

Physiological Concept of Krodha (Anger)

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Abstract: Background: Anger (*Krodha*) is emotional response of feeling of wrong. It is responsible for illusion of memory and mind. It is mentioned under *Dharaneeyavega* by *Charak Samhita*. It is associated with vitiation of *Pitta dosha* in human beings. *Pitta dosha* brings various changes based on chemical metabolism and secretions. Physiological changes due to anger is observed as after effects.

Ayurvedic Concept: Ayurveda relates anger with *Prakriti*. It influences psychological, physical, immunological or physiological and behavioral traits of an individual. *Pitta* dominance *Prakriti* is associated with anger. Causing factors of anger are affiliated to *Sadhaka Pitta*.

Input and Output Circuit: Amygdala is integrative center of anger as feelings reaches here and evaluated through different circuit relays for appropriate action. Hypothalamus is important being related to input of amygdala. The septal nuclei are connected with pleasurable response. The neurons from periventricular nucleus of hypothalamus projects to pituitary and they are responsible for secretion of corticotropin releasing hormone and thyrotropin releasing hormone.

Discussion: Pungent, sour etc. are suggested as characteristics of *Pitta*. One of experiment on anaesthetized rats have shown that pungent compounds increase the catecholamine secretions. Epinephrine activates nervous system to regulate blood pressure by contracting vasculature, increasing the contraction of cardiac muscles and pupillary dilator through different receptors. It means, at molecular level, physiological alterations are observed with vitiations or changes in any of *Tridosha*.

Key words: Anger, *Krodha*, *Tridosha*, *Pitta*, Amygdala, Brain, *Rajoguna*

Krodha (anger) is an emotional state known to everyone across the globe. American Psychological Association defines anger as an emotion characterized by antagonism towards someone or something as respond to feeling of wrong¹. *Charak Samhita* mentions *Krodha* under *Dharaneeyavega*² and devoid of *Krodha* is essential to give strength to *Mana*³. It is generated by hindrance in desire of anyone related with attachment towards anything or any subject⁴. It is originated from *Rajoguna*⁵. *Rajoguna* is responsible for psychic doshas⁹. *Krodha* brings foolishness and that is responsible for illusion of memory and mind⁴. Such illusion destroys intelligence and wisdom of anyone⁴. It is one of four *Kasayas* to overpower the soul⁶. Whenever it is visible or observable through behavior, it is called as 'overt anger' whereas when it is suppressed, it is termed as 'suppressed anger'. Overt anger leads verbal and physical assault, low self-esteem, property destruction etc.⁷ while suppressed anger brings hypertension, anxiety and their related diseases⁸. *Charak Chikitsasthana* mentions *Krodha* as cause of *Paittik gulma*¹⁰, *arochaka*¹¹, *unamada*¹² etc. Basically, it is due to *Pitta dosha*³⁴. *Pitta dosha* brings number of physiological changes in body based on chemical metabolism and secretions resulting in aftereffects of anger.

Ayurvedic Concept

Ayurveda relates anger with *Prakriti* (physical constitution) and *Prakriti* is decided at the time of birth. Impacts of sperm and ovum suggested in *Charak Samhita* hints for genetic relation of *Prakriti* of an individual. Influence of season, condition of uterus, food and regimens of mother are related to effects of environmental factor

on individual *Prakriti*. *Panchmahabhutas* suggest about specific physiological constitution with dominance of specific constituent in body³¹. *Dosha* dominating at that particular time is passed to fetus and that is reflected in terms of *Prakriti*. So, *Prakriti* is considered as fixed for whole life of an individual. It influences psychological, physical, immunological or physiological and behavioral traits of an individual. Seven types of *Prakriti* are mentioned as *Vata Prakriti*, *Pitta Prakriti*, *Kapha Prakriti*, *Vata-Pitta Prakriti*, *Vata-Kapha Prakriti*, *Pitta-Kapha Prakriti* and *Prakriti* with balanced *doshas*³². *Pitta* dominance *Prakriti* is associated with anger³⁴. Out of five types of *Pitta*, *Sadhaka Pitta* is connected to anger as discrimination, intelligence, pride etc. are causing factors of anger and these factors are affiliated to *Sadhaka Pitta*³³.

