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UNDERSTANDING NEOPLASIA PATHOLOGY THROUGH AGNI, AMA, DOSHA, SROTAS, DHATU DUSHTI : A CRITICAL REVIEW

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ABSTRACT:
The term neoplasia literally means “new growth.” Neoplasia means, abnormal new growth, which may be benign (localized growth) or malignant (progressive destructive growth). Neoplasia is essentially the result of disrupted cellular metabolic functions. Cancer features uncontrolled cell proliferation, destruction of adjacent tissues, and gradual systemic deterioration. Neoplasia develops as a result of genetic alterations triggered by several causative factors, including exposure to chemical carcinogens, radiation, viral agents, and hormonal imbalances. It is interrupting chronic and progressive disease. Dushti of Agni, Ama, Dosha, Dhatu, Srotas, and produces long-term pathological changes. Neoplasia represents a major pathological alteration characterized by abnormal tissue growth. Its development, driven by dormant harmful factors that become active under conducive conditions, closely resembles modern theories of carcinogenesis. These include chronic inflammation, immune imbalance, oxidative stress, genetic injury, and exposure to environmental toxins. Other risk factors including pollutants, chemicals, pesticides, tobacco, alcohol, radiation. In Ayurved it is produced from Vata, Pitta, Kapha, Mamsa and Meda. Its symptoms are similar to those of Granthi and Arbuda can be correlated with benign and malignant tumors respectively. The disease was initially referred to as “Apachit,” which described swellings occurring in different parts of the body. Later, Acharya Charaka and Acharya Sushruta elaborated on these conditions by classifying swellings into inflammatory (Shopha) and non-inflammatory (Sotha) types. They further described various forms such as Shopha (inflammatory swelling), Apachi (cystic swelling), Gandamala (glandular swelling), Granthi (minor neoplasm), and Arbuda (major neoplasm). Additionally, conditions like Dushtavrana (non-healing ulcers) and Gulma (abdominal tumor) are also mentioned in the classical texts. Ayurveda describes the development of disease as a result of Doṣha imbalance, weakened Agni, accumulation of Ama, vitiation of Dhatus, and blockage of Srotas. Disorders like Arbuda show similarities with tumor pathology. Interpreting neoplasia through these Ayurvedic principles can help in understanding its systemic and multifactorial nature more comprehensively. Benign tumors remain confined to their site of origin, grow slowly, and lack the capacity to invade nearby tissues or spread to distant sites. On the other hand, malignant tumors are characterized by aggressive growth, local tissue invasion, and the potential to disseminate to other organs through metastasis. Neoplasia holds great clinical importance since malignant tumors contribute significantly to morbidity and mortality. Therefore, early detection and timely management are essential for improving patient prognosis.

KEYWORDS: Neoplasia, Benign, Malignant, Cancer, Tumor, Metastasis

INTRODUCTION

ETYMOLOGICAL DERIVATION-From an etymological perspective (Vyutpatti), the term Arbuda is derived from the root word “Arb,” which conveys the meaning of growth or mass formation. When combined with the suffix “Vich” (from Lingadivarga), it forms the root “Abba,” indicating something that becomes fixed or firmly established. Further addition of the suffix “Udeti” results in the final word Arbuda1.Granthi and Arbuda related diseases have been elaborately explained by Acharya Sushruta and Acharya Madhavkar. Acharya Charaka has

given a concise description of Granthi Roga in the chapter titled "ShvayathuChikitsadhyaya." In Ayurvedic texts, Arbuda is classified as a Rakta, Mamsa,MedaPradoshajaVikara by Acharya Susruta and MamsaPradoshajaVikara by Acharya Charaka.2-3-4 Neoplasia is also called a malignant tumor or cancer. Cancer is a disease that can start in any part of the body. It happens when some cells begin to grow too fast and do not stop growing. These cells do not follow the body's normal control system. As they increase in number, they can damage nearby tissues and affect how the body works. Sometimes, these abnormal cells spread to other parts of the body and form new lumps there. This spreading is called metastasis, and it makes cancer more dangerous. Cancer is also called a malignant tumor or neoplasm. Understanding how cancer begins and spreads helps doctors find it early and treat it better, which improves the chances of recovery5.

