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A REVIEW OF HRIDAYAVARANA AS AN AYURVEDIC APPROACH TO PREVENTIVE CARDIOLOGY

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ABSTRACT

Cardiotoxicity, characterized by structural and functional impairment of the myocardium, is increasingly associated with chronic exposure to environmental pollutants, heavy metals, chemotherapy agents, and lifestyle-related toxins. These agents contribute to oxidative stress, endothelial dysfunction, and activate pro-inflammatory signalling pathways, ultimately contributing to the progression of cardiovascular diseases. Ayurveda addresses such toxin-mediated pathogenesis through the classical concept of *Hridayavarana*, a therapeutic strategy under *Vishachikitsa* designed to preserve the functional integrity of the *Hridaya* (heart) and *Oja* (vital life force). *Hridayavarana* encompasses two distinct modalities: curative *Hridayavarana*, involving the acute administration of *Vishagna* medications and emetics post-exposure to neutralize and eliminate toxins; and preventive *Hridayavarana*, which advocates for the routine consumption of cardioprotective formulations such as *Amruta Ghrita*, etc, to mitigate the long-term effects of *Dooshivisha* and *Garavisha*. These interventions enhance cardiac resilience by *Ojavardhan*, thereby improving systemic immunity and vitality. In the context of rising global exposure to cardiotoxic agents, the integrative application of *Hridayavarana* offers a scientifically

relevant, sustainable approach to cardiac prophylaxis and health management.

KEYWORDS: Cardiotoxicity, Hridayavarana, Vishachikitsa, Oja, Amruta ghrita, Preventive Hridayavarana.

INTRODUCTION

Cardiotoxicity refers to the occurrence of electrophysiological dysfunction or muscle damage in the heart, resulting in a weakened heart incapable of efficiently pumping and circulating blood. This condition can be induced by various chemicals, including metals, environmental pollutants, oxidative agents, chemotherapy drugs, and other medications. Cardiovascular diseases (CVDs) remain the leading cause of mortality and morbidity worldwide, accounting for approximately 17.3 million deaths annually and costing over $316.1 billion. The initial step in the pathogenesis of CVDs involves endothelial damage, wherein the inner cell layers are exposed to harmful inflammatory processes, ultimately leading to lesion formation.

1. Tobacco Abuse and Cardiovascular Toxicity

Tobacco use is a major global health hazard. Around 1 billion individuals smoke daily, and millions die annually due to smoking-related conditions.[1] Tobacco abuse is the most preventable cause of morbidity and mortality, increasing the risk of heart failure by 47% compared to nonsmokers. Notably, quitting smoking reduces cardiovascular mortality risk by 50% within one year.[1]

Cigarette smoke contains nicotine and several other harmful chemicals, many of which produce reactive oxygen species (ROS)[2] Nicotine acts as an agonist at nicotinic acetylcholine receptors (nAChRs), which modulate cardiovascular function through the sympathetic nervous system, leading to elevated blood pressure, tachycardia, arrhythmias, and endothelial dysfunction.[2] These effects increase the risks of atherogenesis, myocardial infarction, and thrombus formation.[3]

2. Environmental and Occupational Contributors

A. Air Pollution and Particulate Matter (PM)

Industrialization and urbanization have significantly increased air pollution, comprising both gaseous pollutants[4] (e.g., ozone, nitrogen dioxide, sulfur dioxide) and particulate matter (PM2.5 and PM10). PM2.5 originates from fuel combustion and vehicle emissions and is associated with hypertension, myocardial infarction, and atherosclerosis.[5] Chronic exposure

reduces life expectancy and contributes to endothelial dysfunction, arrhythmias, and thrombosis. Ultrafine particles (<0.1 µm) pose higher cardiovascular risks due to their deeper tissue penetration and systemic distribution.[6]

B. Per- and Polyfluoroalkyl Substances (PFASs)

PFASs are persistent pollutants absorbed through ingestion, inhalation, and dermal contact.[7] They accumulate in the blood, liver, and kidneys, increasing oxidative stress, endothelial permeability, and hyperlipidaemia. These factors are directly associated with atherosclerosis, stroke, and coronary heart disease.[8]

