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Review Article

CRITICAL ANALYSIS ON PHYSIOLOGY OF MICTURITION REFLEX AS PER AYURVEDA

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ABSTRACT

Background: The word *Vata* derived from the verbal root 'Va' meaning is *Gati* and *Gandhana*. *Vata* is responsible for *Gati* (movement), *Jnana*(knowledge or perception) and *Prapti*(obtaining or receiving).

Aims & Objectives: To critically analyze the physiological points emphasized in the derivation of *Vata Dosha* by considering the micturition reflex.

Materials & Methods: The *Ayurvedic classics* were scrutinized regarding the references for derivation of *Vata Dosha*. Later, physiologico-anatomical aspects of the micturition with reference to reflexes were studied from modern physiology books. Later, supportive correlation was done between *Ayurvedic* and modern views to build valid and reliable hypothesis regarding derivation of *Vata dosha* in relation to the various anatomical and physiological aspects of the reflexes.

Discussion & Conclusion: Physiological importance is emphasized in the word *Gamana*, *Gnyana*, *Prapti*. *Prapti* refers to physiology of receiving the impulses from the stimulus and receiving the motor response by the effector organ. *Gamana* refers to movement of impulses from sensory nerve to micturition center and from micturition center to effector organ even it signifies the motor response generated through contraction of urinary bladder and opening up of internal and external urethral sphincters. *Gnyana* refers to perceiving of the sensory impulses and generating appropriate response by the micturition center.

Keywords: *Gamana*, *Gnyana*, *Prapti*, Micturition, Physiology.

INTRODUCTION

The five basic elements exist in all matter. Water provides the classic example: - the solids of iced water are manifestation of the *Prithvi Mahabhuta* (earth principle). Latent heat in the ice (*Agni*) liquefies it, manifesting into *Jala Mahabhuta* (water principle)¹. And then eventually it turns into steam expressing the *Vayu Mahabhuta* (air principle) the steam disappears into *Akasha* or space². *Bhuta* is that which is not born out of something, but out of which something is born. It is the material cause of substances in the world. When we say *Bhuta* we mean that subtle level of existence, where as *Mahabhuta* refers to gross level of existence.³*Panchikarana* is the process through which invisible *Bhutas* combine with each other and form the visible *Mahabhutas* in such a way that all *Bhutas* are present together in each *Drisya Bhuta* in varying degrees of predominance. Thus in the physical world everything is a combination of *Pancha Mahabhutas* & we cannot see them independently⁴.

Thus the five basic elements *Akasha*, *Vayu*, *Teja*, *Jala* And *Prithvi* are present in one substance. This proves that all five elements are present in all matter in the universe⁵. Visualization of the identity of the individual with the universe paves the way for salvation. The body is described as the modified form of *Mahabhutas* hence the description of the identity of the individual & the universe relates to *Mahabhutic* composition only. The multitudes of the human features are ascribed to the proportion of different *Bhutas* each of different nature.

The balance of *Dosha* represents the healthy state and imbalance will cause various diseases. In normalcy *Doshas* will be performing their own functions and individual *Doshas* will be having their own specific sites. The word *Vata* derived from the verbal root 'Va' meaning is *Gati* and *Gandhana*. *Vata* is responsible for *Gati* (movement), *Jnana*(knowledge or perception) and *Prapti*(obtaining or receiving)⁶. Word meaning of *Vata* in derivation suggest the physiological functioning of *Vata* in the body in different dimensions.

Brief Physio- anatomical understanding of the micturition reflex is necessary to understand physiological points emphasized in the derivation of *Vata Dosha*.

Urine is continuously formed by nephrons and it flows into urinary bladder drop by drop through ureters. When urine collects in the pelvis of ureter, the contraction sets up in pelvis. This contraction is transmitted through rest of the ureter in the form of peristaltic wave up to trigone of the urinary bladder. Peristaltic wave usually travels at a velocity of 3 cm/second. It develops at a frequency of 1 to 5 per minute. The peristaltic wave moves the urine into the bladder. After leaving the kidney, the direction of the ureter is initially downward and outward. Then, it turns horizontally before entering the bladder. At the entrance of ureters into urinary bladder, a valvular arrangement is present. When peristaltic wave pushes the urine towards bladder, this valve opens towards the bladder. The position of ureter and the valvular arrangement at the end of ureter prevent the back flow of urine from bladder into the ureter when the detrusor muscle contracts. Thus, urine is collected in bladder drop by drop⁷.

