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Etiopathological and diagnostic study of *Margavaranajanya Hridroga* w.s.r. to Coronary Artery Disease - An Observational Study

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ABSTRACT

The incidence of cardiac diseases is increasing at an alarming rate in our society due to sedentary lifestyle as an impact of western culture. In India, many studies have reported increasing coronary artery disease incidence over 60 years. One in 4 deaths in India are due to coronary artery disease. So thorough understanding of pathogenesis of this disease is very important. Ayurveda literature elaborates multiple maladies related to heart under *Hridroga*. *Margavarana* is a unique pathology explained in our classics. Various dietary, behavioural, psychological factors contribute to morbid accumulation of *Kapha* and *Medas* leading to *Shonita Abhishyandana*. Further morbid state of *Shonita Abhishyandana* by *Upalepa* of *Dhamani* culminates in development of *Dhamani Prathicchaya*. Eventually due to *Siraaja Granthi Dhamani Prathichhaya* ends up in *Margavarna* and is the leading pathology of *Hridroga*. In the realm of conventional medicine, it is said that sedentary life style is the major cause of morbid accumulation of fat in the body leading to metabolic syndrome. It is characterised by dyslipidemia which in turn leading to atherosclerosis. Atherosclerosis predisposes the thromboembolism and complete obliteration of blood circulation within the vessel. Hence, in the present study an endeavour is made to corelate the concept of Coronary artery disease and its ill effects with the classical reference regarding the concept of *Margavarana* pathology occurring in the *Hridaya* causing *Margavaranajanya Hridroga* and also its diagnosis through the modern tools.

Key words: *Coronary artery disease, Margavaranajanya Hridroga, Guru Ahara, Atisnigdha, Ahara, Acheshta, Ativyayama, Chinta, ECG, Lipid profile.*

INTRODUCTION

The incidence of cardiac diseases is increasing at an alarming rate in our society due to sedentary lifestyle, faulty diet and mechanical life as an impact of western culture. One in 4 deaths in India are due to coronary artery disease. An estimated 3.8 million men and 3.4 million women die each year from this disease.[1]

Ischaemic heart disease (IHD) is defined as acute or chronic form of cardiac disability arising from imbalance between the myocardial supply and demand for oxygenated blood. Since narrowing or obstruction of the coronary arterial system is the most common cause of myocardial anoxia, the alternate term 'coronary artery disease (CAD)' is used synonymously with IHD. IHD or CAD is the leading cause of death in most developed countries (about one-third of all deaths) and somewhat low incidence is observed in the developing countries. Men develop IHD earlier than women and death rates are also slightly higher for men than for women until the menopause. Coronary Artery Disease (CAD) is a class of diseases that involve the heart or blood vessels. CAD mainly involves underlying mechanism of atherosclerosis which may be caused by high blood pressure, smoking, diabetes, lack of exercise, obesity,

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dyslipidaemia, poor diet and excessive alcohol consumption.[2]

Arteriosclerosis is a general term used to include all conditions with thickening and hardening of the arterial walls due to degenerative changes. The most common and most important form of arteriosclerosis or atherosclerosis; if not specified the two terms are used interchangeably with each other. Atherosclerosis refers to the build-up of fats, cholesterol and other substances in the artery walls which can resist blood flow to the distal part of the artery. Atherosclerosis of coronary arteries may present with Angina, MI and in some with sudden cardiac death.[3]

Hridroga is among those diseases mentioned in Ayurveda where in the description is quite brief and the ayurvedic view point needs clarification. In the presence of limited available literature which is too much scattered and in conclusive and even *Hridroga* needs to be analysed critically to verify whether it stands the test of the times. Most of the symptoms of *Hridroga* explained in our classics like *Hridshoola, Swedagamana, Murcha, Shwasavarodha* etc. go hand in hand with the symptoms explained in the contemporary science.

Margavarana is a unique pathology explained in our classics which may herald wide variety of diseases namely *Vatarakta, Pakshaghata* and *Hridroga*. *Hridroga* is one among the complications of ignoring the treatment of *Margavarana* in *Vatavyadhi*.[4] *Margavarana* is formed by the two component terms i.e., *Marga* and *Avarana*. *Marga* refers to channels in general. *Avarana* refers to *Avarodha* and is translated as obstruction. So together we can consider *Margavarana* as obstruction in the channels. The distinct form of channelopathy characterized by obstruction, affecting the circulation of physiological entities within it and is popularly known as *Margavarana*. Due to sedentary life style which we can understand as indulging in *Santarpana Nidanas* and *Virudhaahara* there is vitiation of *Kapha* and *Medas* which gets lodged in the *Rasa Rakta Marga* leading to *Dhamani Pratichaya* which eventually end up in *Margavarana.* The event of *Marargavarana* can happen in any part of the body and hence manifests as different diseases in different parts of the body. It is also said in the text that *Hridroga* is said to be caused by the pathology of *Margavarana.*[5]

The description of coronary artery disease and its signs and symptoms simulate the description of *Lakshanas* of *Margavaranajanya hridroga*. ECG, Holter monitoring, cardiac enzymes, TMT, Angiography, ECHO are various tools for the diagnosis of Cardiac disorders. Considering the high mortality related to Coronary artery disease, early diagnosis is the key for the better prognosis. Coronary artery disease is a non-communicable disease. Prevention of this disease is possible if we understand the etiological factors. So, the present study has been conducted.

