



Physiological Importance of *Apan Vayu* in *Mutranishkramanprakriya* in Relation to Micturition Reflex

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ABSTRACT:

Ayurveda is an ancient Indian system of medicine whose major goal is to keep healthy people well and cure diseased people. That is why, from ancient times, people from all over the world have been looking to India. Health, according to *Ayurveda*, is a state in which the *dosha*, *agni*, *dhaatu*, *mala*, and all physiological processes are in a homeostatic state, and the soul, sense organs, and mind are all in a state of absolute wellbeing. The *Vatadosha* is the most significant of the three *doshas*, and it is in charge of controlling all types of movements. *Aahara* is turned into *saara* and *kitta* part when the food is digested by *agni* with the help of *samanavayu*. With the harmonization of other *Prana* and *Vyanavayus*, *apanavayu* eliminates the *kitta* part of food. In *pakvadhana*, the *apanavayu* passes through the *sroni* (pelvis), *basti* (urinary bladder), *medhra* (external genital equipment of each sex), and *uru* (thighs). It aids *samirana* (flatus), *sakrit* (feces), *mutra* (urine), *sukra* (semen), *garbha* (foetus), and *artava* (menstrual fluid) removal. An attempt has been made in this article to comprehend the physiological significance of *apanavayu* in micturition. The core resources for this study were gathered from *Ayurvedic* classics with available commentaries, as well as modern medical science text books for a better grasp of the subject.

Keywords: - *Apana vayu*, *Prana Vayu*, *Saman Vayu*, *Vyana vayu*, Micturition reflex.

INTRODUCTION

Ayurveda, the science of life, is founded on the *tridosha* theory, which is a fundamental theory. The term *tridosha* comes from the Sanskrit words *tri* and *dosha*, which translate to "three polluting or vitiated factors." These

pollution variables have an important role in both maintaining health and preventing sickness or illness. These three *doshas* work at numerous levels, including cellular, single-system, and organizational levels. *Vata* is the most powerful of the three *doshas*, as it is the one that



initiates and controls all of the functions. It is also in charge of all types of movement.¹ *Pitta*, *Kapha*, and all of the *dhatu*s and *malas* are inert, like a lame individual. When *vata* is active, it becomes mobile. They were transported away from their original place by the active *vata*, much like clouds are swept away by the wind.²

All cerebral functions are controlled and impelled by *Vatadosha*, while all sensory faculties are employed by *Vatadosha*. *Vata* connects the body's tissues and gives it compactness, as well as promoting speech, sound production, and touch feeling. *Vatadosha* is the root cause of the auditory and tactile sense faculties. *Vata* is also the cause of joy and courage, stimulates the digestive fire, and aids in the absorption of the *dohas* and excretory secretions. *Vata* flows through all gross and subtle channels, gives the embryo its shape, and is the sign of life's continuance.³

Site and function of *Apan vayu* by different *acharyas*- (Table 1)

Mootra- Nishkramanprakriya:

It stands for micturition, and when the bladder fills, multiple superimposed micturition contractions emerge, as indicated by the dashed spikes. They are caused by a stretch reflex triggered by sensory stretch receptors in the bladder wall, particularly in the posterior urethra, when this area begins to fill with pee at greater bladder pressures. The bladder stretches receptors send sensory signals to the sacral regions of the cord via the pelvic nerves, which are then automatically sent back to the bladder via the parasympathetic nerve fibers. When the bladder is only partially filled, micturition contractions normally relax on their own after a fraction of a minute, when the detrusor muscles cease contracting and pressure returns to normal. Micturition reflexes became more frequent as the bladder filled, causing larger contractions of the detrusor muscle.⁸

Micturition Reflex:

The process of emptying urine from the storage organ, the urinary bladder, is known as micturition or urination. The smooth or involuntary muscle of the bladder wall is known as the detrusor. The external and internal sphincters make up the urethral muscles. Both the internal sphincter and the detrusor muscle are controlled by the autonomic nervous system. The external sphincter, on the other hand, is a voluntary muscle controlled by voluntary nerves. Adult's bladders can generally hold up to 300-400 ml. When the bladder is distended it sends signals to the brain, which is perceived as the 'full bladder' sensation. The process of emptying the urine into the urethra is regulated by nervous signals, both from the somatic and the autonomic nervous

system. The autonomic nervous system comprises both the sympathetic and the parasympathetic nervous system. The bladder has two states of function; the storage and emptying phases.

