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A Review On Physiology Of Basti Karma

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Abstract: *Basti Karma* (enema therapy) is considered as integral component of the treatment protocol in professional practice and known as *Ardha Chikista* or *Poorna Chikitsa* in *Kaya Chikitsa*. This practice aims to cleanse the colon, remove toxins, and restore balance in the body according to Ayurvedic principles. The physiology of *Basti Karma* revolves around several mechanisms, including the action of *Basti* may be because of endocolonic action, encolonic action and diacolonic action. The influence of *Basti* over body can be studied under the broad headings of action based on its *Veerya*, action over *Pakwashaya*, action over *Dosha*, and action over *Dhatu*, Absorption mechanism, Colon cleansing and excretory function, On the basis of microbiome gut brain axis, Through enteric nervous system, System biology theory. Through an in-depth exploration of the physiological mechanisms, this article elucidates how *Basti Karma* influences overall equilibrium of the body. By unravelling the intricate connections between *Basti Karma* and body's physiological dynamics, this article contributes to a comprehensive understanding of Ayurvedic principles and their applications in contemporary healthcare.

Keywords: *Basti*, Physiology, Action, *Karmukata*,

INTRODUCTION:

Basti therapy, also known as *Vasti*, is an essential treatment method in Ayurveda. Its root trace back to Vedic era, making it one of the oldest therapeutic practices. The *Atharva Veda* suggests that enema serves as an alternative to minor surgical procedures[1]. *Garuda Purana* also has references regarding *Yanta* of *Basti* and *Netra Dosha*. According to the *Agni Purana*, the practice of *Turanga Basti*, or enema in horses, was traditionally administered to horses exhausted from battle[2]. This specialized enema, typically delivered with oil, aimed to rejuvenate and revitalize the animal, restoring its strength and vitality after intense physical exertion. In the *Gheranda Samhita*, the techniques of *Jala Basti* and *Shushka Basti* are elucidated[3].

Enemas for colon cleansing are observed in nature, with species like birds and primates engaging in behaviours like "anting" or using water to cleanse the colon, indicating a natural basis for this practice.

Basti denotes the *Karma* wherein the drugs administered through the rectal canal stay for certain period - Produces coating of Sneha - Draws out the waste substance from all over the body into the colon - Eliminates them by producing movements in the colon resulting into beneficial effect[4].

Basti Karma is not solely addressing to *Vataja Roga* (diseases originated from *Vata Dosha*), but also used in *Pittaja, Kaphaja, Samsargaja* (combination of 2 Dosha) as well as *Sannipataja Roga* (combination of all 3

Dosha). *Basti* has the potential to address a variety of diseases through the permutation and combination of drugs employed in its administration[5].

BASTI DRAVYA AND *BASTI DRAVYA SAMYOJANA:*

Understanding the rationale behind the sequence of mixing *Basti Dravya* is crucial. It ensures optimal therapeutic outcomes and minimizes potential adverse effects. The order of mixing Basti Dravya goes like Makshika(honey), Lavana(salt), Sneha (oily substance), Kalka (paste of medicine), Kashaya (decoction) and Avapa (additional ingredients)[6].

1. *Madhu:* Considered as *Mangalakaraka* (Auspicious). Hence added in the beginning.
2. *Saindhava:* Breaks *Picchila* (viscus), *Bahulatva* (heaviness), and *Kashaya* (astringent) properties of *Madhu* due to its *Teeksha Guna* (sharp nature)
3. *Sneha:* Introduces *Ekibhava (*being one or single) properties in the solution.
4. *Kalka & Kwatha:* helps to Achieve *Samata* (evenness)
5. *Avapa:* Enhances the *Guna* (properties) and *Veerya* (potensy)of *Basti.*

The homogeneity of the final product is determined by mixing *Madhu, Saindhava,* and *Sneha*. Usually, Urli (wide mouthed vessel) is used as vessel for mixing *Basti Dravya*. The larger surface area of the vessel leads to increased collisions, exposing drug particles to the drug media and enhancing the rate of reaction[7]. Stability is achieved through unidirectional rotations in manual methods, while in churners, the rotation direction is opposite. When the *Basti Drvaya* mixing is done like this, closer bonding of particles was observed, extending the stability period of the *Basti Dravya* and shows approximately 90% of particles are below 0.010 micrometre in size[8].