Objectives

1. To study the etiopathology of *Margavaranajanya Hridroga* / Coronary artery disease.
2. To study the diagnostic approach of *Margavaranjanya Hridroga* / Coronary artery disease.

Materials and Methods

Total 30 patients who were suffering from *Margavarnajanya Hridroga* between the age group of 20 to 70 years with the help of a structured case proforma which covering the *Nidanas* of *Hridroga* and *Margavarana* along with details of history taking, physical signs and symptoms as mentioned in our classics and allied science were selected.

Patients were analysed and selected accordingly who fulfils the diagnostic and inclusion criteria. Values obtained were assessed on the basis of percentage of gradation of individual parameters in relation with *Aharaja, Viharaja* and *Manasika Nidanas* of *Margavaranajanya Hridroga.*

Diagnostic Criteria

Diagnosis will be made on the basis of clinical features of Coronary artery disease mainly Chest pain, Chest discomfort, Sweating, Dyspnoea, Syncope, radiating pain to the arms and shoulders etc.

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Inclusion Criteria

- Patients presenting with symptoms related to Coronary artery disease.
- Patients aged between 20-70 years
- Patients of either sex will be taken

Exclusion Criteria

- Patients of congenital heart disease
- Pregnant women
- Patients suffering from other systemic disorders
- Non cardiac conditions of chest pain

Assessment Criteria

Assessment will be based on the basis of framed questionaries incorporated with *Ahara, Vihara* and *Manasika Nidanas* and also with following parameters:

Subjective Parameters

- Sudden onset of chest pain
- Sweating
- Shortness of breath
- Pain radiating to the arms, jaws
- Dyspnoea

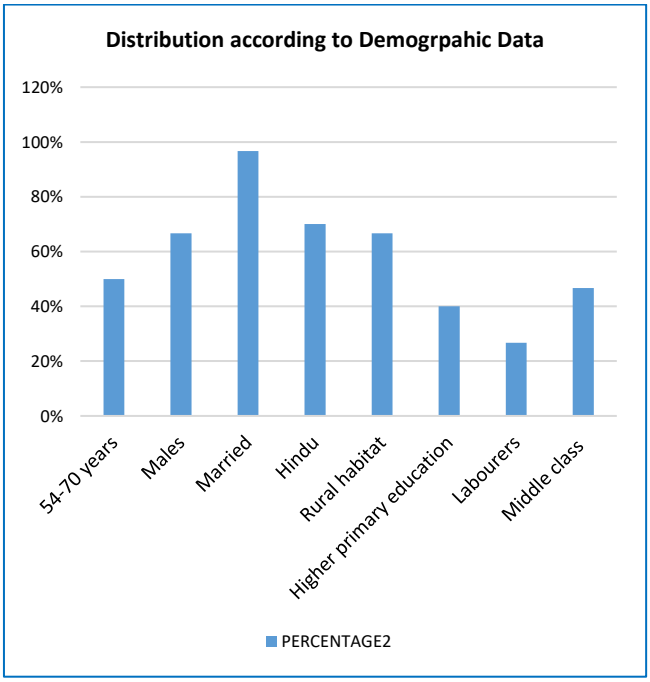
Objective Parameters

- ECG
- Lipid profile

Observations and Results

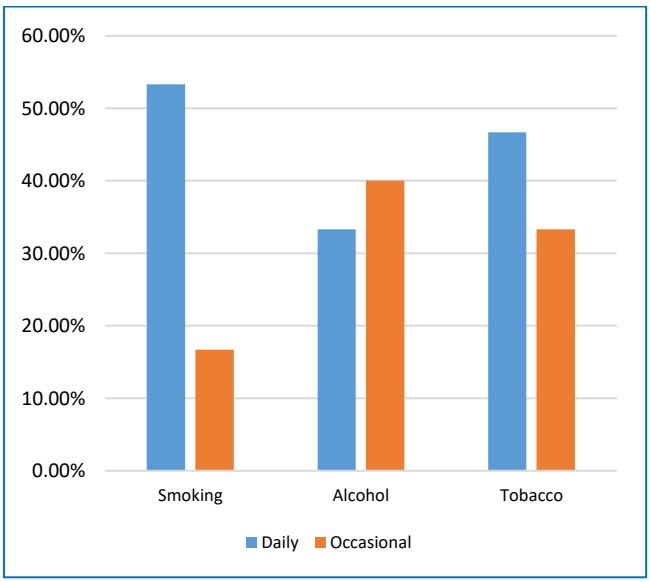
On Demographic Data

Majority of the patients, 50% were belong to the age group of 58-70 years, 66.7% were males, 96.7% were married, 70% were Hindu, 66.7% were belong to Rural habitat, 40% had Higher primary education, 26.7% were Labourers, 46.7% were belong to Middle class family.



