



Review Article

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A CRITICAL APPRAISAL ON THE MECHANISM OF ACTION OF BASTI PROCEDURE OF AYURVEDA IN PERSPECTIVE OF MODERN PHYSIOLOGY

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ABSTRACT

In *Ayurveda*, *Basti* is a medical procedure in which the drug is administered through anal route. In ancient time physicians used urinary bladder of sheep, cow and buffalo for giving medicated enema as an instrument. In *Ayurveda*, there are three basic humours *vata*, *pitta* and *kapha*. Disturbance in the homeostatic condition of these humours cause diseased condition. There are certain procedures explained by acharyas where increased *doshas* should be eliminated through the nearest opening. The principal site of *vata* is *pakwashaya* (large intestine) and the nearest opening is anus. Drug administered through this route act on the increased *dosha* bring it in homeostatic condition after removing excessive *doshas* through the anus. *Vata* is the only motivating force in the body which is responsible for spreading *doshas* all over the body and *Basti* is the main treatment for *vata* disorders. *Ayurveda* students should learn to appreciate their practical value through experimental experience. In an age where validity of concepts is judged by their scientific relevance, establishing the scientific validity of *Basti* is a programme of significance. It requires practical application and translating concept into the idiom of modern biology and medicine. In this article we are trying to establish a relevant correlation in terms of mechanism of action with modern physiology.

Keywords: *Basti*, *Basti dravya*, *Doshas*, Enema and *Vata*.

INTRODUCTION

Basti is one among the major procedures in *Panchakarma* therapy. A matter of fact, *Vata* is leader among all *doshas* and it is controlled by *Basti* treatment so *Basti* is the chief treatment among all the *Samshodhan* procedures. The classical literature attaches a great significance to this form of treatment and points out a vivid scope of its acceptability. In this article we used the term *Basti* for all those drugs or medicaments which are introduced through the rectum with the help of *Basti Yantra*. *Basti* is administered through the anal route. *Basti* is the principal treatment for all *Vatika* disease. *Basti* is given with many different combinations of herbs and other substances like oil, milk, honey, salt, herbal paste, etc¹. Pharmacodynamics of *Basti* is different with different combinations of herbs and substances.

Basti is administered in the body through four routes *Pakwashayagata* (Anal), *garbhashayagata* (uterine), *mutrashayagata* (urethrovesical) and *vranagata* (wound/abscess). *Basti* is classified into two types on the basis of pharmaceutical composition i.e., *Niruha Basti* and *Anuvasana Basti*. *Anuvasana Basti* is further divided to *Sneha Basti*, *Matra Basti* and *Anuvasana Basti*. The *Poorva karma* of *Panchakarma* procedure brings the *doshas* from *Shakha* (whole body) to *Koshtha* (intestine). *Basti* eliminates the *doshas* from the *Koshtha* to the outside of the body through anal opening. *Basti* therapy shows significant improvement in *vatika* disorders. *Basti* is the chief treatment of *vatika* disorders and it is considered as the *Ardha chikitsa* (50% of all treatment modality) in *Ayurveda*². When *Basti dravya* is administered it reaches to *Pakwashaya*. The "*Virya* (active principal) of the *Basti*" spreads in the entire body to do desire action. *Basti virya* may act through several mechanisms. This article deals with the mode of action of *Basti*.

