

Autonomic nervous system → It is very important from medical point of view

→ responsible for regulation of all visceral and external organ.

In treatment of many disease we should relate to the function of A.N.S that is say to increase ~~the~~ or decrease autonomic function.

In CNS → we have heart if we do exercise we should increase the heart rate and cardiac output and this can be done by stimulation of Sympathetic N.S while increase the exercise we should increase the respiration and so it occur by change in A.N.S. → it will regulate this system according to need of body indifferent state.

* Autonomic nerve fiber → distribute all over the body all over the internal organ and even in the skin on the gland like sweat gland they are responsible for effective organ.

There are center A.N.S within the spinal cord and from these center the impulses are going to different organ in the body so that we have what is called (out flow)

Outflow \rightarrow divided to

① Cranial outflow \rightarrow represent 4 cranial that carry A.N.F which are the oculomotor, facial & vagus & glossopharyngeal while the rest of cranial nerve doesn't have A.N.F

② Thoraco lumbar outflow \rightarrow going from the thoracic and lumbar segment, it include all the thoracic segment from $T_1 - T_{12}$ and the upper lumbar segment $L_1 - L_2$

③ Sacral outflow \rightarrow which include upper segment sacral part of the spinal cord these are S_2, S_3 and maybe S_4

(Cranial + Sacral) outflow \rightarrow have the similar function and their function is regarded by parasympathetic division of the A.N.S

On the other hand the sympathetic division represent by the thoraco lumbar outflow so we have \cong division

* If you want to change the function of uterus you shouldn't give any thing related to parasympathetic N.S because there is not parasympathetic N.F while GIT does contain parasympathetic N.S. lead me explain it in another way. e.g anyone who get abdominal colic it might be due to increase in the parasympathetic N.S. So to treat such patient we give drug block the parasympathetic if there is increase in the contraction of the uterus if it is happen in dis minoria which is ~~depend~~ ^{depend} during uterus cycle we can't block the parasympathetic in this condition because there are no parasympathetic N.F in uterus

→ on the blood vessel the effect of Ach produce vasodilation and also stimulation of B receptor by sympathetic stimulation may lead to vasodilation so both of them (S+para) N.S produce same function in certain organ.

* Autonomic ganglia → present outside the CNS these ganglia are 3 types:

- ① paravertibral ganglia
- ② peripheral which present as organ
- ③ collateral. is present ~~between~~ between the (paravertibral + peripheral)

→ Paravertebral ganglia

Short pre-ganglionic f → because the ganglia present near the spinal cord

Long post-ganglionic f → because the fiber present out of the ganglia and sometime it divided into many branches.

→ peripheral ganglia → present on the organ or near it (heart + stomach + bladder)

these ganglia are present away from the spinal cord so that they have long pre-ganglionic (start at spinal and end at organ) but short postganglionic f. and not branching so there effect is localized.

→ collateral → all their activity and all their structure intermediate in between the paravertebral and terminal ganglia

Adrenal gland → present above renal (kidney) its medulla (embryological and functional) related to A.N.S because these ganglia (gland) receive pre-ganglionic fibers

(Cranial + Sacral outflow) $\xrightarrow{\text{they are}}$ para sympathetic N.F. \leftarrow SOL

- their preganglionic secrete ACH
- their post ganglionic secrete ACH

Thoracolumbar segment have preganglionic which is secreted ACH but (post) \rightarrow NE (nor adrenaline)

Thoracic segment \rightarrow norfiber (pro) which go to adrenal medulla ~~will~~ ^{will} secrete ACH and the adrenal medulla will secrete Adrenaline + Noradrenaline.

\rightarrow The ganglia (sympathetic or para sympathetic) release ACH. So if we give ganglionic blocking agent like Hexamethonium it will block the sympathetic and para sympathetic N.F. While if we give atropine which block the muscarinic receptor we are blocking only the para sympathetic N.F. So we can manipulate or change A.N.S by the effect on ACH receptor at the ganglia and effector organ.

ACh should be removed \rightarrow in order to get R.M.P and this can be done by choline Esterase \rightarrow it will destroyed ACh

If there is leakage of some of ACh from the site of action to the blood it should be removed and removal occur by the pseudo choline esterase

Noradrenaline \rightarrow substance has the ability to produce effect in most of the post ganglionic sympathetic + Adrenal medulla + CNS

formed from Amino acid phenylalanine converted then to Tyrosine \rightarrow Dopa \rightarrow Dopamine \rightarrow Norepinephrine

* B_3 is present in the adipose tissue so it is thermogenic substance *

The Blood vessel contain ($\alpha_1 + B_2$) receptors so that if we give noradrenaline or adrenaline they will act on α_1 receptor produce stimulation and this stimulation will produce contraction of B.V while B_2 which is also stimulated by the adrenergic receptors it will produce ~~vasoconstriction~~ vasodilation

Adrenergic Receptors

$\beta_1 \rightarrow \uparrow$ Cardiac output (C.O)

$\beta_2 \rightarrow$ present in Respiratory passages like bronchus and they are responsible for vasodilation or dilation or relaxation of the smooth muscle of bronchus. So during asthma we make bronchospasm which is spasm of smooth muscle of the bronchus and broniole and give adrenaline that produce dilation of these smooth muscle.

bladder is also affected by β_2 receptor

$\alpha_1 \rightarrow$ produce contraction of smooth muscle and present in sphincters like bladder. So stimulation of sympathetic NS will produce relaxation of the wall of the bladder by β receptor and contraction of the sphincter by α_1 . So that it will accumulate urine without ~~urine~~ urination on the other hand.

α_2 receptor \rightarrow proper SM (relaxation)

So that over stimulation (α_2) in the intestine produce paralysis of the intestine

If someone goes to a hot place so the thermoreceptors will be stimulated and they will change their impulses through the sensory nerve fiber to the autonomic neuron present in spinal cord. These are the dorsal horn, ventral horn and these are the lateral horn. On the other hand in a cold place it will send impulses to autonomic neurons and from these autonomic nerve fibers impulses will go to the intestine and it may lead to colic abdominal contraction.

The function of autonomic N.S. and changing the activity of the body depending on reflex activity or reflex arc.

The anatomical difference between reflex arcs in somatic R.A. and autonomic R.A. is in the autonomic R.A. the nerve fiber (sensory) instead of ending in the dorsal horn like somatic R.A. it will end in the lateral horn while in somatic sensory nerve fiber will end at the dorsal horn.