

THEORIES OF SKIN AGING IN AYURVEDA AND CONTEMPORARY SCIENCE

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ABSTRACT

Ayurveda is a holistic science, believed in total health from internal as well as outer naturally; everyone could stay young, healthy and energetic to an extent of time. One branch of *Astang Ayurveda* especially dedicated to remain healthy concept is *Rasayan Tantra* describes aging with great details. There are many theories regarding the aging. In classical science *Vata* dominance *purush*, regular use of *gramya ahara*, excess exercise and *vihara*, *sahaja* theory, *rasa vikriti*, *oja kshaya* and *sarva dhatu vyuhakara* decline the life span and appear early aging. According to modern science there is Telomerase theory, error theory, free radical theory, age pigment theory, wear and tear theory, gene mutation theory, cross linkage theory and enzyme impairment theory decline the life span and appear early aging. The *Rasayana* treatments improve our biological age, rejuvenate the body and the mind along the skin. This review provides Ayurvedic and contemporary perspectives on theories of skin aging.

Key words: *Aging, Rasayana, Skin, Dhatuvyuhakar.*

INTRODUCTION

Today's culture is so obsessed to look young, hair dyes, botox, viagra, wrinkle free creams to a plethora of surgical procedures, the race is on to remain forever young. We are bombarded daily with images via magazines, billboards, television and the internet all about the look and the image of young adult, year 2011 alone, Americans spent 10.4 billion dollar on cosmetic surgery. Annually >1.2 billion dollar is spent annually on liposuction, \$800 million on hair transplants and 11 billion dollar on vitamins and supplements in all these cosmetics more money and concern is spent on skin to look healthy and younger.¹

Aging is a universal and inevitable process that probably began with the origin of life. Accumulation of the diverse deleterious changes produced by aging throughout the cells and tissues progressively impairs function and can eventually cause death. In *Sharangdhar Samhita* a sequential degenerative phases of ten decades in normal 100 year life span² in which two decades clearly are the indicator of skin condition third *chavi* (loss of luster or fine wrinkles due to *Shoshana*/inability to get proper nutrition) and fifth *tvak* (loss of skin glow due to *Dhatukshaya*/degenerative changes due to increased *Vata*) thus 30-50 years of age is seen related to degenerative changes of skin.

There are different ways of measuring age, chronological age, which measures how many years have passed since the birth of a person; and then there is the biological age, which tells us about the health condition of the cells, tissues, body, and the mind of a person. Biological age estimates the functional status of an individual in reference to his or her chronological peers on the basis of how well he or she functions in comparison with others of the same chronological age.³ In effect, chronological age tells us how long we've been alive, and the biological age tells us how long we've got left. Thus Rasayana treatments in *Ayurveda* and other rejuvenative processes help us to improve our biological age and rejuvenate the body and the mind.

Aging changes can be attributed to development, genetic defects, the environment, disease and an inborn process.⁴ Gray-ing population is one of the most significant characteristics of the twentieth century and quite often the first quarter of the twenty first century is going to be called as 'The age of Ageing'. According to the United Nations, the number of people of 60 years or older will increase to 1 in 10 currently to 1 in 5 by 2050. By 2050, the ratio of people aged 65 years or older to those aged 15–64 years will double in developed nations and triple in developing nations. Aging of population is an end product of demographic transition. This demographic shift compels us to confront the changes associated with aging.⁵ The contemporary concept of wellness includes health, fitness with beauty and anti-aging treatments have become in US \$1 trillion business by 2010. According to Euromonitor International's recent Industry report, today's consumers clearly prioritize age-prevention above any other category of

cosmeceuticals (topical cosmetics). Hence the naturals and wellness segment basically targets consumers in the 35–55 age group for anti-aging which is also may be said age of skin aging as discussed above, and even teens who want to postpone the aging process.⁶ In between all materialistic worlds *Ayurveda* has a sound philosophical and experiential basis.⁷ Atharvaveda, Charak Samhita and Sushruta Samhita are its main classics, giving detailed descriptions of over 700 herbs. *Ayurveda* has several formulations for management of aging and related conditions in one of the branch of *Astang Ayurveda*. Its literature describes over 200 herbs, minerals and fats to maintain and enhance the health and beauty of the skin.⁸

Aging:

The urge to live, the fear of death, the desire of youth, the distaste for old age and the quest for rejuvenation have always interested mankind from antiquity to modern times. Everyone wants to stay young forever but have to face inevitable phase of life *viddhavastha* or old age because of the natural occurring aging process. Aging is not a disease. It is a slow and natural process through which an adult individual passes after certain age. It is a universal, inevitable, continuous, complex and dynamic process that begins with birth and end with death and lead to decreasing ability to survive stress, increasing functional impairment and growing probability of death. According to *Ayurveda* aging is an inevitable *Swabhava* of living being which is hallmarked with involution of the organism manifesting with a set of biological features and incapacities. Aging can be divided of three types- Chronological age (number of years lived), Biological age (age by body function) & Psychological age (age how individuals feels it).

