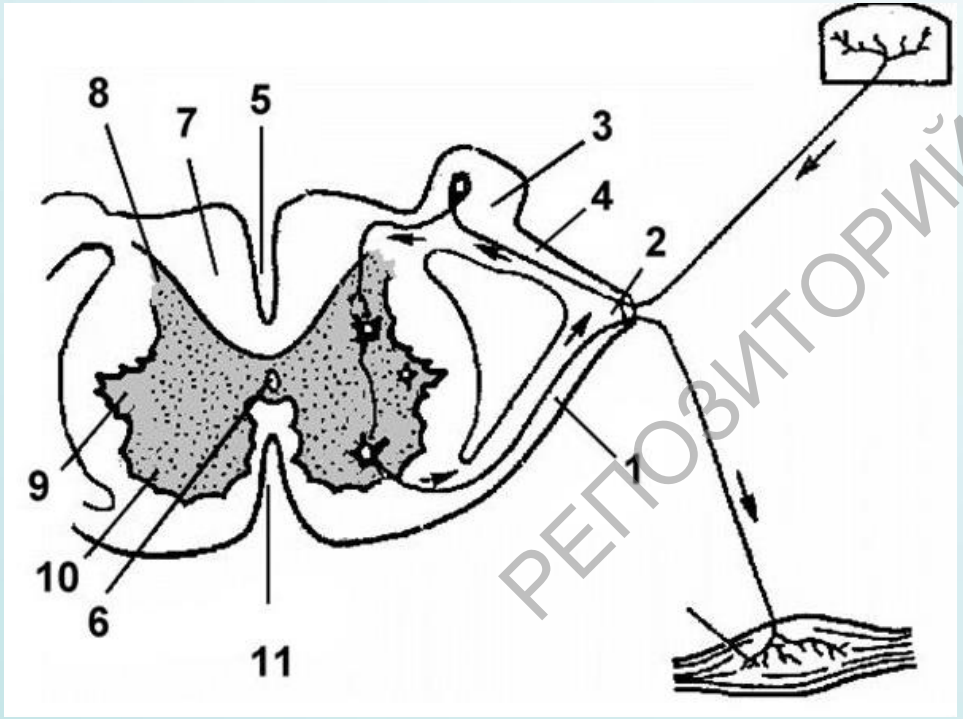
crosscut (2)



1. ventral horn
2. dorsal horn
3. central canal
4. front nerve root
5. back nerve root
6. spinal knot (ganglion)
7. spinal nerve