C. Heavy Metals

Heavy metals like lead, cadmium, arsenic, mercury, and aluminum contribute to CVDs even at low exposure levels. They mimic essential elements and disrupt metabolic processes, induce oxidative stress, and cause endothelial dysfunction.[9]

- **Lead (Pb):** Mimics calcium, causing cardiac lesions, endothelial dysfunction, and hypertension.[10]
- **Mercury (Hg):** Induces inflammation, oxidative stress, and disrupts cardiac rhythm.[10]
- **Cadmium (Cd):** Alters lipid profiles, induces myocardial fibrosis, and impairs calcium handling.[10]
- **Arsenic (As):** Promotes vascular inflammation and endothelial injury.[10]
- **Aluminum (Al):** Leads to increased cholesterol and myocardial necrosis.[10]

D. Gaseous Pollutants[11]

Carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide are associated with increased cardiovascular morbidity. Ozone induces systemic inflammation and atherogenesis. CO interferes with oxygen transport and elevates cardiac biomarkers like troponin. NO_2 exacerbates existing cardiovascular conditions by promoting oxidative stress and inflammation.

3. Lifestyle and Substance-Induced Cardiotoxicity

A. Alcoholic Cardiomyopathy[12]

Chronic alcohol abuse leads to dilated cardiomyopathy through oxidative stress, apoptosis, and mitochondrial dysfunction. Ethanol metabolism results in ROS formation, disrupting cardiomyocyte integrity and cardiac function.

B. Cocaine-Induced Cardiotoxicity[13]

Cocaine causes myocardial infarction, arrhythmias, and heart failure through sodium channel inhibition and vasoconstriction. It prolongs the QRS interval, disrupts cardiac conduction, and diminishes left ventricular performance.

C. Pesticide Exposure[14]

Pesticides affect both humans and animals by altering cardiac morphology and function, including cardiomegaly and increased blood flow velocity. Long-term exposure can lead to vascular damage and CVDs.

D. Plastics and Plastic Additives[15]

Micro- and nanoplastics (MNPs) have been found in human tissues and plaques, increasing risks of myocardial infarction and stroke. These particles promote oxidative stress, platelet aggregation, and vascular inflammation.

4. Chemotherapy-Induced Cardiotoxicity[16]

Cancer therapy advancements have increased survival but also led to chemotherapy-induced cardiotoxicity. Common manifestations include systolic dysfunction, hypertension, and arrhythmias, primarily caused by drugs like anthracyclines.

Doxorubicin, a widely used anthracycline, exerts its antitumor effects through Topoisomerase II b inhibition, which causes DNA damage and ROS generation. Its cardiotoxic effects include:

Morphological and Functional Cardiac Changes in Doxorubicin-induced cardiomyopathy are marked by chamber dilation, decreased wall thickness, increased wall stress, systolic and diastolic dysfunction, and mural thrombi. Histologically, the presence of Adria cells, vacuolated cardiomyocytes, and interstitial fibrosis is characteristic.[16]

Dose dependency is a key risk factor, with cardiomyopathy incidence rising steeply beyond cumulative doses of 450 mg/m^2.

Mechanism of Cardiotoxicity

1) Oxidative stress arises from an imbalance between ROS production and the body's ability to neutralize them.[18] It plays a central role in cardiac toxicity, especially through the damage caused by free radicals like superoxide and nitric oxide.[19] These ROS interact

with proteins, DNA, and lipids, triggering inflammation, lipid peroxidation, and endothelial injury.[20]

2) Doxorubicin increases ROS production, inhibits mitochondrial function, depletes antioxidants like glutathione peroxidase, and alters calcium homeostasis. It also affects epigenetics, telomere integrity, and gene expression of cardiac contractile proteins. Accumulation of secondary alcohol metabolites further exacerbates long-term toxicity.[17]

Hridaya

The *Hridaya* has been especially described as the seat of *Chetana* in all living beings.[21] *Hridaya* is one of the *Trimarma*, *Pranayatana*, and *Koshtanga*; thus, any injury to it causes *Marana*. *Hridaya* is also the site of *Para Oja*, called *Asthbindu Oja*, along with *Triguna Gunas—Satva*, *Raja*, *Tama*—as well as the *Anahata Chakra*, *Dasha Dhamani*, *Chinta*, *Buddhi*, *Vyana Vata*, *Sadhaka Pitta*, *Avalambaka Kapha*, *Rasavaha srotas*, *Mana*, and *Aatma*.[22] These are the vital entities of the body responsible for the proper functioning of both the *Sharira* and the *Manas*.