Colon – The principal site for action of *Basti dravya*

Basti is given through the anus. *Basti dravya* present in the colon do not cross the ileocaecal valve it may reach up to ileocaecal junction. So, *Basti dravya* remain present in the *pakwashaya* (large intestine) which is the principal location of *vata*. Enterogastric reflex and Colonoileal reflex helps to hold the *Basti* for longer duration in case of *Asthapana Basti* which is recommended empty stomach. The maximum time to hold the *Asthapana Basti* is one *Muhurta* i.e., 45 minutes. It is very important to the body for *Basti* to come out because if *Basti dravya* retained in the body for more than one *muhurta* (forty five minute) then *Upadrava* (complication) develops as its side effect such as weakness, gas in abdomen, hiccups, dysentery, headache, body ache, anal fissure and excess secretions in the rectum. Secretion of bicarbonates from large intestine helps to neutralize the acidic end products of bacterial action in the large intestine. *Niruha Basti* is a homogenous mixture of oil, honey, '*kwatha*' (decoction) and '*Kalka*' (fine paste obtained after wet grinding of the plant material). These ingredients are immiscible with each other. A homogenous mixture is prepared by mixing of honey and rock salt together in the beginning followed by addition of oil. This mixture is then thoroughly mixed. The finely wet grinded paste of prescribed medicinal plants is then mixed in it. *Kwatha* (decoction) is then added to it and the mixture is subjected to thorough churning to produce a homogeneous mixture. As *Basti dravya* has salt in it and water content as well. Absorption of sodium and chloride ions creates an osmotic gradient across the large intestinal mucosa, which in turn causes absorption of water. The large intestine can absorb a maximum of 5 to 8 litres of fluid and electrolytes each day. In this article we have examined *Basti dravya* for glucose, specific gravity, pH and protein in its different

stages of preparation. There was no significant finding was observed which can influence pharmacokinetics of *Basti dravya*.

Importance of empty stomach for *Asthapana basti* administration

Presence of food in the stomach develops a series of changes in the form of reflexes throughout gastrointestinal tract. It develops Gastro Intestinal Reflexes into the stomach leads to the evacuation of the colon (the Gastrocolic reflex), results in evacuation and ultimately no retention of *Basti dravya* in the colon. When the *Basti dravya* administered in empty stomach it does not develop gastro colic reflex and ultimately no evacuation of *Basti dravya* from the colon. *Basti dravya* administered through anal route reaches to colon. Signals from the colon and small intestine inhibit stomach motility and stomach secretion (Enterogastric reflexes), and reflexes from the colon to inhibit emptying of ileal contents into the colon (Colonoileal reflex). Both Enterogastric reflexes and Colonoileal reflexes helps in retention of *Basti dravya* in the colon for longer duration and helps to achieve its maximum effects³. Therefore, *Asthapana Basti* is recommended in empty stomach.

Effect of lukewarm temperature of *basti dravya*

Cold, lukewarm and hot temperature of *Basti dravya* shows different effect on smooth muscles of GIT. Freshly prepared lukewarm *Basti dravya* is recommended for administration to get desirable effect. It helps in further breakdown of waste material in GIT and it decreases the tone and peristalsis of gastro intestinal smooth muscle which increases the holding capacity of *Basti dravya* for the desired period and desirable effect. *Basti dravya* is liquid in nature.

Gastro intestinal reflexes

Role of Gastrocolic reflex

In empty stomach there is no distension in the wall of Gastrum and no development of gastro colic reflex. Gastro colic reflex is a facilitatory kind of reflex, presence of food in the stomach gives signal to colon for evacuation of content present in the colon hence *Basti* will come out. So, *Asthapana Basti* is recommended in empty stomach.

Role of Enterogastric reflex and Colonoileal reflex

Basti dravya should remain in the colon for one *muhurta* to attain its desirable effect. This aim is achieved by two reflexes, Enterogastric reflex and Colonoileal reflex. *Basti* is given through anal route. *Basti dravya* may reach up to the proximal half of colon or up to the ileocaecal junction due to its volume and pressure gradient. Ileocaecal junction has ileocaecal valve. This valve allows only unidirectional movement of content from ileum to Caecum or colon. *Basti dravya* present in the colon do not cross the ileocaecal valve. So, *Basti dravya* remain present in the *pakwashaya* (large intestine) the principal location of *vata dosha*. Administration of *Basti dravya* develops Enterogastric reflex due to stretching of the wall of intestine which in turn inhibits the stomach motility and its secretions. Colonoileal reflex also develops and inhibit the emptying of ileal contents in the colon. So, both these reflexes help to retain *Basti* in the colon for a longer duration and to get the desirable effects. So, by these three reflexes *Basti dravya* remain in the colon for longer duration without developing evacuation reflex.

