

In This lecture we will talk about the function of ANS.

* Why we can't study the sympathetic N.S excitation or stimulation to each organ separately?

Because the anatomic arrangement of the sympathetic N.S is through the autonomic ganglia and most of the sympathetic autonomic ganglia are paravertebral thoracolumbar region so on thoracolumbar region they have short ganglia and long branched ganglia nerve fiber.

General stimulation of sympathetic nervous will produce (fight and flight) →

Because fight → this stress full condition or run away from this " " "

or some time it freezed of

subject you don't do any response just (stare) all this happen by

sympathetic stimulation.

* The external change include:

① Pallor of skin means → There is pallor skin decrease blood flow to the skin and this occur due to →

This is not always because some time excessive stimulation of the sympathetic N.S will produce release adrenaline and noradrenaline inside the body and this lead to Flashing of the skin rather than pallor of skin.

→ When you face any stress full condition you may get pallor of skin or Flashing of skin

If we look in the eye → exophthalmos it means there is protrusion eye forward and this protrusion is occurred due to lid retraction excessive opening large opening of the eye so it appear as exophthalmos

Midriasis → during stress you ~~should~~ should be alerted and aware of all the thing that occur around you so there will be wide opening of the eye in order to produce a fast and rapid response for the stress full condition

②

→ Tremor of the fingers and increase in muscle tone → due to over stimulation of the sympathetic N.S. that will produce increase in the excitability of the nervous system and produce clinical condition

→ Erection of hair → this symptom or sign will appear mainly in animal rather than human being this occur due to contraction of the erector muscle that produce erection of the hair but it is more predominant in lower animal

* Internal changes *

→ During stress we don't need GI tract so that there will be decreased in the contractility of gastrointestinal system and decrease in the absorption of GIS ~ lead to diarrhoea occur as an osmotic effect.

because the decrease in motility and decrease in absorption will produce accumulation of the food inside GIT and this will produce osmotic effect that pull water from the wall of GIT and it's mainly to diarrhoea

Adrenal medulla \rightarrow is regarded as a part of sympathetic N.S because the adrenal medulla can secrete adrenaline and noradrenaline which have similar effect of sympathetic N.S stimulation because there are representing the same neurotransmitter. So that once there is stimulation of the sympathetic N.S specially in emergency state (Sever stress) there will be delete of adrenaline and noradrenaline in to the blood and this will produce wide spread action of the sympathetic nerve system all over the body and it may prolonged for along period not like of Sym. N.S this prolonged stimulation and diffuse stimulation will produce exhaustion + tiredness of the body in sever stress

* Removal of sympathetic can occur by 2 mechanism \rightarrow (1) pharmacological block of the sympathetic N.S when we give $(\alpha + \beta)$ blocker so remove the function of the sympathetic N.S because it do it's effect through the receptor or we can do instead a surgical operation that will cause section of all sympathetic N.S supply to body

In such condition by removal of the sympathetic N.S. the subject will not die why doesn't die? because the Internal organ all the organ of the body have innate property of function and the function of S.N.S. is just to regulate to increase or decrease. So some subject will not die but in state will be extremely sensitive to any changes in the environment. For example → if the subject go to removal of the S.N.S. if there is changes in the environmental temperature of body temperature if there is changes in the blood like minor bleeding if there is ~~increase~~ increase in CO_2 or ~~decrease~~ decrease in O_2 and decrease in glucose level this subject can't feel stress full condition and he will die from these minor changes.

There are 3 types of fiber for sympathetic N.S.:-

(1) Reflexly acting n.f: That increase heart rate and blood pressure normally. during rest this nerve fiber doesn't produce stimulus but if there is decrease in blood pressure

(5)

this decrease will produce stimulation of specific ~~Baro~~ receptors present at the carotid sinuses at the big B.V

→ the decrease in B.P.R at these big B.V will stimulate the Baroreceptor that stimulate the sympathetic fibers and produce increase heart rate and there will be vasocontraction →

all these will produce in cardiac output ↑ B.P.R and correct the condition then it will return back to resting state and it will be inactive.

② Continuously active n.f. →

* normally the heart rate is 70 → why?
because there is continuously impulse from the sympathetic N.S that will shift the rate up to 70 so some fiber which going to the heart have a continuously discharge that produce regular tone of the heart regular

③ Fibers that are stimulated only on emergency like fiber to the adrenal gland →

In severe stress will be stimulation of the nerve fiber that go to the adrenal gland in order to release adrenaline and noradrenaline into the blood to produce a defuse and prolonged effect. So during rest they are inactive they are stimulated only in sever stress on emergency

⑥

* parasympathetic N.S. → this system can be simply studied by stimulation of the specific nerve fiber to the specific organ of the body. Why → not like that of the sympathetic nervous system because we said in the anatomical arrangement of the parasympathetic N.S. differ from that the S.N.S.