Bladder Filling and the Guarding Reflex-

The exterior urethral sphincter contracts voluntarily during the filling phase, while the inner urethral sphincter contracts sympathetically. In contrast to most voluntary muscles, the sympathetic nervous system allows the detrusor to distend without reflex contractions. During this procedure, urethral reflexes, often known as the 'guarding reflex,' help to prevent involuntary bladder emptying. To trigger a spinal reaction, all of the afferents travel through the pelvic nerves.

Bladder Emptying and the Micturition Reflex-

The micturition or emptying phase is characterised by sympathetic and somatic modulation of the inner and outer urethral sphincters, as well as powerful contractions of the detrusor muscle due to parasympathetic impulses.

Micturition is characterised by:

- striated sphincter relaxation (somatic innervation)
- smooth muscle sphincter relaxation and opening of the bladder neck (sympathetic innervation)
- detrusor contraction (parasympathetic innervation)

The distension of the urinary bladder wall generates a modest increase in wall tension. When the bladder is nearly full, at 300-400 ml, the detrusor's inherent contractility causes reflex contractions that are less forceful than the voiding contraction. Although the frequency of afferent firing increases as the bladder fills, cerebral control continues to override the micturition reflex until voluntary voiding is determined.

.During micturition, urinary flow is assisted by additional detrusor contractions and external sphincter relaxation which further lowers resistance to the passage of urine. The abdominal wall and pelvic floor musculature also participate by increasing the force on the bladder to help achieve complete emptying.

Pathway Of Micturition Reflex:⁹

Sensory (afferent) impulses from the receptors travel through the sensory fibres of the pelvic (parasympathetic) nerve to the sacral portions of the spinal cord. Motor (efferent) impulses from the spinal cord flow down the pelvic nerve's motor fibres to the bladder and internal sphincter. Motor impulses force the detrusor muscle to contract and the internal sphincter to relax, allowing urine to pass from the bladder into the urethra. The stretch receptors in the urethra are triggered when urine enters the

urethra and convey afferent signals to the spinal cord through pelvic nerve fibres. The pudendal nerve is now inhibited by the impulses generated by spinal centres.

As a result, the external sphincter relaxes, allowing micturition to take place. Once a micturition reflex is set in motion, it is self-regenerative, meaning that the first contraction of the bladder stimulates receptors, causing an increase in sensory impulses from the bladder and urethra. These signals lead the bladder's reflex contractions to grow even more. The cycle repeats itself until the bladder's contraction force reaches its maximum and the urine is fully emptied. The flow of urine is aided during micturition by an increase in abdominal pressure caused by the voluntary contraction of abdominal muscles.⁹

Higher Centers for Micturition-

Micturition centres can be found in the sacral and lumbar portions of the spine. However, higher centres control these spinal centres. There are two sorts of higher centres that influence micturition: inhibitory centres and facilitatory centres. Micturition inhibitory centres Micturition is inhibited by midbrain and cerebral cortex regions that repress spinal micturition centres. Micturition facilitation areas in the pons assist micturition via spinal centres. Micturition is aided by some cerebral cortex areas.

MATERIAL AND METHODS

For this study ayurveda text has been used to evaluate the concepts. The text from *Brihatrayee* i.e., *Charaka Samhita*, *Sushruta Samhita* and *AshtangaSangraha*, *AshtangaHridaya*, *sharangdhar Samhita* and their respective commentaries in *Sanskrit* as well as *Hindi* which were easily available. Also, text from *Laghutrayee* i.e., *MadhavaNidana*, *BhavPrakasha*, have been used. Various related websites have been searched.