On Personal Data

Among 30 patients taken for the study, 53.3% have habit of smoking daily, 16.7% of them used to smoke occasionally, 40% of patients were habituated to alcohol occasionally, 33.3% were taking alcohol daily, 46.7% of patients were using tobacco daily, occasional users of tobacco were 33.3%. Most of the patients in this study had Mixed diet (66.7%). Screening of patients as per *Agni* showed 50% of patients were having *Vishamagni*. Data obtained pertaining to *Koshta* of the patients shows highest incidence of patients with *Madhyama Koshta* (53.3%). As per *Prakriti* of the patients 50% of them were having *Vata-Pittaja Prakriti.*



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On Data related to Disease

On *Samanya Hridroga Lakshana*

Among the 30 patients selected for the study about 66.7% of patients had *Swedagamana* as the prime *Lakshana*, followed by 60% of patients had *Hridshoola*, 40% of patients had *Hridguruta,* 36.7% of patients had *Murcha*, 23.3% had *Moha,* 20% of them had *Hridbheda* and 16.7% of them had *Vivarnatha.*

On Family History

Among the 30 patients 53.3% had positive family history and 46.7% had no family history.

On *Dashavidha Pareeksha*

Majority of patients in this study belonged to the *Vata-Kaphaja Prakriti* (50%), 46.7% were having *Madhyama Sara*, 56.7% were of *Madhyama Samhanana*, 50% had *Madhyama Satva*. Most of the patients showed *Madhyama Abhyavarana Shakti* (56.7%) and *Madhyama Jarana Shakti* (76.7%). 50% of them had *Avara Vyayama Shakti*.

On *Aharaja Nidana*

Data obtained pertaining to *Atyushna Ahara*, highest incidence of patients 66.7% were not taking *Atyushna Ahara*, 50% daily consumes *Guru Ahara* and 36.7% occasionally consumes *Guru Ahara*. 36.7% of the patients were occasionally used to have *Ati Kashaya Rasa* and 30% of them had *Ati Kashaya Rasa* daily. 70% of them had no habit of having *Ati Tikta Rasa* and 16.7% of them had *Ati Tikta Rasa* daily. 46.7% of the patients consumed *Ati Teekshna Ahara* daily and 43.3% of them were having *Ati Teekshna Ahara* occasionally. 54.3% of the patients had *Adhyashana* daily and 36.7% of them had *Adhyashana* occasionally. 56.7% of them had *Ati Ruksha Ahara* daily. 40% of the patients consumes *Ati Sushka Ahara* occasionally. 86.7% of the patients consumed *Ati Lavana Rasa* daily. 43.3% of *consumed Ati Katu Rasa* daily. 43.3% of the patients used to have *Ati Kshara Ahara* occasionally and 46.7% of the patients used to consume *Ati Snigdha Ahara* daily.

On *Viharaja Nidanas*

Data obtained pertaining to *Ati Shrama* shows, 40% of them were doing *Ati Shrama* and 36.7% of them were doing *Ati Shrama* daily. 43.3% of the patients were doing *Ati Vyayama* occasionally. 40% of the patients had *Trasa* occasionally and 33.3% of the patients had *Trasa* daily. 36.7% of them were *Achesta* occasionally and 33.3% of them were *Achesta* daily. 43.3% of the patients had *Nidra Sukha* occasionally.

On *Manasika Nidanas*

Among 30 patients, 56.7% of the patients were having *Chinta* daily and 26.6% of them were having *Chinta* occasionally. 60% of the patients were having *Bhaya* daily and 30% of them had *Bhaya* occasionally. 53.3% of the patients had *Shoka* daily and 33.4% of the patients had *Shoka* occasionally. 50% of the patients had *Krodha* daily and 26.7% of them had *Krodha* occasionally. 43.3% of the patients were *Achinta* daily and 30% of the patients were *Achinta* occasionally.

On Diagnostic Study

Lipid profile

Among 30 patients selected for the study 36.7% of them had High level of LDL, 26.7% of them had optimal level of LDL, 23.3% of them had Very high level of LDL and 13.3% of them had Borderline high level of LDL. Among 30 patients 83.3% of them had normal level of HDL and 16.7% of them had low level of HDL. Among 30 patients 63.3% of the patients had high level of Triglycerides and 36.7% of them had normal level of Triglycerides. Among 30 patients 73.3% of the patients had high level of total cholesterol, 23.3% of them had borderline high level of total cholesterol and 3.3% of them had normal level of total cholesterol. Among 30 patients 63.3% of the patients had high level of VLDL and 36.7% of the patients had normal level of VLDL.

ECG Impression

Among 30 patients selected for the study 30% of them had AWMI, 23.3% each of them had IWMI and ANSTEMI, 13.3% of them had IHD and 10% of them had ASWMI.

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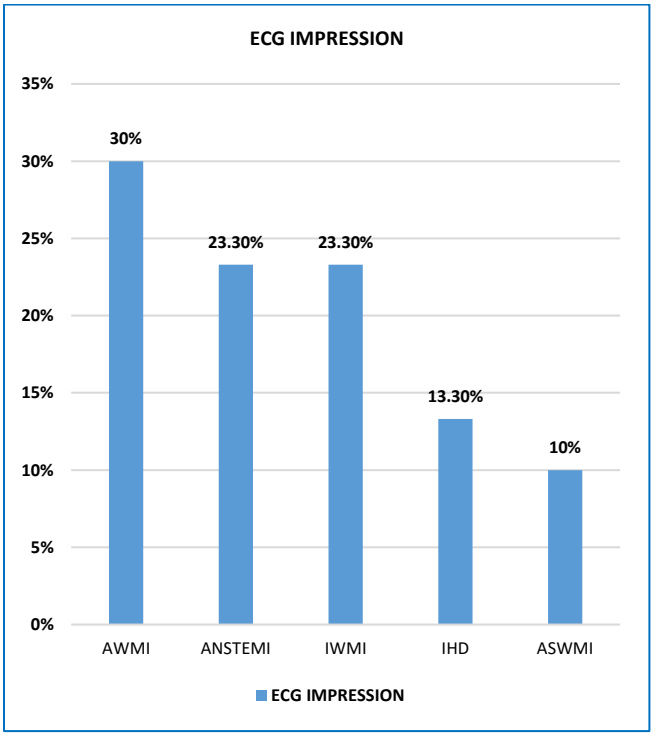