Aim and Objective

To critically analyse and interpret the pathology of neoplasia through the Ayurvedic concepts of Agni, Ama, and Doṣha,Srotas,DhatuDushti, and to correlate them with modern mechanisms of tumor development, To evaluate relation to abnormal tissue proliferation.

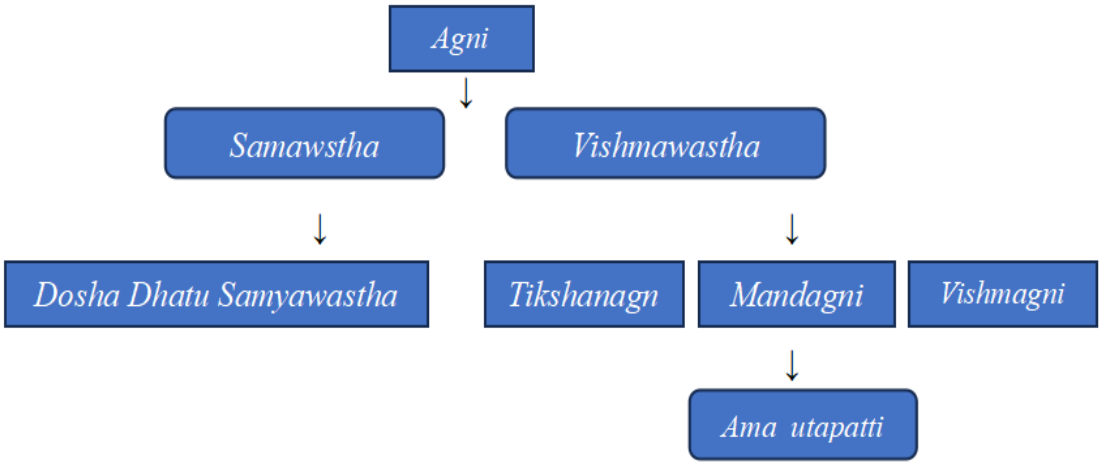
MATERIAL AND METHOD

The present conceptual review was conducted through an extensive examination of classical Ayurvedic texts. Along with their authoritative commentaries. Contemporary medical information regarding tumors was gathered from standard oncology textbooks, peer-reviewed scientific journals, and reliable online databases.

Concept of Agni in Neoplasia

According to Ayurveda, Dehagni is the main factor responsible for nourishing the entire body and is the primary source of digestion6. "Rogahsurveypi mandengnau7". States that all diseases originate from impaired Agni.The processes of creation and dissolution of the universe, as well as metabolism and catabolism within the body, are governed by the fundamental principle of Agni. When Agni is strong, digestion occurs properly and food is efficiently transformed into nourishment for the body. However, when Agni becomes weak, digestion is incomplete, leading to the formation of toxic byproducts known as Ama. Ama accumulates within the body, causes Srotorodha, impairs tissue metabolism (Dhatu Poshana), and contributes to progressive tissue dysfunction and the manifestation of chronic diseases.8

Agni involved in disease formation JatharagniDushti causes improper digestion leading to the formation of Ama, the precursor of all diseases. DhatvagniDushti causes improper tissue metabolism resulting in Dhatu Dushti (faulty cellular metabolism). BhutagniDushti leads to abnormal protein synthesis, poor tissue nutrition, and improper transformation at the elemental level9. Agnimandya the root trigger of any disease. In the context of neoplasia, impairment of Agni (Agnimandya) plays a crucial role in initiating pathological changes. Weak or disturbed Agni leads to improper digestion and metabolism, resulting in the formation of Ama, which acts as a toxic and inflammatory substrate within the body. Causes include Adhyashana, Ajirnashana, Atibhojana, Vishamashnaa, Virudha Ahara, Guru, Snigdha, Abhishyandi Ahara etc, chronic stress, prolonged sitting after meals & Vega Dharana (suppression of natural urges). The Effects include disturbed metabolism, improper digestion Apakva Ahara Rasa formation and inefficienct cellular level metabolism (DhatvagniDushti)10. From a Modern perspective,these changes are associated with metabolic dysfuction and chronic low-grade inflammation. Dysplasia (a precancerous stage) refers to abnormal growth or development of cells, tissues or organ. Hyperplasia (not cancer) refers to an increase in the number of cell within a tissue or organ, often causing to enlargement of that organ.11.



