

SOMATIC SENSORY PATHWAY

Somatic sensory Pathway is also called ascending pathway.

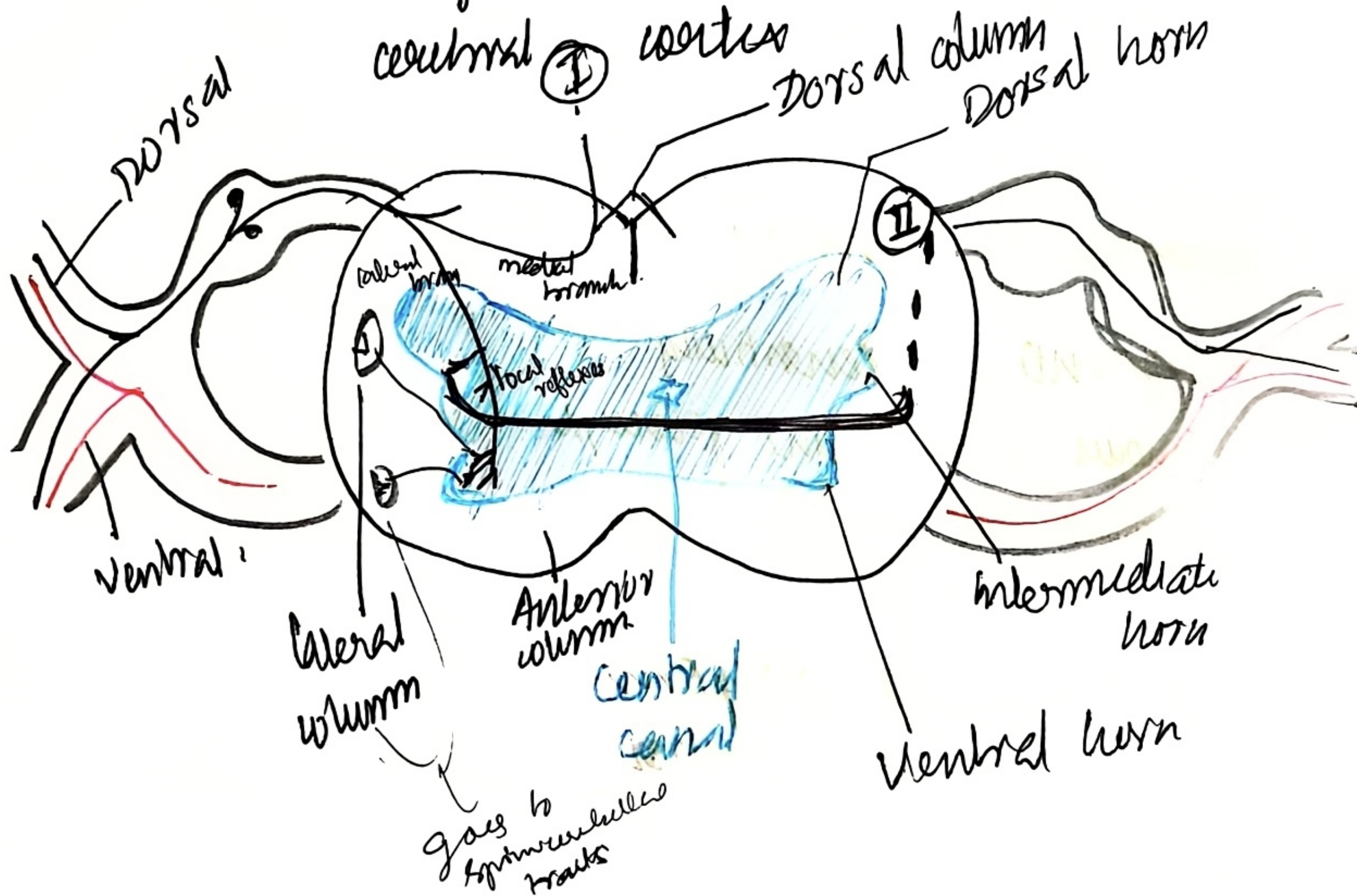
↳ From sensory cortex to cerebral cortex path

At the level of spinal cord divided into two pathway

- ① Dorsal column medial
ventral pathway

to go from spinal cord to

central $\textcircled{1}$ cortex



collection of grey matter - horns

white column

dorsal root — sensory neurons

ventral root — motor nerves

Sensory Spinal Nerve.



Enters Dorsal Root



Dorsal column medial lemniscal pathway (I)



Medial branch of spinal nerve enters dorsal column



Ascends upwards



Central cortex

Anterolateral spinothalamic pathway (II)

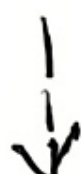


Lateral branch of spinal nerve terminates in dorsal horn & synapses with new anterolateral fibres

Anterolateral fibres enter anterolateral column.



Ascends upwards



Central cortex

Dorsal Column Pathway.

(I)

* largely myelinated n. fibres

* Velocity of cond.

[30 - 110 m/sec.]

