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CONCEPTUAL STUDY OF *VATA NIRUKTI (GATIGANDHAN)* W.S.R. ACTION POTENTIAL

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ABSTRACT

Ayurveda have great ability to define physiological and pathological condition of human body as well as mind, the main aim of the *Ayurveda* is to maintain the health of the healthy person and cure the diseased of a diseased person. In *Ayurveda samhitas* mentioned 3 main *doshas* like – *vata*, *Pitta* and *Kapha*, the term *dosha* in Sanskrit language means is the supervision functional factors of the human body, these three *doshas* in normal state perform normal physiological functions of body. In human body any component which is responsible for any type of movement is called as *vata dosha*. *Vata dosha* has great significance among *tridoshas*. *Vata dosha* is *avyakta (*invisible), but can be experienced from its functions**.** *Vata* can be similar with electrical impulse which we cannot see but we can experience it as an activity of body. For electrical impulse or any movements (contraction and relaxation) of any part of body, modern science mentioned actional potential. All type of body activity regulated by action potential. For this study, the basic resources have been collected from the ayurvedic classics and an attempt has been made to compare *vata nirukti (gatigandhan)* and actional potential.

KEYWORDS: *Vata, Dosha, Tri doshas, Avyakta,* Action potential.

INTRODUCTION

Ayurveda is holistic science based on basic fundamentals like *trisutra (hetu, ling, ausadha), tridand(satva, atma, sharir), tryoupstambha (Ahara, nidra, brahmcharya) and*

tristhoon/tristambha(vata, pitta, kapha). These three *doshas* are basic element (structural and functional units) of the human body. The elements which are responsible for formation of *Prakriti* and which have the power of vitiating other body organs and tissues are called as *doshas*. In ayurveda *samhitas* mentioned three *doshas* – *vata, pitta* and *Kapha*, *vata dosha* have more affinity among *doshas*. *Acharya Charak* explain mostly *vata dosha* 5 types-

1. *Prana vata*
2. *Udan vata*
3. *Saman vata*
4. *Vyan vata*
5. *Apaan vata*

Gun of *vata* explain by *acharya Kush*, causative factor (*prakopak karan*) of *vata* explain by *acharya Kumarshira bharadwaj* and *vata saman karan* explain by *Vahinik rishi Kankayan.*[1] *Acharya Susruta* explain mostly *pitta dosha* namely, *Acharya Vagbhata* explain mostly *kapha dosha* namely.

Nirukti- *Tatr "VA" gatigandhanyoriti.* The term *gati* refferd with movement, and *gandhan* word indicate enthusiasm so, the movement required for union and separation is supported by *vata dosha.*[2] *vata* is *rajo gun bahul* because of this *rajo gun vata* has *chal* properties, so there are four meaning of *gati.*

1. ***Gaman*** (sensory impulse from sensory receptor to higher center): in human body sensory system are widespread, sensory receptor are potential to see, hear, taste, and smell, and to sense touch, vibration, pain, temperature and body position. All sensory receptors in the human body work on the same general principles. Their membranes carry particular type protein molecules that are activated and change their shape when the proper stimuli come into contact them. Activation of the specific protein receptors in the cell membrane is followed by a sequence of reactions, called transduction, leading to the initiation of nerve impulses ***(action potential)*** which are travel along with fiber towards the higher center.
2. ***Prapti*** *(*integration of sensory information)
3. ***Gyan*** (knowledge about sensory information) and
4. ***Moksha*** (motor impulse from higher center to target organ).

Sushrut said for *vata* that – *vata* is ***"sarvchestasamooh sarvsarirspandanm"***[3] means the term *vata* is the evidence of- ***Gatimulak:*** Means the appropriate stimuli stimulate the sensory

receptor to initiate action potential and the sensory information is carried by afferent nerve fiber to higher center.

Gyanmulak: Knowledge about sensory information

Praptimulak: Integration of sensory impulse and

Utshamulak*:* Motor activity.

All are these activities performed in human body under nervous system through action potential. In human body, *pitta, kapha dosha, dhatu* and *mal* are handicapped for doing their activities independently. For each and every action in hu*man* body needs the stimulation of *vata dosha*. Same things we can observe in nature. *Acharya Sushrut* has mentioned that *vata is avyakt* (invisible) but we can observe from its functions. It does not obtain physical measurements like length, breadth, height but the activities of *vata* can be seen. *Vata* can be compared with electrical energy, we cannot see the electrical energy but we can experience its functions like lightning bulbs, televisions.[4]

Synonyms of *Vata*: - *Marut, chala, anila, samirana,* and *pavan* all these synonyms indicate *gati* (movements).

