



# 20- Sensory function of CNS.

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## Touch sensation

**Touch receptors** can also detect vibration and pressure sensations. Types of touch receptors :

1. Free nerve endings.
2. Meissner's corpuscles.
3. Merckels discs.
4. Hair end organ.
5. Ruffini's corpuscles.
6. Pacinian corpuscles.
7. Spray type endings, these are multi-branched structures present in deeper tissues (adapted very slowly).

-Meissner's corpuscles, hair end organ and Pacinian corpuscles adapt **very rapidly**.

### Types of touch :

#### A. Crude (rough) touch :

Poorly localized, its receptors are free nerve ending and hair end organ, Transmission occurs in **A delta fibers** (1-5  $\mu$ , 5-15 m/sec.).

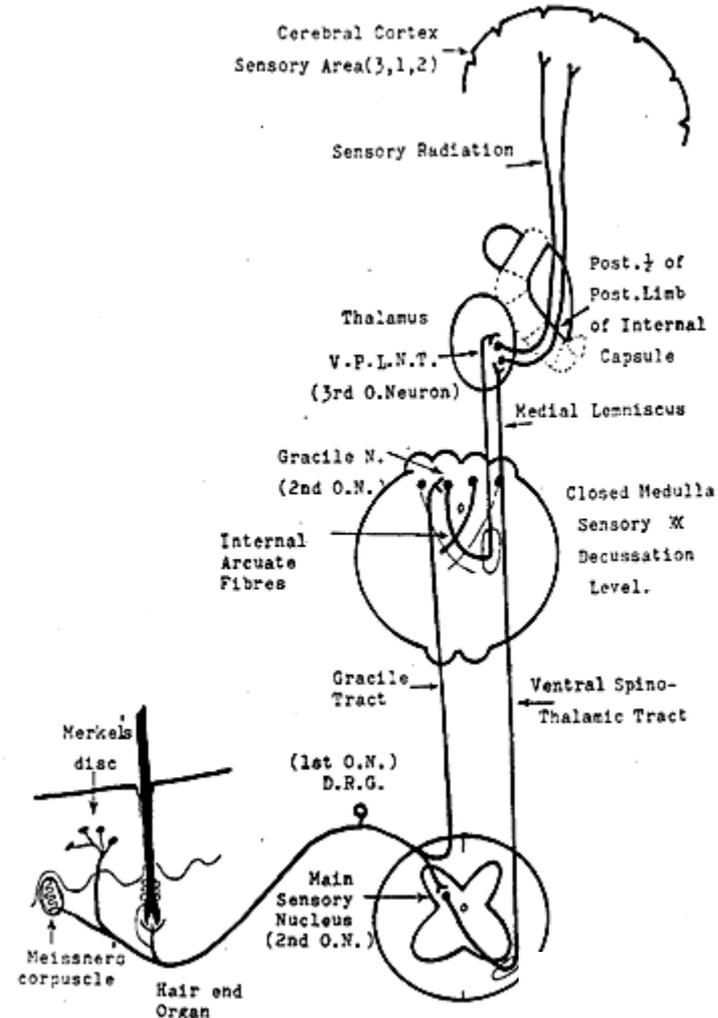
## B. Fine touch:

