A Conceptual Study on Ayu Hraas Krama (Gradual biological decline)

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Abstract

The classics have categorised *Vayas* into *Baalya* (undeveloped), *Madhya* (developed) and *Vruddha* (degenerative) *Avasthas*, they have observed changes occurring during growth and the initiation of decrement of certain faculties of the body. *Acharya* Vagbhatta was the first one to record such an observation which was followed later by *Acharya* Sharangdhara. *Acharya* Vagbhata and *Acharya* Sharangdhara have given the concept of '*Ayu Hraas Krama*.' In consonance with this, different components of human body decrease in different decades of life. Both the Acharyas have presented an interesting scheme for loss of different biological factors during the lifetime, in the process of ageing in different decades. An attempt regarding establishing a relation between *Ayu hraas krama* with sequential biological loss with ageing has been established in the article.

Keywords: Aging, *Ayu hraas*, *Medha*, *Vaya*

Introduction

Ayu Hraas Krama can be understood as ageing with sequential loss of biological factors at different stages of *Vaya*. Entire system, organs and body tissues of human being do not remain same all over the lifetime. Some changes always occur with aging, they occur at

different rates and to different extents. According to *Acharya* Gangadhara Ray, every substance that is in their *Parmanu* or *sukshma roopa* is *Nitya* and in *Karya Roopa* or in the effect form is *Anitya* [1]. From this concept it is understood that all organs, tissues etc are in their effect form are Anitya or degradable. To understand this degradation, the concept of *Swabhavouparamvada* can be taken into consideration. According to this *Siddhant* there is a cause behind dhatu *saamya* and dhatu *vaishamya*, but there is no cause in their destruction or degradation. In the same manner the destruction of body *Dhatus*, organs and tissues are a natural phenomenon. Aging, progressive physiological changes in an organism that lead to senescence, or a decline of biological functions and of the organism's ability to adapt to metabolic stress [2]. Aging takes place in a cell, in an organ, or in the whole organism with the passage of time. It is a process that goes on over the entire life span of any living being. To understand this ageing process *Acharyas* has done various researches regarding 'which element of body starts to decrease at which stage of *Vaya* (lifetime) thousands of years ago. Hence, *Acharya* Vagbhata and *Acharya* Sharangdhara have given the concept of *'Ayu Hraas Krama*.' In consonance with this, different components of human body decrease in different decades of life. The discernment of this decadence of body components can be done by the theory of *Parmanuvibhaga* [3] (degradation of body elements). According to *Acharya* Sharangdhara the components that decrease with age are *Baalyam, Vruddhi, Chhavi, Medha, Twak, Drushti, Shukra, Vikrama, Buddhi, Karmendriya* and *Chetas* [4]. These components can also be correlated with different organs and tissues. The cessation of this degradation cannot be done because it is a natural process but, in some ways, it can be delayed with the use of different *Rasayanas* at different stages of component decrement.

Literature Review and Contemporary Review

Ayu Hraas Krama that is sequential loss of biological factors includes different human body factors as stated by different *Acharyas*. Here in the table is given the list of all factors and the age at which these factors start to decline.

List of factors and the age at which these factors start to decline

Decades	Year	Loss of tissue

		Vagbhata [5]	*Sharangdhara*
First	1-10	*Balyam*	*Balyam*
Second	11-20	*Vruddhi*	*Vruddhi*
Third	21-30	*Prabha*	*Chavi*
Fourth	31-40	*Medha*	*Medha*
Fifth	41-50	*Twak*	*Twak*
Sixth	51-60	*Shukra*	*Drushti*
Seventh	61-70	*Akshi*	*Shukra*
Eighth	71-80	*Shruta*	*Vikrama*
Ninth	81-90	*Manas*	*Buddhi*
Tenth	91-100	*Sarvendriya*	*Karmendriya*

After a thorough study the factors of *Ayu Hraas Krama* which are told by *Acharyas* can somehow be correlated with body organs and their functions that start declining at a certain age.

1. *Baalyam* (childhood phase): -

Vaya or age is classified in three divisions- young, middle, and old age [6]. The young stage is again classified viz. immature stage and mature stage. The immature stage lasts up to 16 years of age and mature stage lasts up to 30 years of age. In pursuant to this classification the immature stage can be interpreted as childhood phase during which various organs of the body are not well developed and *Dhatu, Indriya, Ojas* are in their growing stage. *Balyavastha* (childhood phase) is a *Kapha* dominant stage, wherein the functions of *Kapha* are increased in the body that's why growth and development is faster in this stage in comparison to the other stages. The growth implies increase in mass and size, which results by cleavage and synthesis of protoplasm with cell and intracellular fluid which are specific tissue components.

Besides this there are some features which are only limited to *Baalyavastha* or childhood phase and after the completion of this stage the growth rate and other traits start declining. These Characteristics are like immature *Dhatus* (Tissues), *Indriya* (senses) and *Ojas* (Immunity), *Ajatavyanjana* (not any sign of primary and secondary sexual characters), *Sukumar* (soft and tender in nature), *Asampoorna Bala* (incomplete strength) and *Klesh Asahishnutwa* (can't tolerate the difficulties) [7].