→ most of the ganglia which are related to the parasympathetic N.S. are ^{peripheral} ganglia so that they have long preganglionic and short ~~post~~ ganglionic localize to the effector organ so we can stimulate each organ separately and will get response of that organ separately.

effect parasympathetic stimulation

→ Fibers to salivary gland → will produce salivation and if we remove the parasympathetic it will get dryness of the mouth. These 2 symptoms can be easily seen when we are used anticholinergic (atropin, buscopan) that block the parasympathetic N.S. so the side effect of atropin there will be dryness of the mouth there will be constriction the pupil that might lead to blood vengeance and we can guess any side effect anticholinergic drug.

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N O T E B O O K

→ GIT → on parasympathetic stimulation it will increase in the motility of GIT and increase in secretion of GIT →

→ Fibers of esophagus → help in pushing food → Stomach → if patient go to high HCl secretion we do section of fiber to stomach and this will produce decrease in secretion HCl.

Fibers to the lung → is important in certain clinical condition which is called as exercise in due to asthma. In such condition some patients during exercise they may get spasm of the bronchiole muscle and produce asthma like state. Such patient can be improved by giving atropin that block the parasympathetic nervous system to RS.

Fibers to the heart → stimulation of para S. will produce decrease in the activity of SA node that there will be decrease in heart rate + ↓↓ activity of AV nodes that there will be decrease in transmission of impulse from the atrium to ventricle and which is called as heart block in severe stimulation of para S.N.S.

* The urination and defecation is the function of parasympathetic N.S *

Compare between Sympathetic and Parasympathetic N.S

* Sympathetic stimulation occur all over the body while parasympathetic stimulation in local stimulation in each organ in body.

On the eye sympathetic stimulation it will produce dilatation of pupil to increase the lightness of subject while the parasympathetic N.S will produce constriction of the pupil.

On salivary gland the S.N.S will produce inhibition of the salivation although it will produce increase on contraction of the smooth muscle and release of thick this type of secretion but it doesn't produce watery salivation like parasympathetic N.S stimulation.

On the heart the S.N.S will produce increase in the heart rate and increase in heart output and blood flow while the parasympathetic N.S will produce decrease \rightarrow (heart rate + excitability)

On the lung the S.N.S produce dilabion of Smooth muscle in the bronchis whil etthat of the para sympathetic N.S will produce constriction and this in ~~adrenaly~~ Clinically is very important in certein condition in asmatic state and bronchitis which are characterized by contraction of smooth muscle we can give adrenaline or noradrenaline to the patein and this will produce dilation of bronchis and bronchospasm.

On the stomach the parasympathetic stimulation will produce increase in secretion of HCl and in the contraebion while the sympathetic stimulation will produce inhibition of the secretion and inhibition of digestion

On the liver stimulation of parasympathetic will produce release of the bile while S.N.S stimulation will produce increase in the glucose release from the liver.

On the intestine the parasympathetic will produce increase in the motiliby of the small intestine and produe defecation while the S.N.S stimulation will produce decrease in the motility this also important-

in certain surgical operation if the surgeon manipulate this small intestine for long period touch small intestine for long period \rightarrow it might lead to over stimulation the S.N.S and paralysis intestine will occur and this might lead to death due to osmotic diarrhoea and electrolyte distemper that occur as result of stimulation S.N.S

On the bladder the parasympathetic is responsible for urination while SNS will produce decrease in the urination.

Hypothalamus \rightarrow the most important higher center

cerebellum \rightarrow related to ^{motional changes} ~~movement~~ of the body

Higher center

① cerebral cortex \rightarrow if there is stress full condition as (doing exam at this moment or tomorrow) you will get a stress full condition due to excitation of the cerebral cortex this orientation of stress full condition of exam will send impulses to the mid brain and hypothalamus and this will produce increase in heart rate + blood pressure and sympathetic stimulation that occur during to orientation through the cerebral cortex

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N O T E B O O K

if the subject doesn't have cerebral cortex he will not understand that there will be an exam today or tomorrow so that there will be no changes in the body according to this emotional factors.

another e.g. → if you feel shame also this through the cerebral cortex it will produce changes in the activity to the body in the organ of the body according to the cerebral cortex. So stimulation and then through hypothalamus and brain stem it will change the body activity.