* High degree of spatial orientation of n. fibres

* Rapid transmission of sensory inf. through spatial and temporal summation

* narrow spectrum of sensory modalities

[mechanoreceptive sensatⁿ]

* Fine type of transmission

Anterolateral Spinothalamic Pathway

(II)

* less myelinated n. fibres

* Velocity of cond.

[8 - 40 m/sec.]

* low degree of spatial orientation of n. fibres

* Not rapid summation

* Broad spectrum of sensory modalities

[Pain, warm, cold, tickle, itch, crude touch]

Coarser

* ~~Coarse~~ Coarse type of transmission

① DORSAL COLUMN PATHWAY

→ touch sensation

* Requiring high degree of localisation of stimulus

* Requiring transmission of fine gradations of intensity

* Signal movement against the skin

* Phasic sensations - vibratory sense

→ Pressure sensations related to fine degrees of judgment of pressure intensity.

→ Position sensation from joint [conscious proprioception]

② ANTEROLATERAL SYSTEM

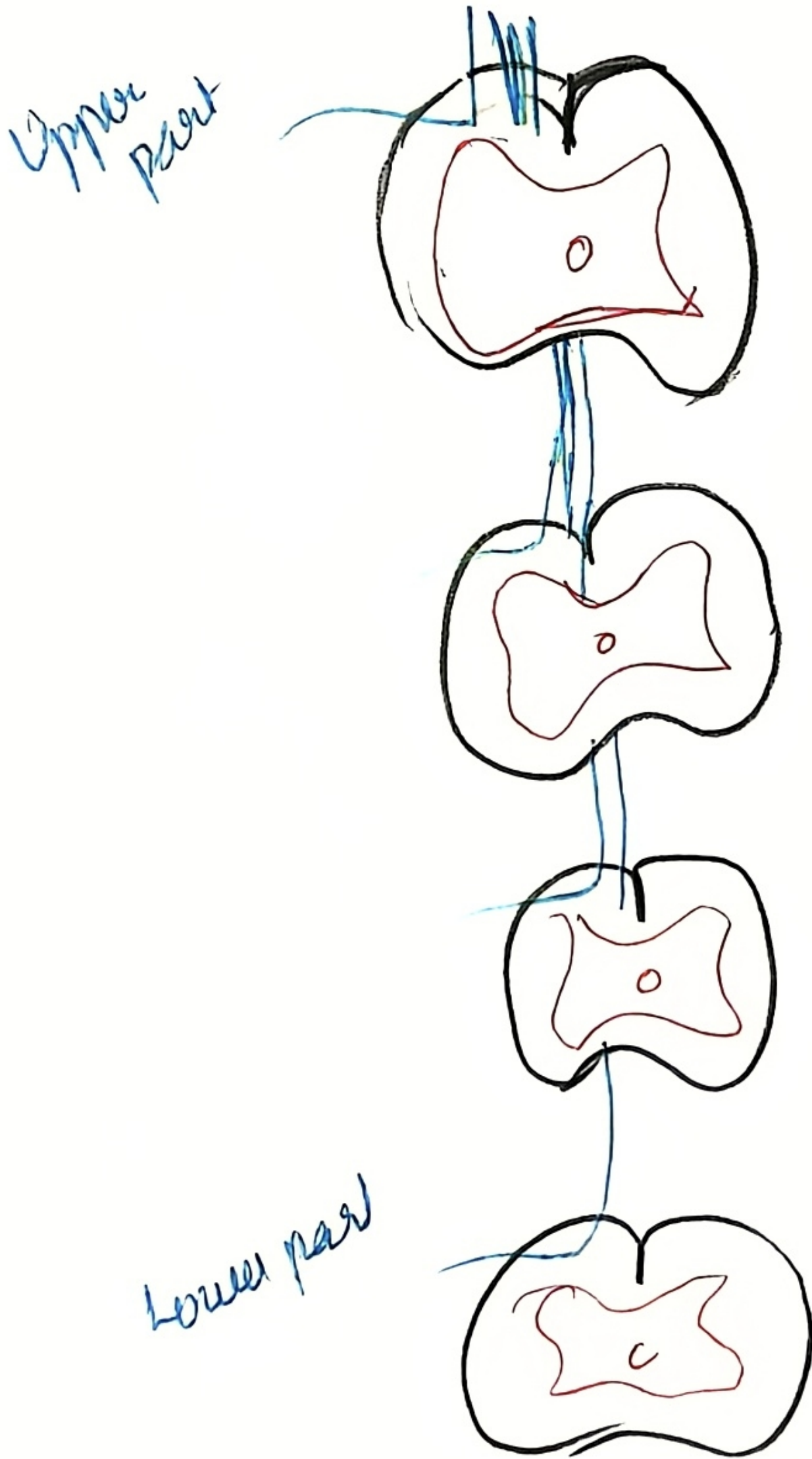
→ Pain

→ Thermal sensations including cold & warmth.

→ Crude touch & pressure sensation

→ Tickle & itch sensation

→ Sexual sensation.



Dorsal column Pathways.