2. *Vrudhi* (growth and development)

Growth refers to the increase in mass and size of a body or organs. It typically occurs through the multiplication of cells and an increase in intracellular substance whereas Development refers to the physiological and functional maturation of the organism. It also refers to the increase in capacity and skill to effectively function. Growth is an essential feature of life that distinguishes Childhood and Adolescence phase from an adult. The process of growth starts from the time of conception and continues until the child grows into a fully mature adult. *Acharyas* have stated different factors that influence the growth and development of a person from before birth to after birth till maturity stage, these factors are- *Shukra* (semen), *Aartav* (ovum), *Garbhashaya* (uterus), *Panchmahabhuttas* (five physical elements – earth, water, fire, air and aether/space), *Garbhini Paricharya* (actions of a pregnant lady), *Garbha-upghatkara* bhava (harmful factors for a pregnant lady), *Garbha Poshana* (nutrition of a foetus) and *Sharira Vruddhikara Bhava* (factors influencing the growth of a person)- *Kaalyoga* (time), *Swabhava samsiddhi* (innate potentiality), *Aahar Saushthav* (nutritious and balanced diet) and *Avighata* (protection from trauma). *Acharya* Sushruta has classified the *Vaya* in 4 parts that is- *Vruddhi* (Growth phase), *Yovan* (Phase of youthfulness), *Sampoornata*(Maturation Phase), *Haani* (Phase of slow regression). Through this classification, the major growth is completed up to 20 years though *vruddhi* is continuing in later phase also but after the second decade it starts decreasing subsequently. The reason behind this is that the rapid growth shoot which occurs at the time of puberty is due to growth hormone androgen and oestrogen and subsequent cessation of growth is due in large part to closure of epiphysis by oestrogen so, the complete growth of the body is achieved by mid-twenties.

3. *Chhavi/Prabha* (Lustre)

The *Chaya* (shadow) circumscribes the complexion of the body whereas the *Prabha* (Lustre) illuminates the complexion. The shadow can be observed from nearby whereas the lustre or

Chhavi illuminates from the distance [8]. With the Ageing process *Chhavi* or *Prabha* or lustre loss begins to take place at the age of 30s, reaching a peak in 40s and deep wrinkles are increasing in the 50s (*Tvaka Hani*).Wrinkles are formed and promoted by both internal and external factors. Internal factors include aging, changes in the endocrine system, nervous system, and hereditary factors. External factors include exposure to UV rays and the oxidation or drying associated with UV exposure. In the aging process of skin, oxidative damage in cells and tissues caused by a disturbance in the balance between the productions of reactive oxygen species (ROS) and the natural antioxidant defences. In the skin, free radical damage can cause deterioration of the stratum corneum and supportive connective tissue, resulting in decreased elasticity and resilience. It affects the skin through wrinkling, scaling, dryness, and mottled pigmentation which is a type of *Prabha Chavi Hani* [9].

4. *Medha* (Intellect)

Medha is the power of retention of the knowledge [10] or cognitive ability to understand and assimilate the scriptures [11]. *Jara Avastha* is the predominant stage of *Vata* having nature of distraction and *Swabhava* i.e., *Uparam* of *Shareera* is a natural condition, both reasons are responsible to reduce normal functions. In context of *Medha Hani*, *Vata Dosha* will be increased by its *Ruksha*, *Sheetadi Gunas*. Influences of *Vata Dosha* over *Rajas* cause *Rajas Vridhhi* and consequently *Manoanavasthanata*. Again, it leads to *Medha Hani*. With ageing physical as well as cognitive changes occurs in brain. Physical changes include shrinkage of different brain parts, white matter and grey matter, declination of neurotransmitters and blood supply to brain also decreases with age. These all-physical changes induce the cognitive changes like decline in performance of cognitive tasks that require one to quickly process or transform information to decide, including measures of speed of processing, working memory, and executive cognitive function. Memory and intelligence decline also occurs with age. There are two types of intelligence that is fluid intelligence & crystallized intelligence out of which the fluid intelligence starts to decrease after the age of 30's or 40's that's functions are correlated with *Medha* and the crystallized intelligence whose functions are correlated with *Buddhi* tends to increase up to adulthood and starts to decrease after late adulthood (after 70's or 80's).

5. *Twak* (skin)

Skin is the first organ or layer of face and body. It reflects the *Prabha* (lustre) and *Chaya* according to individual's health/body inner environment. It is an Indriya. Sensation and

response are governed by *Tvak* (Skin). It remains the largest organ of the body. Healthy skin displays the healthy environment of body. As time passes skin get involved in the aging process and the most visible signs of aging skin then observed are dryness, wrinkles, atrophy, laxity, sagging, blemishes and sparse grey hair. Symptoms of chronological aging include dry and thin skin, fine wrinkles, abnormal blood vessels, age spots, benign and malignant skin tumours due to the deterioration of the skin immune system. Development of fine wrinkles begins to take place at the age of 30s, reaching a peak in 40s but tending to rather decrease from the 60s and over, deep wrinkles are increasing in the 50s.