STRUCTURE OF THE SPINAL CORD

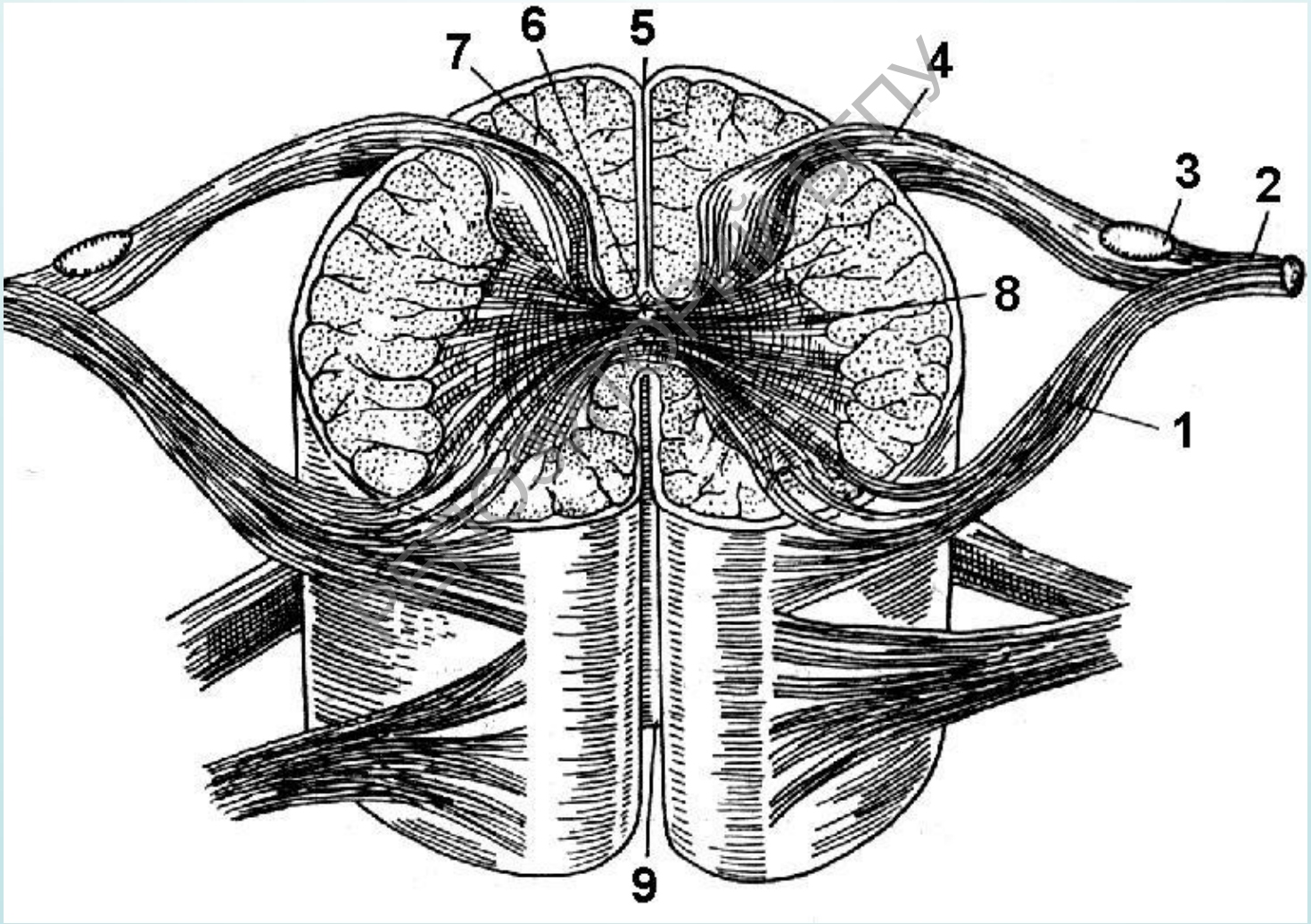
crosscut (3)