Since the retention period of *Basti Dravya* in the body is very less (specially in *Niruha Basti* or decoction enema), it's crucial to uniformly decrease the particle size of the ingredients, ensuring close bonding, and enhance emulsion stability to facilitate better absorption of the *Basti*.

STABILITY PERIOD: Previous research has demonstrated that the adequately mixed *Basti Dravya* maintains stability for over 48 hours[9].

The mixture of two or more liquids that are typically immiscible is called as emulsion. Researches proved that *Madhutailika Basti,* is an oil-in-water emulsion, as evidenced by dilution, conductivity, and dye tests[10]. *Madhu* acts as an emulsifier in the *Basti Dravya*, ensuring emulsion stability. Honey and salt serve as stabilizing agents. *Saindhava* breaks down glucose in honey, while *Sneha* (fatty substances), dispersed liquid, should be added after *Saindhava,* forming an emulsion. *Sneha* breaks down into free fat chains, facilitating rapid absorption in the intestine. *Kalka* (paste of medicines) accelerates *Basti* absorption by forming a colloid, and *Kwata* (decoction) ensures *Sneha* is uniformly distributed throughout with a stabilizer, achieving a stable physical state of emulsion.

Intestinal absorption of otherwise unabsorbable macromolecules such as insulin and heparin were enhanced by incorporating them into emulsions[11]. This indicates being an emulsion, *Basti Dravya* gets easily absorbed in large intestine.

DOSE OF *BASTI DRAVYA*:

The maximum *Niruha Basti Matra* (dosage of decoction enema) is approximately 1200ml in *Dwadasha Prasruthika Basti*[12]. The average quantity that fills the colon is about 1.45L, with variations between 0.6-3L[13]. Gerson Therapy, a dietary-based alternative for cancer and chronic degenerative diseases, incorporates enemas for blood stream detoxification. In this theory the dose of the enema is approximately 32 ounces or 1 quart, equivalent to about 950ml which is almost near to *Dwadasha Prasruthika Basti*[14].

The maximum *Anuvasana Basti Matra* (dosage of enema given with fatty substances) is 300ml in *Sneha Basti*[15]. The average volume required to induce the defecation reflex ranges from 185ml (45-660ml) in patients to 265ml (70-505ml) in healthy individuals. The maximum tolerable volume ranges from 245ml (65-885ml) in patients to 360ml (160-760ml) in healthy individuals[16]. Since there is a need for retention of the *Anuvasana Basti Dravya*, the volume should be adjusted to avoid triggering immediate defecation reflex. These indicates the classically explained *Anuvasana* Basti is going to stay in colon for considerable time period.

TIME OF ADMINISTRATION:

NIRUHA BASTI: After *Jeerna* (digestion) of previously consumed food, in *Madyahne Kinchit Kaale* (during midday)[16], there's a window of opportunity for better absorption when the colon is empty. In *Niruha Basti*, there's a need for quick absorption due to less retention time of *Basti Dravya*.

While administering *Basti Dravya*, it triggers the Enterogastric reflex, which inhibits stomach motility and secretions due to intestinal wall stretching. Also, there is stimulation of the colon-ileal reflex, which hinders the emptying of ileal contents into the colon. These two reflexes help in withholding the *Basti Dravya* in colon for some time. The gastrocolic reflex acts as a facilitator; when food is present in the stomach, it signals the colon to evacuate its contents, leading to the expulsion of *Basti Dravya*. So, *Niruha Basti* should not be given after food (when there is food content in stomach) to avoid immediate evacuation of *Basti Dravya* due to stimulation of gastrocolic reflex.