The commonly understood meaning of aging is showing the effects or characteristics of increasing age but biological age does not correlate with chronological age. In fact there is no reliable measurement for determining biological age. Here Biological age is the area where *Ayurveda* gives miraculous effect.

Skin:

Skin is the first organ or layer of face and body. It reflects the *prabha* (luster) and *chaya*⁹ according to individual's health/body inner environment. It is an *indriya*. Sensation and response is governed by *tvaka* (Skin). It remains the largest organ of the body. Skin is the mirror of health because the foremost health impairment is seen in skin as *Prabha* and *Chhaya*. Healthy skin displays the healthy environment of body. As time passes skin involve in the aging process. The most common amongst visible signs of skin aging are wrinkles and in the search of youthfulness and to stay young most people proceed to various harmful chemical and surgical therapies. In this quest of stay young forever *Ayurvedic* cosmeceuticals is back into trend. Modern research trends mainly revolve around principles of anti-aging activity described in *Ayurveda*: *Vayasthapana* (age defying), *Varnya* (brighten skin-glow), *Sandhaniya* (cell regeneration), *Vranaropana* (healing), *Tvachya* (nurturing), *Shothahara* (anti-inflammatory), *Tvachagnivardhani* (strengthening skin metabolism) and *Tvagrasyana* (retarding skin aging).

Theories of Aging:

Aging is known as "*Jara*" defined as to become old by the act of wearing out "*juryati iti jara*". It is synonym as "*vardhakya*" meaning increasing age.¹⁰ Human life has three phases *Balya* (young), *Madhya*

(middle) and *Vridhdha* (old).¹¹ In middle age biological aging is best characterized by progressive constriction of the homeostatic reserve of every organ system. The decline often referred to as homeostasis of Skin is evident by the 3-5th decade and is gradual and progressive with *tvak hani*, although the rate and extent of decline vary. The main causative factor for natural aging is vitiated *Vata* which in turn affects compactness of the body. Other theory of natural destruction is *Svabhavoparamvada* (Self destruction by unknown cause). *Ayurveda* has theories for aging which are very much comparable to modern concepts.

The process of senescence begins as naturally *Vata* attains provocation and the process of aging is genetically determined according to *Ayurveda*.

a. Sahaja Theroy:- *Chakrapani* opines that the time of onset of natural aging varies from individual to individual. It may be delayed in persons having the feature of *Deerghayu* (long life span), whereas early in persons having the features of *Madhyamayu* (medium life span) and *Avarayu* (short life span)¹² *prakriti guna sampat* i.e. constitutional compactness is one of the prime factor required to achieve long life span, which is genetically determined in *Chakrapani Tika*.¹³

Charaka had explained about *Sarvadhatusa- ra* may be called compactness of body tissue is another condition where the onset of aging will be delayed is called as *Manda jara*.¹⁴ The onset and progress of aging depends on factors like *prakriti* (individual's constitution) and *sara* (compactness of body tissue) which are genetically predetermined according to *Ayurveda*. Hence the process of aging can be considered as a genetically

predetermined entity. *Sahaja* theory seems to be similar to that of programmed aging theory as explained by modern aging. It suggests that aging as a predetermined presumably genetic, age related alteration cellular function that leads to susceptibility to disease and death.¹⁵

As earlier said *Vata Dosha* is responsible for proper functioning and main cause for aging. In early age or the age when it is not aggravated its *Prakrita* functions are *Sarva Dhatu Vyuhakarata* (Providing compactness to body tissue by required nourishment)¹⁶, *Dosha Dhatu Agni Samata* (Maintaining state of vitiating factor, tissues & metabolism)¹⁷, *Sharira* and *Manas Kriya* (Keeping the body and mind in appropriate functional status)¹⁸, *Ayu Anuvrittikara* (Maintaining the body elements in normal physiological condition)¹⁹ after certain age passes *Vata* vitiates naturally and sets in the molecular program of cellular senescence in different organs at different time.

