



Review Article

THE PHYSIO ANATOMICAL VIEW OF KLEDACA KAPHA

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KEYWORDS: *Kledaka Kapha*, gastric mucus, digestion.

ABSTRACT

Dosha, Dathu and *Mala* form the elemental cause of human body. Our body fails to exist without these three chief constituents. The concept of *Tridosha* is unique contribution of *Ayurveda*. They are *Vata, Pitta* and *Kapha*. These constitute the anatomical and physiological aspect of human body in general. *Kapha* is the element which gives stability and endurance to the body. There are 5 types of *Kapha* according to the location and function. *Kledaka* is one among them. It is located in *Amashaya* where the major part of digestion occurs. It is anatomically the stomach. Its function is to moisten and disintegrate the ingested food particles. It also protects the stomach from self digestion. It supports other *Kapha sthanas* of the body. According to its location and function given in *Ayurvedic* classics, its role in digestion can be assessed. When we consider the functions; *Kledaka Kapha* can be correlated with the gastric mucus which is secreted by surface epithelial cells of gastric mucosal layer and cells of gastric glands. The functions of gastric mucus are to lubricate the food particle for the formation of chime and to protect the gastric wall.

The paper is intended to explore the physio anatomical aspect of *Kledaka Kapha* and its action as gastric mucus and its importance in digestion and metabolism of food.

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INTRODUCTION

The presence of *Vata, Pitta* and *Kapha*- the *Tridoshas* in human body is detailed by our *Aacharya*. The expression of its normalcy is well being and vitiation is disease. The integrated medicine of healing: *Ayurveda*; advises different preventive and curative practices to maintain the normalcy of the *Tridosha* in the body and thus keeping individual healthy. So the location, function and attributes of *Dosha* should be considered. As per this, each *Dosha* are divided into five.

Kapha, one among the three humors give unctuousness, stability, endurance and helps in binding the joints of body¹. The two root words from which the term *Kapha* is derived are 'ka' which means water and 'pha' which means flourishes. So the humor which originates from water is *Kapha*. The term can be defines as "*kena jalena phalatheeti Kapha*"- the product of water. It also helps to prosper. The total anabolic events in the human body may be correlated with *Kapha*, Potential source of strength of the body. The functions are fluid balance, nutrition, tissue binding, immunological and anabolic activities. There are several synonyms for this humor. They are *Sleshma, Bala, Valasa, valasaka, Ojus, soma* etc. the synonym *Sleshma* can be defined as "*slish alingane*" which means to embrace or keep together³.

Mala and *Papma* are the terms denoted when *Kapha* is vitiated. This denotes waste materials or disease as such.

The attributes of bodily humors represent the physiology. The *Guna* of *Kapha* are *Snigdha* (unctuousness), *Seetha* (cold), *Guru* (heaviness), *Manda* (dullness), *Slakshna* (smoothness), *Mritsna* (sticky), *Sthira* (firm/immobile), *Mridu* (softness), *Pichila* (sliminess), the color is *Swetha* (white). The normal taste is *Madhura* and *Lavana* in abnormalcy⁴.

The functions are of *Kapha* are *Snehana* (providing unctuousness), *Bandhana* (binding various structures of body), *Sthiratwa* (providing stability to the body), *Gaurava* (promotes bulk of the body), *Vrishatwa* (promoting virility and reproductive ability), *Bala* (promoting strength), *Kshama* (forbearance), *Drithi* (power of retention and understanding) and *Alobha* (greedlessness)⁵. *Ropana* is also a function of *Kapha*. The *Visarga Karma*, conservation of strength is done by *Kapha*⁶.

The locations of *Kapha* in the body are *Uras* (chest), *Kanda* (throat), *Sira* (head), *Kloma* (pharynx), *Parva* (joints), *Amasaya* (stomach), *Rasa Dathu* (fluids of body), *Medas* (fatty content of body), *Ghrana* (nose/ perception of smell) and *Rasana* (tongue/ perception of taste). In which the major seat is *Uras*⁷.

According to function and location it is divided into 5 namely *Avalambaka*, *Kledaka*, *Bhodaka*, *Tarpaka* and *Sleshaka*⁹. The one which is located in *Amasaya* is known as *Kledaka Kapha*. The present paper deals with the physio-anatomical aspects of the *Kledaka Kapha*.