ANUVASANA BASTI: *Anuvasana Basti* should be given in *Ardra Pani* (after *Ahara Sevana* when the hands are still wet)[17] indicating that *Anuvasana* should be given within 15-30min after food. After food intake, the colon-ileal reflex is activated, causing the colon to inhibit the emptying of ileal contents which help in undisturbed absorption of *Anuvasana Basti Dravya*. The dense and viscous nature of the Basti content leads to shorter travel distances. Since the quantity is lower, it is unaffected by the gastrocolic reflex and does not initiate the defecation reflex.

Dr. P. Yadayaih correlates this with the capillary pressure of the pipette. Dr. P. Yadayaih delved into the intricate correlation between this physiological mechanism and the retention property ascribed to the capillary pressure of the pipette. He likened the function of the upper opening of the pipette to that of a gate: when

sealed shut, it actively draws in the liquid, creating a vacuum-like effect; conversely, when left open, the absorbed liquid is released or allowed to flow out. Drawing a parallel, after the consumption of meals, the closure of the pyloric sphincter acts as a gatekeeper, preventing the immediate release of *Sneha* from the *Pakwashaya*. This analogy underscores the significance of the pyloric sphincter in regulating the retention of *Sneha* within the gastrointestinal tract post-meal ingestion.

POSITION OF THE PATIENT:

In the *Vamaparshwa Supta* position, where the individual lies on their left side[18]. This position is advised because the *Grahani*, predominantly resides on the left side of the abdomen[19]. As the *Guda*, or rectum, extends, it becomes softened, facilitating the easy penetration of the *Basti Netra*, or nozzle, into the rectum. Consequently, the *Guda Vali*, or rectal folds, become relaxed. This relaxed state allows for the seamless passage of the *Basti Dravya* into the *Pakwashaya*, or large intestine, ensuring effective administration of the *Basti*.

The rectum features three rectal valves, with the middle one primarily situated on the right side, playing a crucial role in the defecation process. When positioned on the left lateral side, the body naturally protects these valves. Additionally, the anatomical slope aids gravity in facilitating the passage of faecal matter. Moreover, the absorptive area of the mucosa is notably greater on the left side of the rectum, contributing to efficient absorption processes.

GUDA VALI AND *BASTI NETRA* INSERTION:

The *Guda* is considered a *Sadyopranahara Marma*, implying its critical role in immediate life-threatening situations. Therefore, preserving the integrity of the *Guda* during *Basti Karma* is of utmost importance. The *Guda* measuring 4.5 *Angula* in length and 4 *Angula* in diameter, it comprises three *Guda Vali*, each projecting obliquely by 1 *Angula*[20]. These *vali* are arranged spirally, resembling the *Shankhavarta*[21]. The *Basti Netra* (nozzle), having *Gopucchakara* shape and measuring 12 *Angula* in length. The first *Karnika* is positioned at 1/4th of the *Netra's* length, approximately 3 *Angula*[22]. When administered, the *Netra* lands between the *Pravahini* and *Visarjini Valis*, effectively traversing the main centres of defecation. Application of pressure over the *Vasti Putaka* ensures that the *Dravya* reaches the *Pakwashaya*, facilitating the desired therapeutic effect.

WHERE DOES THE *BASTI DRAVYA* REACHES?

Both experimental and clinical research findings indicate that the administered *Niruha Basti Dravya* reaches the ilio-caecal junction after completely filling the ascending colon[23]. The *Anuvasana Basti Dravya* being viscous and dense does not travel more distance.

BASTI KARMUKATA:

Basti Karmukata has been explained by Acharyas in various references. This includes

1. Action of *Basti* based on its *Veerya*
2. Action of *Niruha Basti* at *Pakswashaya*
3. Action of *Anuvasana Basti* at *Pakswashaya*
4. Action of over *Dosha*
5. Action of *Basti* over *Dhathu*

1. Action of *Basti* based on its *Veerya:*

The administration of *Basti Dravya* through the Basti Netra facilitates penetration up to the *Pravahini* and *Visarjini* Vali. With the application of pressure, the *Basti Dravya* reaches the *Pakwashaya*, where it resides for a period of time, given the *Ashaya* nature of the *Pakwashaya*. When it is staying here, the *Basti Veerya* is absorbed ad spreads throughout the body, ensuring its therapeutic effects are dispersed comprehensively[24]. The branches of *Adhogami Dhamanis* present in the *Pakwashaya* efficiently absorb the *Veerya* and transport it to both the *Urdhwa* and *Tiryak Dhamanis*, facilitating its distribution throughout the body[25]. This process ensures that the therapeutic effects of the *Veerya* are effectively disseminated to the targeted areas.