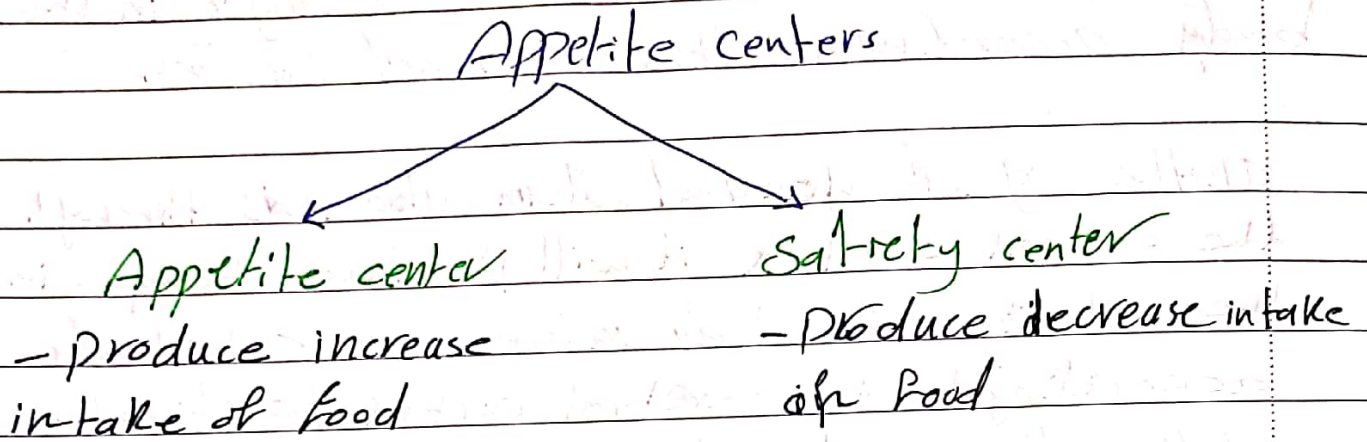
Hypothalamus

The main higher center to regulate the autonomic nervous system, it is present within the brain.

① Direct effect: Neural

- Hunger → will stimulate the GIT + Appetite and this will change the activity of GIT
- Thirst center → will affect the intake of water and affect process of urination decrease in the urination and these will represent the main control through direct effect in neural factor.

② Indirect → through pituitary gland which secrete release hormone that control all gland in body



* abnormality may cause: (clinical disease)

- Obesity → occur due to over stimulation of the appetite center
- Anorexia nervosa → due to over stimulation of the satiety center

Why this is happen??

because either this is increase in the sensitivity of these receptor to glucose level due to the fact that there are another stimulus from the cerebral cortex or from other site of the body that stimulate the

Appetite center e.g. → There are certain woman who has increase in appetite when there are stress or there is depression so that they will get obesity due to depression and not due to increase in blood glucose.

(3)

* Some women feel shame from obesity so that there will be over stimulation from the cerebral cortex to the satiety center to produce stimulation of the satiety center so there will be decrease in the intake of food and some time associated with nausea vomiting so there will be starvation state that may lead even to changes in the electrolyte of body ~~and other~~

Sleep center

How can the Reticular activating system do? it represent a pathway a gate that ~~control~~ ^{lead} the impulses to go from the ~~subcortical~~ ^{subcortical} nerve system to cerebral cortex to get awake. if there is block of this pathway or block of this gate then the sensory impulse can't reach to cerebral cortex so that there will be sleep.

The raphe nuclei and locus ceruleus will influence the function of the reticular activating system so we will get wake and sleep according to this control

- noradrenaline will produce excitation
- Serotonine → will produce inhibition so this will produce sleep ~~and~~

Indirect effect

If we do stimulation for hypothalamus this will produce release of releasing factors \rightarrow these will act on certain cell in the pituitary gland (Anterior)

Adeno-corticotrophic hormone \rightarrow it will act on the supra renal cortex and this will produce increase the cortisone and change in the body

also we have releasing factor (FSH + LH) these hormone are responsible for regulation of the gonitourinary system and these will increase formation of the sperm + $\uparrow\uparrow$ ovulation + $\uparrow\uparrow$ sex hormone + \uparrow Formation of ovum

* Posterior pituitary gland *

Release Oxytocin \rightarrow Stimulation of release milk from breast of mother it also important for the process of the delivery pregnant \rightarrow (birth of child)

ADH \rightarrow release from nuclei from hypothalamus
 \hookrightarrow will regulate the process of concentration and diuresis

* Diabetes insipidus * → is due to congenital disease ↓↓ ADH

Polyuria

Polydipsia

in addition there will be diluted urine it is of low specific gravity

Brain stem

(a) Vital center → regulate vital organ

this will regulate respiration all the time it is not occur reflex

→ control vital organ continuously, if it is damage of these vital center it will lead to death

(b) Reflexes → we have certain collection of nerve cell acting as reflexes center

→ During swallowing there is inhibition of respiration by reflex activity

→ During vomiting there will be dilation of the cardiac opening of the esophagus or stomach