Ayurvedic Review

Etymology

The word *Kledaka* means wetness or moisture⁹. It is the phlegm of the stomach or excessive *salaiva*¹⁰. In *sabdakalpa druma* it is told "*kledayathi sleshmaadi-bhirithi*".¹¹

Location

Ayurvedic classics have no disputes about the seat of *Kledaka Kapha*. It is located in *Amasaya*⁹. As further clarification, *Chakrapani* says that it is the upper part of *Amasaya*¹². *Susrutha* opines that it is above the seat of *Pitta* in *Amasaya*¹³.

Function

Peetham, *Leedam*, *Khaditham* and *Asitham* are the four mode of ingestion of food. *Amasaya* receives it and facilitates its easy digestion by the *Drava* and *Snigdha guna* of *Kapha* present in it.

So, the main function of *Kledaka Kapha* is in the digestion. *Amasaya* is the organ of the body where the major part of digestion process occurs. *Kledaka Kapha*, which is resides in *Amasaya* moistens the food particles and help in breaking down its complexity. This is thus the prime function of this *Dosha* to split the bolus of food and make into smaller particles, making the process of digestion easier.

The *Madhura veerya* of *Kapha* and its *Seetha guna* of *Kledaka Kapha* aids to protect the *Amasaya*. The seat of *Kapha* is situated above *Pitta*. The primary function of *Pitta* is heating in an upward direction due to *Tejo guna* and its *Urdwagaami* nature. On the other hand *Kapha* is endowed with a property of cooling. In this *Kapha* act as *Chandra* in relation to *Aditya (Pitta)*. Thus the cooling property of *Kapha* counter the heating property of *Pitta*. Hence *Kledaka Kapha* protects the *Amashaya* from being digested by *Pitta*.

By the peculiarity of its attributes, *Kledaka Kapha* enhances the location of all other *Kaphasthana* in the body. It improves other *Kaphasthana* by *Atmaveerya*. The *Kittapaka* of *Rasadathu* is *Malaroopa Kapha* which is secreted to *Amasaya* for the purpose of supporting digestion.

Action of Kledaka In Digestive Process

The food which has reached the *Jathara* is retained there for 2 to 3 hrs. Here quantity of *Kledaka Kapha* (mucin) and *Pachaka Pitta* (hydrochloric acid) increase considerably *Kledaka Kapha* in the beginning and *Pachaka Pitta* afterwards. *Kledaka Kapha* (mucin) breaks down the food material in to finer particles (*Bhinna-sanghata*), soaks it thoroughly and imparts the necessary fluid consistency (*Klinnata*) so that *Pachaka Pitta* can penetrate into every particle of food and bring about *Paka*. This phase of predominance of *Kapha* is called *Madhura-avastha Paka* and is the first phase of *Ahara Paka*. After this, the fraction of *Pachaka Pitta* which has increased by this time initiates the second

phase known as *Amla-avastha Paka* or *Shukta Paka*. The *Pitta* enters into the finer particles of food and brings about *Paka* in both its aspects - *Parinamana* (physical change) and *Pravritti* (chemical change). When *Amla-bhava* has reached its maximum, *Grahani-dwara Mudrika* (pyloric sphincter) opens allowing food to pass slowly into *Grahani*. Actions of two *Mudrika* and contraction of *Jathara* helps in increased production of *Kledaka Kapha* and *Pachaka Pitta* is stimulated by *Samana Vayu*¹⁴.

Hence *Kledaka Kapha* is having 3 main functions

- 1) Disintegration and moistening
- 2) Supports other *Kapha*
- 3) Protective function

Modern Review

The mammalian stomach is a specialized organ of the digestive tract that serves as reservoir of ingested food and process food for subsequent intestinal absorption. Gastric juice contains hydrochloric acid, one of the most corrosive acids known. The gastric acid is capable of dissolving zinc and is deadly to cells. Yet in the stomach, hydrochloric acid ordinarily acts only to perform the useful functions of killing ingested bacteria, softening fibrous foods, and promoting pepsin production. The corrosive juice is prevented from attacking the stomach wall by a complex physico-chemical barrier termed the gastric mucosal barrier (GMB).