The *Veerya* of the *Dravya* is considered important in producing therapeutic effects, as it is responsible for a variety of outcomes such as *Samshodhana, Samshamana, Lekhana, Brimhana,* and more in the treatment process[26]. This comprehensive action occurs due to the diverse array of drugs present in the *Dravya*, allowing the Veerya to exert its influence throughout the entire body. Similarly, the *Basti* acts over almost all diseases when planned wisely with permutation and combination of different *Aushadhi*[27].

2. Action of *Niruha Basti* at *Pakswashaya:*

Initially, the *Dravya* reaches the *Nabhi* (navel), *Kati* (waist), *Parshwa* (sides), and *Kukshi* (hip) regions. It effectively churns the *Shakruth* (fecal matter) as well as dosha. The *Sneha* (oil) present in *Niruha Basti* spreads throughout the body, facilitating the extraction of dosha and expelling it along with *Pureesha* (fecal matter)[5]. This comprehensive process ensures thorough cleansing and detoxification of the body.

The hyperosmotic solution[28] of *Niruha Basti* aids in the absorption of endotoxins into the lumen of the colon, facilitating detoxification.

3. Action of *Anuvasana Basti* at *Pakswashaya:*

Acharya Parashara has explained the action of *Anuvasana Dravya* in *Pakswashaya*[5]. The *Guda* is considered the *Moola* (main root) of the body, containing *Sira* (channels) that facilitate the spread of *Basti Dravya*. This nourishes the entire body, allowing *Nara* (individual) to attain *Bala* (strength) and *Veerya* (vitality).

4. Action of *Basti* over *Dosha*:

   The *Veerya* first acts on *Apana Vayu*, primarily present in the *Pakwashaya* (colon). Once *Apana Vayu* attains satisfaction (*Tripti*), it influences *Samana Vayu*. Upon satisfaction of *Samana Vayu*, it then extends its influence to *Vyana Vayu*. Subsequently, the satisfaction of *Vyana Vayu* leads to the pacification of *Udana Vayu*, followed by *Prana Vayu* satisfaction. Ultimately, this satisfaction of *Prana Vayu* contributes to the normalization of *Pitta* and *Kapha Doshas*[29]. In its entirety, the *Veerya* of *Basti* ensures nourishment and well-being of the entire body. This can also be understood as transport of *Bastivirya* is by *Kedarikulya Nyaya* which makes it spread all over the body by virtue of different *Vayu*

5. Action of *Basti* over *Dhathu:*

   Acc to Sushrutha effect of *Basti* depends on the number of *Sneha Basti* given. The enumeration of *Basti Sankhya* entails various actions[30]:

   1st *Basti* initiates *Snehana* (oleation) of *Basti* and *Vankshana*.

   2nd *Basti* influences *Murdhasta Anila* (vital breath located in the head region).

   3rd *Basti* enhances *Bala* (strength) and *Varna* (complexion).

   4th *Basti* penetrates into the *Rasadhatu* (plasma tissue layer).

   5th *Basti* nourishes the *Rakta Dhatu* (blood tissue).

   6th *Basti* nourishes the *Mamsa Dhatu* (muscle tissue).

   7th *Basti* facilitates the nourishment of *Meda* (adipose tissue).

   8th *Basti* aids in the nourishment of *Asthi* (bone tissue).

   9th *Basti* supports the nourishment of *Majja* (marrow tissue).

   10th to 18th *Basti* Contributes to the nourishment of *Shukra Dhatu* (reproductive tissue).

THE ACTION OF BASTI:

This can be studied as endocolonic action, encolonic action and diacolonic action.