Stimulation of peristalsis by *basti dravya*

The usual stimulus for intestinal peristalsis is distension of the gut. That is, if a large amount of food gathers at any part in the gut, the stretching of the gut wall excites the enteric nervous system to contract the gut wall 2 to 3 centimetres behind this point, and a contractile ring appears that initiates a peristaltic movement⁴. When the *Basti dravya* reaches to the colon segmental contractions begin which helps in the propulsion of *Basti dravya* in forward direction towards rectum.

Initiation of defecation reflex

As soon as *Basti dravya* reaches the rectum distension of the rectal wall inductees afferent signals that spread through the myenteric plexus to initiate peristaltic waves in the descending colon, sigmoid, and rectum, compelling *Basti dravya* along with faeces toward the anus. As the peristaltic wave approaches the anus, the internal anal sphincter is calm by inhibitory signals from the myenteric plexus; if the external anal sphincter is also consciously, voluntarily calming at the same time, *Basti* will come out as defecation occurs. The intrinsic myenteric defecation reflex functioning by itself normally is relatively weak. To be effective in causing defecation of *Basti dravya*, it usually must be fortified by another type of defecation reflex, a parasympathetic defecation reflex that involves the sacral segments of the spinal cord. When the nerve endings in the rectum are stimulated, signals are transmitted first into the spinal cord and then reflex back to the descending colon, sigmoid, rectum, and anus by way of parasympathetic nerve fibres in the pelvic nerves. These parasympathetic signals greatly intensify the peristaltic waves as well as relax the internal anal sphincter, thus converting the intrinsic myenteric defecation reflex from a weak effort into a powerful process of defecation that is sometimes effective in emptying the large bowel all the way from the splenic flexure of the colon to the anus⁵. In this way *Basti dravya* come out with faeces.

Nervous regulation of defecation of *basti dravya*

When the *Basti dravya* enters the colon, the autonomic nervous system comes in action due to distension of intestinal wall. Centres located in the spinal cord, brain stem and hypothalamus activates the autonomic nervous system. Also, portions of the cerebral cortex, especially of the limbic cortex, can transmit signals to the lower centres and in this way influence autonomic control. The autonomic nervous system also often operates by means of visceral reflexes. That is, subconscious sensory signals from a visceral organ can enter the autonomic ganglia, the brain stem, or the hypothalamus and then return subconscious reflex responses directly back to the visceral organ to control its activities. In this way the gut sends signals to spinal cord, brain stem, and hypothalamus and cerebral cortex which in turn do parasympathetic stimulation and hence muscarinic effect appear which relax the whole body. As long as the *Basti* retained in the body parasympathetic tone remains dominant and hence the body feels relax and resting. *Basti* is recommended in pathological condition of *Vruddha vata*. Sign and symptoms of *Vruddha vata* is similar to the effect produced due to the increased sympathetic tone. *Basti* increases the parasympathetic tone which nullifies the effect of increased sympathetic tone and brings it in homeostatic condition.

Effect of meal on *basti*

Effect of meal on *Asthapana Basti*

If *Asthapana Basti* is given after meal (which is not recommended) *Basti* will not retain in the large intestine for a period of *muhurta* hence desired effect will not be achieved. Presence of food in the stomach causes distension of stomach wall and development of Gastrocolic reflex and peristalsis in the colon and due to this *Basti* will come out early and no desired effect of *Basti* will be seen in the patient.

