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# Exploring the Concept of *Kala Sharir*: An Ayurvedic and Histological Perspective

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## Abstract

Ayurveda, the ancient Indian system of medicine, provides a detailed understanding of the human body through the concept of *Kala Sharir*, as described by Acharya Sushruta. The term *Kala* refers to membranous layers that separate and support different *Dhatus* (tissues) and *Ashayas* (body cavities). Understanding these structures through the lens of modern histology enhances the integration of traditional and scientific anatomical knowledge. To explore the concept of *Kala Sharir* as described in Ayurvedic texts and to correlate it with modern histological structures, emphasizing its clinical and anatomical significance. This is a descriptive and analytical study based on classical Ayurvedic literature including *Sushruta Samhita*, *Ashtanga Sangraha*, and *Sharangadhara Samhita*, along with standard modern anatomical and histological references such as *Gray's Anatomy*. Comparative analysis was carried out between the seven *Kalas* mentioned in Ayurveda and their modern anatomical and histological equivalents. Each of the seven *Kalas* shows close resemblance to specific modern tissues. *Mamsadhara Kala* corresponds to fascia and muscle sheaths; *Raktadhara Kala* to vascular endothelium; *Medodhara Kala* to adipose tissue; *Shleshmadhara Kala* to synovial membrane; *Purishadhara Kala* to intestinal mucosa; *Pittadhara Kala* to gastric and intestinal linings; and *Shukradhara Kala* to reproductive epithelial layers. These correlations reveal functional and structural parallels that validate the scientific basis of ancient descriptions.

The concept of *Kala Sharir* provides a profound anatomical framework consistent with modern histological understanding. Recognizing these correlations bridges classical Ayurvedic principles

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with contemporary biomedical science and highlights the potential of Ayurvedic anatomy in disease understanding, diagnosis, and management.

**Key words :** *Dhatu*, Histology, Membranous layers, Pathology, *Sushruta Samhita.*

In the *Sushruta Samhita*, "*Kala*" refers to the delicate membranes that separate the essential bodily tissues (*Dhatus*) from their designated cavities (*Ashayas*).[12] According to *Vruddha Vagbhata*, *Kleda* between *Dhatu* and *Ashaya* are metabolized by the heat of body tissues and transforms into a separating factor called *Kala*, similar to the pith of wood.[3] According to *Acharya Sharangadhara*, the moisture between *Dhatu* and *Ashaya* is processed by body heat and transforms into *Kala*.[5] *Acharya Sushruta* explores seven types of *Kala*, crucial for maintaining tissue integrity and regulating bodily functions. These membranes, akin to modern epithelial tissues and synovial membranes, reveal the relevance of *Ayurvedic* principles in understanding human anatomy. Understanding *Kala Sharir* enhances *Ayurvedic* insights and opens opportunities for research in modern healthcare applications.

*Aim & Objectives :*

*Aim :* This study investigates *Kala Sharir* in *Ayurveda*, comparing its traditional relevance with modern histology and their implications for health and integration into current healthcare.

*Objectives:*

- To explore the significance of the seven *Kalas* in the *Sushruta Samhita*, focusing on their anatomical and physiological roles in the human body.
- To compare the descriptions of *Kala Sharir* in *Ayurvedic* literature with modern histological insights on epithelial tissues, synovial membranes, connective tissues, and adipose tissues etc.
- To analyse the characteristics of *Kala Sharir* (*Mamsadhara Kala, Raktadhara Kala, Medodhara Kala,* etc.) in relation to contemporary anatomical elements like fascia, blood vessels, and mucosal layers etc.

The Seven *Kalas* and their Modern Correlations;

| *Sushruta*[13] | *Sharangdhara*[6] |
|---|---|
| *Mamsadhara Kala* | *Mamsadhara Kala* |
| *Raktadhara Kala* | *Asrugdhara Kala* |
| *Medodhara Kala* | *Medodhara Kala* |
| *Shleshmadhara Kala* | *Yakrutpleehodhara Kala* |
| *Purishadhara Kala* | *Aantradhara Kala* |
| *Pittadhara Kala* | *Agnidhara Kala* |
| *Shukradhara Kala* | *Retodhara Kala* |

1. *Mamsadhara Kala :*

*Mamsadhara Kala* is the first *Kala*, characterized by the network of *Sira, Snayu, Dhamani*, and *Srotas*. Like the rhizome and stalk of a lotus growing in muddy water, these

structures develop within the muscles.[8] It is located between muscle tissue (*Mamsa Dhatu*) and plasma/lymph (*Rasa Dhatu*). Its main role is to support muscle formation, nourishment, and function.