DISCUSSION

Coronary artery disease involves the reduction of blood flow to the heart muscle. CAD develops when the major blood vessels that supply to the heart with blood, oxygen and nutrients become damaged or diseased due to build-up of plaque in the arteries of the heart. Typically, coronary artery disease occurs when the part of the smooth, elastic lining inside a coronary artery develops atherosclerosis. Atherosclerotic lesions are asymmetric focal thickenings of the innermost layer of the artery, the intima. They consist of cells, connective tissue elements, lipids and debris. Increased Lipoproteins and Cholesterol are considered as the major cause for development of atherosclerosis.

Hridroga is among those diseases mentioned in Ayurveda where in the description is quite brief and the ayurvedic view point needs clarification. In the presence of limited available literature which is too much scattered and in conclusive and even *Hridroga* needs to be analysed critically to verify whether it stands the test of the times. Most of the symptoms of *Hridroga* explained in our classics like *Hridshoola, Swedagamana, Murcha, Shwasavarodha* etc. go hand in hand with the symptoms explained in the contemporary science.

Margavarana is a unique pathology explained in our classics which may herald wide variety of diseases namely *Hridroga, Pakshaghata* etc. *Margavarna* is formed by two terms, *Marga* refers to channels and *Avarana* refers to obstruction. Hence *Margavarana* refers to obstruction in the channels of circulation. To be clearer the accumulation of morbid *Kapha* and *Pitta dosha* along with *Medas* within the channels or *Marga* causes obliteration and is known as *Avarana.* Due to this the momentum of the *Vata dosha* circulating in these channels are affected and this impairment of momentum is termed as *Margavarana*. The influence of *Margavarna* is not limited to proximal to the obstruction but distal to the obstruction, the circulation of the nutrients is affected and hence the body part distal to the obstruction is deprived of nutrition. If this pathogenesis occurs in the *Dhamanis* in the *Hridaya* it results in *Margavaranajnaya Hridroga.*

Discussion on Observation

Discussion on Demographic Data

Significant part of the subjects associated with this study had a place with the age bunch of 58-70 years (50%). The ageing and elderly population are particularly susceptible to Coronary artery disease. Ageing can cause changes in the heart and blood vessels. Major cause of Coronary artery disease is the build-up of fatty deposits in the endothelial walls of the arteries over many years. The most common aging chance is increased stiffness of large arteries called arteriosclerosis or hardening of arteries. Advancing age increases the risk of developing atherosclerosis. Plaque builds up inside the endothelial walls of the arteries and over time it gets harden and narrow the arteries, which eventually limits the flow of oxygen rich blood to organs and other parts of the body. Oxygen and blood nutrients are supplied to the heart muscle through the coronary arteries. Hence build-up of plaques in the endothelial walls of the coronary arteries as the age advances will eventually cause coronary artery disease. Majority of the patients were male. As atherosclerosis is the major cause for the Coronary artery disease, the incidence and severity of

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atherosclerosis are more in men than in women and changes appear earlier in men than in women. The lower incidence of Coronary artery disease in women especially premenopausal age is probably due to high levels of oestrogen and high-density lipoproteins both of which are anti-atherogenic influence. Dominant part was married. This is because patients between the age group of 20-70 years were chosen based on the inclusion criteria. Data obtained pertaining to the Religion of the patients shows highest incidence of CAD in Hindu community, this data may be due to the locality selected for the study was predominant of Hindu population. Most of the study areas were Rural locality, so data showed highest incidence in Rural habitat. As such there is no relation between Coronary artery disease and Education. Data obtained pertaining to occupation, shows highest incidence in Labourers. As labourers usually will be having much strenuous works, this may precipitate the symptoms of CAD. Socio economic status of the patients shows highest incidence in the Middle-class family. Since this people find it difficult to follow the regimens needed for healthy life due to their circumstances. In this study, most of the patients presented with a positive family history. Coronary artery disease is mainly due to atherosclerosis, genetic predisposition is one of the Non modifiable risk factors for development of atherosclerosis. Several approaches have provided evidence for several genes contributing to atherosclerosis including Apolipoprotein A-II, Ox40 ligand and 4-lipoxygenase.

