



The Conceptual Review of Pakwashaya with Special Reference Togut Brain Axis

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ABSTRACT - The large intestine is called as Pakwashaya. The large intestine extends from the ileocecal junction to anus. It is about 1.5 metres long, 6.5 cm in diameter. It is divided into caecum, appendix, rectum, ascending colon, descending colon, transverse colon, and anus. It is the one of the site of Vaat dosha in our body. The Gut Brain Axis describes the two-way connection and communication between gut and the brain. The gut has its own nervous system called as enteric nervous system (ENS) which is located in sheath of tissue lining the oesophagus, stomach, small intestine and colon. Hundreds (100) trillions off neurons in gut which is present it is more than brain and spinal cord. Therefore, what is happening in the Gut can directly influence our brain function and behaviour. During embryonic system, the chunk of tissue from which CNS is formed this tissue is called as neural crest. Any miscommunication between this two-way system can bring about a range of health conditions such as irritable bowel syndrome (IBS), depression, anxiety, and obesity. Correlations of concept of Pakwashaya and Gut-Brain Axis have positive answer and will help in diagnosis, prognosis and treatment.

KEYWORDS – Pakwashaya, Gut Brain Axis, Enteric Nervous System

INTRODUCTION

पक्वाशय व्याख्या :

तत्र समासेन वातः श्रोणी गुदसंश्रयःतदुपरि अधोनाभेः पक्वाशयः।

सु.शा. ५/८

Pakwa means digested (in terms of food) and Ashaya means place¹. So Pakwashaya means the place where Pakwa (Anna) (digested food) stays². The term *Ashaya* means a reservoir or storage place. It means that the ashaya are tubular or bag like structures with a lumen and the lumen usually contains some inclusion.

Ashaya is the place where some substance lies. The body contains innumerable substances and many of them are stored temporarily or comparatively permanently in the body. For their storage body requires special containers or structures suiting the function, structure and quantity of the contents. These containers or reservoirs are termed Ashaya in ayurveda.

The term aadhara is a synonym of the term, frequency used in our treatises.

The term aadhana also is used in the same sense ex. pakwadhana.

Pakwashaya is listed as one of the Koshtanga. Pakwashaya is also listed in Ashaya of Sharira. Pakwashaya comes in Abhyantara Rogamarga. Pakwashaya is Matruja Avayava.

Pakwashaya is formed from essence of Rakta and Kapha. When the essence of Rakta and Kapha are being digested by Pitta, Vayu runs through it resulting into formation of Antra, Guda and Basti.

Function of Pakwashaya can be summarized as follows –

- Malavibhajana - segregation of Mala into Drava Mala and Ghana Mala takes place at Pakwashaya.
- Purishapindikarana - Purisha gets formed form.
- Purishavahana - carrying Purisha from Pakwashaya to Guda for excretion.
- Mutra Utpatti - Mutra gets formed in Pakwashaya.
- Katu Bhava Udirana - As Pakwashaya is site of third stage of Avasthapaaka - Katu Avasthapaaka1.
- Vayu Utpatti - Aharamala Svarupa Vayu gets formed in Pakwashaya.
- As site of Pradhana Chikitsa of Vata Dosha - Basti which is main treatment of Vata.

Common Sites of Vata-Dosha

The nature of tridoshas is all pervading throughout the body. But the organs where Vata Dosha functions are predominately observed have been mentioned as its main site.

1. Pakwashaya (large intestine) Here, digested food gets separated in sara (useful) and kitta (waste) by Vata dosha. Also waste parts are thrown out of the body by stimulation from Vata. Vata dosha and pakwashaya are intimately related with each other. Pakwashaya is the place, for genesis of Vata main site of activity, site as an origin of pathogenesis and selective site for main treatment of Vata (i.e. basti or medicated enema)
2. Kati (Pelvic girdle) – This region incorporates important organs like large intestine, rectum, anus, urinary bladder, uterus and ovaries. These organs are related with excretory activities like micturition, defecation, menstruation etc. These functions are part of the separations – type functions of Vata Dosha.
3. Sakhti (thigh) – Walking, running are the activities of leg. These movement functions are related with Vata Dosha.
4. Shrotra (ears) – Sound is perceived by ears. Sound is a property of akasha (ether) mahabhuta. Composition of Vata includes akasha. For the proper activity of Vata includes akasha. For the proper activity of Vata in the ear, Ayurveda has suggested karna-puran (filing of ears with oil) as a part of daily regimen (dinacharya).
5. Asthi (bone) - Bones and Vata dosha has a special relation called as ‘ashrayashrayi’. Bones are ashraya (media) and Vata dosha is ashrayi (dweller).
 - a) Body activities are mainly concerned with body joints, and any activity cannot take place without Vata.
 - b) Bone is the hardest element in the body.
6. Sparshanendriya (Sense organ of touch is skin) - Skin perceives different types of touch sensations like cold, hot, soft, hard. Vata dosha is composed of Vayu and Akasha (air and ether). Touch is a property of Vayu mahabhuta, hence, relation of Vata dosha with touch sensation is established.