Ama Formation (Toxic Metabolic Formation)

Ama -According to Acharya Vagbhatta, when Ushma (Agni) becomes weak or functions inadequately, the first Dhatu, Rasa, is not formed properly. Instead of being transformed into healthy Rasa, the Annarasa remains in the Amashaya and undergoes improper digestion, leading to fermentation or putrefaction (Dushti). This improperly processed, toxic form of Rasa is referred to as Ama (uncooked food, to incomplete transformation).

Ama is a harmful by product of incomplete digestion and metabolism that adversely affects health. Heavy (difficult to digest) foods, foods that are excessively dry, very cold, impure or contaminated, and those that produce Vidaha (gastric irritation or inflammation) can contribute to the formation of Ama Doṣha. Similarly, excessively dehydrated foods or food items soaked in water for prolonged periods may also impair digestion and promote the accumulation of Ama. Due to improper eating habits, exercising immediately after consuming solid food, or consuming other Ama producing foods, the ingested food is not digested properly, resulting in the formation of Amarasa. This Amarasa become polluted and circulates throughout the body through the blood vessels. On coming into contact with various Dhatus, it causes sluggishness of the Dhatvagnis leading further production of Amarasa. As a result, obstruction and accumulation occur in various Dhatus and Srotas. Ultimately, various disorders are produced12.

Accumulation of Oxygen Derived free Radicals: Cell generate energy by reducing molecular oxygen to water reduce. During this process, the formation of reactive oxygen species (ROS) is an unavoidable by product of mitochondrial respiration. These reactive oxygen species, commonly referred to as free radicals, can damage lipid, protein, and nucleic acids. Free radicals are chemical species that contain a single unpaired electron in their outer orbital, making them highly reactive and unstable. Examples of free radicals include OH, H- O2-, ferric (Fe3+) Cells possess antioxidant defense system that protect against free radical induced injury. An imbalance between free radical generation and antioxidant (radical scavenging) defense system results in oxidative stress, cause cellular damage and play a major role in aging and several chronic diseases, including cancer. The relationship between oxidative stress and the development of various diseases has been extensively studied. In cancer, oxidative damage to DNA plays a significant role in initiating tumorigenesis triggering13. Due to long-standing Ama (chronic metabolism disturbance), persistent inflammation develops, resulting in increased oxidative stress. This leads to accumulation of reactive oxygen species (ROS) and increased production of oxygen-derived molecules such as hydrogen peroxide and superoxide. When the levels of these reactive species exceed the antioxidant capacity of the cell, oxidative stress increases and enhances the glycation process, leading to the formation of advanced glycation end products (AGEs). Glycation of histone alters chromatin structure, affecting gene expression and promoting carcinogenesis. Protein glycation disrupts molecular conformation and alters enzyme or receptor functions, thereby impairing normal cellular processes. It also causes extracellular matrix modification and promotes binding of (AGES) to the receptor for advanced glycation end products (RAGE).Activation of RAGE mediated signaling pathways promotes tumor cell proliferation, invasion and metastasis, thereby creating a favourable microenvironment for tumor growth and progression14.

TridoshaDushti (Vitiation of Doshas)

The disturbance of Agni along with the generation of Ama disrupts the balance of the Tridosha Vata, Pitta, and Kapha ultimately resulting in pathological alterations in the body and cancer develops when there is an imbalance between Dosha15.

Kapha Dosha (Guru, bulky): Kapha predominates in the initial structural stage. When aggravated, its Guru (heaviness) and Sthira (stability) qualities promote stagnation and excessive tissue accumulation, resulting in the development of a firm, localized mass.

Vata Dosha (Active Dosha): Vata governs movement and activity. When vitiated, it facilitates uncontrolled cellular proliferation and the spread of malignant cells to distant sites, contributing to metastasis process.

Pitta Dosha (Being Tejas): Pitta is linked with Dhatvagni (cellular metabolic activity). When disturbed, it accelerates metabolic processes within cells, enhancing rapid and aggressive tumor growth16.

