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Conceptual Study of *Shatkriyakala* w.s.r to Cell Injury

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ABSTRACT

Health may be defined as the ability to adapt and manage physical, mental and social challenges throughout life¹⁵. *Ayurveda* is mainly concerned with preventive aspect of health. The goals of medicine are to promote health, to preserve health, to restore health when it is impaired and to minimize suffering and distress¹⁴. In *Ayurveda*, aetiopathogenesis of disease i.e progression of disease is explained in six stages termed as *shatkriyakal* and those are *Sanchaya*, *Prakopa*, *Prasara*, *Sthanasamshraya*, *Vyakat*, *Bheda*. A clear understanding about the stages of *Kriyakala* is an essential factor for early diagnosis, prognosis and for adopting preventing and curative measurement. *Sanchaya* and the other five stages develop one after the other successively and become stage of evolution of disease process known as *Rogasamprapti* (pathogenesis). During these stages the *Doshas* gets aggravated, brings about abnormalities in *Doshas*, *Dhatus*, *Malas* and *Ojas*. The number and severity of the symptoms and the curability or incurability of the disease depends upon severity of such vitiation. So in present era *Shatkriyakala* can be understood as cellular injury, which is the common representation in almost all the diseases. Cell injury is defined as an alteration in cell structures or biochemical functioning resulting from stress that exceeds the ability of the cell to compensate through normal physiological adaptive mechanism². Hence a great emphasis has been laid on a clear understanding of these six progressive stages of disease.

KEYWORDS

Shatkriyakal, *Cell injury*



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INTRODUCTION

When the vital energies of human body are imbalanced with physical makeup for a longer period, there is an origin and spread of disease. The disease begins in the smaller form and then progresses, thus disease is demonstrated in different stages and these steps are called as *Kriyakala*. The disease being deep rooted decreases the *Bala* (strength) and *Ayu* (life span) of a person.

The concept of *Kriyakala* describes the mode and stages of development of a disease, a very good understanding of a disease and its prognosis is essential for preventive and curative measures³.

Acharya Sushruta in *Sutra Sthana Vranaprashna adhyaya* has enumerated these *Shatkriyakala* as *Sanchya*, *Prakopa*, *Prasara*, *Sthanasamshraya*, *Vyakta*, *Bheda* and has beautifully furnished the details of each¹.

1. *Sanchaya*

Accumulation of *Dosha* in its own *Sthana* and *Dosha Vriddhi* occurs in both qualitative and quantitative manner. This is the first stage for commencement of treatment.

2. *Prakopa*

Expansion of *Dosha* in *Vilayana* (liquid form).

Accumulated *Vatadi Dosha* start moving to the other sites from their own places but doesn't spread in all body parts

3. *Prasara*

The word *Prasara* means to spread. In this stage aggravated *Dosha* are in the state of spreading, the *Dosha* are spreaded to other parts of body by a means of any *Srotas*.

4. *Sthana Samshraya*

The aggravated *Dosha's* goes on spreading in the body through *Srotas* and once such excited *Dosha* gets obstructed at any part of the body, will produce disease respective to the body parts.

5. *Vyakta*

Stage of manifestation of fully developed disease and it is represented by its characteristic symptoms.

6. *Bheda*

Stage of differentiation, specific sign and symptoms are observed in this stage.

Cells are the basic structural and functional unit of any living thing, which combines to form tissues and in turn organs and organ system in human body. In health, the cell remain in accord with each other. In 1859 Virchow first published cellular theory of disease², bringing in the concept that disease occurs due to abnormalities at cellular level².

Most forms of disease begin with cell injury followed by consequent loss of cellular function.



Cell injury is defined as variety of stress, a cell encounters as a result of changes in internal and external environment¹⁰. The cause can be any like physical, chemical, infectious biological nutritional, immunological and idiopathic factors¹⁰. The goals of *Ayurveda* are to promote health, to preserve health to restore health when it is impaired and to minimize suffering and distress. Hence a good understanding of *Kriyakala* is very essential for preventive and curative measurements.

MATERIALS AND METHODS

Sources of data

- Relevant *Ayurvedic* text book
- Various national and international journals
- Modern Medical books.