Effect of meal on *Anuvasana Basti*

Anuvasana Basti is advised to be given immediately after having meal is due to its less quantity. When food reaches to the stomach gastro colic reflex comes in action peristalsis develop in the colon. This physiology occurs inside the GIT. This is the time for administration of *Anuvasana basti*. Due to gastro colic reflex it may reach up to splenic flexure i.e., distal colon. The main content of *Anuvasana Basti* is oil, therefore it is denser and more viscous as compared to the *Niruha basti* therefore it does not travel for the longer distance due to its small quantity, increased viscosity and peristalsis. Due to *snigdha* and *ushna* property of oil it neutralizes the *ruksha* and *sheeta guna* of *vayu*.

Usually after having meal when a mass movement due to peristalsis forces *Basti* into the rectum, the desire for defecation develops. In *Anuvasana Basti* the urge of defecation does not become intense due to its low quantity. Usual duration of reverting back of *Anuvasana Basti dravya* is 3 *Prahara* (9 hrs). Sometimes due to its low quantity of *Anuvasana Basti* which produces poor defecation reflex causes *Basti* to retain up to twenty-four hours or more. If *Basti dravya* does not come out and simultaneously does not produces any complication, in this condition it is recommended to don't do any effort for removal of *Basti dravya*⁶. Due to excessive dryness in the body or due to enveloped by the faecal matter it may not come out. In this case further *Anuvasana Basti* is advised after three days⁷.

Action of *basti dravya* on bacterial flora of large intestine

Human gastrointestinal microbiota also known as gut flora are the microorganisms that live in the digestive tracts of intestine. This

flora is very important for the health of intestine and is present even normally in the absorbing colon.

Bacteria present in the intestine are capable of digesting small amounts of cellulose, in this way providing a few calories of extra nutrition for the body. Other substances formed due to bacterial activity vitamin k, vitamin B12, thiamine, riboflavin, and various gases like carbon dioxide, hydrogen gas and methane⁸. The bacteria-formed vitamin K is especially important because the amount of this vitamin in the daily ingested foods is normally insufficient to maintain adequate blood coagulation. When *Basti dravya* reaches the large intestine, it contains NaCl and water in abundant amount. The mucosa of the large intestine has a high capability for active absorption of sodium, and the electrical potential gradient created by absorption of the sodium causes chloride absorption as well. The mucosa of the large intestine secretes bicarbonate ions while it simultaneously absorbs an equal number of chloride ions in an exchange transport. The bicarbonate helps neutralize the acidic end products of bacterial action in the large intestine. Absorption of sodium and chloride ions creates an osmotic gradient across the large intestinal mucosa, which in turn causes absorption of water. The large intestine can absorb a maximum of 5 to 8 litres of fluid and electrolytes each day. So, when the NaCl rich *Basti dravya* reaches throughout the large intestine most of the Na⁺, Cl⁻, and water are reabsorbed. The mucosa of large intestine secretes bicarbonate ions which neutralizes the acidic end products of bacterial action in the large intestine. The amount of gases entering or forming in the large intestine each day averages 7 to 10 litres, whereas the average amount expelled through the anus is usually only about 0.6 litres. If these gases are not released it causes severe vatic disorders like *tuni*, *pratituni*, *adhmana* etc have origin from large intestine. pH of large intestinal secretion is 7.5 to 8. *Basti* treatment is prescribed in *vatika* disorders. *Basti dravya* stimulates secretion of bicarbonate ions, therefore acidic end product neutralization occurs which is very important to maintain the gut flora and important to maintain a good health.

Examination of *basti dravya* at different stages of preparation

Basti dravya was examined for glucose, specific gravity, pH and protein in its different stages of preparation. Results are summarized below in Table 1. There was no significant finding was observed which can influence pharmacokinetics of *Basti dravya*.