Srotodushti And Srotoavrodha (Tumor Progression)

Srotas are the channels of the body that pervade all Moola Sthanas such as the Hridaya and other vital organs. Predominantly constituted by Akasha Mahabhuta, they provide the pathways for the continuous transportation and circulation of Ahara, Anna Rasa, Doshas, Dhatus, Malas, Prana, Ojas, and Manas17. All the pathways through which Vata, Pitta, and Kapha, circulate throughout the body are known as srotas. As long as these Srotas remain in their normal physiological state, health is maintained and diseases do not occur18.The Doshas circulate throughout the body along with body fluids and nutrients. When the Doshas become aggravated or vitiated, and when the channels (Srotas) become weak or damaged, the vitiated Doshas accumulate at these sites. Their localization in such weakened areas leads to the manifestation of disease19. Sanga refers to the obstruction of the Srotas. Due to the Sroto-Sanga, the movement of Dhatus, Updhatus, or Malas through the Srotas is reduced or completely obstructed. Thus, Sanga denotes the stagnation or blockage of the normal flow of substances within the srotas20. Srotorodha refers to the obstruction of body channels (Srotas), which disrupts the proper flow of nutrients and the elimination of waste products. This obstruction may manifest as conditions such as lymphedema and constipation21. Kshaya of Ojas leads to reduced immunity. Ojas, the vital essence responsible for mental stability and immune strength, becomes depleted, resulting in fatigue, anxiety, and increased susceptibility to illness22. While describing Srotodushti, Acharya Charak has explained that the aggravated Doshas, while circulating through the Srotas, cause Srotodushti and also vitiate the local Dhatus present at the affected site23.Srotorodha (obstruction of body channels) may be interpreted as a pathological condition that induces metabolic alterations at the tissue level, leading to impaired nutrient circulation and focal accumulation. This disturbed microenvironment parallels the metabolic reprogramming observed in the Warburg effect, in which cells adopt an alternative pathway of energy production. Under such conditions,

cancer cells preferentially metabolize glucose through aerobic glycolysis, even in the presence of adequate oxygen, resulting in profound alterations in cellular metabolism. Therefore, Srotorodha can be conceptually correlated with localized metabolic disruption, nutrient stagnation, and the Warburg phenomenon described in cancer biology24.

Dhatu Dushti (Impairment Of Tissues)

Dhatvagnimandya reduced or weakened metabolic function at the tissue level, resulting in defective or improper formation of Dhatus25. Mamsa and Rakta Meda Dushti- Pathological vitiation of muscle, blood tissues and metabolic dysregulation characterized by their abnormal accumulation, excessive growth, or uncontrolled proliferation. Dhatus are the fundamental structural and functional components of the body. Neoplastic growth may be interpreted as an abnormal increase or excessive proliferation of this Dhatus (Dhatu Vṛiddhi)26. Dhatu Dushti (tissue level derangement) leads to loss of cellular intelligence, abnormal proliferation, impaired apoptosis (programmed cell death failure), and when the immune system gets compromised, unnecessary cells persist, resulting in neoplasia development27.

Modern Review

Neoplasia

A neoplasm or tumor is an abnormal mass of tissue that develops due to uncontrolled, excessive, unregulated, and autonomous cell proliferation. This growth continues even after the original stimulus that triggered it has been removed, and it serves no useful purpose in the body. The scientific field that studies tumors or neoplasms is known as oncology (where oncos means tumor and logos means study)28. A tumor is an abnormal mass of tissue that develops due to uncontrolled proliferation of cells and may be benign or malignant. A carcinoma is a particular type of malignant tumor that originates from epithelial cells and constitutes about 90% of all cancers. Therefore, while every carcinoma is a malignant tumor, not every tumor is classified as a carcinoma29.

Classification of Neoplasia

Based on behaviour and their histogenesis all tumours, whether benign or malignant, consist of two fundamental components. Parenchyma is made up of the actively proliferating tumour cells. It determines the tumour's biological behavior, classification, and progression. Supportive stroma consists of fibrous connective tissue and blood vessels. It forms the structural framework that supports and nourishes the growing tumour cells. Malignant tumours arising from epithelial tissue are termed carcinomas, whereas those originating from mesenchymal tissue are called sarcomas28.

Etiology

Genetic Factors:

- Loss or inactivation of tumor suppressor genes that normally control cell growth.
- deficiencies in DNA repair mechanisms, resulting in accumulation of mutations.

Environmental Factors:

- Exposure to harmful chemical carcinogens such as tobacco, asbestos, and aflatoxin.
- Physical factors like ultraviolet (UV) rays and ionizing radiation.
- Cancer-causing biological agents, including viruses such as HPV, EBV, HBV, and HCV.