- ✓ Endocolonic actions occur inside the colon, such as in *Malashodhana Basti*, which primarily focuses on cleansing the colon.
- ✓ Encolonic actions target the tissues of the colon, as seen in *Piccha Basti*, which aims to nourish and support the health of colon tissues.
- ✓ Diacolonic actions involve systemic effects beyond the colon. An example is *Yapana Basti*, which exerts its therapeutic influence throughout the body, beyond the colon.

INFLUENCE OF BASTI (MODE OF ACTION):

These aspects can be explored under the following headings:

1. Absorption mechanism
2. Colon cleansing and excretory function
3. On the basis of microbiome gut brain axis
4. Through enteric nervous system
5. System biology theory

1. Absorption mechanism: The colon has a nominal mucosal surface area of approximately 2000 cm^2 [31]. Additionally, colonic crypt cells are capable of both absorption and secretion processes within the colon.
   - Transcellular route of absorption depends on lipophilicity, and the use of *Sneha Dravya* in *Basti* promotes this type of absorption.
   - Paracellular route involves diffusion through the spaces between epithelial cells, and it serves as the route of absorption for Kashaya(decoction) preparations.

   This route of absorptions defines how *Basti Dravya* cross cell membrane.

   Abhyanga (oil massage) and *Swedana* (sudation therapy) are known to enhance blood circulation in the body. When it is done over abdomen and back region before *Basti* administration it will increase the local circulation and enhances absorption.

   The upper 1/3rd of the rectum is drained into the portal vein, while the lower 2/3rd is drained into the inferior iliac vein, eventually joining the inferior vena cava, thus bypassing the liver. A study conducted by Dr. Rohini Purohit et al. demonstrated the presence of Ricinine content from *Madhutailika Basti* in the blood samples of individuals. Another study conducted by Dr. Kusuma H et al. confirmed the excretion of Gallic acid in urine after giving *Madhutailika Basti*, indicating systemic absorption and excretion of the Basti Dravya.

   When the *Basti* is administered, it also acts as irritant to the lumen of colon. This may induce,

   a. Intestinal inflammation that can lead to a general increase in capillary permeability, potentially enhancing the absorption of drugs.
   b. Additionally, inflammation may reduce the multidrug resistance function in the intestinal wall epithelium, resulting in decreased pumping of drugs from the enterocyte into the intestinal lumen.

   And the absorption of *Basti Dravya* takes place.

2. Colon cleansing and excretory function:

   Basti Karma does, expulsion of *Vit, Pitta, Shleshma, Anila* and *Mutra* from the body[32]. It does,
   - Enhanced removal of waste and toxins from the body.
   - Improved absorption of nutrients and therapeutic substances.
   - Functional enhancement of other organs due to improved overall health and vitality.

3. On the basis of microbiome gut brain axis: The human gastrointestinal microbiota maintains a mutualistic relationship with the host, contributing to various neuroactive compound production and regulating neurological function[33]. Additionally, it reduces stagnation and consequent bacterial proliferation in the large intestine, promoting optimal colon health by maintaining harmony within the intestinal flora. *Basti* therapy enhances the endogenous synthesis of essential vitamins such as B_{12} and K, while also facilitating thiamine production through bacterial assistance.

   Gut flora can be altered by various factors such as nutrition, medication, and diseased conditions. When the composition of gut flora is disrupted, it can lead to changes in brain function and neurological processes. These alterations in gut microbiota have been linked to conditions like mood disorders, cognitive dysfunction, and neurodegenerative diseases[34]. Maintaining a healthy balance of gut flora is crucial for supporting optimal brain health and function.

   The microbiome-gut-brain axis highlights the crucial role of gut flora in mediating biomechanical signalling events between the gut and the brain, influencing various physiological and neurological processes. Additionally, during *Basti* therapy, the NaCl content of the herbal decoction reaches throughout the large intestine, where most of the Na+, Cl-, and water are reabsorbed. The mucosa of the large intestine secretes bicarbonate ions, which neutralize the acidic end products of bacterial action, nourishing the bacterial flora and fostering a healthier environment within the large intestine. This mechanism further underscores the importance of *Basti* therapy in promoting gastrointestinal health and supporting the microbiome-gut-brain axis.