Table 1

	<i>Lavana + Madhu</i>	<i>Lavana + Madhu + Tail</i>	<i>Basti dravya</i>	<i>Dashmoola Kwatha</i>
Glucose	Negative	Negative	Negative	Negative
Specific gravity	1.030	1.030	1.030	1.005
pH	6	5	5.5	6
Protein	Negative	Negative	Negative	Negative

Spread of *Basti Veerya* through *Vayu*

The *Virya* of given *Basti* is immediately transferred to *Apana Vata*, from *Apana* to *Samana*, then to *Vyana* and then to *Udana* and then to *Prana*. Then the *Virya* reaches to *Pitta Sthana* and *Kapha Sthana* and bring them back to normalcy⁹. The *Virya* is carried in transverse direction by *Vyana vata*, descending direction by *Apana vata*, upward direction by *Prana vata* just like through channels water enters to field¹⁰. The *Virya* is carried by *Vata* through *Sira* and spread throughout the body¹¹. The (*Virya* of) *Basti* is taken upward by *Vata* then influences *Pitta sthana* and then *Kapha Sthana* and drag from their site¹². In explanation of the above mechanism, *Basti* treatment is given in aggravated *vata* conditions i.e., hyper action of all sub types of *vata*. All the five

types of *vata* and its actions are exaggerated. *Basti* helps to normalize all the subtypes of *vata* as it is the *Ardha chikitsa*.

Virya of given *Basti* is immediately transferred to *Apana Vata*. *Apana vata* helps to holds the *Basti* in rectum through the inhibitory centres in the brain stem, located mainly in the Pons and cerebral cortex¹³ so that *Basti* have sufficient time to do its effects on the whole body. *Basti dravya* in large intestine stretches the intestinal wall and activates the parasympathetic nervous system and secretion of acetylcholine (Ach). Ach stimulates the digestive secretions. Tone and peristalsis in the gastrointestinal tract are increased. Gastric secretions will also get increased. In this way *Basti* helps in normalizing the aggravated function of *Samana vayu*. Then to *Vyana*, *Vyana vayu* controls the both

somatic functions and autonomic functions. Acetylcholine helps to neutralize all the hyperactive functions by stimulating autonomic nervous system through Vagus nerve. About 75 per cent of all parasympathetic nerve fibres are in the Vagus nerves (cranial nerve X), passing to the entire thoracic and abdominal regions of the body. Stimulation of Vagus nerve causes secretion of Ach. Vagus nerve is inhibitory in nature. It gives supply to the heart the principal organ controlled by *Vyana vayu*. Hence, it controls and normalizes the Inotropic, Chronotropic, Dromotropic and Bathmotropic action of heart. Stimulation of Vagus nerve also helps to normalize all the hyperactive functions of *Udana vayu* like *Vak Pravriti* (speech), *Pryatan* (action), *Urja* (energy), *smriti* (memory) etc. As the parasympathetic nervous system controls the hyperventilation, and intellectual factors that are the hyperactive functions of *Prana vayu*. This helps to maintain normal homeostatic functions. Therefore, in this way *Basti* shows its effect in all over the body.

DISCUSSION

In *Panchakarma Chikitsa*, individually *Basti* is considered as half of the *chikitsa*. It is superior to other (*Virechana*, *Vamana*) *Shodhan as chikitsa* (bio purification therapies). The effect of *Basti* is basically due to its *Shodhana* property that starts right from the *Pakwashaya* i.e. Colon. *Shodhana* process is associated with the removal of *Mala* and *Doshas* from the body. There are various waste material and oxidants are regularly formed which accumulated in the body due to defective removal which can be considered as a part of *Mala* and morbid *Doshas*.

Different temperature of *Basti dravya* shows different effect on smooth muscles of GIT. Freshly prepared lukewarm *Basti dravya* decreases the tone of gastro intestinal smooth muscle and peristalsis which increases the holding capacity of *Basti dravya* for the desired period to get desirable effect. NaCl content of *Basti dravya* reaches throughout the large intestine most of the Na^+ , Cl^- , and water is reabsorbed and mucosa of large intestine secretes bicarbonate ions which neutralizes the acidic end products of bacterial action in the large intestine. So, it nourishes the bacterial flora of large intestine and makes them healthier.