Discussion on Personal History

Carbon monoxide, nicotine and other substances in tobacco smoke can promote atherosclerosis and trigger symptoms of coronary artery disease. Both smoking and tobacco use causes the platelets in the blood to clump together easily by making the blood cells more sticky and more likely to form clots. Clumping platelets can block the coronary arteries and cause CAD. It also causes spasms in the coronary arteries which reduces the blood flow to the distal part of the coronary artery ending up in CAD. Non vegetarian food contains more amount of Saturated fat which is most important cause for development of atherosclerosis in the arteries. Even most of the Non vegetarian food is having *Guru guna*, *Abhishyandi guna* which results in *Kapha Medo Vridhi* in the *Dhamani* ending up in *Margavarana* in the *Hridaya* resulting in *Margavaranajanya Hridroga* (CAD). *Vishamagni* is the state in which improper digestion and metabolism takes place. i.e., sometimes performs normal functions followed by abnormal one. Because of this *Vata dosha* will gets increased in the body causing different type of *Shoola*. In case of *Hridroga* the patients with *Vishamagni* will have *Hritshoola* as major symptom due to underlying pathology by *Vata dosha.*

Discussion on Data related to disease

Discussion on *Samanya Hridroga Lakshana*

60% of the patients had *Hridshoola* (Chest pain) as one of the major symptoms. Even in the classics it is told that Circulation of *Rasa, Raktha* (essential nutrients and oxygen rich blood) in the *Hridaya* is obstructed by *Kapha* and *Pitta* leading to morbidity of *Vata dosha* and eventually causes *Hridshoola.* This obstruction is caused due to *Margavarana* in the *Hridaya* causing *Hridshoola* which is one of the symptoms of *Margavaranajanya Hridroga.* Chest pain or Angina is an acute pain of cardiac origin related to inadequate blood supply to the heart muscle. It is felt over the left side of the chest or more commonly in the retrosternal region, it can radiate to the neck, shoulders and even to the tip of the fingers. By nature, it is expanding (*Aayamyathe*), pricking (*Tudyathe*), twisting (*Deeryate*), exploding (*Sphotyathe*), cramps (*Veshtana*), Stiffness (*Stimitha*) type of pain and is aggravated by exercise and heavy meals. Again, *Hridguruta* is the symptom explained by the patients which is one of the characters of chest pain. Patients usually complaints that as if a heavy stone is kept over the chest (*Ashmavrta*). Sweating is controlled by the autonomic nervous system. Pumping blood through clogged coronary arteries takes more effort from the heart, this will result in activation of autonomic nervous system to maintain the body temperature during the exertion. Hence there will be *Swedagamana* (Sweating) in *Margavaranajanya Hridroga*. Due to unwholesome diet and also due to *Mano Vikshobha,*

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the *Sharirika* and *Manasika Doshas* gets vitiated and obstruct the *Rasavaha* (channles that carry nutrients), *Raktavaha* (circulatory system) and *Sanjnavaha Srotas* leading to *Murcha.* Syncope is the temporary loss of consciousness usually related to insufficient flow to the brain. As a result of blockage in the coronary arteries, the brain is not perfused because the heart is failing to generate enough cardiac output to send its freshly oxygenated blood to the brain. Syncope is typically secondary to either mechanical or structural cardiac defect or an arrythmia that alters electrical conduction through the myocardium. A chronic obstruction to forward blood flow (*Margavarana*) out of the heart will lead to increase in ventricular size and pressure. The increase in size leads to ventricular myocyte irritability, which can potentially induce arrythmias and finally *Murcha* (Syncope). In my study few patients who had inferior infarction had *Murcha* as one of the symptoms. *Prana* and *Udana Vata karma Badha* along with *Avalambaka Kapha Pramana Vridhi* give rise to *Pranavaha Sroto Dushti*. This *Dushti* manifests *Shwasa* with *Ati Pravrutti, Shwasadhikya* or *Alpa Shwasa*. Chest pain and Dyspnoea are the most common presenting symptoms of acute or stable coronary artery disease. Exertional angina pectoris caused by myocardial ischemia is a common manifestation in CAD. Usually, the dyspnoea is exertional and is thought to be related to a transient rise in left ventricular end diastolic pressure caused by myocardial ischemia superimposed on reduced left ventricular compliance. Non frequently the dyspnoea will occur in combination with angina pectoris. The patients with coronary artery disease will be having severe chest pain, Dyspnoea, sweating and heaviness in the chest, usually because of fear of undue death the patients will end up in *Santrasa.* Due to blockage in the coronary arteries, there will be slight to marked variation in both pulse rate and also the blood pressure. Because of this the patients usually complaints of generalised weakness. Also, in case of elderly Diabetic patients who are having blockage in the coronary arteries, due to neuropathy the patients usually complaints of generalised weakness as the major symptom rather than chest pain. Due to *Rasa Dhatu Dushti* there will be *Chardhi* in *Hridroga*. Cardiogenic vomiting is a useful predictor of major adverse cardiac events in ST elevated myocardial infarction patients. In my study, patients with inferior infarction had *Chardhi* as one of the symptoms.

Discussion on *Dashavidha Pariksha*

Acharyas have mentioned that *Prakriti* of a person influences the diseases that occur in that person. So, persons with *Vata Kapha Prakriti* will be more prone to *Vataja* and *Kaphaja* diseases. Since *Vata* and *Kapha* are involved in the *Samprapti* of *Margavarana* (atherosclerosis), the persons with *Vata-Kapha Prakriti* are more vulnerable to this disease. As *Madhyama Sara* is most beneficial to the body which helps in maintaining the health, hence this observation was not having relation with my study. *Samhanana* means compactness of the *Dhatus*. As such in the present study maximum patients belonged to *Madhyama Samhanana*, hence it is difficult to establish the relation between *Madhyama Samhanana* and *Margavaranajnaya Hridroga. Satva* refers mental stability of the person. *Manasika Vikaras* like *Krodha, Shoka, Bhaya* and *Chinta* plays a role in manifestation of *Hridroga.* Here in my study seemingly no influence of *Abhyavaharana Shakti* and *Jarana Shakti* can be draw because of smaller sample size. *Avara Vyayama Shakti* refers to less capable of accomplishing any activities and finds difficult to get involved in activities, also gets easily tired. Usually, such persons will be least active. This will eventually end up in *Santarpana Vikara* leading to *Kapha Medo Vridhi* (atherosclerosis) in the Coronary arteries which will end up causing *Margavaranajanya Hridroga.*