*Modern Correlations of Mamsadhara Kala*:

Fascia is a crucial type of connective tissue that varies in composition but is characterized by intertwining collagen fibres. In tendons and aponeuroses, these fibres are closely packed and aligned, offering strength and support. Investing fascia refers to the specialized fascia that forms distinct layers on the outer surfaces of muscles and their epimysial sheaths. It envelops muscles and allows for the movement of vessels and nerves, demonstrating the role of *Mamsadhara Kala* in providing coverage while enabling flexibility and mobility for the body's functions.[13]

1. Fascia: Connective tissue surrounding muscles for support and nutrient exchange.
2. Perimysium and Epimysium: Layers protecting and structuring muscles.
3. Endomysium: Surrounds individual muscle fibres for nutrient exchange.
4. Blood Supply: Vascular network delivering oxygen and nutrients, aligned with *Mamsadhara Kala*.
5. Interstitial Spaces and Lymphatics: Transport fluids and nutrients in muscle tissue.

2. *Raktadhara Kala* :

*Raktadhara Kala* is located inside the *Mamsa* and in the *Siras, Yakrit* and *Pleeha.* Just as milky sap flows out when trees with milky sap are cut, similarly when muscles are cut, blood flows out quickly in great quantity.[9] *Acharya Sushruta* mentions *Raktadhara Kala* as a thin membrane responsible for holding and regulating blood within the body, found in *Sira* (veins/capillaries), *Yakrit* (liver), and *Pleeha* (spleen). It is positioned below *Mamsadhara Kala* and closely associated with *Raktavaha Strotas* (blood-circulating channels). It serves as a structural boundary and plays a crucial role in absorption, secretion, and support of blood-related tissues.

Modern Correlations of *Raktadhara Kala :*

The tunica intima is the innermost layer of arteries, lining the lumen and compared to the *Raktadhara Kala*. Sinusoids in the liver and spleen also resemble *Raktadhara Kala*. This layer can be compared with elastic arteries (*Dhamani*), muscular arteries (*Sira*), and capillaries.[14] It is a microscopic structure similar to vascular endothelium, crucial for blood regulation and disease pathology, particularly in liver disorders, splenic diseases, and circulatory issues.[2]

3. *Medodhara Kala :*

*Medodhara kala* is the third *kala*. *Meda* is present in the abdomen of all Animals and small bones. The fatty substance present in large bones is called *Majja* (marrow).[10] *Meda Dhatu* refers to the body's fat tissue, which acts as a protective and insulating barrier, separating various tissues while supporting numerous physiological functions. It provides lubrication for joint movement, regulates body temperature through insulation, nourishes surrounding tissues with essential nutrients, and cushions internal organs from physical shocks.

*Modern Correlation of Medodhara Kala :*

*Medodhara Kala* is closely associated

with adipose tissue, composed mainly of adipocytes. This tissue is crucial for energy storage, as it stores excess calories as triglycerides for later use. Additionally, adipose tissue provides thermal insulation and is found in key areas like the subcutaneous layer, around the kidneys, and in the abdominal cavity, highlighting its protective and supportive roles as noted in Ayurvedic texts.[17]

Types of Adipose Tissue- *White Adipose Tissue* serves as an energy reserve and insulation. It's the most common fat type, found under the skin (subcutaneous) and around internal organs (visceral).[1] *Brown Adipose Tissue* is specialized for heat production, especially in cold exposure or after eating. It is more common in infants, helping them maintain body temperature, and contains more mitochondria than white adipose tissue, leading to greater energy expenditure.

