

**CORRELATIVE STUDY OF RAKTADHARA KALA WITH REALATIONTO
ENDOTHELIAL LINING OF BLOOD VESSELS W.S.R. TO ATHEROSCLEROSIS**Vd. Priyanka D. Nirwal*¹ and Dr. S. D. Rokade²

¹PG Scholar Department of Rachanasharir, Government Ayurved College Nanded –431601, Maharashtra State, India.
²HOD and Professor Department of Rachanasharir, Government Ayurved College Nanded – 431601, Maharashtra State, India.

*Corresponding Author: Vd. Priyanka D. Nirwal

PG Scholar Department of Rachanasharir, Government Ayurved College Nanded –431601, Maharashtra State, India.

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ABSTRACT

The word *Kala* has been used in many senses in Vedic and other ancient literature, *Kala Sharir* is an important part of *Ayurvedic* anatomy. *Kala* was first time described by Sushruta. *Kala* is one of the prime topic described by Sushruta in *sharirsthana*, *Garbhavyakarana Sharir Adhyaya*. *Kala* is defined as membranous structures which separates *Dhatu* and *Ashaya*, Vagbhata has then added embryological development that it is the important physical and functional components of the body. They form a protective coating for *Ashayas* as well as boundary between *Ashayas* and *Dhatus*. There is seven *Kala* in the body, in which second *Kala* is *Raktadhara Kala*. *Kala sharir* (Anatomy and Physiology of *Kala*) gives us information about the important membranes and layers of the body which take part in many important functions of the body. But till date there is no such any clinical significance of *Kala Sharir* is established. *Raktadhara Kala* is second prime *Kala* in the body which is situated in *Mansa* and holds the *Rakta* present in *Sira*, *Yakrit* and *Pleeha*. *Raktadhara Kala* is correlated with endothelial lining of blood vessels, *Kala* is one of the treatment sites. The endothelial lining as a semipermeable barrier separating lumen from vessel wall. Endothelium is organ responsible for a variety of physiological process vital for vascular homeostasis. In Atherosclerosis, dysfunction of endothelial lining of blood vessels. So, we could correlate the *Raktadhara Kala* is a endothelial lining of blood vessel, it will be helpful in diagnosis and treatment of many ailments.

KEYWORDS: Atherosclerosis, *Kala*, *Kalasharir*, *Raktadhara kala*, *Sira*.**INTRODUCTION**

Ayurveda is a science of life. The first principal of *Ayurveda* is to maintain a healthy body and mind of person and to give relief to the patient. The basic knowledge of *Sharira* (human body) is essential for application of the above said principals. Hence, *Ayurveda* physicians and surgeons must be perfect with basic knowledge. *Acharya Sushruta* while explaining the detailed development of body parts in *Garbhavyakarana Sharir*, chapter of *Sharirsthana*, mentioned the concept of *Kala*. There are total seven *Kala* in body. *Kala* is limiting membrane or layers in our body situated between *Dhatu* and *Ashaya*.^[1]

If we cut a wood, the cross section of the wood shows it's different layers and parts. In the same way we have to cut the superficial layer of *Mansa* (flesh) to reveal the *Dhatu*. It means that *Dhatu* are principal factors of our body and they are located deeply. We have to incise the covering to reveal these *Dhatus*, these covering are *Kala*.² Among seven *Kala* *Raktadhara Kala* is said to be second prime *Kala* in the body. It is situated in *Mansa* and holds the

Rakta present in *Sira*, *Yakrit* and *Pleeha*.^[3]

Raktadhara Kala support *Rakta* and help for it's circulation. Throughout the body is the major role of this *Kala*. In modern science *Raktadhara Kala* is correlated with the endothelial lining of blood vessels and Sinusoid of the liver and spleen. According to *Ayurveda* *Kala* performs the vital functions of the body and malfunctions develop pathology. The *Doshas* are moving across the body in their normal as well as in abnormal form but whenever they get suitable environment get stuck to respective body part and ultimately results in the formation of disease⁴. If *Kala* performs normal function then it holds body physiology, but unable to carry out physiology leads to pathology. It is a wide spread generalized structure also and can be considered as microscopic internal lining of blood vessels, that are said to be location of the *Kala*.

Dysfunction of *Raktadhara Kala* which leads to a Atherosclerosis, Arteriosclerosis etc. Disorders and it is a site of treatment of diseases.