Micturition reflex is the reflex by which micturition occurs. This reflex is elicited by the stimulation of stretch receptors situated on the wall of urinary bladder and urethra. When about 300 to 400 mL of urine is collected in the bladder, intravesical pressure increases. This stretches the wall of bladder resulting in stimulation of stretch receptors and generation of sensory impulses. Sensory (afferent) impulses from the receptors reach the sacral segments of spinal cord via the sensory fibers of pelvic (parasympathetic) nerve. Motor (efferent) impulses produced in spinal cord, travel through motor fibers of pelvic nerve towards bladder and internal sphincter. Motor impulses cause contraction of detrusor muscle and relaxation of internal sphincter so that, urine enters the urethra from the bladder.

Once urine enters urethra, the stretch receptors in the urethra are stimulated and send afferent impulses to spinal cord via pelvic nerve fibers. Now the impulses generated from spinal centers inhibit pudendal nerve. So, the external sphincter relaxes and micturition occurs. Once a micturition reflex begins, it is self-regenerative, i.e. the initial contraction of bladder further activates the receptors to cause still further increase in sensory impulses from the bladder and urethra. These impulses, in turn cause further increase in reflex contraction of bladder. The cycle continues repeatedly until the force of contraction of bladder reaches the maximum and the urine is voided out completely. During micturition, the flow of urine is facilitated by the increase in the abdominal pressure due to the voluntary contraction of abdominal muscles⁸.

AIMS AND OBJECTIVES

To critically analyze the physiological points emphasized in the derivation of *Vata Dosha* by considering the micturition reflex.

MATERIALS AND METHODS

The *Ayurvedic classics* were scrutinized regarding the references for derivation of *Vata Dosha*. Later, physiologico-anatomical aspects of the micturition with reference to

reflexes were studied from modern physiology books. Later, supportive correlation was done between *Ayurvedic* and modern views to build valid and reliable hypothesis regarding derivation of *Vata dosha* in relation to the various anatomical and physiological aspects of the reflexes

DISCUSSION

Urinary Bladder is distended due to the accumulation of urine, sensory nerve endings are stimulated. Impulses from the nerve endings are transmitted via afferent fibers of pelvic nerve to the micturition center, situated in sacral segments (center) of spinal cord. The center in turn, sends motor impulses to the urinary bladder via efferent nerve fibers of pelvic nerve. Motor impulses cause strong contraction of urinary bladder and relaxation of internal sphincter. Simultaneously, voluntary relaxation of external sphincter occurs. *Vata* is responsible for *Gati* (movement), *Jnana*(knowledge or perception) and *Prapti*(obtaining or receiving).

Physiological importance emphasized in the word *Prapti* of *Vata Dosha* derivation can be understood as Receiving (*Prapti*) of the sensory stimulus by the sensory nerve endings present in the urinary bladder. Physiological importance emphasized in the word *Gamana* of *Vata Dosha* derivation can be understood as Impulses from the nerve endings are transmitted via afferent fibers to the micturition center, situated in spinal cord and higher centres of micturition. The center in turn, sends motor impulses to the primary and accessory muscles of respiration via efferent nerve fibers. Physiological importance emphasized in the word *Gnyana*(knowledge, perception) of *Vata Dosha* derivation can be understood as Perceiving the impulses and generating the appropriate response by the micturition center. Physiological importance emphasized with reference to motor part in the word *Gamana* of *Vata Dosha* derivation can be understood as contraction of urinary bladder and opening up of internal and external urethral sphincters.

CONCLUSION

Physiological importance is emphasized in the word *Gamana*, *Gnyana*, *Prapti*. *Prapti* refers to physiology of receiving the impulses from the stimulus and receiving the motor response by the effector organ. *Gamana* refers to movement of impulses from sensory nerve to micturition center and from micturition center to effector organ even it signifies the motor response generated through contraction of urinary bladder and opening up of internal and external urethral sphincters. *Gnyana* refers to perceiving of the sensory impulses and generating appropriate response by the micturition center.

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