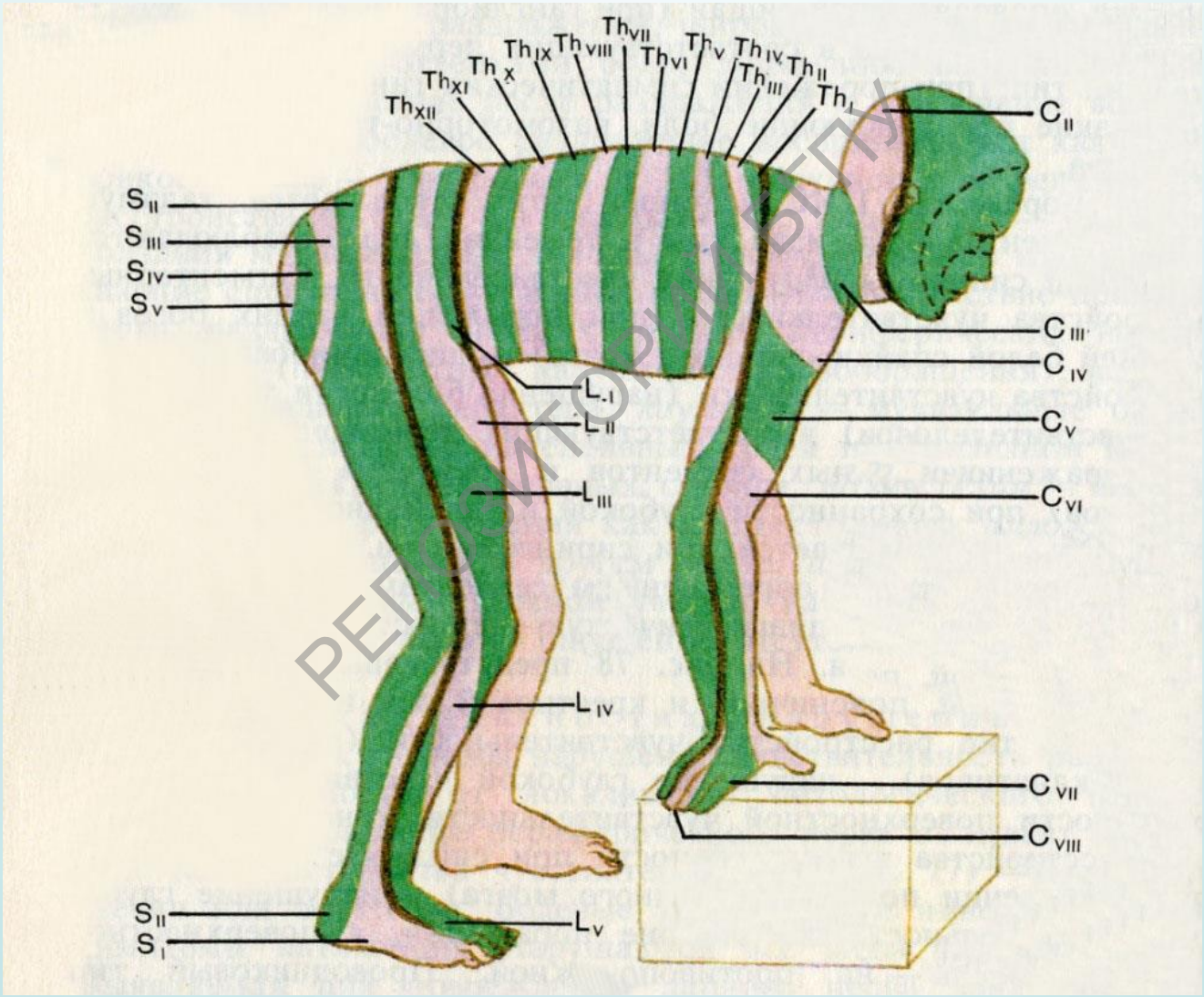
1. front nerve root
2. spinal nerve
3. spinal knot (ganglion)
4. back nerve root
5. posterior fissure
6. spinal canal
7. white matter
8. dorsal horn
9. lateral horn
10. ventral horn
11. anterior fissure

STRUCTURE OF THE SPINAL CORD

(test yourself)

