

L 11

* One of the property that affect the function of the receptor is their nerve supply (N.F) → What is the role of the nerve supply and its conduction velocity in the function of the sensory receptor.

* Sensory information are sent to CNS to produce a response

The transmission should be fast like proprioceptive sensation should be transmitted to CNS in a very fast conduction in order to get a response. e.g. When I come down on stairs if there is sleeping of my leg there should be a very rapid correction of my position of my tone least I will fall down so that these proper certain receptor are innervated with high conducting nerve fiber to send the impulses to CNS to correct the position of the leg + tone of the body in order to prevent accidents.

On the other hand if there is dull chronic pain like

the visceral pain this pain should be transmitted slowly because it is a chronic pain it doesn't need a very rapid response and so that it is passing to CNS through slowly conducting N.F. so that the N.F. with supply specific receptor depending on function will have different conduction velocity.

* How can the brain explain that there is increase in the stimulation of the receptor or decrease in the stimulation of the receptor? Whether this type of pain is strong or weak this type of heat is minor increase in temperature or it is very high temperature? ⇒ this can be done depending on frequency of impulse that reach the CNS because the code to the CNS is frequency of impulse.

* How can the receptor increase this frequency?

* How can the sensory nerve system increase the frequency of discharge to CNS? → this can be done by 2 mechanism either by temporal summation or spatial

it occur in one single receptor ← there will be sharing of many receptors connected to the same neuron and when we are increase the intensity of the stimulus then there will be increase in the frequency of discharge from that receptor send it to CNS

* the increase in strength depending on increase the frequency and spatial summation will produce the increase	each receptor will send certain frequency → will produce a high frequency in CNS
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* if you look on the pain pressing on area of skin and as there is pressing there will be stimulation of a receptor which are present immediately underneath the pain as we are increase the pressure it will stimulate other receptor which are connected to the same nerve fiber which are present surrounding the area of stimulation and as we are increase more there will be more discharge more receptor which are excited that send the impulse to CNS but we should know that the ~~central~~ central part of the stimulation is called as the receptive decentral part feel surrounding these central part of the receptive feel there are another branch of the same N.F. that contain many receptor this area a whole is called as receptive feel → the area which is supplied by certain spinal nerve

The central part is very high sensitive. The surrounding part contain less number of receptor so it is less sensitive and the outer border is having less than of the previous area and they are the least sensitive area.

So that for each nerve fiber there is certain receptive field one of the eg that we notice many condition clinically when there is compression of spinal root from prolapse intervertebral disk ($\sigma\beta\gamma\delta\epsilon\zeta\eta\theta\iota\kappa\lambda\mu$) it will press on the nerve root for example if the pressure occur on C5 this patient will feel pain at the side the receptive field and this is usually present as a circle at shoulder region so the receptive field is related to certain N.F but we should know that if there is stimulation of on single receptor and this is stimulated by weak stimulus this will produce A.P in the pre-synaptic fiber and this one single stimulus cannot send the impulses to CNS it doesn't produce an A.P in post synaptic nerve they should be large number of impulses that are originated from the certain receptor or from another receptor, there should be large number which are sent either simultaneously or in rapid successive discharge in order to produce excitation of the second neuron so always there should be increase or large number of receptor to be excited or larger intensity of the stimulus to excite the same receptor in order to get sensation in certain area.

If we give a moderate stimulus which is more than the threshold so it will produce excitation of the discharge zone this is the Discharge zone which is high sensitive area but at the same time on this stimulation

there will be excitation of the receptor which are present at the surrounding but the number of receptor which are excited and the intensity of the excitation is less than that which produce an A.P. to the second N.F. so that the central area which is called the discharge zone will be excited but the surrounding area will have facilitation so it is called facilitated zone in which there will increase in (we can say the excitability of this area or sensitivity of this area so that if we apply minor stimulus later on it will produce an A.P. in the N.F. and it will produce stimulation of the area so that in the area of stimulation we have discharge zone the zone that will send impulses to CNS and inform it that there is stimulation and surrounding area → facilitated zone → it doesn't send impulses to CNS.

* Inhibitory + excitatory

The receptor which send the impulses to CNS may be influence by stimulation of another N.F. and this will either facilitated transmission of impulses to CNS or inhibit the transmission of impulse to CNS and we will describe certain point about the inhibition of transmission or impulse to CNS in gate control.

Dermatome

C2 → means second cervical root that supply certain area
* We have different dermatome which related to one spinal cord segment or spinal cord root

* Spinal root is represented by area of spinal cord that is connected to one spinal root so that each area is related to certain dermatome.

