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Clinicopathological Aspects of Neurogenic Bladder: Modern and Ayurvedic Perspective

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ABSTRACT

Mutraghata is one of the complicated and less understood term in *Ayurvedic* classics. Previously, various authors have related a certain types of *Mutraghata* with Neurogenic bladder. Considering that, this research work focuses on, “how and up to what extent, clinical conditions under *Mutraghata* are related to neurogenic bladder”. For that, we have collected data mainly from *Sushruta Samhita*, *Charaka Samhita*, *Ashtanga Hridaya* and their commentaries by *Dalhana*, *Chakrapani* and *Arundatta*, respectively. As per modern texts, neurophysiology of micturition and types of neurogenic bladder according to site of lesion has explained first. Then, according to the clinical features mentioned in our classical texts, correlation of clinical entities under *Mutraghata* with neurogenic bladder has been established. This research work concludes that clinical features of *Vatakundalika*, *Vatabasti*, *Mutrajathara* and *Bastikundala* are alike to that of neurogenic bladder.

KEYWORDS

Mutraghata, *Neurogenic bladder*, *Vatakundalika*, *Vatabasti*, *Mutrajathara*, *Bastikundala*.



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INTRODUCTION

Neurogenic bladder is a condition that affects the functions of urinary bladder (detrusor) and urethral sphincters which are caused by nerve damage resulted from external or internal trauma, injury or diseases. Symptoms can include overflow incontinence, frequency, urgency, urge incontinence and urinary retention. Urinary retention is cardinal sign of *Mutraghata*. *Dalhana* has stated *Mutraghata* as “*Mutraghatenmutravarodhah*”, where obstruction to the flow of urine is a pathogenic sign¹. This obstruction leads to urinary retention. He further states, that “*Sarvesham-mutraghatanam-vayu-eva-prayashah-karanam*”². The *Apanavata* is responsible for excretion of urine, faeces and flatus³. Vitiating of *Apanavayu* results into manifestation of *Mutraghata*. *Sushruta* and *Vagbhata* have mentioned 12 types of *Mutraghata*⁴ while *Charaka* has classified its 13 types under the heading of *Mutradosha*⁵. As we go according to clinical signs and symptoms, only four types of *Mutraghata* or *Mutradosha* i.e. *Vatakundalika*, *Vatabasti*, *Mutrajathara* and *Bastikundala* are clearly related to neurogenic bladder.

AIMS AND OBJECTIVES

Aim of the research is to establish the relation of *Vatakundalika*, *Vatabasti*,

Mutrajathara and *Bastikundala* with neurogenic bladder as per today's science of urology. Objective of the study is to demonstrate contribution of *Ayurveda* in the field of urology.

MATERIALS AND METHODS

Collection of data was done mainly from *SushrutaSamhita*, *CharakaSamhita*, *AshtangaHridaya* and their commentaries by *Dalhana*, *Chakrapani* and *Arundatta* respectively. Along with it modern urology books, websites and research articles have also been searched to elaborate the work.

a) Modern review: Before directly going to neurogenic bladder, we have to understand neurophysiology of micturition (urination).

Neurophysiology of micturition⁶: During storage phase of bladder, afferent nerves carry information regarding bladder wall pressure through A-fibers and temperature or pain into the bladder through C-fibers via the pelvic or hypogastric or pudendal nerves, to the lumbo-sacral spinal cord. Information is then transferred up to the spinal cord, spino-thalamic tracts and from here to midbrain's periaqueductal grey region. Input from the pre-frontal cortex and limbic system feeds back to the midbrain. It either facilitates further storage of bladder or initiates micturition.