The **gut–brain axis** is the biochemical signaling that takes place between the gastrointestinal tract (GI tract) and the central nervous system (CNS). The term "gut–brain axis" is occasionally used to refer to the role of the gut flora in the interplay as well, whereas the term "**microbiota–gut–brain (MGB or BGM) axis**" explicitly includes the role of gut flora in the biochemical signaling events that take place between the GI tract and CNS.

Broadly defined, the gut–brain axis includes the central nervous system, neuroendocrine and neuroimmune systems, including the hypothalamic–pituitary–adrenal axis (HPA axis), sympathetic and parasympathetic arms of the autonomic nervous system, including the enteric nervous system and the vagus nerve, and the gut microbiota.

The enteric nervous system is one of the main divisions of the nervous system and consists of a mesh-like system of neurons that governs the function of the gastrointestinal system; it has been described as a "second

brain" for several reasons. The enteric nervous system can operate autonomously. It normally communicates with the central nervous system (CNS) through the parasympathetic (e.g., via the vagus nerve) and sympathetic (e.g., via the prevertebral ganglia) nervous systems. However, vertebrate studies show that when the vagus nerve is severed, the enteric nervous system continues to function.

In vertebrates, the enteric nervous system includes efferent neurons, afferent neurons, and interneurons, all of which make the enteric nervous system capable of carrying reflexes in the absence of CNS input. The sensory neurons report on mechanical and chemical conditions. Through intestinal muscles, the motor neurons control peristalsis and churning of intestinal contents. Other neurons control the secretion of enzymes. The enteric nervous system also makes use of more than 30 neurotransmitters, most of which are identical to the ones found in CNS, such as acetylcholine, dopamine, and serotonin. More than 90% of the body's serotonin lies in the gut, as well as about 50% of the body's dopamine; the dual function of these neurotransmitters is an active part of gut-brain research.

The first of the gut-brain interactions was shown to be between the sight and smell of food and the release of gastric secretions, known as the cephalic phase, or cephalic response of digestion.

MATERIALS

It's a literary study, all available ayurvedic classics modern textbooks, journals, reputed articles, websites & relevant information were referred for collecting and analyzing the literature related topics scientifically. Information regarding about gut brain axis collected from various research article, peer reviewed journals, authorized website related to subject.

Information regarding pakwashaya collected from Bruhatrayees, Laghutrayis and other classical texts including journals, presented research papers and articles, previous thesis work done & correlated, analyzed with the knowledge of contemporary science on the subject.

DISCUSSION

- In Ayurveda, tridoshas i.e. vata, pitta, kapha are fundamental elements responsible for movement, transformation & cohesion in the body.

- These doshas are susceptible to imbalance & vitiation, among which vata is dominant & its main site is pakwashaya, so to determine the exact organ related to pakwashaya with the aid of modern science, this study was initiated through review of relevant literature from all available sources.

It is the main organ related to the site of vata dosha, purishwah strotas, purishdhara kala, koshtanga and aashaya. Pakwashaya plays an important role in formation of urine & digestion of food. The review of literature of pakwashaya & present knowledge of contemporary science indicates that the pakwashaya described in ayurveda can be correlated with entire part of large intestine. i.e. From caecum to rectum. Pakwashaya is the organ mentioned by various acharya's in different text having various anatomical and physiological function. It is the main organ related to the site of vata dosha, purishavah Strotas, purishdhara kala, koshtanga and aashaya. It have anatomical importance as many organ mentioned in Samhita in relation with pakwashaya so by knowing the exact position of this pakwashaya is particularly based on anatomy and physiology of the organ mentioned in the Samhitas.

- It is seen that Pakwashaya is an organ included in Koshtang by Charaka and Sushruta where as Vagbhata mentioned whole Antra as a Koshtang. Exact position of is different in different text but mostly in relation with Amashaya, Nabhi, Shroni, Guda. All these organs are placed in abdominal cavity so it is clear that is the organ placed in abdominal cavity. Charaka and Dalhan mentioned Pakwashaya is situated below

Pittashaya. i.e. Gall Bladder, which is situated, at inferior surface of right lobe of liver at which can be felt at the tip of 9th costal cartilage and by Charaka below Amashaya i.e. stomach which is situated in the epigastric, umbilical and left hypochondrium. Sushruta placed this organ in relation with Shroni and Guda, which is related with the pelvic region. As per Vrudhavaghat Nabhi or umbilicus placed in center of the Pakwashaya which is situated at anterior median plain at the level of 3rd or 4th lumbar vertebra. While comparing the surface anatomy of the pakwashaya it is connected with superior surface of urinary bladder and posterior surface of the uterus as mentioned by the Acharyas.

