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Kriyakala: An Ayurvedic Perspective And Its Corelation With Biomarkers

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ABSTRACT
The concept of Shat-Kriyakala (Stages of disease manifestation) emphasizes the significance of timely interventions in disease progression, strategically aligning therapeutic actions with the distinct stages of disease development. It guides the understanding of disease manifestation through the lens of doshic imbalances Vata (dosha regulating movement and cognition), Pitta (dosha regulating body temperature and metabolic activities), and Kapha (doṣha responsible for cohesiveness)—provoked by dietary, lifestyle, and environmental factors. Kriyakala encompasses into six stages, beginning with Sanchaya(Stage of a dosha increasing in its own location), where doshas accumulate in their natural sites, offering an opportunity for preventive strategies through lifestyle adjustments, Prakopa(Stage of a dosha reaching the threshold) and Prasara(Stage of a dosha spreading beyond its own location) avasta of Kriyakala representing a progressive state of imbalance and increasing specificity in symptoms along with complexity in management with poor prognosis. This concept parallels modern biomedicines use of biomarkers, which are biological indicators used to detect and measure diseases states or physiological changes. Biomarkers become vital for precise diagnosis and prognosis. Diagnostic biomarkers confirm the presence of illness, while prognostic biomarkers evaluate the potential for recurrence or progression. This framework not only facilitates early diagnosis and prevention but also enriches understanding of disease classification, especially in ailments like cancer and diabetes. The synergy of ancient wisdom with contemporary biomarker research promises enhanced health outcomes.

Keywords: *Dosha*, *Kriyakala, Sanchaya, Prakopa, Biomarkers, Biological indicators.*

INTRODUCTION

Acharya Sushrutha has narrated in detail idea of Shatkriyakala in 21st chapter of Sutrasthana. Shat means six, Kriya means action or treatment, Kala means time or period. It is the concept of timed intervention in disease progression, emphasizing that different disease progress through predictable stages and each stage provides an opportunity for specific therapeutic actions. The treatment in Ayurveda is of two types, maintenance of health in a healthy person, by adopting the ritucharya (Seasonal routine), dincharya (Daily routine) and sadvritta (Harmonious way of living) and curing of a disease of diseased person by adopting therapeutic measures. Understanding the occult function and structures of the body based on dosa, dushya (A bodily structure which can be vitiated by aggravated doṣa) and srotas (Channel, conduit) helps to adopt line of treatment by proper intellect and knowledge.
The goal of kriyakala is early diagnosis and prevention of disease before it becomes deeply rooted and harder to treat.

The vyadhi (disease) kriya kala explained by Sushrutha, considered as shat kriyakala described in six stages[1]:

1. Sanchaya[2]

This is the stage when the aggravated dosha begins to accumulate in its natural location. For example, vata in colon, pitta in small intestine and kapha in stomach. Symptoms are often mild, and it's the best stage for prevention through dietary and lifestyle modifications.

2. Prakopa[3]

In this stage the accumulated dosha begins to overflow but is still confined to its original site. Mild symptoms like bloating, acidity or lethargy may appear, but the condition can still be easily reversed by addressing the imbalance.

3. Prasara[4]

Here the aggravated dosha starts spreading from its original location to other parts of the body. The symptoms become noticeable and if untreated the disease can become more difficult to manage.

4. Sthana samshraya (Stage of a dosha localizing outside its location)[5]

This is the stage where the dosha settles in a vulnerable tissue or organ (khavigunya stana), forming a nidus for disease. Srotovaigunya (Functional alteration of body channels) leads to doshdushya sammurchana leading to disease manifestations and is easy to recognise due to presence of purvarupas (prodromal symptoms), doshas start to localize in any part of the body

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and manifest the specific diseases pertaining to that part. Symptoms become more pronounced, and this is where structural changes or tissue damage begins.

5.Vyakta (Stage of clinical manifestation of a disease)[6]
Dalhana has called this stage as a stage of complete manifestation of disease, the disease becomes clinically apparent with specific symptoms and signs and need early prompt intervention. Increased body temperature is observed in case of jwara (fever). Excessive watery stool is seen in atisara (Diarrhoea) and an unusual enlargement of abdomen is observed in udara roga (Generalized abdominal enlargement due to ascites or other localized reason). Vyadhi pratyanika chikitsa (disease specific treatment) is the key for treatment.