Somatosensory areas of
post central gyrus

3, 1, 2

Specific motor
nuclei

Thalamus

C. Corder

M. oblongata

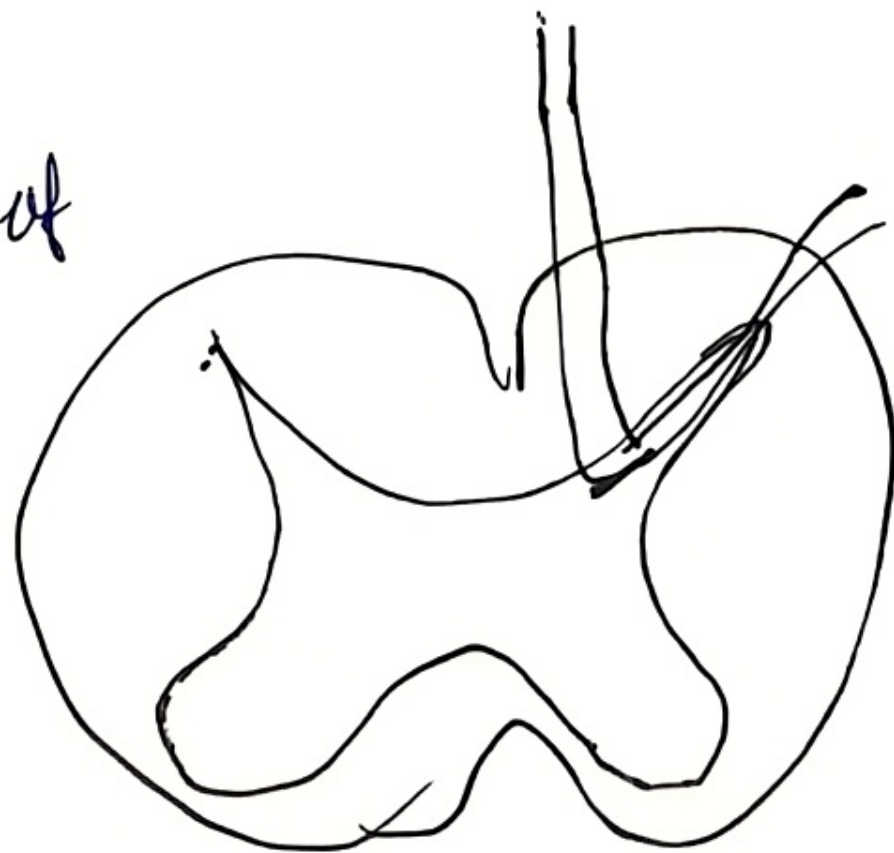
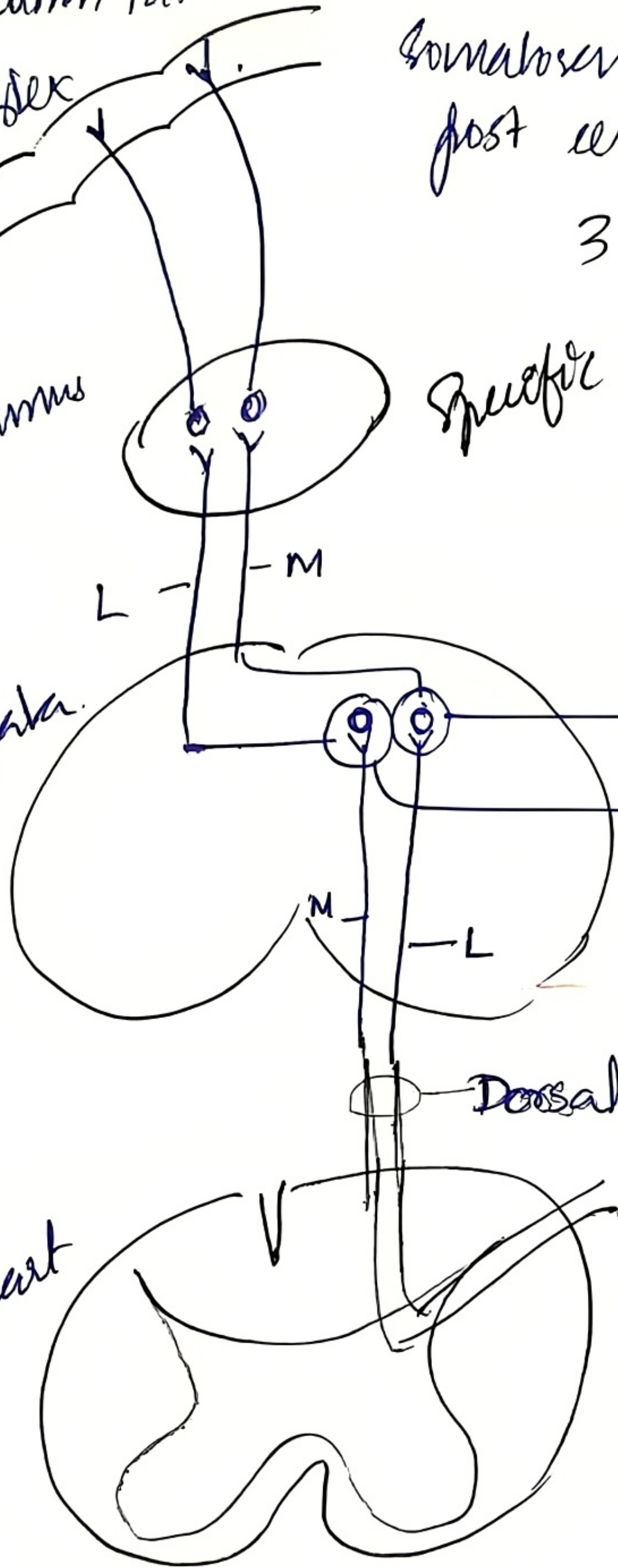
LM
CG.