Discussion on *Aharaja Nidanas*

Here *Guru Aharas* found more prevalent are different types of Meats, *Dadhi, Ksheera, Payasa, Shushka Mamsa* etc. All these are heavy for digestion and it also increases the Lipoprotein levels in the body leading to Dyslipidaemia. Classically *Guru Ahara* is having *Maha Abhishyanda Guna*, which leads to *Kapha Meda Prakopa* (metabolic syndrome). This excess *Kapha* and *Medas* gets lodged in the *Dhamanis* entering the *Hridaya* leading to *Shonita Abhisyandana* (dyslipidaemia) and *Margavarana* (Atherosclerosis). *Ati Kashaya Rasa Sevana* leads *to Rakta Stambhana.*

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This in turn leads to *Rakta Marga Upalepa* and *Dhamani Praticchaya. Dhamani Praticchaya* ends up in *Margavaranajanya Hridroga.* In the *Vidhishonitiya Adhyaya* of Charaka Sutrasthana, it is told that intake of *Ati Teekshna Ahara* will leads to *Shonita Dushti. Shonita Dushti* will in turn causes *Shonitabhishyanadana* leading to *Rakta Marga Upalepa* and *Margavarana. Adhyashana* refers to having food before the previously taken food is digested. If proper time is not given for the previous food to get digested and stomach is still occupied with a previous food is taken, in such condition there is disturbance in the rate of production of secretion from the stomach and also there will impairment in the *Jatharagni.* Due to this the food gets partially digested thus producing *Ama.* This *Ama* then gets lodged in the *Srotas* leading to *Srotodushti* in the form of *Sanga* (Obstruction). *Ati Ruksha* and *Ati Sushka Ahara Nidanas* will affect *Snigdhata* of *Rakta Dhatu*, and owing to *Vata Prakopa*, they will lead to *Sroto Kharatwa* (Coronary spasm). In modern environment, these *Apatarpana Nidanas* will cause a shortage in fatty acids and anti-oxidants, which will increase the creation of cholesterol. Excessive use of *Lavana* is described as the cause of *Shonitaja Roga*. Moreover, literature also stress that, *Lavana* should not be consumed in excess and for longer duration. *Lavana* possessing properties like *Ushna* and *Tikshna* tend to abnormally increase the liquid portion within the body. Evidently, excessive consumption of dietary salt causes fatigue, lassitude and weakness in the body and are attributed to the morbid change in the *Rakta Dhatu*. In parlance, an excessive intake of salt in the diet enhances ability of blood to hold water eventually increasing the blood volume in the body. As the blood volume is directly proportional to the blood pressure, excessive consumption of salt precipitates Atherosclerotic pathogenesis leading to coronary artery disease. It is told in the classics that *Ati Katu Rasa Sevana* is solely responsible for *Shonita Dushti.* Thus, morbid *Shonita* circulating in the *Dhamani* predisposes to *Upalepa* or adherence of *Kapha* and *Medas* within the wall of the *Dhamani*. Vessels affected by this tend to increase in diameter a phenomenon known as compensatory enlargement in type of vascular remodelling. This pathological change in the *Dhamani* is known as *Dhamani Praticaya*. Eventually these changes in the *Dhamani* are the events of *Sirajagranthi.* The formation of *Sirajagranthi* leads to *Margavarana*. Indulging in *Santarpana Nidanas* like excessive use of *Snigdha*, *Madhura*, *Guru Aharas,* intake of cow's milk and its products etc. will lead to increase in *Kapha* and *Medas* in the body. This *Kapha* and *Medas* gets lodged in the *Rasa Rakta Marga* leading to *Shonitabhishyandana* and finally ends up casuing *Maragavarana. Madya Sevana* will lead to *Shonita Dushti*, which in turn causes *Shonita Abhisyandana* causing *Margavarana*. *Vaaruni* a type of *Madya* is one of the major *Nidana* for *Medo Dushti*. This will lead to accumulation of excess *Medas* (Saturated fats) in the body which is one of the major risk factors for the *Margavarana* Pathology in the *Hridaya.*

Discussion on *Viharaja Nidanas*

Ati Shrama can be understood as doing strenous work. If person is already having blockage in the coronary arteries and if he indulges in strenous work it leads to more pressure over the heart triggering the myocardial infarction. Few of the patients in my study who approached the hospital with symptoms of CAD were doing strenous works during the episode of chest pain. It is well known that exercise is good for physical and mental health. But too much of exercise beyond one's limits can trigger the atherosclerotic pathology and cause coronary artery disease. Fatigue has been found to be the most frequent and bothersome symptom seen in CAD patients. Due to presence of blockage in the coronary arteries and reduced blood supply to the heart, the patients will usually have fatigue while walking and working. In my study patients diagnosed with IHD were found to have more fatigue as primary symptom. Physical activity contributes to normal growth and development, reduces the risk of several chronic diseases. Even the short bouts of physical activity can improve health and wellness. Not getting enough physical activity can lead to heart disease. It can also increase the likelihood of developing obesity, high blood pressure, high blood cholesterol. *Nidra Sukha* in the present era can be understood as