6.Bheda (Stage of disease developing into subtypes or leading to complications)[7]
This is the stage of full-blown disease with potential complications. If the condition has not been treated properly, it can lead to irreversible damage or the transformation into a chronic condition.

Treatment according to shatkriyakala -
1. Sanchaya -nidana parivarjana (Avoidance of etiological factors)
2. Prakopa a) vata- vatanulomana (Normal course of movement) b) pitta- pitta shaman/sukhvirechan (Therapeutic purgation) c) kapha- agnideepana (Stimulating digestive fire or appetizing action), pachana (Digestive action),
3. Prasara a) vata- basti(enema) b) pitta- virechana c) kapha-vamana (Therapeutic emesis)
4. Sthansanshraya- samprapti vighatan (stage wise intervension in pathophysiology)
5. Vyakta- as per vyadhi chikitsa siddhanta
6. Bhedha- doshpratyanika and vyadhipratyanika chikitsa.

The doshas mitigated in sanchaya avasta does not lead to disease manifestation, if not treated on time the disease progress, treatment because difficult and lead to poor prognosis[8].
Each stage of Kriyakala offers a window for intervention, with the earlier stages being easier to manage and treat. The concept stresses the importance of addressing imbalances before they manifest as full-blown disease, highlighting the preventative nature of ayurveda.
In modern biomedicine, Biomarkers are used as objective indicators of biological processes, pathogenic states, or responses to treatment. They provide a measurable way to detect disease, assess risk and monitor progression or treatment effectiveness.

Biomarkers can be classified into several categories:
1. Diagnostic biomarkers-A diagnostic biomarker detects or confirms the presence of a disease or condition of interest or identifies an individual with a subtype of the disease. Such biomarkers may be used not only to identify people with a disease, but to redefine the classification of the disease.

For example:
-The detection of cancer is moving rapidly toward a molecular and imaging-based classification rather than a largely organ-based classification scheme[9].
-Blood sugar or haemoglobin A1c (HbA1c) may be used as a diagnostic biomarker to identify patients with Type 2 diabetes mellitus[10].
-Sweat chloride may be used as a diagnostic biomarker to confirm cystic fibrosis[11]

2. Prognostic biomarkers-A prognostic biomarker is used to identify the likelihood of a clinical event, disease recurrence, or disease progression in patients with a disease or medical condition of interest[12].

For example:
-BReast CAncer genes 1 and 2 (BRCA1/2) mutations may be used as prognostic biomarkers when evaluating women with breast cancer, to assess the likelihood of a second breast cancer [13]
-Increasing prostate-specific antigen (PSA) may be used as a prognostic biomarker when evaluating patients with prostate cancer during follow-up, to assess the likelihood of cancer progression[14]

3. Predictive biomarkers–A predictive biomarker is defined by the finding that the presence or change in the biomarker predicts an individual or group of individuals more likely to experience a favourable or unfavourable effect from the exposure to a medical product or environmental agent[15].

For example:
-BReast CAncer genes 1 and 2 (BRCA1/2) mutations may be used as predictive biomarkers when evaluating women with platinum-sensitive ovarian cancer, to identify patients likely to respond to Poly (ADP-ribose) polymerase (PARP) inhibitors[16]

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4. Pharmacodynamic biomarkers–When the level of a biomarker changes in response to exposure to a medical product or an environmental agent, it can be called a pharmacodynamic/response biomarker. This type of biomarker is extraordinarily useful both in clinical practice and early therapeutic development[17]. These indicate the effects of a drug on a patient, helping clinicians understand whether a treatment is working.

For example:

-Circulating B lymphocytes may be used as a pharmacodynamic biomarker when evaluating patients with systemic lupus erythematosus to assess response to a B-lymphocyte stimulator inhibitor[18]

5. Susceptibility/ risk biomarkers–A biomarker that indicates the potential for developing a disease or medical condition in an individual who does not currently have clinically apparent disease, or the medical condition is classified as a susceptibility/risk biomarker[19] These assess the risk of developing a disease.