Method

A review article on *shatkriyakala* and its correlation with cell injury for an easy understanding of pathogenesis and diagnosis of a disease from a minutest level of its origin.

DISCUSSION

Cell injury is defined as the effect of variety of stress due to etiologic agents a cell encounters resulting in changes in its internal and external environment². In general, cells of the body have inbuilt

mechanism to deal with changes in environment to an extent². The cellular response to stress may vary and depend upon following two variables:

- Host factor i.e the type of cell and tissue involved.
- Factors pertaining to injurious agent i.e extent and type of cell injury².

In *Ayurveda* aetiopathology of disease i.e progression of disease is explained in six stages termed as *Shatkriyakal* and those are *Sanchaya*, *Prakopa*, *Prasara* *Sthanasamshraya*, *Vyakat* & *Bheda*. A detailed study on *Kriyakala* is very essential for early diagnosis, prognosis and for adopting preventing and curative measurement.

Sanchaya (Stage of accumulation)

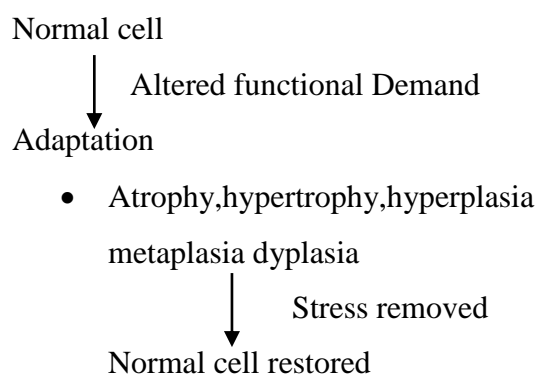
First stage of *Kriyakala* is known as *Sanchaya* which means collection or putting together i.e. the accumulation of *Dosha* due to various *Nidana* or causative factors. In this stage, *Doshas* get accumulated but they do not leave their own place and this state of *Dosha* is known as *Sanchaya*. In *Vata Sanchaya* *Stabdhapurnakoshthata* (fullness of abdomen), in *Pitta Sanchaya* *Mandoshmata* (decreased digestive fire), *Pita-Avabhasata* (yellowish discoloration) and in *Kapha Sanchaya*—*Gaurava* (heaviness), *Alasya* (laziness) are observed. *Samhati- Rupa Vridhhi* (gradual



accumulation) of *Dosha* in respective places is seen in the first stage of *Shatkriyakala*¹. Foremost stage for the commencement of disease. When there is increased functional demand, the cell may adapt to the changes which are expressed morphologically and then revert back to normal after the stress is removed (cellular adaptation)². For the sake of survival on the exposure to stress, the cell make adjustments with changes in their environment (i.e adapt) to the physiological needs (physiological adaptation) and to non-lethal pathological injuries (pathological adaptation), an such adaptation occur by following processes those are²:-

- Decreasing or increasing their size i.e atrophy and hypertrophy respectively, or by increasing their number i.e. hyperplasia.
- Changing the pathway of phenotypic differentiation of cells i.e metaplasia and dysplasia².

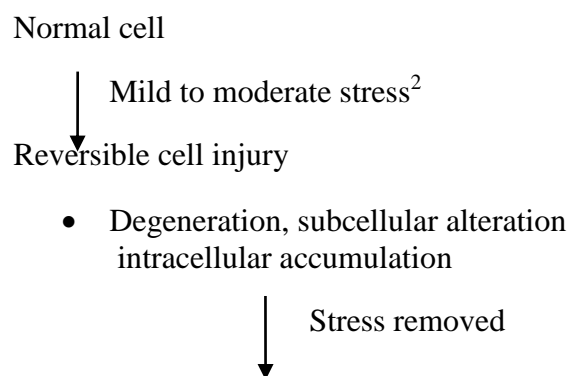
In general, the adaptive response are reversible on withdrawal of stimulus².



Prakopa (Stage of aggravation)

This is the second stage of *Kriyakala* i.e stage of *Vilayan Rupa Vriddhi* of *Dosha* means the expansion of *Dosha* in *Vilayana* form. This *Prakopit Dosha* will exhibit its particular *Lakshana*'s and the probability of disease manifestation (*Rogautpatti*) will increase¹³.