anterior
nucleus
granite nuclei

Dorsal column pathway.

Upper part

Lo. Part of
body



of lower part of medulla
② medial branch enters dorsal column (1st order neuron) and ascends upwards

upper part of medulla
medial branch enters dorsal column (1st order) and ascends upwards.

Medulla Oblongata

medial fibres terminate in gracile nucleus

lateral fibres terminate in cuneate nucleus

From each nucleus new fibres originate and ascend upwards after crossing each other
this ascending tract is called medial lemniscus [2nd order neuron]

x Due to crossing lateral → medial neuron
medial → lateral neuron

Pons enters brainstem — pons → Ascends up

midbrain travels & moves up.

Thalamus

there is ventrobasal complex in thalamus

↳ nuclei inside it — Ventroposterolateral nuclei

2nd order neuron terminate here & 3rd order originates

Reaches post. limb of internal capsule.

and passing through it reaches cerebral cortex
cerebral cortex terminate in somatosensory area of post central gyrus (of c. cortex)

Summary

Spinal Nerve



Sensory Spinal Nerve enters Dorsal Root



Medial Branch Ascends to Medulla Oblongata



Termination of 1st order neuron at gracile and cuneate nuclei of medulla oblongata.



2nd order neuron begins and decussate at med-obl. and continues as tract of a medial lemniscus



2nd order neuron ascends via medial lemniscus throughout brainstem & terminates in. ventrobasal complex (VPL nucleus) of thalamus



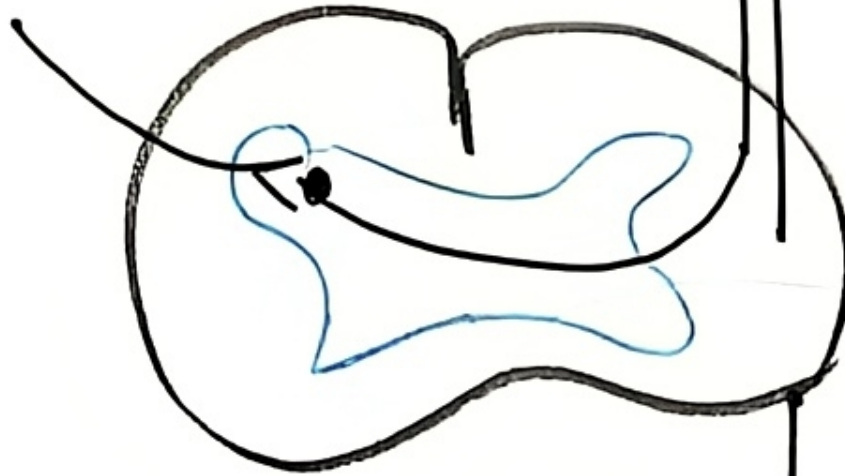
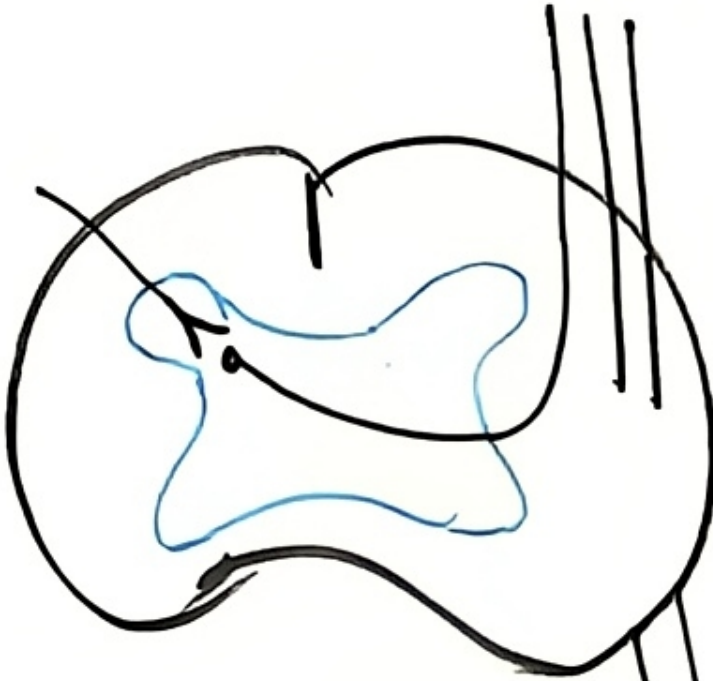
3rd order neuron begins at VPL nuclei and ascends to the posterior limb of internal capsule
(internal capsule is compact white matter lateral to thalamus)