b. Impaired Sarva Dhatu Vyuhakarata-

The vitiated *Vata* gradually became unable to provide the compactness to the body tissues because of faulty assessment of the type of nourishment which is required to the cells. Hence it brings out the vitiation of *vikrita dhatu* i.e. defective cells, while ultimately resulting in cellular senescence.

c. Rasa Shoshana (Error in nourishing elements) –

The skin of an individual is a critical indicator of the body's nutritional status. Bhavamishara²⁰ and Susruta²¹ explained that the middle age vitiated *Vata* bring the *shoshanata* in *poshaka rasa* i.e. errors in nourishing elements which results in inadequate nourishment to the tissues and leading to improper cell formation resulting in cellular senescence.

d. Dhatu Asamata-

Sushruta explained that senescent cells (*Paripakva shariratva*) have decreased capacity for uptake of nutrient to repair of cellular damage.²² Dalhana commentary on this, adds that under this state nourishment will be inadequate and only maintains minimal cellular functions.²³

e. Agni Asamata-

Charaka explained that functional condition of *Agni* is digestion and metabolism. It is responsible for *Ayubala*.²⁴ It kept the body and mind under functional state. As middle age passed naturally *Agni Mandhyata* occur which results in improper cellular formation (*Vikrita Dhatu*) by improper digestion and metabolic activities, which ultimately resulting in cellular senescence.

f. Oja kshaya-

Oja is responsible for *Sharira Sthairya* i.e. compactness of body elements by providing adequate nutritional defense against body element, *Ojas* is nourished by *Anna Rasa*.²⁵ In old age *Agni Kshaya*, *Dhatu Kshaya* and errors in nourishing elements leads to the state of *oja kshaya* i.e. inadequate nutritional defense against body elements that leads to the molecular & cellular injury, exceeds their repairs capacity and further accelerating the aging process ultimately ending in death.²⁶

DISCUSSION

There is several aspect of explanation of skin aging. The skin represents body health. *Rasa dhatu* represents skin status. *Twaka* is a *updhatu* of *mansdhatu*. Skin texture is governed by the genetic constitution, diet, behavior and environment. In old age *Vata Dosha* is dominant and it decline the skin shining and texture. In *Balyavastha* and *Madhyam Ayu* skin remains glow and

smooth. According to Sharangdhara *twak* are going to decay in 41 to 50 years of age. This is normal phenomenon and represents aging.

According to modern science several theories were proposed for description of aging. There is some genetic theory for aging process. In 1959 L. Szilard proposed that aging is due to random mutations which destroy genes and cause loss of chromosomes of somatic cells. Specific genes guide synthesis of specific proteins. Aging may be due to the failure of the organism to maintain the activities of genes, required for the reproductive and adult phase. Errors in genetic transcription & translation results in impaired protein synthesis and deterioration in cell function.

Non-genetic theories based on the possibility that the balance of ongoing damage and repair is disturbed. In error theory, states that errors in amino acid sequences of enzymes like RNA polymerase and aminoacyl t-RNA synthetase which are responsible for protein synthesis, such mistake may amplify the production of wrong proteins which on reaching critical levels makes the cell function hampered.

Endogenous oxygen radicals are generated continuously in cells in the metabolic process results in a pattern of cumulative damage. The burden of reactive oxygen species (ROS) production is largely counteracted by an intricate antioxidant defense system that includes the enzymatic scavengers superoxide dismutase (SOD), catalase and glutathione peroxide and a variety of other non-enzymatic, low molecular mass molecules are important in scavenger the ROS. These includes ascorbate, pyruvate, flavonoids, carotenoids and perhaps most importantly glutathione. The antioxidant defense mechanism decreases as age increases

and resulting in arise of inter cellular oxidant levels has two potentially important effects. Damage to various cell components and Triggering of activation of specific signaling pathways both of these effects can influences the numerous cellular processes linked to aging and to development of age related disease.

Human growth hormones produced in the pituitary gland decreases in about half of all adult with passage of time. The decline of GH seems to plays a role in the aging process. Enzyme can decreases or increase in activity and some do not change with age. Some enzymes like acetyl cholinesterase (AChE) of the brain, whereas Gamma amino butyric acid (GABA) and glutamate stimulate it, these effects decrease significantly in old rats. AChE maintains the level of Acetylcholine (ACh).