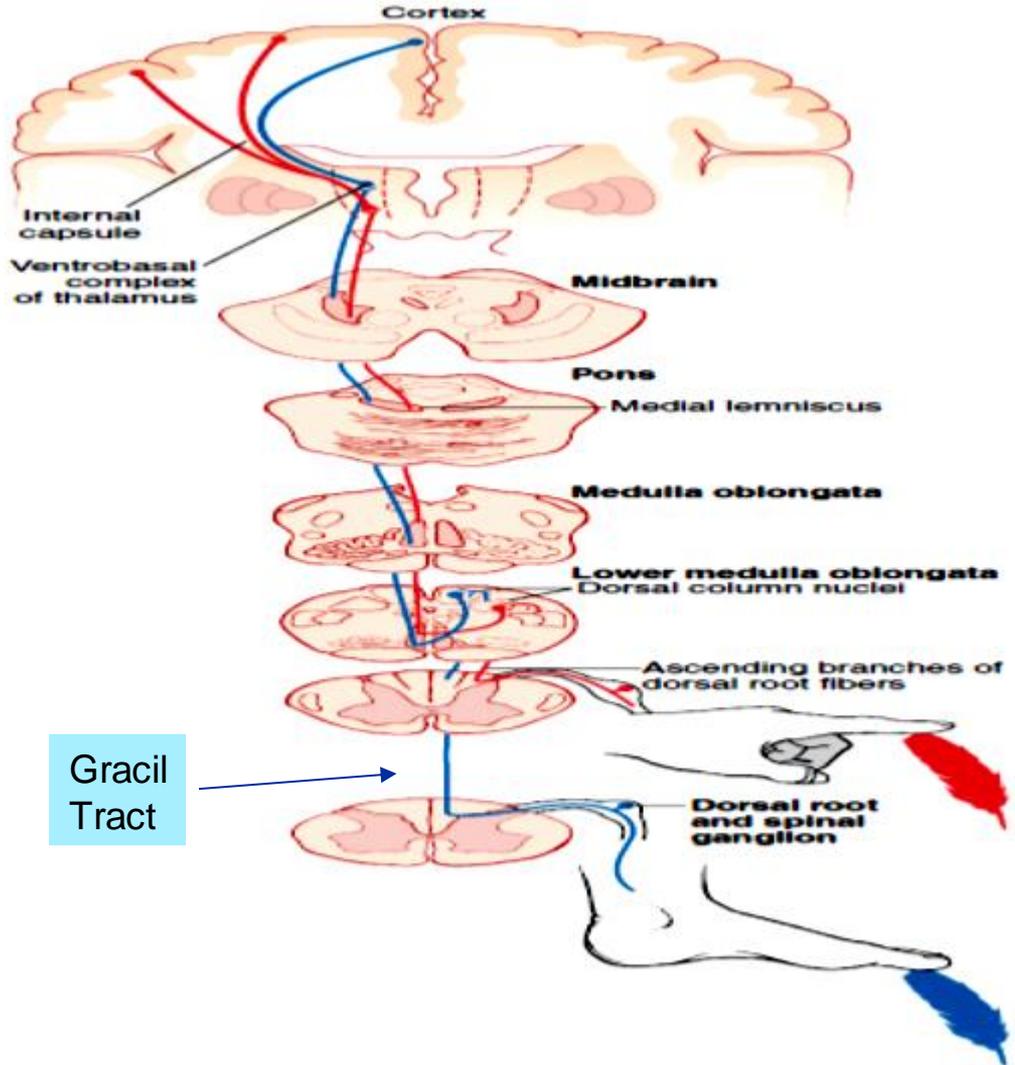
1) **Tactile localization** (Topognosis): ability of the **closed eye** person to determine the previously touched point on skin.

2) **Tactile discrimination** : two point discrimination ; This means the ability of a closed eye person to differentiate between touch in one point or simultaneous touch in two separate points. This type of sense is most accurate in **tips of the fingers, face, lips, tongue** (up to 2 mm) while it is less accurate in back (15 mm). The receptors also are very crowded and impulses are conducted by group "A" **beta** fibers (8 - 15  $\mu$ ) and velocity of 30-60 m/second.

### -Pathway of fine touch:

The same as the pathway of **proprioception** carried by the **gracile and cuneate** tracts but the receptors are different they are: Merkel's, Meissner's and Basket hair endings.





## **B- Proprioceptive (deep) or Kinesthetic Sensations**

They include the sense of position, movements, deep pressure, muscle tension and relation of parts of body to each other and to the space.