For example:

-BReast CAncer genes 1 and 2 (BRCA1/2) mutations may be used as a susceptibility/risk biomarker to identify individuals with a predisposition to develop breast cancer[20]

DISCUSSION

While both Kriyakala and Biomarkers aim to understand disease progression and guide interventions, they do so through very different paradigms. Here's a breakdown of how Kriyakala can be mapped to modern Biomarkers, with examples:

1. Sanchaya:

- Kriyakala: This is the initial stage where the doshas accumulate in their respective sites.
- Biomarkers: Early changes in blood chemistry or the presence of inflammatory markers like c- reactive protein (CRP), raised erythrocyte sedimentation rate (ESR) and allergy through absolute eosinophil counts (AEC).
- Example: In obesity, there may be an increase in leptin levels during the early accumulation of fat. Lipid profile with high LDL and low HDL is guide for hyperlipidaemia.

2. Prakopa:

- Kriyakala: The doshas become aggravated and begin to cause disturbances within their sites.
- Biomarkers: A slight increase in oxidative stress markers or early dysregulation in metabolic pathways.
- Example: In diabetes, increasing blood glucose levels would signal the aggravation of metabolism, even though symptoms may not yet be prominent.
- raised total counts indicating Antigen Antibody reaction (infection)

3. Prasara:

- Kriyakala: The doshas start to overflow from their sites and circulate through the body.
- Biomarkers: Elevated levels of systemic inflammatory markers, liver enzymes, or hormones like cortisol.
- Example: In cardiovascular diseases, elevated levels of cholesterol or triglycerides indicate prasara, where lipids have started to affect the circulatory system.

4. Sthana Samshraya:

- Kriyakala: The doshas find a weak spot in the body and settle there, initiating disease formation and is a stage of specific disease manifestation with accurate clinical signs and symptoms.
- Biomarkers: Local tissue damage markers, organ-specific enzymes (e.g., ALT for the liver), or localized inflammation markers.
- Example: In rheumatoid arthritis, localized inflammation in the joints is marked by elevated Rheumatoid Factor (RF) or Anti-CCP antibodies.
- border line raise in Serum Amylase and Serum Lipase in pancreatitis
- border line raise in Serum Creatinine, blood urea and uric acid in kidney disease.

5. Vyakta:

- Kriyakala: The disease is now fully manifested, and symptoms become apparent.
- Biomarkers: Disease-specific markers or overt changes in diagnostic tests.
- Example: In hypothyroidism, high levels of TSH (Thyroid Stimulating Hormone) would be evident, signalling that the disease has fully manifested with symptoms like fatigue, weight gain, etc.
- raised levels of Serum Amylase and Serum Lipase in pancreatitis with pain abdomen, fever, nausea, and vomiting
- raised trop-t in congestive cardiac disease with heart burn, chest tightness, difficulty in breathing and pain radiation to neck and hands.

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-raised Serum Creatinine, blood urea and uric acid in kidney disease with reduced urine output, pain and burning sensation during micturition.

6. Bheda:
- Kriyakala: The disease leads to complications or spreads further, causing tissue or organ damage.
- Biomarkers: High levels of damage markers, such as troponin in heart attacks or creatinine in kidney failure.
- Example: In chronic kidney disease (CKD), elevated creatinine levels signal severe damage to kidney function, representing the Bheda (Stage of disease developing into subtypes or leading to complications)[21] stage.

CONCLUSION

As Kriyakala helps in early detection, diagnosis, prognosis & also in treatment, similar way the biomarkers also accurately guide the stage of damage and associated risk factors which need to be taken care during interventions, like usage of higher antibiotics in minimal infections play no role same way lesser antibiotics in chronic infections may not help as well.
The dosage modifications and drug selections can be made based on biomarkers, as some renal and hepatic toxic compounds can be avoided in case of renal and hepatic involvements in chronic illness.
If we can utilize these objective parameters in ayurveda like specific biomarkers for specific dosha chayadi lakshanas or in specific type of a disease it will be beneficial to understand the pathogenesis in depth & to treat the disease on scientific basis of ayurveda according to state and stage of the disease.

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