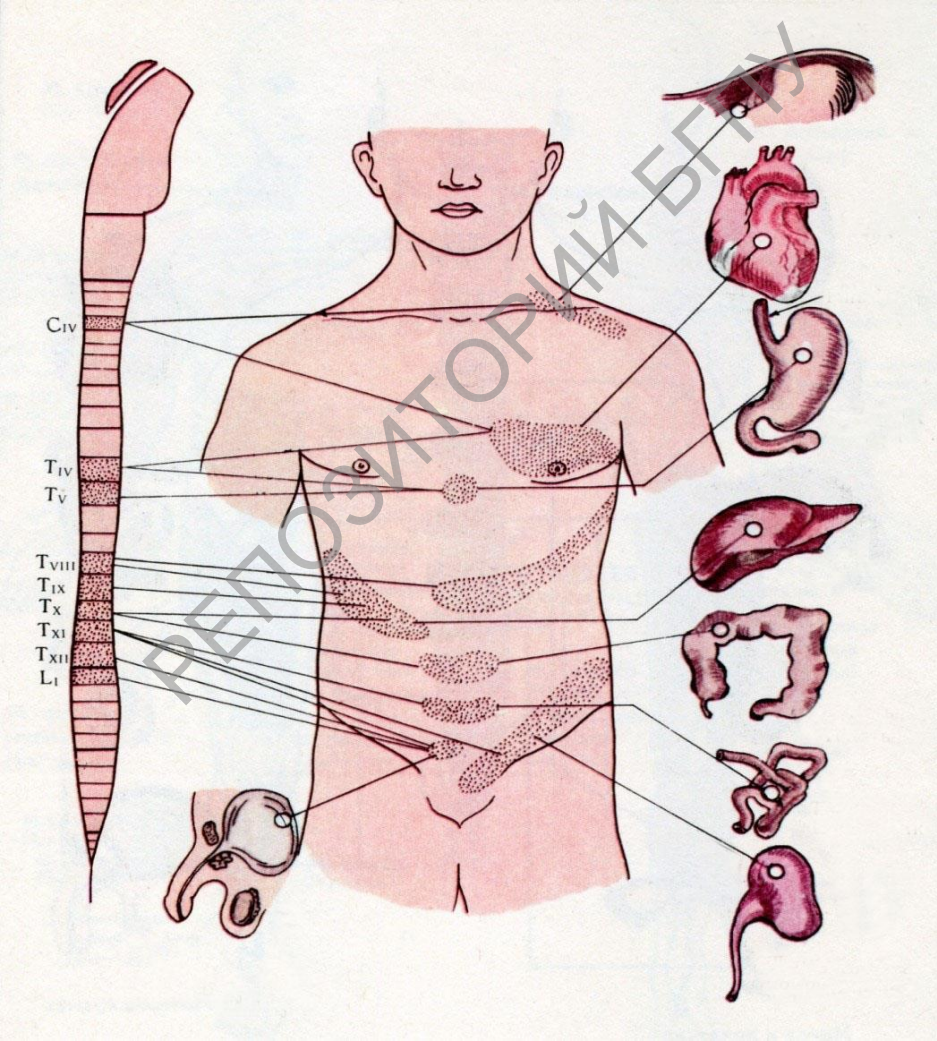


SEGMENTAL DERMAL INNERVATION



RELATIONSHIP BETWEEN SPINAL SEGMENTS & INTERNALS

(Head's zones)



FUNCTIONS OF THE SPINAL CORD

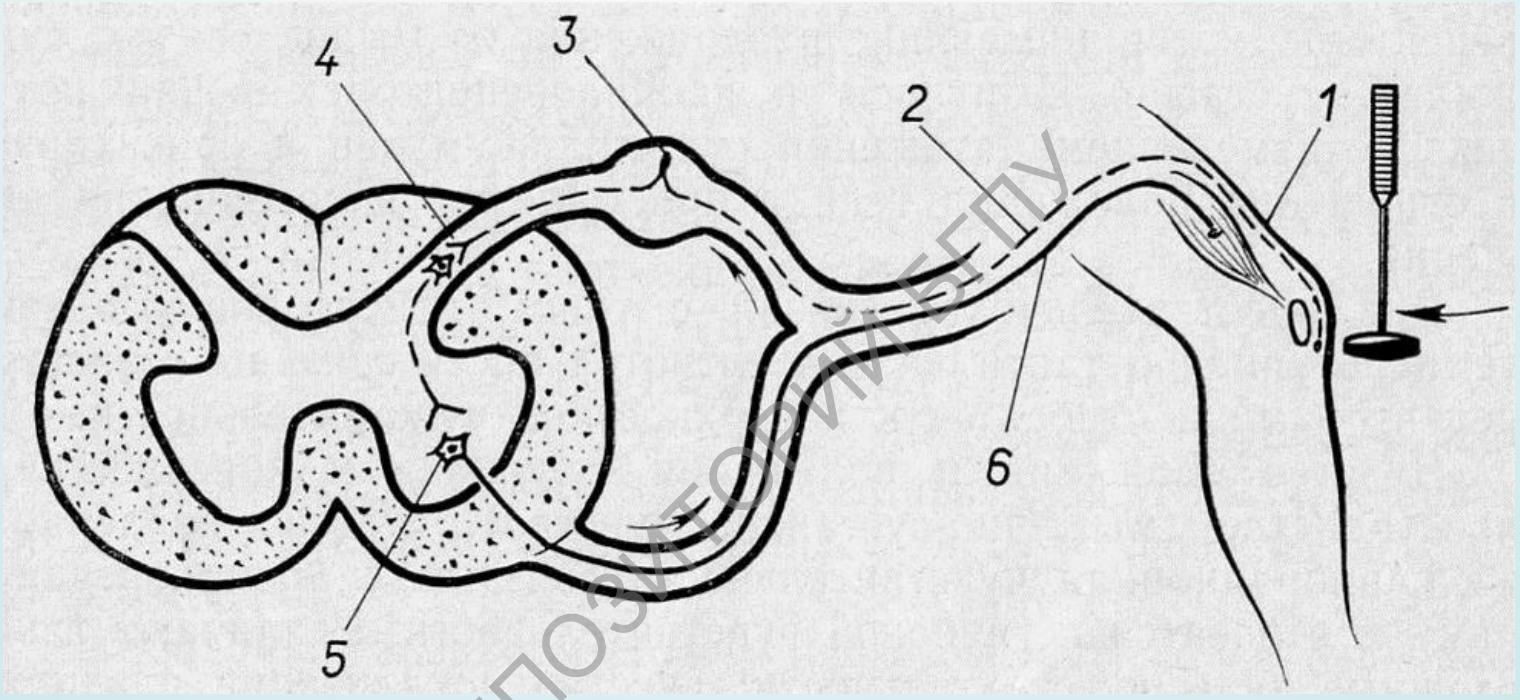
- **conductive**
  – ascending current of impulses (to brain)
  & descending current of impulses
  (from brain to muscles & internals)