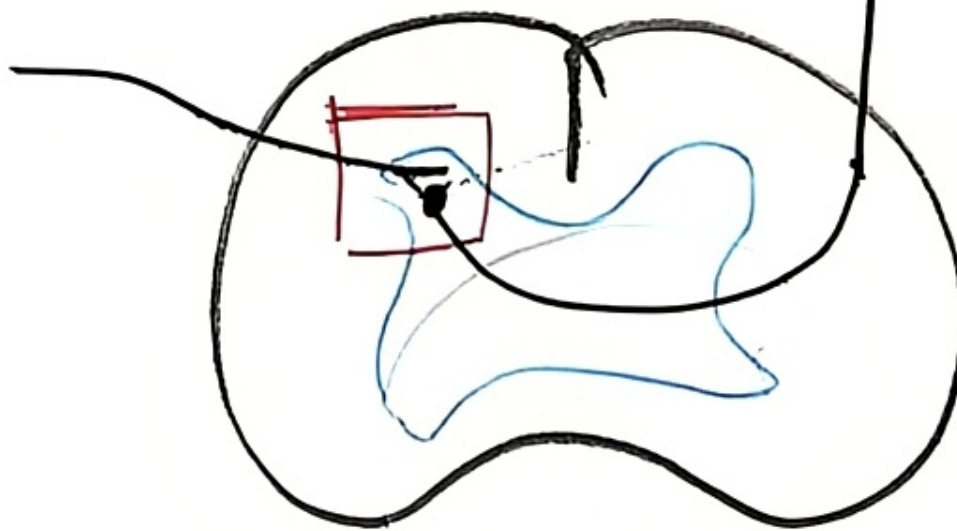
Finally N-terminates at somatosensory area
located at postcentral gyrus of cerebral cortex