AIMS AND OBJECTIVE

1. To find out the applicability of *Kalasharir* described in *Ayurved* in the light of contemporary science.
2. *Raktadhara Kala* (endothelial lining of blood vessels) is a treatment site of Atherosclerosis.

MATERIAL AND METHODS

Through critical review of available literature from *Ayurveda* and modern science related to *Kala*. *Kala* unable to carry out physiology it leads to diseases. This *Kala* is one of the treatment site, of disease. So to study the applicability of the *Kala* described in *Ayurveda* in the light of present contemporary knowledge this study was initiated.

REVIEW OF LITERATURE

There are seven type of *Kala*, which separator between *Dhatu* and it's *Ashaya*.

These are not mere the limiting membranes but also perform some vital functions of body.^[5] According to *Sushruta* in *Garbhavyakarana Sharir* of *Sharirsthana* there are seven *Kala*, *Mansadhara Kala*, *Raktadhara Kala*, *Medodhara Kala*, *Shleshmadhara Kala*, *Purishdhara Kala*, *Pittadhara Kala* and *Shukradhara Kala*. *Shrangdhara* explanation of *Kala* also gives the same meaning and anatomical definition of *Kala*. According to him the *Kleda* or moisture or liquid portion present in between *Dhatu* and *Ashaya* is processed by the heat of the body and converts in to *Kala*. *Sharangdhara* told seven *Kala*, i.e. *Mansadhara Kala*, *Asrukdhara Kala*, *Medodhara Kala*, *Yakrit Pleeha Dhara Kala*, *Antradhara Kala*, *Agnidhara Kala* and *Retodhara Kala*.^[6]

Sushruta says, *Raktadhara Kala* is embedded in muscles and it is a thin mucous membrane inside Arteries, Veins formed by epithelial tissue and Liver and Spleen formed by Sinusoids.^[7] When muscles are cut *Rakta* flows from the wound just as a milky sap when trees are cut.^[8] *Sharangdhara* explains second *Asrukdhara Kala* and fourth *Yakrit Pleeha*.

Dhara Kala. *Asrukdhara Kala* is semipermeable membrane in the blood vessels and *YakritPleeha Dhara Kala* is present in Liver and Spleen.

The word *Kala* stands for property or a quality so these are some special membranes in the body which are having important role in performing body physiology. The *Kala* are further classified in 3 groups.^[9]

- i. *Snayu pratichanna kala*** – Membranes of connective tissues such as facia, apponeurosis, ligaments, tendons, external layer of wall of organ of digestive, respiratory, circulatory, urinary, reproductive systems etc.
- ii. *Jarayu santata kala*** – membranes formed from fibrous connective tissue making for superficial and deep facia forming part of muscles etc., separating them into functional units or even uniting the parts together, these

also form body cavities etc.

- iii. *Shleshma veshitā kala*** - membranes formed from fibrous epithelial tissues, which secrete fluids; these are two, viz – mucous membrane and serous membranes.

Modern view of *Kala*: Membrane are formed during the embryonic period itself mainly from three kinds of primary tissue- epithelial tissue, connective tissue and adipose tissue.^[10]

1. Epithelial tissue – Makes for two kinds of secreting membrane viz, mucous and serous; the former secretes thick jelly like fluid i.e. mucus and are inside all hallow organs of digestive, respiratory, circulatory, urinary and reproductive system, Serous membranes secretes thin watery fluid and are present enveloping certain organs (heart, lungs, testes etc.).

2. Connective tissue – Membranes formed from this are of different shapes – long, cylindrical, flat etc and go into the formation of facia, aponeurosis, septa, ligaments, tendons, cartilages etc; some of these are inelastic, some moderately elastic and some greatly elastic. These are found in the skin, walls of organs of digestive, circulatory, urinary, and muscular and haemopoietic systems.

3. Adipose tissue (fat) is a storage tissue. It forms membranes or layers – thin or thick in various places. It is present in the subcutaneous tissue, bone marrow, abdominal wall, omentum, forms padding around some organs like kidneys, eyeball etc. With the help of above facts, threekinds of *kala* may be corrected as fallows.