- **reflective**
  – regulation of muscle contraction
  & internals activity

ELEMENTARY SEGMENTAL REFLEX ARCH

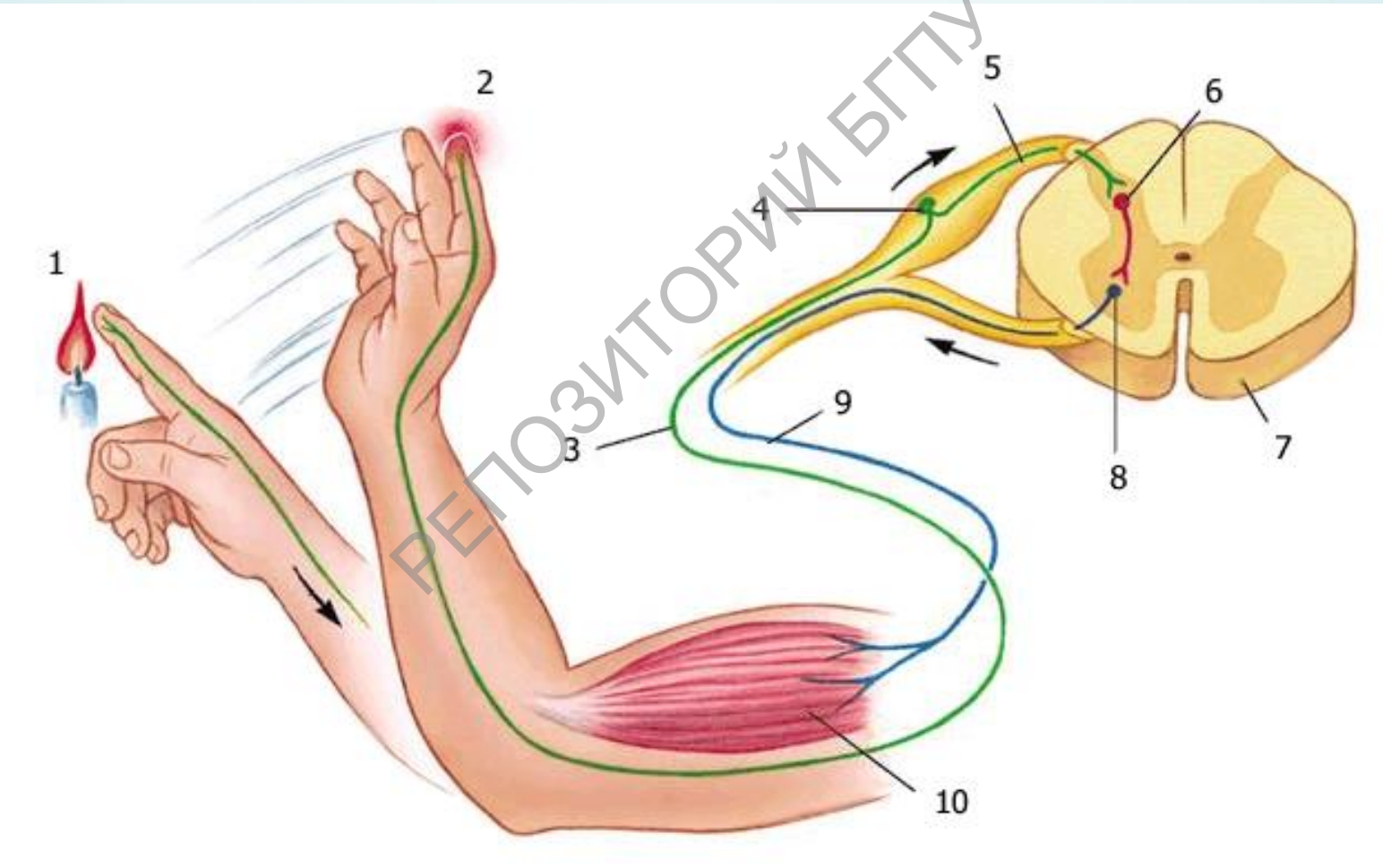
- **afferent part**
  receives & transfer impulses from periphery to nerve centers
- **central part**
  analyses impulses
- **efferent part**
  produces responses