When the *Doshas* are in *Sanchaya* condition, if *Nidana* intake persists, *Dosha Prakopa* stage follows. *Prakopa* stage is limited to the state of readiness of *Dosha* to move from its own place. This means that *Dosha* increases in quantity and is ready to move. Specific symptoms and signs are seen in this stage such as *Koshtha- Toda* (pricking kind of pain in abdomen), *Sancharana* (gurgling sounds in abdomen) of *Vayu* in *Koshtha* in *Vata Prakopa*. *Amlika*(sour belching), *Pipasa* (thirst) , *Paridah*(burning sensation) in *Pitta prakopa* and *Annadvesha*(aversion to food), *Hridayotklesh* (nausea) in *Kapha Prakopa*. *Vilayan- Rupa Vriddhi* of *Doshas* is observed in *Prakopa* stage as per *Acharya Dalhana*¹³.





Repair and healing

The residual effect of reversible cell injury may persist in the cell as evidence of cell injury at subcellular level (sub cellular changes) or metabolites may accumulate within the cell (intracellular accumulation). Intracellular accumulation of substances in abnormal amounts can occur within the cytoplasm (especially cytoplasm) or nucleus of the cell². This phenomenon is referred as infiltration, meaning thereby that something unusual has infiltrated the cell from outside which is not always the case. Intracellular accumulation of the substance in mild degree causes reversible cell injury while more severe damage results in irreversible cell injury^{2,10}.

Prasara

It is the third stage of *Kriyakala*. If *Nidana-Sevan* (indulgence in causes of disease) is continued and *Prakopavastha* is not encountered, the *dosha* will move to the stage of *prasara*. In *Prakopa* state, *Doshas* get excited and are ready to move, whereas in *Prasara* they overflow or spread or will move to other parts of the body. *Prasara* of *Doshas* is of fifteen types including *prasara* of *Rakta*. Here it is important to note that the *Acharya Sushruta* has given weightage to *Rakta*, equivalent to *Doshas* viz *Vata*, *Pitta* and *Kapha*. It may be because of his

association with school of surgery. But, he has discussed the symptoms of *Prasara-Avastha*, according to the *Doshas* only. In the *Vata Prasaraavastha Vimargagamana*, *Atopa*, in *Pitta prasaraavastha* *Osha*, *Chosha*, *Paridah*, *Dhumayan* and in *Kapha prasaraavastha* - *Arochaka*, *Avipaka*, *Angasada*, *Chardi* are observed. *Hetu*, *Linga* *chikitsa* of *dosha* is advised up to *Prasara -Avastha*, after which *Vyadhichikitsa* is followed^{1,3}.

Pathogenesis of cell injury

Common underlying mechanism, following are the intracellular biochemical phenomenon underlie all forms of cell injury²

- Mitochondrial damage
- Cell membrane damage disturbing the metabolic and transmembrane exchanges
- Release of toxic free radicals^{2,4}.

Sthana samshraya (Stage of disease relocation or augmentation)

Localisation of *Doshas* which are aggravated and spreading out, now become localized at certain places and produce disease in such places. The agitated *Doshas* spread to different places and struck some where because of obstruction in *Srotas* due to abnormality (*kha vaigunya*) in *Srotas*¹⁶. The aggravated and expanded *Doshas*, thus firmly take shelter in the different parts of the body, exhibit the premonitory symptoms of disease¹⁶.



For example when they become localized in the abdomen, they produce tumors of the abdomen, abscess, enlargement of the abdomen, gastroenteritis diarrhea and such other diseases.

When localized in the urinary bladder, produces diabetes, urinary calculus, retention of urine etc.

Purvarupa produced (premonitory symptoms of disease) gets produced. This stage of appearance of premonitory symptoms is 4th *Kriyakala*. In this stage treatment should be employed to correct *Dosha Dushya* or both. This is the stage which can invite some degenerative disorders or infective diseases.