In *Charak sutrsthan* 25 *acharya* said that *vata is Prandharak.*[5] *Acharya Susrut* mentioned that *vata is – "doshanaam neta"* and *"rog samhoorat"*, because in *tridosha vata* is main *dosha. Vata* is *amurat* (invisible) but it is pervaded whole body. Due to *shigrgami* it is called as *ashuvaahi.*[6]

Qualities of *vata*: *ruksh, sheet, laghu, sukshm, chal, vishad and khar*, due to all of these *guna panchbhootikatwa of vata* is proved.

Akasha – due to *sukshm guna*

Vayu - due to *chal* and *laghu guna*

Agni- ***"doshdhatumaladinaamushmeti.".***[7]

Jal - due to *sheet guna*

Prithivi – due to *khar guna*.

On the basis of different *garanthas gunas of vata* is classified in 4 group –

1. ***Prakrut guna* –** Sparsh and sabdha are prakrut guna of vata, sabdha due to dominance of akasha mahabhoot.
2. ***Karmuka guna-*** *yogvaahi* and *ashukari.*

3. ***Bhootika guna*** **–** *rukshadi guna*. These *bhootika guna* helps in to maintain normal function/ homeostasis of the body.
4. ***Mansihka guna-*** *rajo guna pradhaan*, because of this *manas guna vata is chal*.

Charak sutrsthan 18/49 *acharya* explain *avikrit vata* functions- *Utsha, uchavas, niswas, chesta. (sharirik- mansik chesthain) dhatugati*, excretion of *mal-mutradi urges.* All of these activities are conducted by *vata* due to its *gati* or *chal, ashukari guna.*[8] In modern medical science all of these activities are explained under nervous system. The information from periphery to cerebral cortex reaches or travels through nerve impulse via action potential, when the action potential reaches the nerve ending, neurotransmitter release for passing the information to next nerve fiber this sequence repeat again and again until information not reaches the higher center.

Functions of *Vata*: - Normal *vata* functions are.

Vayustantrayantradharah: - *Tantra* means - human body.
Yantra means – organs
When we see the structural and functional framework of hu*man* body, it can be compared with a machine. If this machine (*yantra*) has to work smoothly, there should be some specific operational system *(tantra*). Human body and its organs function are totally dependent on *vata dosha*. Hence *vata* is known as *tantrayantradharah.*

Niyanta praneta cha manasah: - *Niyanta* means to control and *praneta* means to stimulate. *vata* gives stimulation to *man* (higher center) for its normal functioning and also control its activities. *Vata dosh* makes *man* (higher center) to think on right and wrong and selects the appropriate one. *Man* (higher center), also known as *"Ubhayendrya"* (dual nature- sensory and motor).

Sarvendriyanamudyojakam: - *vata* stimulates sensory and motor organ. Human body have 5 sense organ - eyes, ears, nose, tongue and skin and every sense organ have appropriate receptors when proper stimuli stimulate receptors, these receptors initiate nerve impulses (action potential) and information travel upwards to higher center. For this action potential generation, a proper powerful stimulation is required.

Sarvendriyarthanamabhivodha: - The term *abhivodha* means attraction or movements. The attraction or movements of sense organs towards their object is due to *vata dosha.*

Like – good perception of sound by ear, respiration (14-18/min) can occur due to *vata*.

Pravartako vachah: - *Vata (Udan vayu)* is responsible for produce different type of sound. e.g. - cardiac sound, abdominal peristalsis sound, respiratory sound. These all sounds are produced due to normal state of *vata* in human body or series of electrical changes (ions exchange) in membrane potential.

Kshepta bahirmalanam: **-** Remove out waste material from the body through *vata (apaan)*.[9]All excretory function occurs when the waste product is in sufficient amount to stimulates the stretch receptor, sensory impulse generated and this impulse required sufficient action potential to reaches the higher center after that motor impulse generated and reaches the target part through action potential for excretion. These all functions are also known as vegetative function and autonomic nervous system controls all these vegetative functions. "The brief sequence of changes (electrical changes) which occur in the membrane potential following excitation of muscle or nerve is called action potential". Excitable cells e.g. nerve and muscle cells; generate action potentials when they are stimulated by a change in membrane potential. It is due to the distribution in the ionic equilibrium across the receptive zone of the cell membrane. Action potential produced by various cell types differ slightly but their origin is same. Inside of nerve negativity and outside of nerve positivity. Since $\mathbf{K^+}$ permeability is greater than $\mathbf{Na^+}$ permeability, therefore, $\mathbf{K^+}$ **channels** maintain the RMP. And the rmp in most of neurons is -70 mV (rmp of skeletal muscle – 90 mV). During depolarization reduction in the membrane potential from its negative value to zero. During depolarization voltage gated $\mathbf{Na^+}$ open there is slow influx of $\mathbf{Na^+}$ when depolarization exceeds 7 to 10 mV, the voltage gated $\mathbf{Na^+}$ channels open faster rate. it is called $\mathbf{Na^+}$ channels activation. When the firing level is exceeds the influx of $\mathbf{Na^+}$ is very high and it leads to overshoot. But the $\mathbf{Na^+}$ influx is short lived. It is because of rapid inactivation of $\mathbf{Na^+}$ channels. Repolarization phase start with $\mathbf{K^+}$ efflux due to opening of voltage gated $\mathbf{K^+}$ channels and decrease in $\mathbf{Na^+}$ influx. $\mathbf{K^+}$ efflux causes net transfer of positive charge outside the cell that serve to complete repolarization.[10]