6. *Drushti* (vision)

Just as our physical strength decreases with age, our vision also grows weaker as we grow older - particularly after 60 years of age. After sixth decade Drishti starts losing. As an individual grows older, the lens grows larger and thicker and becomes far less elastic, partly because of progressive denaturation of the lens protein. Therefore, the ability of the lens to change shape progressively decrease with the age. This makes it harder for your eyes to focus on near objects than when you were younger. As we age, the gel-like vitreous inside the eye begins to liquefy and pull away from the retina, causing "spots and floaters" and (sometimes) flashes of light. This condition, called vitreous detachment, is usually harmless. But floaters and flashes of light can also signal the beginning of a detached retina- a serious problem that can cause blindness if not treated immediately.

7. *Shukra* (reproduction power)

The activity of sperm, sperm count and sperm quality reduces with age. It is also found that Leydig cells are less responsive to gonadotropin stimulation in elderly males (>65 yrs. of age) as compared to younger males (<50 yrs. of age). The pulsatility and amplitude of GnRH and subsequently LH secretion decreases as men age [12]. Testosterone hormone level also decreases with age, producing signs and symptoms like reduced sexual desire and activity, Infertility, Height loss, low trauma fracture or low bone mineral density, Hot flushes, or sweats, decreased energy, motivation and confidence, depressed mood, and poor concentration etc.

8. *Vikrama* (physical strength)

Normal ageing is characterised by a decrease in bone and muscle mass and an increase in adiposity, reduction in muscle strength. These leads to risk of fractures, frailty, reduction in the quality of life and loss of independence, loss of physical functioning. The muscle wasting

in frail older persons is termed 'sarcopenia.' This disorder leads to a higher incidence of falls and fractures and a functional decline. Functional sarcopenia or age-related musculoskeletal changes affect 7% of elderly above the age of 70 years, and the rate of deterioration increases with time, affecting over 20% of the elderly by the age of 80. Strength declines at 1.5% per year, and this accelerates to as much as 3% per year after 60 years of age [13].

9. *Buddhi* (wisdom/decision making power)

Buddhi is the power of forming and retaining the conceptions and general notions, intelligence, reason, intellect, mind, discernment, judgement [14]. According to *Acharya* Chakrapani *Buddhi* gives an initiative to a work and come to conclusion after proper analysis (decision making). The functions of *Buddhi* can be correlated with the prefrontal cortex and the hippocampus; these are the parts of human brain that mainly do the decision making. For the functioning the mutual communication between PFC and hippocampus occurs through neural connectivity by Neurotransmitters. With ageing the Neurotransmitters like dopamine and serotonin that helps in the neural connectivity, they also start to decline with age at the rate of 10% per decade after early adulthood. Besides this the fluid cognitive ability (such as working memory, attention, and executive control) decreases linearly across adulthood, crystallized ability (such as domain-specific knowledge) increases non-linearly and begins to level off in late middle age. So, when a decision requires high fluid ability and low crystallized ability, younger adults should outperform middle-aged and older adults and when a decision instead requires low fluid ability and high crystallized ability, however, older adults should outperform middle-aged and younger adults. The fluid intelligence peaks in adolescence and begins to decline progressively. And the crystalized intelligence continues to grow throughout the adulthood thereafter decline in old age. So, the crystalized cognition can be correlated with the functions of Buddhi that starts to decline after 80's or 90's.

10. *Karmendriya* (Work senses)

The *Karmendriya* or five work senses are *Vaka* (speech), *Paani* (Hands), *Pada* (feets), *Payu* (Anus) and *Upastha* (genitals). The functions of *Karmendriya's* are Speaking, Grasping, Moving About, Excreting and Sexual Activities are the Soul's Powers of responding to and interacting with the external world. With ageing the deterioration of functions of all work senses occurs may be due to the degeneration of neurons that transmits signals to brain for any activity. Due to temporal changes in ageing mainly speech rate and articulation rate is

affected. It has been found in a study that speakers of 80+ age produced pauses more often than speakers between 60 and 79 [15]. Deterioration in movements of extremities in the elderly population is because of age-related degenerative changes in the musculoskeletal, vascular, and nervous systems, local structural changes (joints, muscle, tendon, bone, nerve and receptors, blood supply, skin, and fingernails) and more distant changes in neural control. Sluggish bowel movements leading to constipation, incontinence of faeces and urine due to reduced tone of sphincters are well acknowledged. These signs may sometimes also be associated with degenerative changes in CNS. Considerable downfall in Gonadal endocrinal activity leads to lack of Libido, sexual drive and penile erection in male and menopause and vaginal atrophy in women. In addition, reduced tone in pelvic musculature in women and prostatic hypertrophy also add to the hampered reproductive system in aged.

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