Urinary continence is maintained by the internal and external urinary sphincter (EUS) complexes during urine storage phase of the bladder. The internal urethral sphincter is the continuation of Trigone or detrusor muscle. It also surrounds the bladder neck. During filling of bladder, sympathetic innervations induce the internal sphincter to contract and close the bladder neck. The EUS is a striated muscle located distal to the internal sphincter. In males, the EUS is a distinct structure, distal to the prostate, surrounding the membranous urethra. In females, the EUS is situated distal to the bladder neck and is

made up of the compressor urethrae muscle, sphincter urethrae muscle, and urethro-vaginal sphincter. The pudendal nerve fibers control external urethral sphincter function and are located in Onuf's nucleus between S₂–S₄. During urine storage phase, the pressure in the bladder must be lesser than the pressure in the proximal urethra, because it prevents urinary incontinence. During filling of bladder, pudendal stimulation of the external sphincter and hypogastric stimulation of the internal sphincter raises the urethral pressure progressively. This process termed as “the guarding reflex”.

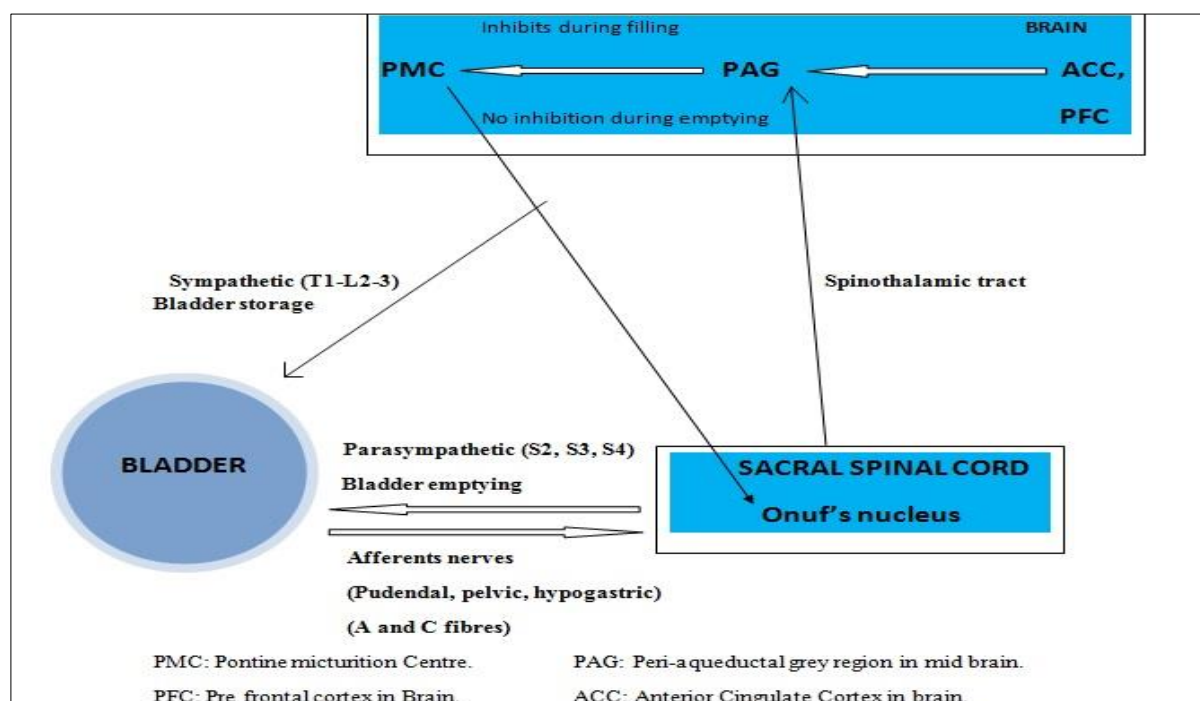


Figure 1 Figure showing neurophysiology of micturition

When voiding is to begin, inhibition from the midbrain and pre-frontal cortex is initiated and guarding reflex is inhibited by

the pontine micturition complex (PMC) via spino-bulbo-spinal tracts. Then inhibition of sympathetic nervous



system occurs; stimulation of Onuf's nucleus and the pudendal nerve decreases. Then external sphincter relaxes and urethral pressure decreases. Stimulation of the parasympathetic nervous system (S₂–S₄) then results in micturition. The figure shown summarizes these pathways.