The presence of acid in the stomach results in small acid back-diffusion into the mucosa in exchange for Na^+ ions that define the permeability characteristics of the gastric mucosa. The gastric mucosal surface, which is covered by a mucus gel, secretes bicarbonates into this adherent mucus layer to neutralize luminal H^+ ions diffusing towards the mucous epithelial cells. This prevents their damaging action. Tight junctions between adjacent epithelial cells, constant secretion of mucus- HCO_3^- produce a continuous protective "blanket" of 200-300 μm thickness on their surface and abundant blood flow in the mucosa form together, "the mucosal barrier"¹⁵.

The gastric mucous membrane is described as being disposed in three regions, known as the cardiac, fundic, and pyloric. These regions, although distinguished from one another by definite microscopic characters, yet merge gradually the one into the other, so as to present no well-defined lines of demarcation. The barrier cannot be defined on a strictly anatomic basis, but is rather a collection of interdependent physical and chemical processes that act in concert to protect the gastric mucosa against secreted acid and pepsin¹⁶.

Gastric glands

In the surface of gastric mucosa, the lining cells are called surface epithelial cells which occupy the surface in between the gastric glands, secrete: (1) mucus and (2) some bicarbonate rich(alkaline) secretion and the alkaline mucus has a strong role in preventing auto digestion of the gastric mucosa by the acid pepsin mixture (APM).

When the stomach is empty the thick gastric mucosa is thrown into numerous longitudinal folds

called as Rugae. These rugae will be disappeared once when the stomach become full. Thick viscid mucus (about 2mm thick) normally lies over the mucosa of the stomach.

The gastric mucosa is divided into three areas

1. cardiac glandular areas (occupying the cardiac region)
2. oxyntic glandular areas (occupying the body)
3. pyloric glandular (occupying the pyloric region) areas.

Cardiac glandular region contains cardiac glands which secrete mucus. Oxyntic glands are the most important and most numerous of the gastric glands. Several oxyntic glands open by a common opening called gastric pit, into the lumen of the stomach. Each glands contains several type of cells

1. mucous neck cells found in the neck region, secreting mucus,
2. parietal or oxyntic cells, secreting HCL and intrinsic factor(IF) and
3. peptic or chief cells, which contain zymogen granules, secrete pepsinogen-the precursor of pepsin.

Mucus produced by surface epithelial cells is viscid whereas that produced by the mucous neck cells is thin.

Function of gastric mucosa

The gastric mucosa is exposed to two kinds of injury:

1. Mechanical injury due to rubbing of food stuffs, and
2. Auto digestion of the gastric mucosa by the APM.

Protection Against Mechanical Injury

The thick viscid mucus which coats the mucosal epithelium gives a mechanical protection. Further, in spite of this, in some areas of the mucosa, the mucus may be removed and the underlying epithelium damaged. But, due to continuous production of mucus by surface epithelial cell and gastric movements the spot again becomes covered by mucus. Mucus is a combination of mucin (a glycoprotein) and water.

Protection Against Auto digestion

The gastric mucosal surface epithelium secretes

1. Mucus, and
2. HCO_3^- ions.

The viscid mucus overlies the gastric mucosa and as it does not move or get stirred easily, it is called the unstirred layer. Entrapped within this unstirred layer of mucus are HCO_3^- ions. In gastric lumen, the pH is about 2.0 so that pepsin is active and can digest the food protein. But in the region, where the viscid mucus is adjacent to surface epithelial cells, the pH is about 7.0 because:

1. The HCL cannot penetrate the unstirred layer rapidly
2. The HCL which does penetrate the viscid mucus, reacts with HCO_3^- to produce CO_2 and thus the pH rises.

Gastric mucosa is daily exposed to the potential ravages of acid and pepsin, a wide variety of potentially damaging agents that include certain foods, a range of temperatures, hyperosmolar and abrasive substances,

chemical damage from refluxed bile and pancreatic juice, as well as to bacterial toxins and a variety of potentially damaging drugs. Some damage is inevitable under these circumstances, yet the gastric mucosa normally retains its integrity even under these attacks.

At pH 7.0, the pepsin becomes inactive and therefore, the mucosal epithelium remains unharmed¹⁷.

DISCUSSION

The three forces which can be recognized in the external world are *Soma* (moon or water), *Surya* (sun) and *Anila* (air) with their actions *Visarga*, *Adana* and *Vikshepa* respectively. Similarly the body is maintained by three humors viz. *Kapha*, *Pitta* and *Vata* having the same qualities and actions respectively¹⁸.