ANTEROLATERAL SPINOTHALAMIC TRACT

Upper part

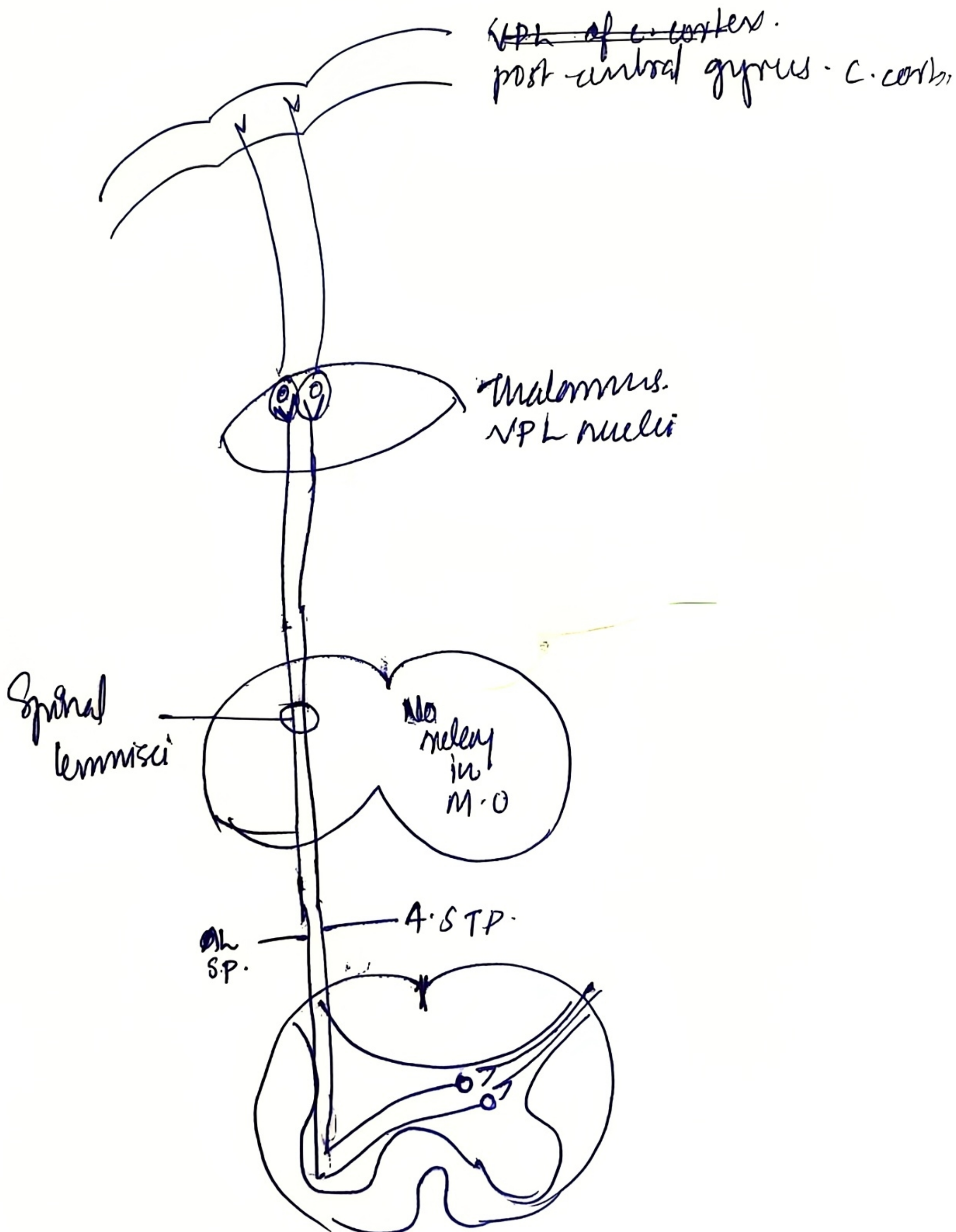


Lower part



M





Spinal cord

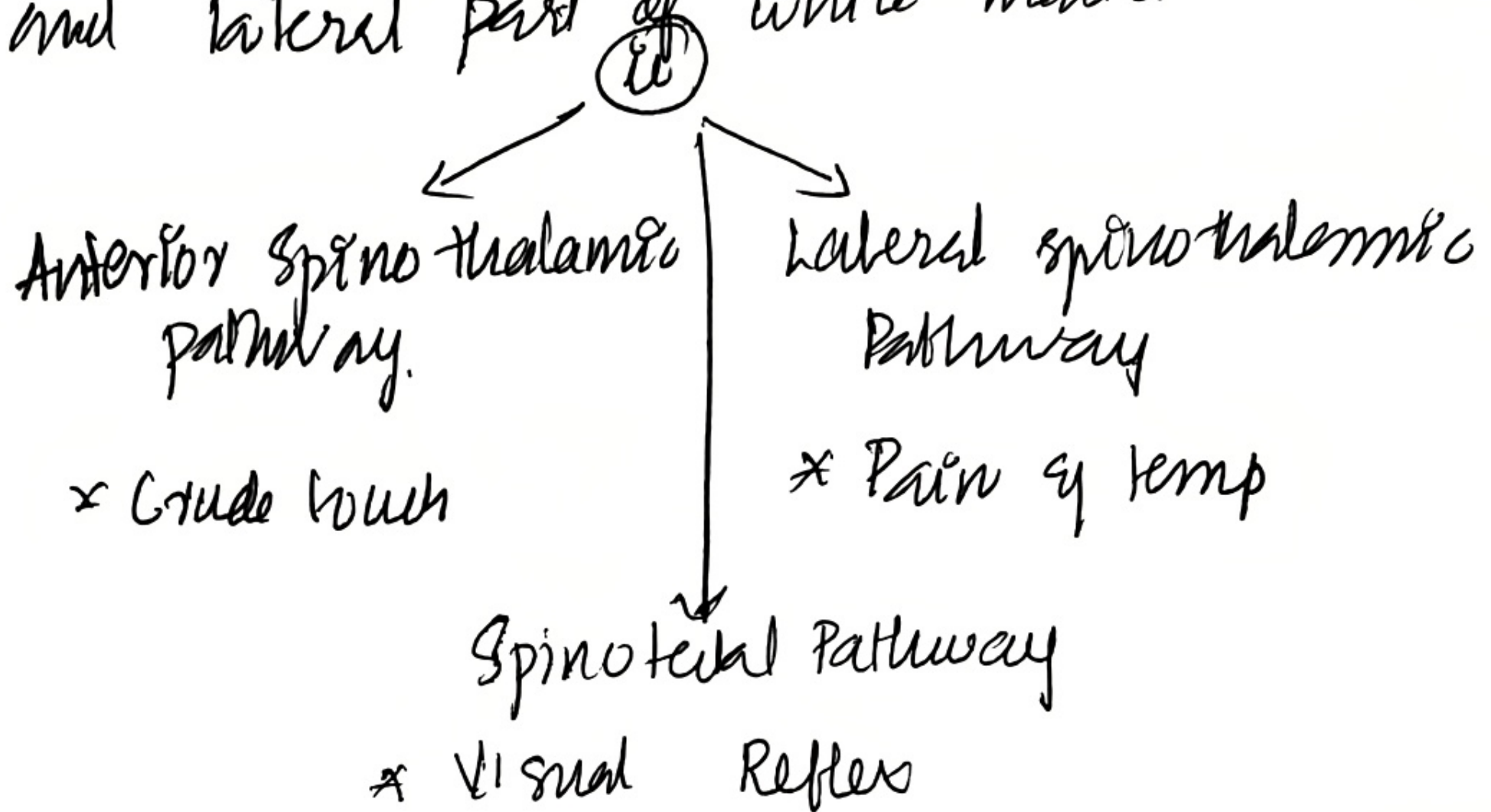
Dorsal root → medial branch → dorsal column pain
lateral branch → dorsal column horn of grey matter