4. Through enteric nervous system: Both the small intestine and colon possess intrinsic innervations through the enteric nervous system (ENS) and extrinsic innervations from the central nervous system (CNS). During embryonic development, both the ENS and CNS originate from the neural crest, comprising similar types of cells, neurotransmitters, and brain proteins. The interactions between the ENS and CNS mutually influence each other, showcasing the interconnectedness of gut-brain communication. Notably, the ENS exhibits independent reflex activity, akin to the brain, enabling it to send and receive impulses, record experiences, and respond to various stimuli. This intricate network underscores the complex relationship between the gut and the brain, essential for maintaining digestive and neurological health.

   Specifically, *Niruha Basti* action can be understood by Hit and run module of pharmacodynamics or touch and go theory due to less retention time of *Basti Dravya.*

   Basti therapy stimulates chemoreceptors or mechanoreceptors through two primary mechanisms. Firstly, it activates the relevant parts of the central nervous system (CNS), triggering neural responses associated with sensory perception and regulatory functions. Additionally, it induces an evacuatory reflex, prompting the body to expel waste materials and promoting gastrointestinal motility. These combined actions contribute to the therapeutic effects of *Basti* therapy, aiding in detoxification, digestive health, and overall well-being.

Niruha Basti being a hyperosmotic solution, creating an osmotic gradient that draws contents from the body into the lumen of the colon, facilitating their removal. Additionally, the irritant nature of the *Kalka Dravya* component causes distension of the gut, triggering an evacuatory reflex. These combined mechanisms promote effective cleansing of the colon and contribute to the therapeutic benefits of *Niruha Basti*.

5. System biology theory: The interconnectedness of all systems within the body ensures a tendency to maintain equilibrium, a principle that can be applied to understand the action of *Basti* on the organ systems. At a molecular level, all organs are interconnected, with molecular events influencing cellular processes, tissue functions, and ultimately organ function. *Basti* therapy's effects on the gastrointestinal tract can extend to other systems, contributing to bodily internal homeostasis by promoting harmonious interactions between various organ systems. This approach shows the importance of considering the interconnected nature of the body's systems in understanding and implementing therapeutic interventions like *Basti*.

CONCLUSION:

In the practice of *Panchakarma*, *Basti* is regarded as a cornerstone therapy, often considered equivalent to half of the entire treatment regimen[35]. Its superiority over other *Shodhana Chikitsa* (detoxification therapies), is emphasized due to its comprehensive and profound effects on the body. *Basti's* efficacy is attributed to its unique *Virya* or potency, which permeates throughout the body via the *Srotasas* (channels). The active constituents within the *Basti* formulation are believed to be absorbed across various segments of the gastrointestinal tract, from the rectum to the ileocecal junction, facilitating their therapeutic action. To validate the absorption of *Basti's* potency, the absorption of specific phytochemicals linked to its unique *Guna* (property) is essential. Furthermore, it's important to note that not all *Basti* therapies follow the same mode of action; each may exert its effects through distinct mechanisms tailored to individual patient needs. Understanding these nuances allows for a more targeted and effective application of *Basti* therapy in practice. *Basti* administration can elicit a range of effects, with its therapeutic outcomes influenced by various factors such as the timing of administration, rate of infusion, and the inclusion of adjuvants. These factors can contribute to either *Brimhana* (anabolic) or *Karshana* (catabolic) effects, depending on the specific context and patient characteristics. A deeper investigation into individual *Basti* treatments and their respective modes of action is essential for optimizing therapeutic outcomes.

Furthermore, conducting radioisotope studies would provide valuable insights into the precise pathways and distribution of *Basti Dravya* within the body. Such studies could elucidate the pharmacokinetics of *Basti* therapy, helping to refine treatment protocols and enhance its effectiveness. By integrating these research findings, practitioners can better plan *Basti* treatments to individual patient needs, maximizing therapeutic benefits and improving patient outcomes.

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