Acharya Charaka stated that, "The *dasah mahamula dhamanis* are the channels for transporting *Ojas* to the *sarva sharir* (entire body).[23]"

The *Oja* is said to be *Prana* or *Chaitanya*, *Hridaya* is the place of *Prana* (life), and one of the *Pradhana marma* (supreme vital organ), and *Oja nasha* or any damage is caused to the *Hridaya*, then it leads to *prana nasha* (destruction of life), because of *ashraya ashrayi bhava*.[24]

The *Oja gunas* are exactly opposite *gunas* of *Visha*, the *visha* which affects *Oja* and *prana*. Acharya Charaka, in Sutra Stana, 4th chapter, explained that *Hridya Mahakashaya*, which includes 10 drugs.[25]

The drugs used in *Hridayavarana* treatment are mostly *Ojovardhaka* and *Pittashamaka*. To save a *prana* (life) or *Oja* from *visha*, Acharyas explained the *Hridayavarana* procedure in *visha chikitsa*.

Hridayavarana

Hridayavarana is a practice involving the administration of specific medicines, particularly *Vishaghna* formulations, to protect the *Hridaya* from the negative effects of *Visha*. Acharya

Charaka first advised protecting the *Hridaya* from *Visha*, recommending various single medicines, formulations, and other measures. *Hridayavarana* is not only suggested after a person experiences acute poisoning but also as a preventive measure against future *Visha* exposures and for protecting the *Hridaya* from chronic and cumulative poisoning.

Hridayavarana is one of the unique concepts explained in *Vishachikitsa*.[26] Protecting the *Hridaya* from *Visha* is the first line of treatment in *Visha Chikitsa*.[27]

When we understand the concepts of *Hridayavarana* explained in most of the Samhitas, we can categorise it under two headings, as the first one, Curative *Hridayavarana*, i.e., administration of *Hridayavarana* medicines soon after exposure to *visha*, be it envenomation or ingestion of *visha*. After that, *Vamana(*emetic*)* is done to complete *Hridayavarana*, and this is to be considered as a curative application of *Hridayavarana*.[28]

While Acharya Sushruta recommends administering *Hridayavarana* medicines on a daily basis to protect the *Hridaya* from any kind of future exposures to *visha*, be it accidental or homicidal. This can be considered as the second one, Protective *Hridayavarana*.[29]

For curative, *Hidayavarana* Acharya Charaka and Vagbhata have explained several medicines like administering the Ghee, ghee and honey, or with *Agadas* (Antitoxic drugs) mixed with honey; which are to be selected by the physician as per the requirement of the condition and availability of the medicines.[30] Such administration leads to the accumulation of *visha* in the *Hrit pradesh* (thoracic area) and prevents the visha from reaching the *Hridaya* by trapping it due to increased *Picchilata*.

Thereafter, the person will show the signs of *Kapha utklesha* like heaviness (*Gourava*), excessive salivation (*utaklesha*), and nausea (*hrullasa*).[31] Then the physician should induce *Vamana* by using emetics with antitoxic properties to eliminate *kapha* along with *visha*(poison), which is trapped in it. Acharya has also advised to avoid the use of substances that are emetics in nature but simultaneously *Visha vardhaka*, and those which are contraindicated in *visha chikitsa*, such as sour gruel (*kanji*), soup of horse gram (*kulattha*), sesame oil (*taila*), alcoholic beverages (*Madhya*), and so on.[31]

While explaining the preventive type of *Hridayavarana*, Acharya Sushruta advises daily use of *Amruta ghrita*, *Ajeya ghrita*, *Dooshivishari agada*, etc. as examples of Preventive *Hridayavarana*. He has also explained *goghrita*, *dadhi*, *dugdha*, *madhu*, and cold water,

which can be taken in combination of two, three, four, or all at a time. Along with this, Acharya has also recommended following the *Pathya* (healthy diet) throughout the course.[29]