DISCUSSION

The partnership of *Samanavayu*, *Pranavayu*, *Vyanavayu*, and *ApanaVayu* performs *Mutraniskramana* and *Sakrit niskramana*-like functions. *Mutra* and *Mala* are divided by *SamanaVayu* and expelled by the *Prana* (pontine centre for micturition), cerebral cortex, which cause both involuntary and voluntary control over micturition. *Vyana* (autonomic functions of *vyana vayu*), and *Apana Vayu* coordinative function (parasympathetic action originated from sacral origin). The ascending tract, which is the role of *vayu*, sends sensory information for micturition to the brain stem and cortex (*Sarvendrinaamudhyojaka* and *sarvendriyarthambhivodha*). *Vyana Vayu* accomplishes

its role by causing muscle contractions to transfer waste material, and then *Apana Vayu* removes the feces and pee. The central integrating centre in the sacral spinal cord controls the micturition and defecation reflex.

It means act of micturition. Micturition reflex is initiated by stretch reflex. When bladder begins to fill urine at higher pressure, Sensory stretch receptors in the bladder wall are stimulated and send signals to the sacral segment of cord through pelvic nerve. Then it reflexively backagain to bladder through motor parasympathetic nerve fibers to causes micturition. It involves coordination between central, autonomic and somatic nervous system. Micturition reflex is an autonomic spinal cord reflex but it can be inhibited and facilitated by centers in the brain. It includes pons and several centers in cerebral cortex. The smooth muscle of bladder (detrusor) and trigone are innervated by both sympathetic nerve fibers from the lumbar spinal cord and parasympathetic fibers from the sacral spinal cord. Stimulation of sympathetic fiber causes contraction of trigone and relaxation of detrusor muscle. Stimulation of parasympathetic fiber causes contraction of detrusor muscle and relaxation of trigone. Urethral sphincter is innervated by somatic pudendal nerve. These nerves coordinative help in micturition.

CONCLUSION

Conclusion: *Vata dosha* is involved in all type of systemic activity. Among five *vata doshas*, *apana vayu* is responsible for eliminations of waste products as well as fetus. Excretion is the process by which all the waste products are eliminated. It is very important in our Life as it helps to promote homeostasis. These functions are regulated mainly by *apanavayu* with the coordination of *samana*, *prana* and *vyanavayu*. It can be concluded that *apanavata* may be correlated with sympathetic part of autonomic nervous system. We can say that *apan vayu* has important role in relation to micturition reflex.

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Table 1 Shows Site and function of *Apan vayuby* different *acharyas*-

	CHARAK SAMHITA⁴	SUSHRUTASAMHITA⁵	ASTANGHRIDAY⁶	ASATANGSAMGRAH⁷
STHAN	<i>Vrishana</i> (testicles), <i>Vasti</i> (urinary bladder), <i>Medhra</i> (penis), <i>Nabhi</i> (umbilicus), <i>Uru</i> (thighs), <i>Vakshyana</i> (inguinal region) and <i>Guda</i> (anus)	<i>Pakvadhana</i> (Large intestine)	<i>apanadesha</i> (perineal region) and ittraverses along <i>sroni</i> (pelvis), <i>vasti</i> (urinary bladder), <i>medhra</i> (external genital apparatus of each sex) and <i>uru</i> (thighs)	Malashay (Rectum), moves along the basti (urinary bladder), (shorni) pelvis, mehan (penis), vankshan pradesh (scrotum), and groin
KARMA	<i>Raja sravan</i> and <i>garbha nishkraman</i> (Menstrual blood and fetal ejection), ejaculation, <i>mutra nishkraman</i> (micturition), <i>mala nishkasan</i> (defecation)	Elimination <i>samirana</i> (flatus), <i>sakrit</i> (faeces), <i>mutra</i> (urine), <i>sukra</i> (semen), <i>garbha</i> (fetus), <i>artava</i> (menstrual fluid)	Expulsion of <i>sukra</i> (semen), <i>artava</i> (menstrual blood), <i>sakrit</i> (faeces), <i>mutra</i> (urine), and <i>garbha</i> (the product of conception that is fetus and placenta)	Elimination of <i>mala</i> (feces), <i>mutra</i> (urine), <i>shukra</i> (semen), <i>raja</i> (menstrual fluid) and <i>garbha</i> (fetus)