**-Most important receptors are :**

Golgi - tendon organ, muscle spindle spray type ending (all these are slowly adapting receptors), pacinian corpuscles are rapidly adapting, all proprioceptive sensations are carried to the sensory cortex by rapid dorsal column system (Gracile and cuneate).

**I. Conscious proprioceptive sensation :** are carried by the dorsal column system (Gracile & Cuneate tracts):

1-Thickly myelinated branches of **the dorsal root ganglion** cells which from its 1<sup>st</sup> order neurons, these fibers are groups **A  $\alpha$**  and **A  $\beta$** .

2-On entering the spinal cord, it ascends directly **without crossing** and it does not enter the gray matter (occupies lateral margin of the dorsal white matter).

## II. Unconscious proprioceptive sensation:

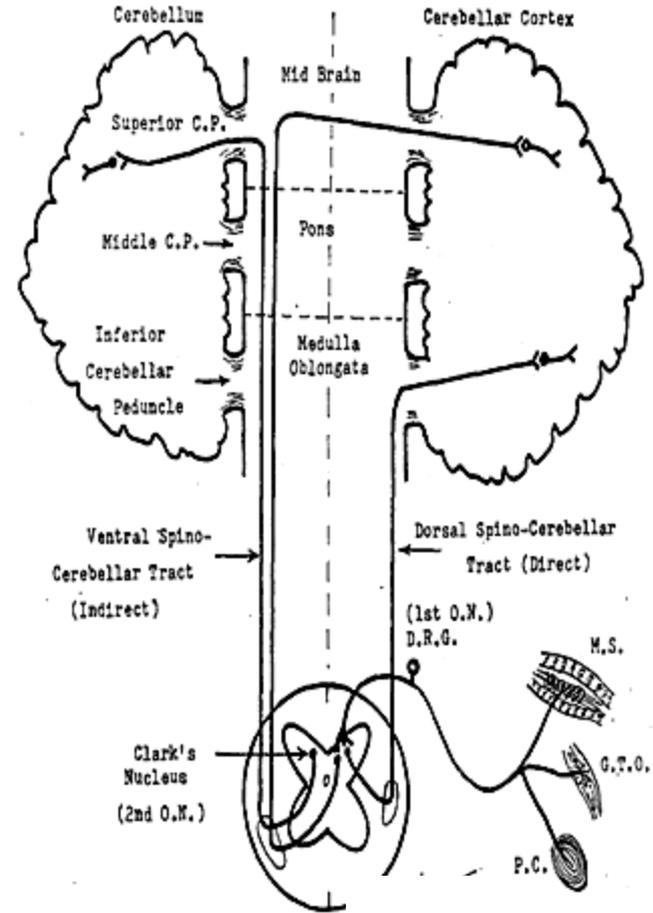
Unconscious proprioceptive sensations (joint and muscle movements during walking, running, swimming) are so called because most of them do not reach the sensory cortex. They are carried by:

### 1- Dorsal (direct) and ventral (indirect) spino-cerebellar tracts:

Carries unconscious proprioceptive sensations (do not reach the cerebral cortex as the person is unaware of them like joint movements during running or swimming), fibers are group "A" beta which is the most rapid tracts in the body (100 m/second).

### 2- Spino-Reticular and Spino-olivary Tracts :

Both tracts carry unconscious proprioceptive sensations, impulses end in the reticular formation and olivary nuclei respectively.



## C- Combined superficial and deep sensations

1) Stereognosis : Means ability to recognize the previously educated objects present **in palms** of hand without vision. This type of fine touch needs both cutaneous and deep receptors, it reaches to certain area in brain (**area 5, 7**) called **center of stereognosis** or sensory association area.

2) Vibration sense: Also it needs both cutaneous and deep receptors. It is transmitted by rapidly conducting gracile and cuneate tracts.

**-Pathway of combined sensations :**

The same as the pathway of proprioception carried by the **gracile and cuneate tracts** .

**Thank You**