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sedentary lifestyle. This is one of the *Nidana* for *Santarpanajanya Vyadhi* leading to *Rakta Marga Upalepa* ending up in *Margavarana* in the *Hridaya.*

Discussion on *Manasika Nidana*

Chinta can be understood as Stress in terms Occupational stress and other stress that led to psychological disturbance in the person. When person is calm, heart beat is regular, pulse is even and blood pressure is relatively low and visceral organs are well supplied with blood. Contrary to stress- due to increase in the cortisol level, the vessels of the visceral organs constrict, blood flows in larger quantities, heart beats faster and work harder. High stress thickens the blood, inturn leading to clotting of blood leafing to coronary artery disease. When an individual is confronted by circumstances not desirable or unpleasant, he experiences *Bhaya*. Person with *Bhaya* has *Heenasatva.* Cardiophobia is defined as an anxiety disorder of persons characterized by repeated complaints of chest pain, heart palpitations and other somatic sensations accompanied by fears of having a heart attack and of dying. Persons with Cardiophobia focus attention on their heart when experiencing stress and arousal, perceive its function in a phobic manner and continue to believe that they suffer from an organic heart problem despite repeated negative medical tests. *Shoka* is distressful condition due to absence / disunion / separation of loved ones in whom we have affection or faith. Due to long term depression, there will impairment in the endocrine system resulting in decrease in the level of dopamine in the body. This decreased level of dopamine is having direct effect over the blood vessel functioning and heart rate which in the later stage causes Ischemic heart disease (IHD). Anger is an emotion that has different effects on human life. Anger and inadequate management can lead to the destruction of property and communication problems, physical pain, substance abuse, problem solving skills, increased risk of health-related problems. Such as hypertension and cardiovascular disease. Hostility is another variable that affects the health of heart patients and is defined as a personality trait that is characterized by the harmful attitudes and negative evaluation of the events and individuals. This character develops a hostile style in interpersonal relationships characterized by competition, struggle and avoidance. Dispositional hostility as measured by Cook Medley Hostility scale has been associated with inflammation and CAD risk. The pathophysiological mechanisms that link hostility to CAD involve inflammatory process that includes CRP and interleukin -6, both of these are found increased in Hostile individuals led to CAD risk. *Achinta* in the present era can be understood as living a sedentary lifestyle. Nowadays sedentary lifestyle has become a major risk factor for many health issues even in the young populations. Coronary artery disease is one such condition where sedentary lifestyle is one of the major causes.

Discussion on Diagnostic Study

Discussion on Lipid Profile

LDL is produced through the metabolism of VLDL in circulation and constitutes about 50% of the total lipoprotein mass in human plasma. LDL consists approximately 50% cholesterol, 25% protein, 20% phospholipid and some triglyceride. LDL is often called as the Bad cholesterol because it collects in the walls of the blood vessels raising the chance of atherosclerosis. LDL carries cholesterol from liver to peripheral tissues where it can be deposited and increase the risk of atherosclerotic heart. LDL estimation is done to determine the risk of coronary artery disease. The LDL is closely correlated with an increased incidence of atherosclerosis and coronary artery disease. HDL is a small particle, consisting mostly of protein, cholesterol and phospholipids with only traces of triglycerides. It is produced by the liver and intestine and is involved in reverse cholesterol transport. In vitro studies suggest that HDL is involved in anti-inflammatory, antioxidant and anti-thrombotic actions. Hence HDL has a protective effect. It is usually called as Good cholesterol. Normal or High level of cholesterol is associated with low risk of developing coronary artery disease whereas decreased value is associated with increased risk of coronary artery disease. VLDL particles are produced by the liver and supply the tissues of the body with triglycerides of endogenous,

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primarily hepatic origin and cholesterol. VLDL particles are smaller and produce turbid plasma when present in excessive amounts. By mass VLDL contain 50% triglyceride, 40% cholesterol and phospholipid and 10% protein. It is also considered as Bad cholesterol. Smoking and sedentary lifestyle increases the levels of VLDL. Triglyceride which is called as neutral fat, composed of three fatty acid molecule and one glycerol molecule, are used in the body to provide energy for various metabolic process with excess amount stored in the adipose tissues. These are fats from the food we eat that are carried in the blood. Most of the fats we eat, including butter, margarines and oils are in triglyceride form. Excess, alcohol or sugar in the body turn into triglycerides and are stored in fat cells throughout the body. High level of triglycerides in the blood are the major cause for coronary artery disease. Cholesterol is an unsaturated alcohol of the steroid family of compounds. It is essential for the normal function of all animal cells and is a fundamental element of their cell membranes. It is also a precursor of various biologically important substances such as adrenal and gonadal steroid hormones, vitamin D and bile acids. Cholesterol being a non-polar lipid substance need to be transported in the plasma associated with various lipoprotein particles. Total cholesterol includes LDL and HDL. With high levels of cholesterol there are chances of developing fatty deposits in the blood vessels, eventually these deposits grow making it difficult for enough blood to flow through the coronary arteries leading to Myocardial infarction.