Pathophysiology of neurogenic bladder⁷:

If there is some pathology in the nervous system, voiding cycle is affected. Any part of the nervous system can be involved, including the brain, spinal cord, sacral cord and peripheral nerves.

1. Brain lesions: (Uninhibited bladder⁸):

Higher conscious control of voiding is interrupted by the lesions of the brain above the pons. The voiding reflexes of the lower urinary tract remain intact in this type of lesions. Affected person shows signs of urge incontinence and experience symptoms of overactive bladder (OAB). Frequency and nocturia with comparatively lower volumes of urine (Low bladder capacity) are seen. Delaying voiding or storing a larger urine amount becomes difficult. No renal damage is seen in such patients because PMC remains intact.

2. Spinal cord lesions (Between pons and sacral cord):

This condition is also called as Upper motor neuron bladder. Here, features of overactive bladder are seen that are often accompanied by urge incontinence. The features are very similar to brain lesions

above pons except that external urethral sphincter (EUS) contracts paradoxically in here. Bladder and sphincters both are spastic that results into a unique condition called as **Detrusor sphincter dyssynergia (DSD)**. It in turn creates high bladder pressure leading to renal damage. In DSD, Patients sense an overwhelming desire to urinate but only a little amount of urine dribbles out.

After spinal cord injury, the initial neurologic response is **spinal shock phase**, which lasts for 6-12 weeks. During this phase, flaccid paralysis is experienced by the patient below the level of injury. Somatic reflex activity may either not at all present or depressed.

The anal and bulbocavernosus reflex typically is not found. The autonomic activity depresses and **urinary retention and constipation** occurs. Urodynamic findings remain consistent because of areflexic rectum and detrusor. The internal sphincter and external sphincter activities, however, are normal.

After spinal shock phase, bladder function recovers back but detrusor hyperreflexia occurs i.e. the detrusor activity is increased up to an overactive state. According on the level of the lesion, **detrusor sphincter dyssynergia–detrusor hyperreflexia (DSD-DH)** may also develop.



Hence supra-sacral lesions show detrusor areflexia initially but after that it progresses to hyperreflexic state. But sacral cord lesions are related with areflexic bladders that might become hypertonic with time.

3. Sacral cord injury: (Detrusor areflexia) It includes a few injuries of the sacral cord and related nerve roots. A condition known as “detrusor areflexia” is present in sacral cord injuries where bladder cannot contract. It prevents the bladder from emptying and the patient doesn't sense a full bladder. Large bladder capacity is found. Overflow incontinence may occur only when the urine in the bladder exceeds very much. Patients who are unable to sense a full bladder are prone to renal damage due to high urine residuals. Innervations of internal urethral sphincter remain intact.

4. Peripheral nerve injury: Peripheral nerve lesions result into detrusor areflexia due to various causes like tabes dorsalis, Diabetes mellitus, iatrogenic and causes leading to urinary retention. This may also cause silent and painless distention of the bladder. Patients seldom have an impaired sensation of filling of bladder. Patients may have difficulty in passing urine and may also develop a hypocontractile bladder. Loss of motor functions, high residual urine level, poor

bladder sensation, impaired contractility of detrusor and eventually, **detrusor areflexia** are seen.

Ayurvedic review : Clinical features of *Vatakundalika*, *Vatabasti*, *Mutrajathara* and *Bastikundala* are mentioned below:

1. Vatakundalika⁹:

Aetiology: *Ruksh-anna-paana* (Ingestion of food, not fulfilling daily requirement of fat in body) and *Vega-vidharana* (Suppression of natural urge e.g. micturition) are the main causative factors.