There are many false beliefs among different *Vaidyas* regarding the function of *Basti*. Most of the authors in different articles have mentioned that *Basti dravya* can reach up to stomach and absorbed, some experts believe fat portion of *Basti dravya* gets absorbed from the mucosa of large intestine¹. Ileocaecal valve present in ileocaecal junction is a unidirectional valve. It always allows passing the materials only from Ileum to Caecum in response to Colonoileal reflex. *Basti dravya* neither cross the ileocaecal valve nor will reach to stomach and absorb. So, this hypothesis doesn't prove to correct and hence not accepted. Another misunderstanding is oil of *Basti dravya* gets absorbed through the mucosa of large intestine. A valid objection of this hypothesis is that the oil portion of *Basti Dravya* must be digested before absorption. Mucosa of large intestine has tight junctions of epithelial cells. Bile is required for the emulsification of fat and pancreatic lipase enzyme for digestion. Both bile and pancreatic digestive enzymes are secreted in the second part of duodenum. Fatty acids formed as a result of digestion must require bile micelles for absorption. Fatty acids are converted into triglycerides that are subsequently released in the form of Chylomicrons through the base of epithelial cells, to flow upward through the thoracic lymphatic duct and empty into circulating blood. The thoracic duct commences at the upper end of the cisterna chyli, on a level with the body of T12 vertebrae between the aorta and the Azygous vein. Blunt fat cannot be absorbed through the intestinal epithelial cells. So, this hypothesis doesn't prove to correct and hence not accepted. Stimulation of

Enterogastric and Colonoileal reflexes and absence of Gastrocolic reflex are helpful to retain *Basti* for the considerable period of time in *Niruha Basti*.

CONCLUSION

Basti dravya does not reach to the stomach. *Basti dravya* does not get absorbed through the mucosa of the large intestine. Volume or quantity of *Basti dravya* proportionately stimulates the muscarinic effects of Para sympathetic nervous system. Stimulation of Enterogastric and Colonoileal reflexes and absence of Gastrocolic reflex are helpful to retain *Basti* for the considerable period of time in *Niruha Basti* prescribed holding time of *Niruha Basti* is 45 min. So, increased parasympathetic tone for 45 min shows the muscarinic effect throughout the body. Due to liquid nature of *Niruha Basti* it dissolves the faecal matter in the intestine and causes defecation and removal of both *Basti dravya* and faecal matter. If *Niruha Basti dravya* doesn't come out after prescribed period of time it causes severe complications.

In case of *Anuvasana Basti* Colonoileal reflex and volume of the *Basti dravya* helps to retain for a longer period of time. Presence of *Basti dravya* in colon inhibits emptying of ileal contents into the colon. *Anuvasana Basti* normally revert back is 3 *Prahara* (9 hrs). If *Anuvasana Basti* doesn't revert back even after 24 hours and produces no further complication, then there is no need to forceful removal of *Basti* due to its less volume. Oil dominant *Anuvasana Basti* neutralizes the dryness of mucosa of large intestines and also enveloped the faecal matter. Sodium chloride is an important content of *Anuvasana Basti*. Absorption of Na^+ and Cl^- causes secretion of bicarbonates from the mucosa of large intestine helps to neutralize the acidic end products of bacterial action in the large intestine. The main content of *Anuvasana Basti* is oil, therefore it is denser and more viscous as compared to the *Niruha Basti* therefore it does not travel for the longer distance due to its small quantity, increased viscosity and peristalsis. Oil envelops the faecal matter and morbid *dosha* and slides it from its place and helps in defecation. Due to *snigdha* property of oil it neutralizes the *ruksha guna* and easily evacuated. Due to less quantity many times it does not show any adverse effects. Temperature of the *Basti dravya* reflexes of the GIT and increased Para sympathetic tone plays a significant role in action of *Basti*.

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