Biochemical and molecular changes underlying cell injury from various agents become apparent first, and are associated with appearance of ultra structural changes in the injured cell. However eventually gross and light microscopic changes in morphology of cell appears^{2,4}.

Concept of *Sthana Samskraya* and *Kha Vaigunya*

a) Fatty changes (steatosis)/fatty metamorphosis

The accumulated intracellular lipid neutral fat within parenchyma cell, wherever gets a proper place to reside (i.e. *khavaigunya*) will stop and will do the manifestation in that tissue, organs results in a specific sign and symptoms of a particular disease.

Eg: *Sthana Samskraya* – lipid/fat

Kha Vaigunya - liver

Vyakt - fatty changes in the liver, depending on the intensity of the damage.

Bheda- the complication which will arrive if treatment is given properly.

b) Cholesterol deposit

Sthana Samskraya of – cholesterol (may be due to hypercholesterolaemia)

Kha Vaigunya - macrophage

Vyakta - macrophages turned into foam cells

Eg. Fibro fatty plaque (atherosclerosis)

Clusters of foam cells in tumor like masses like xanthomas and xanthelasma.

c) Accumulation of protein

Sthana samskraya of – protein in the cytoplasm of cell

Kha vaigunya - in renal tubules

Vyakata - in proteinuria, there is excessive renal tubular reabsorption of protein by the proximal tubular epithelial cells.

d) Accumulation of glycogen

Excessive accumulation of intracellular glycogen

Kha Vaigunya intra cellular accumulation of glycogen in different tissues because cellular uptake of glucose impairs².

Places of deposition

- Epithelium of distal portion of PCT
- Descending loop of henle
- Hepatocytes



- B cells of pancreatic islets
- Cardiac muscles².

Vyakta (which can be visualized)/ (stage of symptoms manifestation)

The progression of disease overpowers the capability of the human body to maintain homeostasis and immunity. At this junctur, structural and functional dysfunction progress to such an extent where the illness has actually started. It is clear manifestation of the symptoms in disease like swelling, malignant, tumor, benign tumor, in fever, diarrhea and many other internal diseases.

In this stage *Vyadhi Prayatnika Chikitsa* may be adopted. Eventually cell injury affects cellular function adversely which has bearing on the body. Consequently, clinical features in the form of symptoms and sign would appear. Further course or prognosis will depend upon the response to the treatment versus the biological behavior of the disease². In this stage *Vyadhipratyanika Chikitsa* may be adopted.

Bheda (stage of updrava or complication)

This stage is a last stage of *Shatkriyakal*, characterized by severe depletion of the tissue function, serious damage to the channels of circulation or *srotas*, and the *updrava* which involves the related tissue¹⁷. This is the stage of bursting / tearing of the swelling and formation of the wound and disease such as fever, diarrhea etc.

becoming chronic. If the disease are not treated in this stage they will become Incurable.

Complication stage in medicine, is an unfavorable evolution or consequence of a disease, a health condition or a therapy. The disease can become worse in its severity or show a higher number of signs, symptoms or, new pathological changes, become widespread throughout the body or affect other organ systems. A new disease may also appear as a complication to a previous existing disease¹⁸.

The cellular response to an injurious stimulus depends on the severity, duration and nature of the injury. To explain this, if a small amount of a toxin is injected into an individual, the cells may be injured and undergo reversible injury, but since the toxin levels are low, the cell is able to recover once the toxin is cleared away. If the levels of toxins persist at a very high level, the cells will undergo very critical injuries, and may eventually die, resulting in irreversible cell injury and cell death¹⁰.

CONCLUSION

In the manifestation of disease it is necessary to rely upon the *Shatkriyakala*, if we are able to understand the concept of *Shatkriyakala* properly the pathology can



be judged and in its initial stage only it can be treated easily. Though *Acharya Sushruta* has mentioned *Kriyakala* in *Vranaprashniya Adhyaya* in respect with *Vrana Shopha* and *Vrana*, but it has to be understood as the universal phenomenon.

Hence I have tried to set a correlation between the *Shatriyakal* and cell injury for a better understanding of a pathogenesis of a disease and also about its early diagnosis, prognosis, and for adopting prevention and curative measurement.



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