Charak Samhita has clearly mentioned *Tridosha* as somatic *doshas* while *rajas* and *tamas* as psychic *doshas*. Somatic *doshas* can be treated by remedial measures while psychic *doshas* need meditation, memory, knowledge and restraints³⁵. The response in terms of 'fight and flight' reaches to high level in *Pitta* related *doshas*³⁸.

Input and Output Circuit (Chart-1)

Among the various causes of anger, feeling threatened, vulnerable, exposed, violated and inability to meet demand are common. These causes play an important role in neuroscience to reveal the complex circuit of physiology of anger. Amygdala is integrative center for anger as data related with different types of feeling reaches amygdala¹³. Accordingly, related information is released to output centers of brain for appropriate action.

Hypothalamus is important being related to input of amygdala. It coordinates autonomic reflexes of brainstem and spinal cord. Gustatory inputs received in hypothalamus is sent to amygdala for evaluation¹⁴. The information related to sleep is received in amygdala from hypothalamus. Hypothalamic-amygdala coupling is important in these regards¹⁵. Amygdala manages the processing of information related with body wasting too received from hypothalamus. Study has been done for integration of emotional balance for information from hypothalamus to amygdala¹⁶.

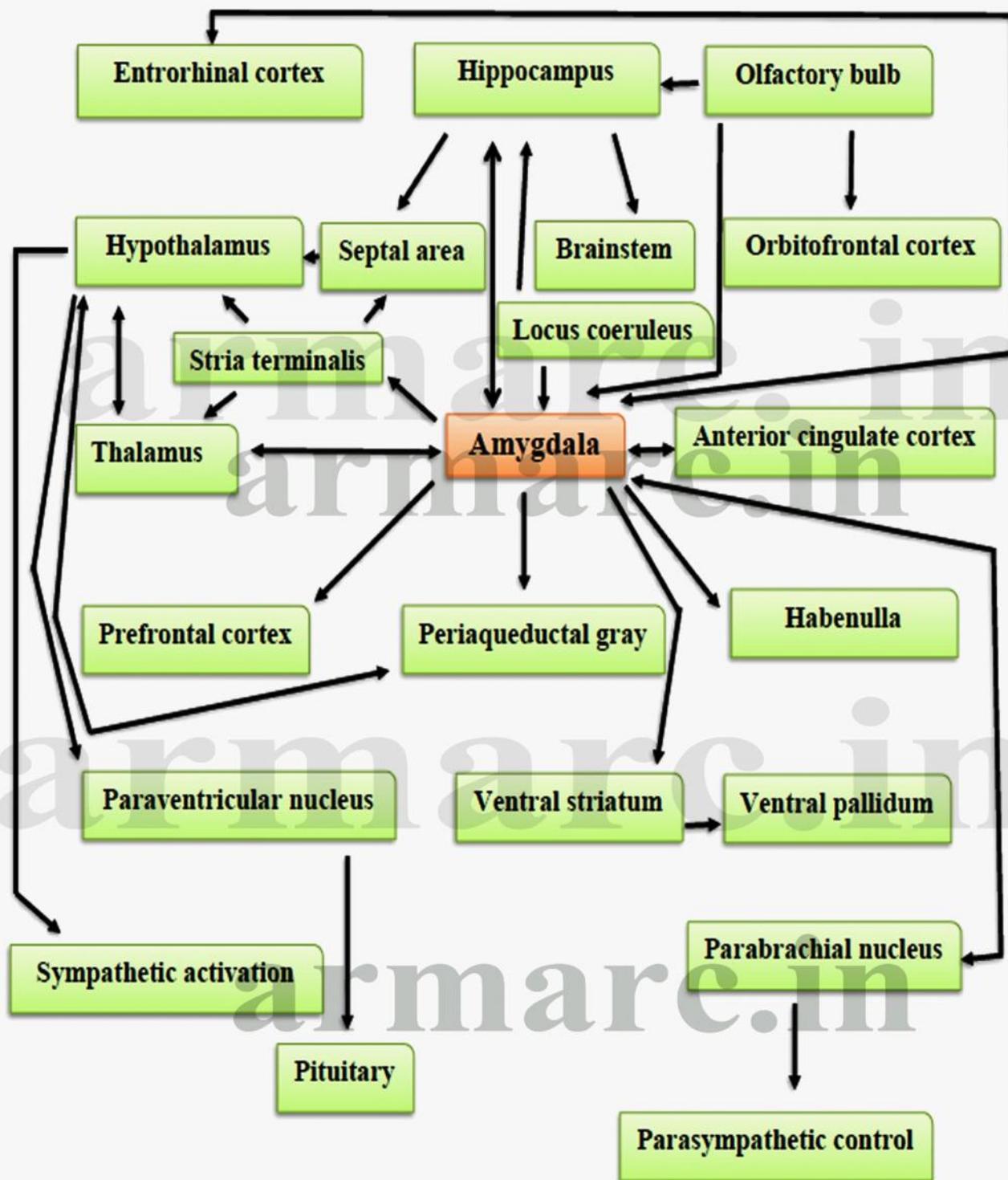
The septal nuclei are located in the cerebral hemispheres in between rostrum of corpus callosum and third ventricle^{17, 18}. They are present in septal area. They are connected with pleasurable response. The information is received through hippocampus, amygdala and stria terminalis which is processed to hypothalamus and thalamus. The hypothalamus projects to the periaqueductal gray (PAG) via the dorsal longitudinal fasciculus¹⁹. The neurons in amygdala also sends projections to PAG²⁰. The PAG is related to defensive behaviours, vocalizations and autonomic regulation²¹. The neurons from periventricular nucleus of hypothalamus projects to pituitary and they are responsible for secretion of corticotropin releasing hormone and thyrotropin releasing hormone²². Anger is accountable for increased testosterone and decreased cortisol³⁶. This results in more stress and impairing of memory³⁷. Pituitary activates adrenal glands.