Host-Related Factors:

- Individual characteristics like age, gender, and hormonal status.
- Reduced immune function (immunosuppression).
- Long-term or persistent inflammation in the body30

Pathogenesis (General Mechanisms)

- Initiation: A permanent and irreversible alteration occurs in the DNA of a target cell.
- Promotion: The altered (initiated) cells multiply and form a clone under the action of promoting agents.
- Progression: The transformed cells develop more aggressive characteristics, gaining the ability to invade nearby tissues and spread to distant sites (metastasis)31.

General Symptoms

Unintentional weight loss, persistent tiredness, loss of appetite, and in advanced cases, severe wasting (cachexia) are common early manifestations of cancer. These symptoms are non-specific and may be seen in many other conditions as well. There is no fixed pattern in the progression of cancer symptoms. In some cancers, such as acute leukemia, lymphomas, and germ cell tumors, symptoms may appear quickly within a few weeks. In contrast, other cancers like those of the bowel and kidney may develop gradually over many years. Early vague and non-specific symptoms eventually progress to more definite signs related to functional impairment or structural changes caused by the primary tumor. In some cases, cancer is first recognized only after metastatic spread produces symptoms at sites distant from the original tumor.

Site-Specific Symptoms

Symptoms occurring at the original site of cancer generally depend on the affected organ and commonly include pain, localized swelling, persistent non-healing ulcers with bleeding, and damage or invasion of nearby tissues. Patients often recognize the seriousness of these features when they continue for a long time or progressively worsen. In the early stages, cancer symptoms are rarely distinctive and mainly correspond to the organ involved32.

Rate of growth

The rate of tumour enlargement is determined mainly by two key factors: The speed of cell proliferation, including the growth fraction and the extent of cell loss. The level of differentiation of the tumour cells33.

Microscopic features

For the identification and classification of tumours, the microscopic appearance of tumour cells is extremely important. The following features are evaluated in histological sections of tumours:

- Microscopic arrangement or pattern
- Microscopic morphology of tumour cells (extent of differentiation and presence of anaplasia).
- Tumour angiogenesis and supporting stroma
- Inflammatory response.34

Spread of Tumours

A defining characteristic of malignant tumours is their capacity to infiltrate and damage nearby surrounding tissues, known as local invasion or direct extension and to spread to distant parts of the body, referred to as metastasis or distant dissemination.

Local invasion (direct spread)

- Benign tumours
- Malignant tumours

The mechanism of direct invasion by malignant tumours is described below, along with the process of metastasis.

Metastasis (meta = transformation, stasis = residence) refers to the spread of a tumour through invasion, resulting in the formation of separate, discontinuous secondary tumour deposits at distant sites where the tumour cells become lodged. Benign tumours lack the ability to spread to distant sites, whereas all malignant tumours possess the potential to metastasis

Routes of Metastasis

Cancers can disseminate to distant locations through the following pathways:

- Spread via the lymphatic system
- Spread through the bloodstream (haematogenous route)
- Dissemination through body cavities and along natural anatomical passages35.

Prognosis

- The outcome of a tumour depends on its type, histological grade (level of differentiation), and stage (extent of spread).
- Tumours detected at an early stage and showing low grade generally have a more favorable prognosis.
- In contrast, high-grade tumours diagnosed at an advanced stage usually have a poorer outcome, even with treatment36.

Muscle cancer is a form of cancer that originates in muscle cells. It is marked by uncontrolled growth of cells within muscle tissue. This cancer develops in the soft tissues and can be classified into several subtypes.

❖ **Smooth muscle tumours**

a. Benign (leiomyoma)

b. Malignant (leiomyosarcoma)37- Leiomyosarcoma is a rare malignant tumor when compared to its more common benign counterpart, leiomyoma. The occurrence of malignancy developing in a pre-existing leiomyoma is less than 0.5%. Primary uterine sarcoma is also uncommon and is observed less frequently than tumors arising from leiomyoma. It most commonly occurs in women between the fourth and sixth decades of life. The symptoms are usually nonspecific and may include enlargement of the uterus and abnormal uterine bleeding.