REFLEX ARCH OF KNEE-JERK REFLEX



1. receptor
2. dendrite of sensitive neuron
3. spinal knot (ganglion)
4. transmission neuron
5. body of motor neuron
6. axon of motor neuron

ELEMENTARY SEGMENTAL REFLEX ARCH (test yourself)



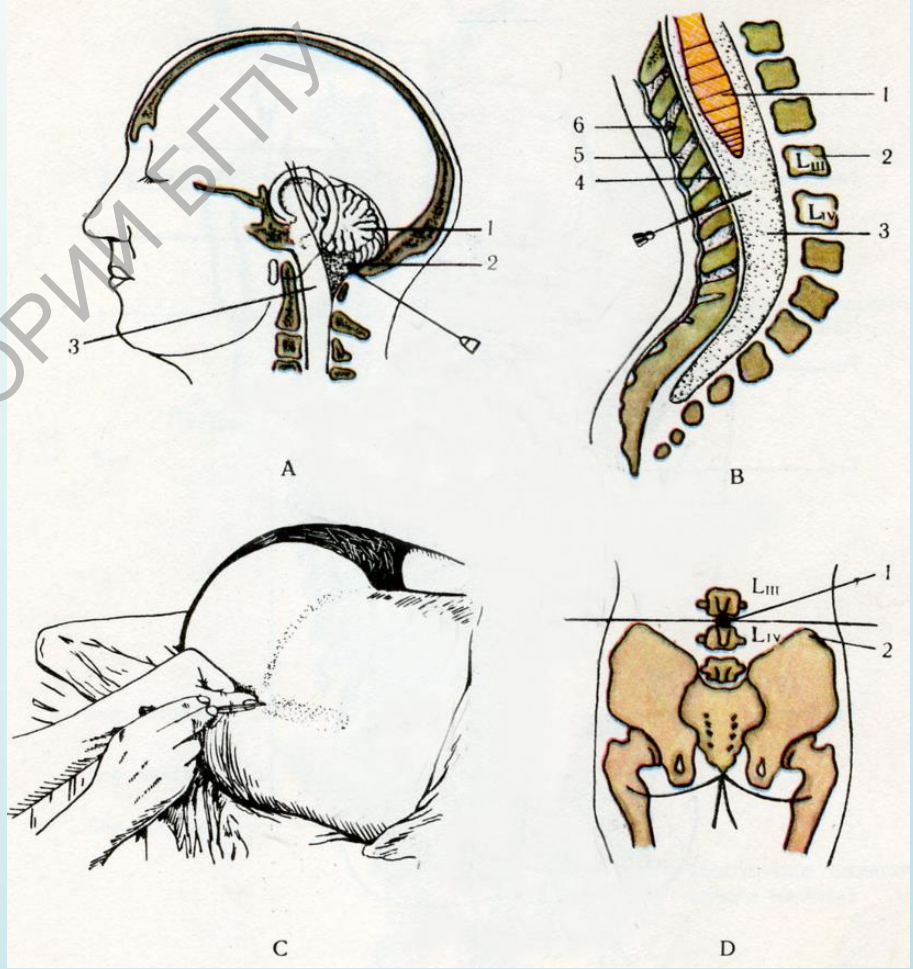
SPINAL PUNCTURE

A – sub-occipital puncture

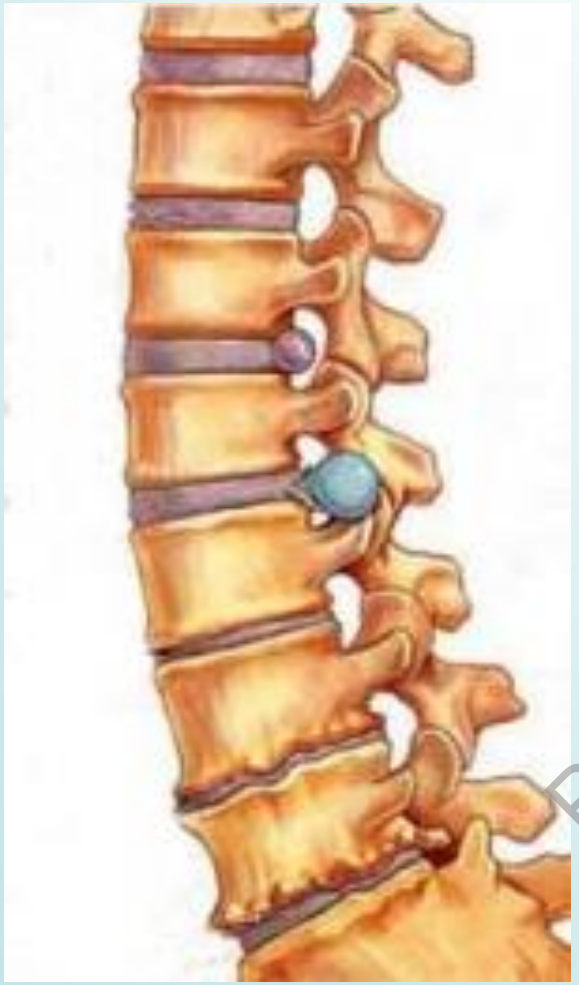
B – lumbar puncture