Ascending of 2nd order neurons

this area → substantia gelatinosa

2nd O.N → Anterolateral spinothalamic neuron

the dorsate grey matter and reaches anterior and lateral part of white matter



* Neurons get ~~add~~ added up medially at each level of spinal cord

Medulla oblongata

Fibres join / come together to form a tract of fibres called spinal lemniscus

Pons

Spinal lemniscus goes through pons

Midbrain

" " " " midbrain

Thalamus

Before reaching thalamus the fibres of spinothal pathway terminate in tectum present in back of midbrain (superior colliculus + inferior colliculus)

- * Nuclei in thalamus → ventrobasal complex (VBL nuclei)
2nd O.N terminate here and 3rd O.N begins here
↳ Goes through post. limbs of internal capsule

Cerebral cortex

Reach cerebral cortex by radiating at ends

- * Somatosensory Cortex (sensory area): connectⁿ to

Assocⁿ → ~~an~~ AST tract
↳ Thus emotions develop due to pain
eg: cry.

- * Insular Cortex [Autonomic response of brain]

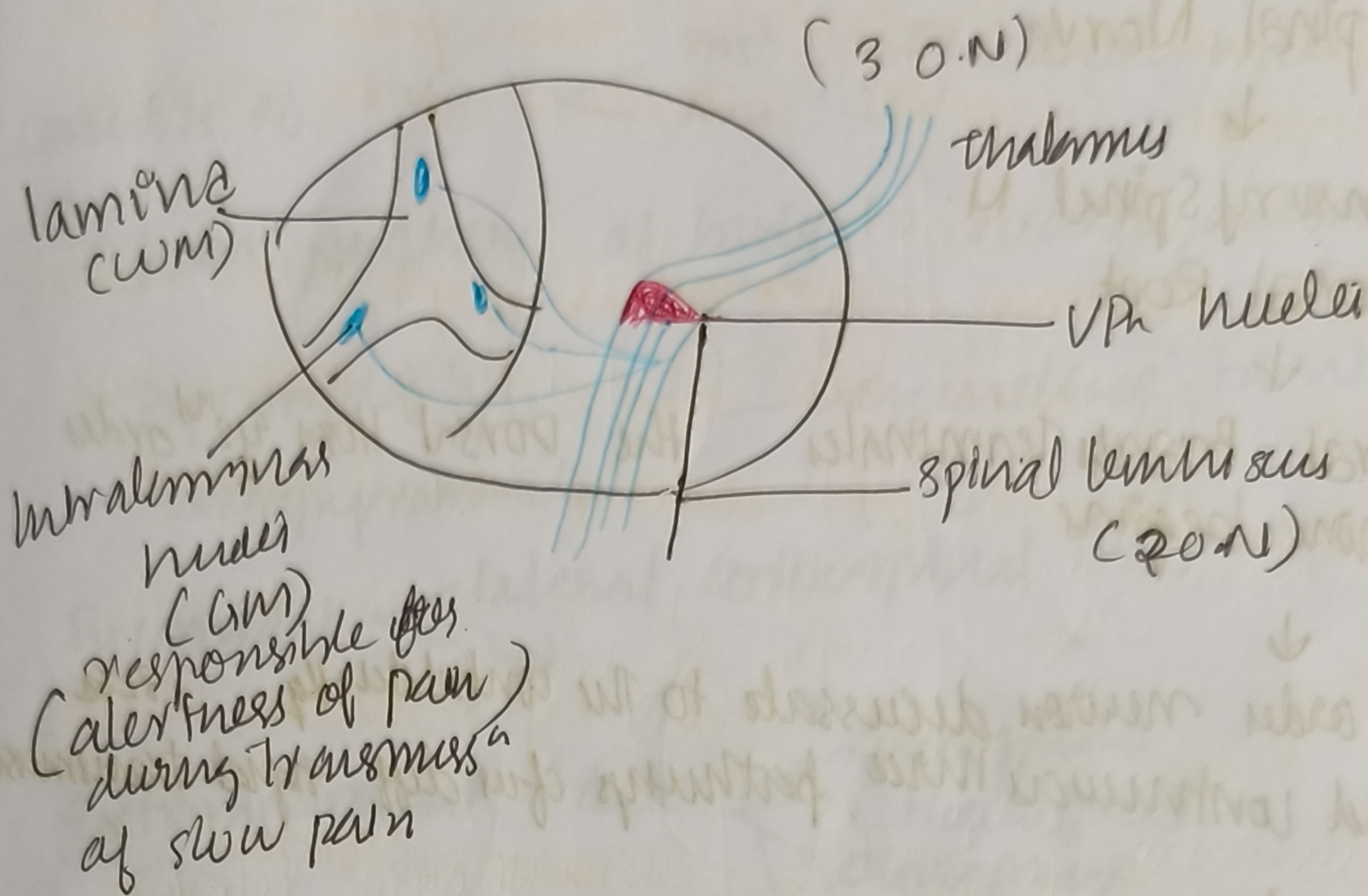
↳ During pain - sweating, tachycardia