The rate of protein synthesis is good index of the activity of cells. Collagens the extra cellular protein of connective tissue constitutes about 30% of the total proteins of the body and play important role in nourishing the cell. It becomes insoluble due to increasing number of cross linkers and prevents the flow of nutrients to cells. During the aging of animals, accumulation of age pigment occurs which is also called as lipid fusion in the cytoplasm of non-dividing cell like neurons, cardiac and skeletal muscles and also in connective tissue cells. The pigment may arise by metabolic disturbance such as interaction of oxidants with polyunsaturated fatty acids. J. Bjorkdten proposed that aging is due to cross linking of macro molecules, nucleic acid and proteins, which are vital for cell function. These are gradual decrease in the number of antibody producing cells and hence the defense mechanism decreases with age.²⁷

Skin Aging:

Skin aging is a complex process determined by the genetic endowment of the individual and the environmental factors.²⁸ The most visible signs of aging skin are dryness, wrinkles, atrophy, laxity; sagging, blemishes and sparse gray hair.²⁹ Symptoms of chronological aging include dry and thin skin, fine wrinkles, abnormal blood vessels, age spots, benign and malignant skin tumors due to the deterioration of the skin's immune system. Intrinsic skin aging is determined primarily by genetic factors and hormonal status. Photo aging is a separate process and largely involves damage to the collagen and the elastic fibers in the skin. The deleterious effects of solar radiation on dermal connective tissue leads to visible manifestations of photo aging termed as premature aging. The UVB rays directly interact with the DNA of the cutaneous cells whereas the deleterious effects of UVA are principally due to the formation of free radical oxygen, which result in an alteration in the nuclear and also mitochondrial DNA and also an activation of enzymes, metalloproteinase, capable of damaging the extra cellular matrix.^{30,31}

In reference to *Twaka*, *Avabhasini* is the outermost layer, reflects the complexion and the quality of the *Rasa Dhatu*. It also acts as a mirror as it indicates whether the

physiology as a whole is balanced or imbalanced, and whether person is healthy or diseased; it also reflects the *Prabha* (aura) of the individual. *Mamsadhara* is the innermost layer platform for the skin's stability and firmness. When this layer is healthy then skin looks young and supple.

Wrinkles:

Wrinkles are result of loosening of dermal-hypodermal junction and shrinking of the superficial fascia, which have their points of insertion at the dermis. With reduction in muscle mass, skin thickness, diminished elasticity of dermal collagen, elastin and dryness of the stratum corneum result in behavioral change, loss of mechanical strength and viscous elasticity. Development of fine wrinkles (*Chavi Hani*) begins to take place at the age of 30s, reaching a peak in 40s, deep wrinkles are considered to be increasing in the 50s (*Tvak 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.³²

From the above explanation theories of cellular senescence contemporary and *Ayurvedic* theories have got almost similarities.

Table 1: Table showing Ayurvedic and modern concept of skin aging theory.

Cause	Concept of Aging in different extremity		
	Ayurveda	Modern	Description
Genetic cause	<i>Swabhavika Roga</i>	Telomerase theory, Genomic instability theory, Somatic mutation theory	Genetic
	<i>Swabhavoparama</i>	Wear and tear theory Gene regulation theory	Genetic

Nongenetic cause	Impaired <i>Dhatu Vyu-</i> <i>hakarata</i>	genetic instability theory , cross linkers	Faulty assessment of nutrition to the cell
	<i>Rasa Shoshana</i>	error theory	Error in nourishing elements
	<i>Dhatu Asamata</i>	somatic mutation theory, other protein i.e. collagen change theory	Metabolic impairment.
	<i>Agni Asamata</i>	free radical theory, and Age pigment theory	Metabolic impairment
	<i>Ayu-anuvritti</i>	hormonal theory	Responsible for growth, development and senes- cence
	<i>Dhatu and Agni Asa-</i> <i>mata</i>	Tissue and metabolic impairment cross link- er's changes	Cellular, enzymatic etc.
	<i>Oja Kshaya</i>	Immune response	Susceptibility to disease and death

CONCLUSION

While there are various theories and approaches to management of aging, the traditional knowledge remains important both in understanding the process and effective management. Since aging process has been experienced by human beings for several generations, aging is the result of *Vata* vitiation and *Mans Dhatu Vikriti*. There is no any specific and definite theory regarding aging. There is no any preventive measure of aging in references of genetic basis of description but it can be lengthen the aging by using traditional life style and therapy.

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