* clinical significance of dermatome

it important to diagnose any damage in the spinal cord or their N.F

* Sensory level → stimulate the skin of the subject. Starting from the head (upper part) descending down to the big toe and at site of region in the spinal cord e.g. at the site of the T₄ there is damage in S.C then there is normal sensation from the head till we reach the nipple area which is supplied by T₄ below the nipple area till the foot we will have no sensation this mean that there is damage in T₄ if the sensory level is at e.g. → L₂ or L₁ then there is normal sensation from the head till the groin and below the groin there will be loss of the sensation this is because at the lumbar segment supply the lower limb and this will produce the loss of sensation if it is damage so the sensory level represent the site of or can indicate the region but this will ~~fast~~ negative and fast positive depending on one segment below because there is sharing between the adjacent segment

* the other thing is the reflexes → each one of reflex is related to segment

Biceps jerk (C5-C6) → if it damage at C5-C6 there will be loss of the biceps reflex, ~~when we hit~~ tendon of biceps in patient who has damage in C5-C6 there will be no flexion of the forearm

* if there is damage in C5-C6 there will be also loss of the supinator jerk → when we hit the tendon by tendon hammer and the ankle jerk when we hit the ^{b patellar} tendon this will produce flexion when we hit the triceps tendon it will produce extension of the forearm so that if there is damage at each of this segment it will produce loss of this reflex

* Sensory pathway → send the impulses from the N.F. which is related to specific receptor to the cerebral cortex to CNS
the sensory pathway that carry the information from the different receptor to CNS are 3
① posterior column pathway → is present in the posterior at the posterior region of the spinal cord
② spino-thalamic pathway → it is starting from the spinal cord ending at the thalamus
So it is called as this
③ spino-cerebellar → which means that it is starting from spinal cord end at cerebellum
* each one has certain function.

each sensory pathway is formed of 3 neurons → these neurons vary in the different pathway of the sensation
Some of them is extending from the receptor till the Sp. like that of the dorsal column, another starting from receptor reach to the medulla oblongata as it happen in the spinal thalamic tract
→ all the sensation in its pathway to CNS should have 3 neuron.

* posterior column → responsible for carrying impulse related to deep touch.

① Fasciculus cuneatus → From superior half or upper part (limb)
② Fasciculus gracilis → From lower limb

* First order neuron → Starting from the receptor whether in the upper limb or in lower limb and this nerve fiber will end at nucleus which is present at the medulla oblongata.

* Second order neuron is started from the nucleus gracilis and it will ascend higher to the thalamus

From the thalamus the third order neuron start to supply the cerebral cortex.

third order neuron → if there is stimulation of touch sensation and this touch is ascend high up to the thalamus if the subject is a sleep then this touch sensation is spread of all over the cortex to wake the subject but if this subject is a wake then this touch is stimulus will go to the specific area and it will inform brain that there is touch sensation with such sensity at such area of the body e.g → if you touch the finger of your friend due to his sleep maybe or just awake he will not understand the type of sensation ⇒ this occur from which is going from the thalamus to defuse all over the cortex but if a subject is awake and you touch his finger then he will say that you are touching my index finger at certain position of body so this impulse in awake subject will go to the specific area in cerebral cortex and it will orient the subject about the different properties of this touch sensation (perception)

* According location each of this part e.g

the cell which are responsible for sensation in the foot are present in the upper part the vertex of the cerebral cortex while those which are responsible for head and face is present on the lateral border of the cerebral cortex. * in the face there are larger number of receptor while in the back there are fewer number of receptor

* Lateral spino-thalamic tract → ① first order neuron → is started from receptor to spinal cord and it in lateral spino-thalamic will end in the same segment or one segment below of the S.C. ② the second order neuron is starting from the dorsal root crossing the side of the S.C. and it will ascend at the lateral-spino-thalamic. ascend to thalamus ③ Third order neuron is starting from the thalamus going to the cerebral cortex to the specific area of that sensation

Gate control theory of pain transmission MECHAS

there is a Gate that late impulse to ascend higher up to the cerebral cortex + close this gate ~~prevent~~ sensation from the special pain sensation from going out up into the cerebral cortex. the impulse which come from touch sensation through (A δ -Fiber) → these will send nerve fiber or branch from the A δ -Fiber into lamina (II+III) and produce inhibition of transmission so that if there is pain sensation can't send higher up because the touch sensation produce block of the gate

If you have a pain on your knee joint and if you rip the area surrounding this painful knee joint you will feel that the pain will be reduce why? because the touch sensation ripping the area surrounding the affected knee will send the impulses through the A δ Fiber → due to block

* the clinical significance in the Lamellate pathway is in diagnose ligen whether this ligen is coming from within in the S.C or as a compression from the outer of S.C

* Dorsal column → entrance of the N.F. → will go laterally to the medulla oblongata and the fiber which is coming from the upper limb as it pass inside the S.C. it will go to adjacent to the fiber which is coming from the lower limb and the fiber which is coming from the lower limb it is present in certain arrangement to that of the upper limb

* In the lateral spinothalamic tract because ~~it~~ it is crossing fiber so it will go medially to that which is coming from the lower limb not like the that of dorsal column so that if there is compression from outside which is affecting the lateral part so it will affect the lower limb more than that the upper limb while the pressure from ~~the~~ within the S.C. it will affect the dorsal column ~~the~~ before that of the lateral spinothalamic