Types of Fibres

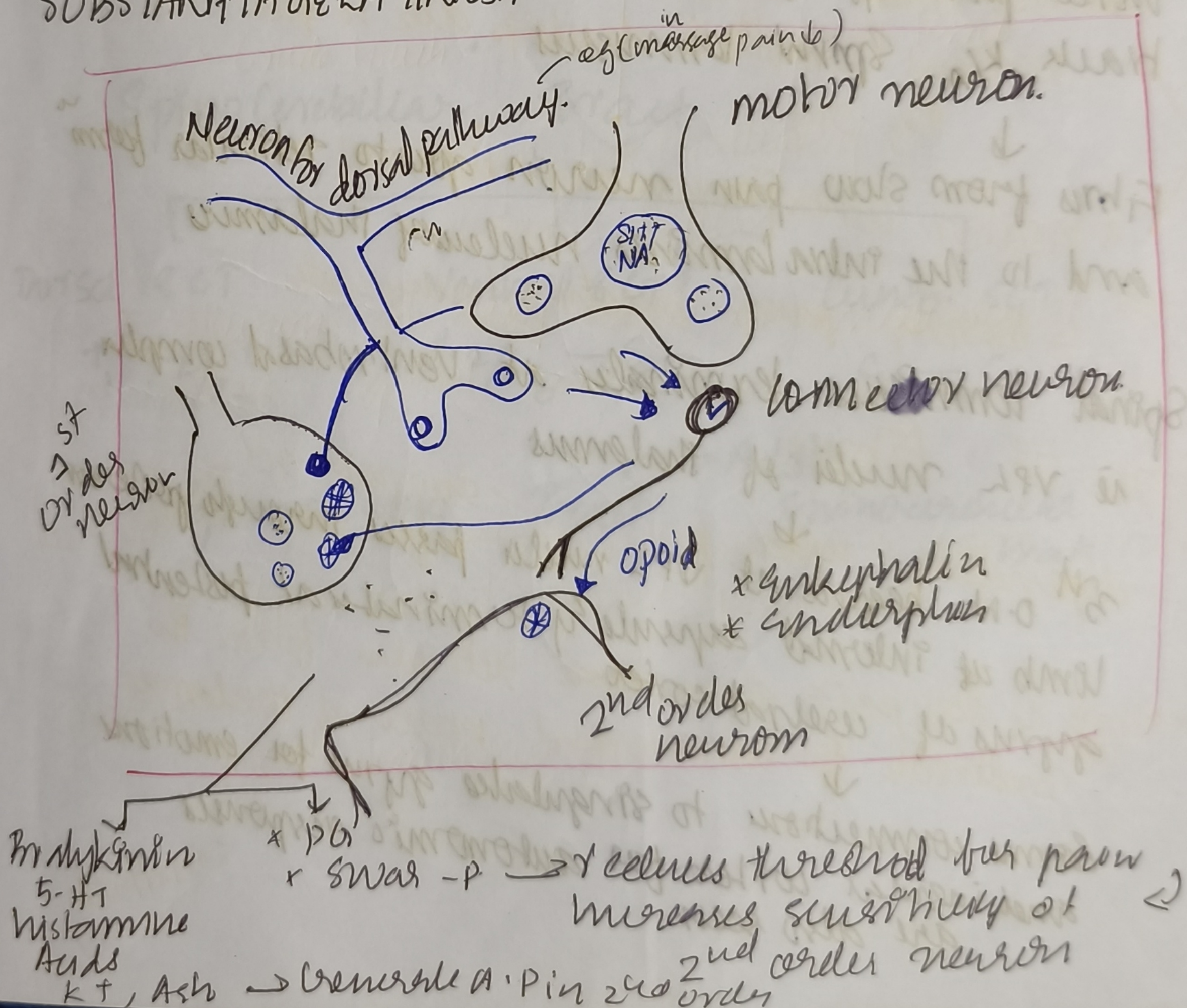
↳ depending upon pain $\begin{cases} \text{slow pain} \rightarrow C \\ \text{fast pain} \rightarrow A\delta \end{cases}$

- * Fibres of slow pain show some reticular fibres in midbrain & intralaminar nuclei of thalamus

Thalamus



SUBSTANTIA GELATINOSA



Summary.

Spinal Nerve



Sensory Spinal N.

Dorsal Root



Lateral Branch Terminates the Dorsal Horn 1st order neuron begins



2nd order neuron decussate to the contralateral side and continues three pathways for diff signal transmissions



Three pathways unite at M.O. to form a single track i.e. Spinal Lemniscus



Fibres from slow pain neurons go to reticular form and to the intralaminar nucleus of thalamus

Spinal lemniscus terminates at ventrobasal complex i.e. VPL nuclei of thalamus



3rd O.N begins at VPL nuclei passes through posterior limb of internal capsule & terminates at postcentral gyrus of cerebral cortex



Some connections to cingulate gyrus for emotions and insular cortex for autonomic responses are also seen.