Pathogenesis: Due to above causative factors, *Vata* gets vitiated and turned upwards thus it moves within the bladder as well as in the urinary channels in circumgyratory way hence affecting the urinary function. It is explained as below:

- *Mutramcharatisangrahyavigunahkundalikritah.*
- *Vaayuhantaramaashritamgatisangaudavritah.*
- *Aavidhyamutrambhramatisanstambhauveshtagauravah.*

Clinical features:

- Scanty and dribbling micturition with increased frequency (*Srijetalpamalpamshanaihsanaih*)
- Dysurea (*Sarujaskam*)
- Rigidity, breaking pain, heaviness, girdle pain (*Sanstambhabhangagauravaveshtanai*)



- *Sanstambha* (to paralyze¹⁰)
- Severe colic(*Tivraruja*)
- Retention of feces(*Vita-sanga*)

2. *Vatabasti*¹¹:

Aetiology: Holding micturition urge beyond physiological capacity of bladder for longer time (*Mutra-vega-dharana*).

Pathogenesis: The vitiated *Vata* enters the bladder causing the obstruction to the bladder outlet. (*Niruddhanimukhamtasya baste bastigatoanila*)

Clinical features:

- Retention of urine (*Mutra-sanga*)
- Pain in hypogastric and loin region (*Basti-kukshi-nipiditah*)
- Itching sensation(*Kandu*)

3. *Mutrajathara*¹²:

Aetiology: Holding urge of micturition (*Mutrasyavihatevege*).

Pathogenesis: Above factors vitiates *ApanaVayu* which causes pain and distention in abdomen. (*Apaanahkupitovaayuudarampurayetbhrisham*)

Clinical features:

- Retention of urine and faeces (*Adhah-sroto-nirodhanam*)
- This distention leads to severe pain in lower abdomen (*Naabhiadhastaadaadhmanjanayettivravedanam*)
- Indigestion (*Apakti*)

4. *Bastikundala*¹³:

Aetiology: Excessive running(*Druta*), Excessive pedestrian walking(*Adhvagamana*), Fasting (*Langhana*), Exertion (*Ayaasa*), Trauma(*Abhighata*)and Compression, compaction (*Prapidana*).

Pathogenesis: By indulging in above mentioned factors, the bladder is displaced upwards and become enlarged and it appears like a gravid uterus. (*Svashthaanaatbastiudvritta, sthoolatishthatigarbha-vata*)

Clinical features:

- Colic(*Shoola*)
- Throbbing pain(*Spandana*)
- Burning pain(*Daaha-arti*)
- Dribbling micturition (*Bindu-bindu-sravati*)
- When the bladder region is pressed, urine comes out in jets. (*Piditahtusrijetdhara*)

RESULTS AND DISCUSSION

1. *Vatakundalika*: It can be very much related to the condition called Detrusor sphincter Dyssynergia (DSD). Here, simultaneous urinary sphincter contractions and detrusor contractions produce high pressures in the bladder (up to 80-90 cm of H₂O). This condition can be compared with “*Mutram-charati-sangrahya-vigunah-kundalikritah*”.



DSD is of three types¹⁴:

- a) **Type 1:** Increased sphincter activity during detrusor contraction which after a while ceases. Hence, detrusor pressure gets decreased to allow urination.
- b) **Type 2:** Intermittent clonic contractions during voiding phase resulting into intermittency.
- c) **Type 3:** Sphincter activity is continuous during detrusor contractions. It results into inability to void.

All these symptoms can be compared with “*Srijet-**alpam-**alpam-athava-saru**jaskam-**shanaih-**shanaih**”***** and with **Mutrasanga**.

2. Vatabasti: It can be related to Detrusor areflexia or lower motor neuron neurogenic bladder or Motor paralytic bladder or Autonomous bladder, where damage to the sacral cord (S2,S3,S4) or peripheral nerve injury occurs.

Detrusor areflexia: The bladder capacity is large because of low detrusor tone and internal urethral sphincter innervations are intact. This high residual urine can lead to *Basti-kukshi-nipeedana*. Poor detrusor tone may also lead to *Mutrasanga*.

Motor paralytic bladder: This condition of *Vatabasti* can also be related to Motor paralytic bladder, where selective obstruction to the motor pathway from micturition centre to the bladder is

exhibited. This condition is characterized by residual urine with normal bladder capacity and atonic bladder (zero voiding pressure). Normal awareness of filling with painful distention is present; justifying ‘*Mutrasanga*’, ‘*Basti-kukshi-nipeedana*’ and ‘*Arti*’.