The adrenal cortex, outer layer of adrenal gland secretes steroid hormones while adrenal medulla, an inner layer secretes catecholamines²³. Catecholamines include dopamine, epinephrine and norepinephrine²³. The 'fight or flight' action is related to secretion of catecholamines. Dopamine levels are directly related to anger. Dopaminergic system is linked to recognition and experience of anger²⁴.

The parabrachial nucleus (PBN) coordinates visceral, nociceptive and thermoreceptive inputs with amygdala, hypothalamus and thalamus²⁸. During anger, it is responsible for panting and respiratory distress²⁹. The anterior cingulate cortex (ACC)-amygdala circuit plays important role in ability to control and regulate uncomfortable emotions³⁰.

Chart 1

Amygdala Circuit For Anger



Discussion

Vitiation in *Pitta dosha* increases anger³⁹. Pungent, sour etc. are suggested as characteristics of *Pitta*⁴⁰. One of experiment on anaesthetized rats have shown that pungent compounds like capsaicin, zingerone and piperine increase the catecholamine secretions⁴¹. Epinephrine activates nervous system to regulate blood pressure by contracting vasculature. It is also responsible for increasing the contraction of cardiac muscles and pupillary dilator through different receptors. Relaxation of smooth muscle of gastrointestinal, urinary and respiratory systems are related with epinephrine²³. The α -adrenergic action is stimulated by epinephrine resulting in increase in systemic and pulmonary vascular resistance causing rise in systolic and diastolic blood pressure²⁵. As result, increase in breathing and blood flow is noted. Overall sympathetic stimulation can be observed²⁶.

One the other hand, norepinephrine controls dilation of pupils, bronchioles, increased blood pressure, increased kidney renin secretion and inhibited peristalsis through noradrenergic neurons from locus coeruleus, thalamus, hippocampus and cortex²⁷. These are related signs of anger and can be observed in anyone.

It means, at molecular level, physiological alterations are observed with vitiations or changes in any of *Tridosha*. A detailed study of *ayurvedic* concepts in light of modern concepts is need of time to bring *Ayurveda* globally with scientific perceptions.

Conflict of Interest: No Conflict of Interest

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