The *Kapha* that which located in the *Amasaya* viz. stomach is known as *Kledaka Kapha*. *Kledaka* name is given to the *Kapha* which is present in *Amashaya* because it moistens the food. The substance which is secreted into stomach and with physical characteristics similar to *Kapha* is gastric mucus. Mucus is composed mainly of water, electrolytes and a mixture of several glyco proteins.

According to *Acharya Susruta Amasaya* is above *Pittasaya* where as *Chakrapani* explains the *Kledaka* is the upper part of *Amasaya* i.e., *Urdhwamasaya* and lower part (*Adhomasaya*) is the seat of *Pitta*¹⁹.

Kledana karma: The food particle which reaches *Amasaya* is lubricated by *Kledaka Kapha*. The food molecules are liquefied by gastric mucus in stomach. Hence the function of *Kledaka Kapha* and gastric mucus are same.

Bhinna Sanghatha: both *Kledaka Kapha* and gastric mucus disintegrate the food particles by loosening it.

Chandra iva aditya: *Kledaka* is situated in the *Urdhwa Amasaya* and *Pitta* which is in *Adhoamasaya*. As the *Pitta* is *Urdwagami* there are chances of *Amasaya* being digested by it. *Kledaka Kapha* provides a protection against this auto digestion as its qualities opposes that of *Pitta*. Gastric mucus protects the stomach wall from being digested by strong acids.

Mucus layer on gastric surface forms a mucosal barrier to damage against several forms of potential injury to the gastric mucosa¹⁷.

1. A gel 0.2mm thick; 80% CHO; 20% protein
2. Secreted by neck cells, surface epithelium
3. Can be cleared by pepsin, so continual production is required
4. Release is stimulated by acetylcholine from nerve endings
5. Also rich in bicarbonate
 - a. HCO_3^- content creates a "micro-environment" around surface cells to prevent acid damage
 - b. HCO_3^- secretion is inhibited by adrenergic input (prominent in stress)

Thus the property of *Kledaka Kapha* in complimenting the other *Kapha Sthana* of the body by helping initial stages of digestion and protecting the stomach can be understood.

How the pH is Maintained in Acid Exposure?

Studies have undergone in human and animal models on the pH of gastric mucosa and its action in auto-digestion. The pH gradient in the mucus gel restrains back-diffusion of luminal acid. The existence of the pH gradient is made possible by bicarbonate transported by the blood flow from the acid secreting parietal cells to the surface epithelium, where a DIDS (4'-diisothiocyanostilbene-2,2'-disulfonic acid)-sensitive bicarbonate transport through the epithelium occurs. Prostaglandin-dependent bicarbonate secretion seems to be less important in maintaining a neutral pH. Of the mucus gel layers, only the firmly adherent one is important for the pH. Accordingly, the pH gradient is found in the 80µm thick mucus gel layer closest to the mucosa. Secreted acid penetrates the mucus gel through specific channels only. Thus, a pH gradient with a neutral pH can still exist during acid secretion. Gastric mucosal blood flow increases on application of strong luminal acid²¹.

Breaking the mucosal barrier represents an initial step in the process of mucosal injury with a subsequent cascade of liberation of histamine and histamine-like substances, overt mucosal bleeding, acute gastritis and several other disorders associated with it.

Similarly the pathology of gastro intestinal diseases in Ayurveda such as *Grahani roga* also shows derangement of *Kledaka kapha* along with *Pachakagni* and *Samana vayu*.

CONCLUSION

- *Kledaka Kapha* is anatomically located in *Urdhwamasaya*.
- It can be considered as gastric mucus which is secreted by surface epithelial cells of gastric mucosal layer and cells of gastric glands.
- The functions of gastric mucus are to lubricate the food particle for the formation of chime and to protect the gastric wall.
- *Kledana* is the basic function of *Kledaka Kapha*. Along with it, causes *Bhinna Sanghatha* (disintegration of food particles) and *Chandra iva Aditya* (protection of stomach wall).
- Hence the functions and locations of *Kledaka Kapha* can be correlated with that of gastric mucus.

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Cite this article as:

Aneesh.T, Archana Madhavi, Swati.S.Badekar. The Physio Anatomical View of Kledaka Kapha AYUSHDHARA, 2016;3(3):694-697.

Source of support: Nil, Conflict of interest: None Declared