- Morphologic Features: On gross examination, the tumor may appear as a large, diffuse, bulky, soft, and fleshy mass, or it may present as a polypoid growth protruding into the lumen. Leiomyosarcoma has a tendency to recur even after surgical removal and may eventually spread to distant organs such as the lungs, liver, bones, and brain38.

DISCUSSION

Neoplasia, in modern pathology, is defined as abnormal and uncontrolled proliferation of cells resulting from genetic mutations, altered cellular signalling, evasion of apoptosis, sustained angiogenesis, and potential metastasis. Chronic inflammation, oxidative stress, environmental carcinogens, and immune dysfunction play significant roles in tumor initiation and progression. From an Ayurvedic standpoint, the root of disease lies in Agnimandya (impaired metabolic fire). When Agni becomes dysfunctional, it leads to improper digestion and metabolism, resulting in the formation of Ama. Ama, being toxic and heavy in nature, circulates through the body and causes Srotorodha (obstruction of channels), thereby disturbing tissue nutrition and waste elimination. Persistent Srotorodha and Ama accumulation lead to Doṣha imbalance. Kapha contributes to abnormal growth, excessive tissue proliferation, and mass formation, while Vata governs abnormal cell division, invasion, and spread. Pitta cellular metabolic activity. The involvement of Dhatu Duṣhṭi, particularly of Rakta correlate blood tissue. Mamsa Dhatu, may be correlated with pathological tissue over growth, Meda correlated metabolic dysregulation seen in neoplasia. Management of neoplasia requires a holistic approach that focuses on correcting underlying metabolic imbalance, removing accumulated toxins, restoring tissue equilibrium, and

strengthening the immune system. In Ayurveda, the therapeutic strategy emphasizes Agnideepana (enhancement of digestive and metabolic fire), Ama Pachana (elimination of toxic metabolic by products), Dosha Shamana (pacification of vitiated Doshas), Srotoshodhana (purification of body channels), and Rasayana therapy to re-establish normal tissue function and overall health. The type of treatment you receive depends on the kind of cancer you have and the stage or extent to which it has progressed.In modern Surgery involves the removal of the tumor or the affected tissue from the body. Chemotherapy uses anticancer medications to destroy or inhibit the growth of rapidly dividing cancer cells. Radiotherapy employs high-energy radiation to damage or reduce cancer cells. Targeted therapy focuses on specific molecules or pathways that promote cancer cell growth. Immunotherapy enhances the body's immune system to recognize and eliminate cancer cells. Hormonal therapy is applied in cancers that depend on hormones for their growth. Diet has an important role in the development and prevention of cancer. Cancer may develop due to exogenous carcinogens present in food, such as aflatoxin from mould-contaminated grains, artificial sweeteners, food additives and pesticide residues. Endogenous formation of carcinogens can also occur when substances like nitrates, nitrites and amines from food are converted in the body into carcinogenic compounds (nitrosamines), which are associated with gastric cancer. Diets high in animal fat and low in fibre may increase the risk of colon cancer, while obesity and high intake of animal protein and fats may contribute to breast cancer. On the other hand, some dietary components protect against cancer, including plant-based foods rich in phytochemicals, dietary fibre, and antioxidants such as vitamins C and E, folate, selenium and beta-carotene, which help reduce oxidative damage and lower cancer risk.

CONCLUSION

The pathology of neoplasia, when analyzed through the Ayurvedic principles of Agni, Ama, and Doṣha, Dhatu, Srotas Dushti, reveals meaningful conceptual parallels with modern oncological understanding. Although the explanatory frameworks differ, both systems acknowledge the roles of metabolic imbalance, toxic accumulation, tissue derangement and abnormal proliferation in disease development. This integrative perspective may enhance early recognition of pathological changes and provide a broader foundation for preventive and holistic therapeutic approaches. Further interdisciplinary research is essential to substantiate these correlations and explore their clinical implications. Conceptually Agnimandya may parallel altered cellular metabolism. Ama formation may resemble chronic inflammation and accumulation of toxic metabolites. Srotorodha may be compared with tumor microenvironment changes and hypoxia. Kapha predominance aligns with uncontrolled Proliferation.Vata aggravation correlates with invasion and metastasis. Pitta heat and biochemical reactions in the body Thus, neoplasia can be interpreted as a progressive metabolic and structural derangement rooted in Agni dysfunction Ama formation and Doṣha, Srotas, Dhatu Dushti.

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