Anatomically Pakwashaya is an organ situated in the abdominal cavity, which is situated below the gall bladder at right side and stomach at left side both are placed at around 9th costal margin and above the true pelvis in relation with uterus and urinary bladder. Physiologically is the main organ, having the function of absorbing large amount of water. After complete process of digestion, it acts as a storehouse of the faecal matter so as per the anatomical and physiological aspects of mentioned in Ayurveda, if compared with modern anatomical structures then are present entire part of large intestine i.e. From caecum to rectum.

Large intestine

The human gut has long been seen as a repository of good and bad feelings. The emotional states from the head's brain are mirrored in the gut's brain, where they are felt by those who pay attention to them.

- Trillions of gut microbes exist mainly inside our intestine and on the skin.
- Most of microbes in the intestines are found in a “pocket” of the large intestine called the caecum and they are referred to as the gut microbiome.
- The gut microbiome refers to all of the microbes in our intestines, which act as another organ that's crucial for human health.
- Bacterial colonization of the infant gut:
 - Intrauterine period: The fetus becomes exposed to maternal microbiota through trans placental passage into amniotic fluid.
 - Full term vaginal delivery: Exposure to maternal vaginal colonic microbiota, aerobic environment initially colonized by facultative anaerobes ex. *Escherichia* & *Enterococcus*.
 - Neonatal period: 2 weeks to 4 months.
 - Introduction of oral liquid feedings shifts to obligate anaerobes.
 - Ex. *Firmicutes* (*Clostridia* *Lactobacilli* *Bifidobacteria*).

By 1-3 years-infant receives table food & intestinal microbiome resembles that of adult intestine (diversity of bacteria with greater than 1000 species).

- New evidence suggests that babies may come in contact with some microbes while inside the womb.
- As you grow, your gut microbiome begins to diversify, meaning it starts to contain many different types of microbial species.
- Higher microbiome diversity is considered good for human health.
- The gut microbiome affects the baby from birth and throughout life by controlling the digestion of food, immune system, central nervous system and other bodily process. Having too many unhealthy microbes can lead to disease.
- An imbalance of healthy and unhealthy microbes is sometimes called gut dysbiosis and it may contribute to weight gain but probiotics can potentially restore gut health and help reduce weight.
- Certain bacteria within the gut microbiome can produce chemicals that may block arteries and lead to heart diseases. However, probiotics may help lower cholesterol and the risk of heart disease.
- The gut microbiome plays a main role in controlling blood sugar and may also affect the onset of type 1 diabetes in children.

- The gut microbiome may affect brain health by producing brain chemicals and communicating with nerves that connect to the brain.
- Eating a wide variety of high fibre & fermented foods supports a healthy microbiome, taking probiotics & limiting antibiotics can also be beneficial.

CONCLUSION

The gut-brain axis (GBA) is a bi-directional link between the central nervous system (CNS) and the enteric nervous system (ENS) of the body. It involves direct and indirect pathways between cognitive and emotional centers in the brain with peripheral intestinal functions. Since intestine is the most complex immune system of the physical body. Its specialty is that it is an interaction between enteric microbiota, central and enteric nervous systems. The gut microbiome can be defined as all the microorganisms that live harmoniously within the human gastrointestinal ecosystem.

ENTERIC MICROBIOTA: The intestine is the largest and most complex component of the immune system. Failure to regulate immune responses to enteric microbiota induces chronic intestinal inflammation.

CENTRAL AND ENTERIC NERVOUS SYSTEMS: It can operate independently of brain and spinal cord. According to science it is one of the main division nervous system.

Brain and gut develops from the same tissue during fetal development, one part becomes CNS and other part becomes ENS and connected via Vagus nerve.

Vata is prime factor responsible for manifestation of different types of disease and also causes all the primary metabolic functions in the body. Pakwashaya is the main stana of vata. To mitigate Vata, Basti is the main line of treatment as basti is indicated number of disorder like pakshwadh, autism, cerebral palsy.

Apparently, the inputs from the CNS can modify gut functions, while inputs coming from the gut to the CNS can modulate specific symptoms. Alterations of these communications may contribute to neuro inflammation and the pathogenesis of CNS diseases.

Human gut microbiota can contribute to brain function, not only via neural, humoral, immune pathways, but also via the cumulative effects of microbial metabolites.

In healthy individuals, gut microbiome is fairly stable to form a host-bacterial mutualism, which when disrupted seems to increase the dysfunction of brain, digestive system and metabolism.

It has been suggested that diet and specific nutrients can affect the microbiome composition and may influence the aggregation or production of amyloid proteins.

All disease begins in gut. The GI tract exerts an influence on brain function, and vice versa. This is a dual way system.

When we water the root of the plant, tree blossoms in same way we can consider pakwashaya is root of our body, which gives nourishment through basti which is best route for administration and absorption of drug.

So we can conclude that there is obvious connection between concept of Pakwashay and Gut Brain axis.

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