Direction of propagation

1. **Orthodromic conduction:** When a nerve impulse is propagated in the normal direction. E.g. from a receptor for a sensory nerve.
2. **Antidromic conduction:** If the impulse is conducted in the opposite direction. E.g. towards a receptor for a sensory nerve.

"Saltatory" conduction in myelinated fibers: No ions can flow through the thick myelin sheaths of myelinated nerves; they will flow with ease through the *nodes of Ranvier*. Action potentials are conducted from node to node. Electrical current flows through the encompassing ECF outside the myelin sheath, also as through the axoplasm inside the axon from node to node. Thus, the impulse jumps along the fiber.[11]

Acharya Sushrut explained five main functions of *vata*-

1. ***Praspandan* –** movements of body
2. ***Udvahan* –** control involuntary and voluntary action
3. ***Puran* –** transportation and regulation
4. ***Vivek* –** division of dhatu and mal through ahara ras
5. ***Dharan* –** holding of urine, semen and menstrual period in isolation and abandon during the period.[12]

DISCUSSION

Acharya Sushrut mentioned that *vata* circulating in the *sira* (nerve fiber) performed bodily functions (voluntary and involuntary) continuous. Apart from this, *vata* also functions in a proper manner for *budhi* action. The function of the *budhi* is to decide the right and the wrong. This is possible only when the *vata* is in homeostatic condition and *gyanendriya* and the *man* are doing their work properly.[13] Cerebrum, brain stem and spinal cord these three are responsible for all type of simple and complex type of movements. The motor cortex is divided into three subareas. Those are.

1. The Primary Motor Cortex,
2. The Premotor Area, And
3. The Supplementary Motor Area.

These areas of brain motor cortex help to initiate motor activity of skeletal muscles of our body. Primary motor cortex lies in the frontal lobes anterior to the central sulcus. This area generates mostly discrete pattern of movement. More than one half the whole motor area cares with controlling the muscle of hand and therefore the muscle of speech. Premotor area be located 1-3 cm anterior to the primary cortex. Nerve signals originated within the Premotor area leads much more complex patterns of movement. The most anterior part of Premotor area first develops a motor image of total muscle movement which is to be performed. This image excites each successive pattern of muscle activity in the posterior Premotor cortex. This posterior part of Premotor cortex sends its signals either direct to

primary cortex or through basal ganglia and thalamus and then back to primary cortex to excite specific muscles.[14] *Acharya Charak* has also called *vata* is the stimulator and controller of the mind. For this reason, in medicine, it is important to bring *vata* in the **psyche diseases**.[15] All these physiological functions and movements of the body comes under the control of nervous system and transferring this information of function and movements from the receptor to the higher center is done by the afferent nerve fibers and the information from the higher center to the effector organ brings the efferent nerve fibers. The activities of the afferent and efferent nerve fibers are done by action potential. This is like that the electricity we cannot see the electricity but we can experience its functions. No functions and movements can be performed in the body without the action potential.

CONCLUSION

Vata control and stimulate the *man*, it gives stimulation to *man* for its normal functioning and also control its activities. *vata* makes *man* to think on right and wrong and selects the appropriate one. Due to *rajo guna of vata, vata* have *chal* (movement) properties, movement is the main function of the *vata* although all the three *doshas* have *trigun(satv, raj, tam),* but the *rajogun* in the *vata* is predominant. Due to this quality, *vata* is self-moving and also inspires the other- *pita, kapha, dhatu and mal*. *Vata, pitta and kapha* remain in equilibrium in the state of health of the body. In fact, these three have conflicting qualities, but do not destroy each other and wear the body. Due to *ruksha guna of vata* the *snigdha guna* of slesma, *guru guna by laghu guna, sthir guna by chal, mandh by shigra, mridu by parush and pichila by vishad gun balanced.* In this way, the qualities of *vata* meet other *doshas* within the body and balance the properties of each other, thereby maintaining the homeostasis of the body. Sensory system helps to detect the state of the body with relation to its nearby. Brain integrates the information and order to motor system to react properly, to maintain homeostasis, these activity perfom properly through action potential.

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