Amruta ghrita is explained in *Sushrut Samhita Kalpasthana Dundubiswaniyakalpa Adhyaya, Amruta ghrita* is one among the medicines advised by Acharya Sushruta for daily use as *Hridayavarana*. This *ghrita* is effective for all types of *Visha (visha samshanam param),* i.e., *Sthavara visha, Jangama visha, and Kritrima visha,* and it acts like a *Sanjeevan and Amruta*.[32]

Amruta ghrita contains six ingredients, namely *Sirisha, Apamarga, Sveta Aparajita & Neela Aparajita, Kakamachi, Gomutra, and Go ghrita*.[32] The in gradients of *Amruta ghrita*, namely *Sirisha*, *Sveta Aparajita*, *Neela Aparajita*, *Go mutra*, and *Go ghrita*, have *vishaghna* properties, and *Go ghrita*, *Apamarga*, and *Kakamachi* are indicated in *Hrudroga*.[33]

Most of these ingredients have *Laghu* and *Tikshna guna*, which aid in their quick action, and they are *Kapha Vatahara pradhana Tridoshahara* in action, which serve to mitigate the negative effects of *Visha*.[33]

DISCUSSION

In the present era the cardiac incidence has become very common, and mostly lifestyle modification is given importance in its prevention. But when we look into the present-day aetiology of cardiac diseases, we can very clearly understand that they are not the usual factors whose effects can be corrected just by lifestyle modification. We need to think beyond the traditional aetiology of cardiac pathologies. We need to evaluate the sources of present-day aetiology, like food, workplace, environment, lifestyle, medications, habits, and so on.

On evaluation, what we will find, residual pesticides, insecticides, herbicides, fertilizers, heavy metals, preservatives, additives, and many more such poisons. Working in a polluted environment, over-the-counter medications, unnecessary prolonged use of medicines, tobacco, alcohol, and so on. In addition to this, the competitive and stressful lifestyle further causes hindrance to the clearance of this poisonous exposure.

Ayurveda has recommended several practices for the management and prevention of cardiac diseases. But simultaneously, it emphasises the importance of aetiology in planning the treatment. In most of the contexts, Acharyas have advised us to treat the conditions as per the causative factors. For example, if *jwara* is caused due to *visha*, treat it with *vishghna* drugs; if

shotha is caused due to *visha*, then treat that in the lines of *visha chikitsa*. So when we look into the etiopathogenesis of present-day cardiac diseases, we need to address the condition as cardiotoxicity-induced cardiac diseases.

Cardiotoxicity results from a multitude of harmful agents, including tobacco smoke, heavy metals, air pollutants, chemotherapy drugs, and synthetic materials like microplastics, pesticides, insecticides, fertilizers, etc. Mechanistically, these agents induce oxidative stress, inflammation, and endothelial dysfunction, which are precursors to cardiovascular pathology.

So, if we give importance to the current aetiology of cardiac problems, we must have to adapt cardioprotective measures that are suitable for the present-day aetiology. The practice of *Hridayavarana* is one of the most suitable practices that Ayurveda has recommended.

Practice of *Hridayavarana* provides protection to the *hridaya* by its two-fold effects, i.e., neutralizing the poisons and their effects and strengthening the heart.

The distinction between curative and preventive *Hridayavarana* is essential. The curative application involves immediate use of *ghrita* and emetic therapy post-exposure, while the preventive application recommends daily consumption of medicated *ghritas* to fortify the heart against inadvertent exposure to low-grade toxins, termed *Garavisha* or *Dooshivisha*. Even though in present clinical practices curative *Hridayavarana* is least applied, but by considering the rise of cardiac incidences and the present-day aetiology, we can say that the practice of preventive *Hridayavarana* can give better outcomes and protect society at large.

This approach is particularly relevant today, where complete avoidance of cardiotoxic exposures—pollutants, synthetic chemicals, and stressors—is impractical. Hence, the preventive application of *Hridayavarana* not only aligns with current needs but also offers a sustainable method for long-term cardiac protection.

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