C – body position over the lumbar puncture

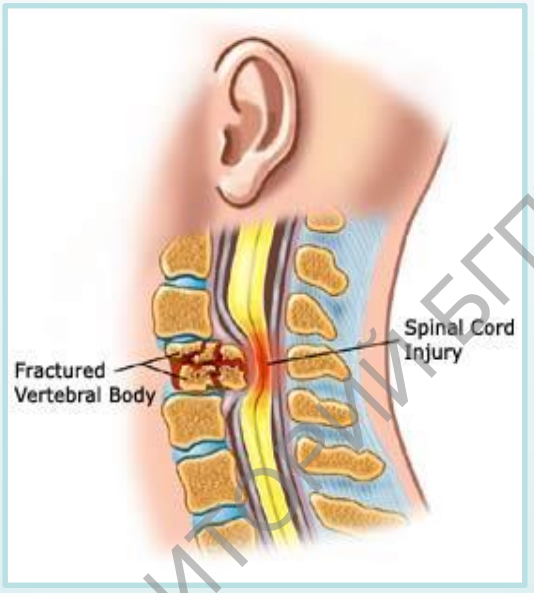
D – anatomical benchmarks for the lumbar puncture



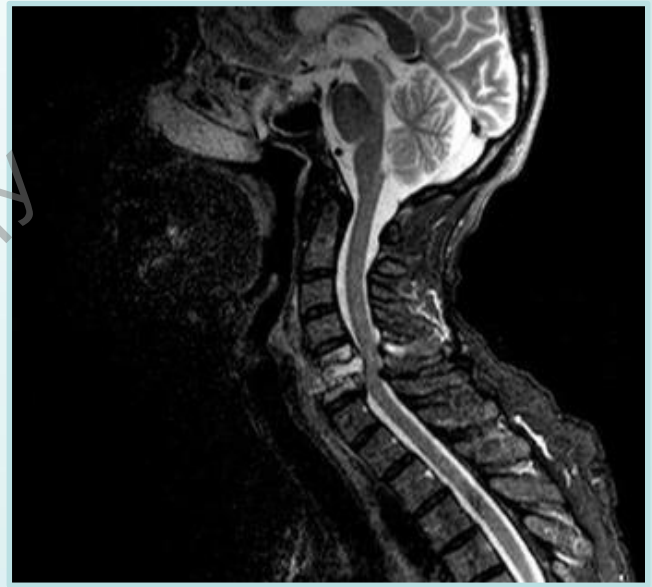
DAMAGE OF THE SPINAL CORD



Herniated disk



Diver's spinal injury



Myelopathy
(compression of the spinal cord)

origin:
- **injury**
- **inflamed vertebra**
- **impaired circulation**