According to location (*Sthana*) of *Kala* they perform following functions; Formation, Secretion, Selection, Protection, Absorption, Transformation etc. So *Raktadhara Kala* helps in the formation and Transmission of the blood.^[11]

DISCUSSION

Kala as a barrier between *Dhatu* and it's *Ashaya*. *Vagbhata* has then added embryological development that it is the important physical and functional component of body. *Kala* is the protective covering between *Ashaya* and *Dhatu*. *Kala* gives us information about the important membranes and layers of the body which take part in many important functions of body. The second *Kala* is *Raktadhara Kala* (supporting membrane of blood). It is present or embedded in *Mansa* (muscle tissue), especially in *Sira*, *Yakrit* and *Pleeha*.^[7] When muscles are cut *Rakta* flows from the wound just as a milky sap when trees are cut.^[8]

Sharangdhara mentioned *Dwitiya Asrukdhara Kala* is the semipermeable membrane or barrier separating lumen from vessel wall. The endothelium has an important role in maintaining vascular homeostasis.^[12] Alterations of endothelial cells and the vasculature play a central role in the pathogenesis of a broad spectrum of the most dreadful of human diseases, as endothelial cells have the key function of participants in the maintenance of patent and functional capillaries. Dysfunction of the

vascular endothelium is thus a hallmark of human diseases like, Atherosclerosis, Arteriosclerosis etc. The endothelium modulates arterial stiffness which proceeds overt Atherosclerosis and is an independent predictor of cardiovascular events.

Unsurprisingly, dysfunction of the endothelium may be considered as an early and potentially reversible step in the process of Atherogenesis and numerous methods have been developed to assess endothelial status and large artery stiffness.^[13]

Atherosclerosis is when plaque clogs and hardens Arteries with loss of elasticity, plaque is made up of fat, cholesterol, etc. Found in blood due to overtime. Plaque hardens and narrows Arteries. A disease that potentially can be prevented by changes in diet, environment and lifestyle, is called lifestyle disorder such as heart disease, obesity, osteoporosis and type 2 diabetes etc. Atherosclerosis causes disease in many parts of the body i.e. cerebral arteries (stroke), Aorta (Aneurysm), Renal Arteries (Hypertension), Iliac, Femoral and Tibial Arteries (Peripheral vascular diseases).

Raktadhara Kala mentioned in *Ayurveda* has great similarity with that of endothelial lining of blood vessels. Any dysfunction will lead to formation of disease. In contemporary science Atherosclerosis associated with endothelium.^[14] *Samprapti* of Atherosclerosis according to *Ayurveda*, the use of *Apathyakar Aahara, Vihara* leads to *Jatharagni Dushiti*. This further leads to instigate the formation of *Ama Anna Rasa* and subsequent *Ama Rasa Dhatu*.^[15] In *Ama Rasa Dhatu* leads *Medodhatwagnimandya. Utpatti* of *Sira* from *Meda Dhatu* then *Apachit Meda Dhatu* progression causes *Margavarana* by *Vata* and *Sanga* in the *Sira*. This results in a condition termed as Atherosclerosis. So *Kala* is treatment site of disease can be possible that means of herbal remedies acting on *Raktadhara Kala* contribute to reverse the pathology occurred in blood vessels, by normalising the functions of *Raktadhara Kala*.^[16] In this view clinical study of Atherosclerosis is, prevention like *Nidana Parivarjana*, Reduce Stress, Avoid Smoking, *Yoga, Pranayama, Vyayama* etc. It could also manage by the *Apatarpana, Langhana, Shamana (Guggula, Medopachaka Yoga, Madhu etc.), Shodhana (Virechana, Basti etc.), Anabhishtyandi Snigdha Chikitsa* like, Medicated *Ghrta* should be used for the purpose of *Shodhana* and *Shamana* etc. Similarly this can be a new instinct to develop *Kala Chikitsa* as a speciality of *Rachana Sharir*.

CONCLUSION

Kala Sharir is important anatomically and physiologically take part in many important components of the body like blood, mucous, stool etc. *Kala* described in *Ayurveda* are special membranes in the body present between *Dhatu* and *Ashaya* which performs vital functions of the body. *Raktadhara Kala* described in

Ayurveda can be correlated with the endothelial lining of present in blood vessels. The diseases also should logically have origin from them or at least show their initial manifestation in the *Kala*. *Kala* can be considered as one of the treatment sites for the disease associated with respective *Kala*.

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