This explanation is based on *Charaka* and *Sushruta*’s verse regarding *Vatabasti*. But *Vagbhata* has explained different features of *Vatabasti*; those are similar to that of *Bastikundalika* which has mentioned only by *Charaka*.

Autonomous bladder: Sacral micturition centre (S2,S3,S4) are destroyed along with motor and sensory parts. Bladder capacity is very much enlarged due to no contractions of detrusor. This leads to very high urine residuals in the bladder making it appear like Gravid uterus (*Bastidudavritta-garbha-ambha-viplutam*). These high residuals can also cause infections in the lower urinary tract leading to burning sensation (*Daaha*) and Pain (*Ruja*). In autonomous bladder, patient empties the urine by Manual pressure (Crede’s Maneuver). Overflow incontinence is also present. Both can be explained as “*Bindushah-cha-pravartate-mutram-bastau-tu-peedite*” by *Vagbhata*. *Vagbhata* further states, that there are two types of *Vatabasti* viz. *Dustara* and *Dustaratara*.



Both are caused by vitiation of *Vata* but later occur due to severe vitiation of *Vata*.

3. Bastikundala: Autonomous bladder or detrusor areflexia can be related to *Bastikundala*. It is explained only by *Charaka*. The clinical features of it are very similar to that of *Vatabasti* explained by *Vagbhata*. For instance: *Basti-udvritta-sthoola-tishthati-garbhavata* (Large bladder capacity, no detrusor contractions), *Peedita-tu-srijet-dhara* (Crede's maneuver) and *Bindu-bindu-sravatyapi* (Overflow incontinence). *Charaka* has also explained involvement of *Pitta* and *Kapha*.

Pitta involvement leads to burning sensation (*Daha*), pain (*Shoola*) and discoloration of urine. It is similar to infections (UTI) caused by high residual urine.

Kapha involvement causes oedema (*Shopha*), heaviness (*Gaurava*) and changes in nature of urine (unctuous and dense). All

these symptoms can be related to renal damage caused by hydroureter and hydronephrosis due to vesico-ureteric reflex.

4. Mutrajathara: It is related to spinal cord lesion leading to spinal shock. In this, flaccid paralysis is experienced by the affected individual below the level of injury. The somatic reflex activity might be depressed or absent. The anal and bulbocavernosus reflex activities typically are absent. Urinary retention and constipation occurs. This condition is justified by "*Adhah-sroto-nirodhanam*". Flaccid paralysis leads to large residual urine in bladder, which is relatable to "*Udaram-poorayet-bhrisham*" and "*Naabhe-adhastad-aadhmaan*".

CONCLUSION

The conclusions are summarized in the table below:

Table 1 Table showing *Mutraghata* types related to neurogenic bladder

| Sr. No. | Mutraghata type | Nearest correlation | Site of injury |
|---------|----------------------|--|---|
| 1 | <i>Vatakundalika</i> | Detrusor sphincter Dyssynergia (Upper motor neuron bladder) | Spinal cord injury between pons and sacral cord |
| 2 | <i>Vatabasti</i> | Detrusor areflexia (Lower motor neuron bladder) Autonomous bladder Motor paralytic bladder | Sacral cord injury Peripheral nerve injury |
| 3 | <i>Mutrajathara</i> | Spinal shock phase in spinal cord injury | Spinal cord injury between pons and sacral cord |
| 4 | <i>Bastikundala</i> | Detrusor areflexia (Lower motor neuron bladder) Autonomous bladder Motor paralytic bladder | Sacral nerve injury Peripheral nerve injury |



From above table, we can conclude that these clinical entities are alike to neurogenic bladder according to clinical sign and symptoms. By this article, we have tried to put *Ayurveda*'s perspective in terms of science of Urology. A small attempt has been made to indicate contribution of *Ayurveda* in the field of Urology.



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