Discussion on ECG Findings

AWMI is a common heart disease associated with significant mortality and morbidity. It results from occlusion of the left anterior descending coronary artery. This can cause ST elevation myocardial infarction or a non-ST elevated myocardial infarction. The mechanism is usually plaque rupture causing thrombus; however, plaque erosion or progressive hemodynamic stenosis can contribute as well. The ECG findings of an anterior ST segment elevation myocardial infarction are: ST segment elevation in the anterior leads (V1-V6) and sometimes in septal and lateral leads depending upon extent of infarction. This ST elevation is concave downward and frequently overwhelms the T wave producing a Tombstone appearance. Chest pain caused by NSTEMI is less severe than the pain in STEMI. ANSTEMI is caused by partial coronary artery occlusion leading to reduction of coronary blood flow and causes subendocardial ischemia. The typical presentation of ANSTEMI is a pressure like substernal pain occurring at rest or with minimal exertion. The pain generally lasts more than 10 min and may radiate to either arm, neck or jaw. The pain may be associated with dyspnoea, nausea or vomiting, syncope, fatigue and sweating. History, ECG and cardiac biomarkers are mainstays in the evaluation. ECG findings suggestive of ANSTEMI include transient ST elevation, ST depression or T wave inversion. Cardiac troponin is the cardiac biomarker of choice in such cases. The culprit vessel in the case of IWMI is the right coronary artery. Symptoms include Chest pain, heaviness or pressure over the left side of the chest, shortness of breath, sweating and pain radiation to jaw or arms. There are often other symptoms such as fatigue, light headedness and vomiting. Particular attention should be given to the heart rate since bradycardia and heart block may occur. Likewise, hypotension and evidence of poor perfusion should be assessed, especially if there is concomitant right ventricular infarction. The most common ECG finding with IWMI is ST elevation in ECG leads II, III and aVF with reciprocal ST depression in Lead aVL. ASWMI are commonly caused by the rupture of an unstable atherosclerotic plaque in the left anterior descending artery. Delayed or missed diagnosis of an anteroseptal MI can lead to high morbidity and mortality. The symptoms may include substernal chest tightness with or without radiation of pain, shortness of breath, nausea and sweating. Patients may also less commonly have epigastric pain, unexplained fatigue. ECG findings is usually Q waves or ST changes in the precordial leads V1-V2. Myocardial ischemia is produced due to a reduced blood supply and these arteries are responsible for regulating the blood supply to the heart. In this condition, the arteries become narrow and lose their elasticity due to collection of cholesterol plaques inside the arterial

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wall, thereby reducing the blood flow to the heart muscle itself. Blood clots obstructing the blood flow through the coronary arteries can also lead to Myocardial ischemia. Coronary artery spasm is one more condition where muscle within the walls of the arteries supplying the heart tighten thereby reducing the blood supply. In my study most of the patients who were diagnosed with IHD had symptoms of Exertional dyspnoea as a prominent history. ECG findings usually will be ST depression in the leads. Cardiac stress test like TMT helps in diagnosis of IHD.

Conclusion

Coronary artery disease is one such condition where atherosclerosis is considered as the major cause. Increase in the level of LDL, Triglycerides, Total cholesterol causes deposition of fat leading to obstruction in the blood supply to the heart. *Margavarana* is a unique pathology explained in classics which may herald wide variety of disorders namely *Vatarakta, Pakshagata* and *Hridroga*. *Hridroga* is one among the complications of ignoring the treatment of *Margavarana.* Circulation of *Rasa, Raktha* in the *Hridaya* is obstructed by *Kapha* and *Pitta* leading to morbidity of *Vata Dosha* and eventually causes *Hritshoola. Margavarana* of *Rasa* and *Raktavaha Srotas* in the *Hridaya* will eventually end up in causing *Hridroga.* The description of coronary artery disease, its signs and symptoms simulate the description of *Lakshanas* of *Margavaranajanya hridroga.* A fraction of the *Ahara, Vihara* and *Manasika* factors described in our classics will contribute as a *Nidana* for *Margavaranajanya Hridroga*, according to the current investigation. In *Aharaja Nidana* - Use of *Guru Ahara, Ati Kashaya Rasa Sevana, Ati Teekshna Ahara, Ati Snigdha Ahara Sevana, Ati Lavana Rasa Sevana, Ati Ruksha Ahara, Ati Sushka Ahara, Ati Katu Rasa, Ati Kshara Ahara, Adhyashana* etc. are present in maximum number of patients which led to *Margavarnajanya Hridroga*/CAD. In *Viharaja Nidana* - *Achesta, Nidra Sukha, Achinta* are present in maximum of the patients which led to *Margavaranjanya Hridroga*/CAD. Other *Viharaja Nidanas* like *Ati Shrama* and *Ati Vyayama* were also seen in the patients which can be considered as the *Vyanjaka Hetu* in causation of *Margavaranjanya Hridroga. Manasika Nidanas* like *Chinta, Krodha, Bhaya, Shoka* also plays an important role in the pathogenesis of coronary artery disease. Habitual intake of Alcohol, Smoking and Tobacco were also seen in maximum of the patients who had *Margavaranajanya Hridroga*/CAD. With the help of current technology available for diagnosing *Margavaranajanya Hridroga*/ CAD, lipid profile and ECG test was done for proper diagnosis.

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