4. *Shleshmadhara Kala :*

The fourth *Kala* is *Shleshmdhara Kala* this is found in the all the joints of human beings. As the wheels moves easily on a well-oiled axle, the joints lubricated by the *Shleshma* perform their proper function.[14] It is significant as it consists of layers that retain mucus and is found in every bony joint. The *Shleshma* secreted by the *Shleshmadhara Kala* ensures effortless mobility and flexibility in the skeletal structure.

***Modern Correlations of Shleshmadhara Kala***: The synovial membrane is a specialized connective tissue that lines the inner surfaces of synovial joint capsules and tendon sheaths. It plays a crucial role in reducing friction by continuously secreting synovial fluid, which is vital for joint health and function. The fluid's composition resembles blood plasma and contains hyaluronan, important for its viscoelastic and thixotropic properties.[16] In modern anatomical science, the architecture of a synovial joint is revealed to comprise several key components: a synovial cavity filled with fluid, articular cartilage cushioning the bony surfaces, a fibrous articular capsule that encases the joint, the synovial membrane providing lubrication, and ligaments that offer stability. Together, these elements create a finely tuned system that allows for both strength and flexibility in movement.[7]

5. *Purishadhara Kala* :

The fifth *Kala* is *Purishdhara Kala*. This separates the mala (the waste products namely the *Kitta Bhag*, in the form of faecal matter & urine, resulting out of fully digested solid and watery portion of diet) inside the abdomen & is located in *Pakvashaya*. *Sushruta* has also defined *Purishdhara Kala* as *Maladhara Kala*.[17] According to classical *Ayurvedic* texts like the *Sushruta Samhita*, *Purishdhara Kala* is located in the large intestine (*Pakwashaya*) and plays a key role in digestion and waste elimination. As explained by *Acharya Sushruta* this kala is place where digested food is seprated in *Sara* and *Mala Bhaga*, which in modern can be correlate with the large intestine. *Acharya Sushruta* said that it is near to the *Yakruta*, so it can be the hepatic flexure as it near to the liver.

***Modern Correlations of Purishdhara Kala*:** Modern science describes the gastrointestinal tract (GIT) as being composed of four layers: the mucosa, submucosa, muscular layer, and the serous or fibrous layer.

1. Mucosa: The innermost layer features specialized epithelial cells with numerous goblet cells that produce mucus, crucial for lubricating faecal matter and protecting the intestinal wall from friction and pathogens. 2. Submucosa: This dense connective tissue layer lies beneath the mucosa, containing blood vessels, lymphatic vessels, and nerves that support the mucosa and aid in nutrient delivery and immune responses. 3. Muscularis Externa: Comprising an inner circular and outer longitudinal smooth muscle layer, it is essential for peristalsis, facilitating the movement and mixing of intestinal contents. 4. Serosa: The outermost layer, the serosa, provides structural support and protection while secreting serous fluid to minimize friction with surrounding organs. This structure can be correlated with the concept of *Purishdhara Kala*. The smooth muscles of the GIT are primarily located in the muscular layer, with some found in the deeper layer of the mucosa. Smooth muscle contraction is initiated by calcium ions ($Ca^{2+}$), which enter the cells from the extracellular fluid during an action potential. Smooth muscle cells have more calcium channels and fewer sodium channels than skeletal muscle cells, making sodium less significant in generating action potentials. The influx of $Ca^{2+}$ is the primary trigger for muscle contraction.[15]

6. *Pittadhara Kala :*

The sixth *Kala* is *Pittadhara Kala*. *Amashaya* receives the four kinds of food: *Asit*, *Khadit*, *Peeta*, and *Leedha* (eatable, chewable, drinkable, lickable) which come out from the *Amashaya* and holds it till reaches the *Pakvashaya*.[2] It bears the digestive fire in it which helps to digest the food received by individual. Here *Agni* is the main factor for digestion and absorption of food. The *Pittadhara Kala*, is vital for digestion, transporting food from the *Amashaya* (stomach) to the *Pakvashaya* (digestive organ).[11] *Pittadhara Kala* is distinctly categorized as *Grahani* and is strategically located between the *Amashaya* and *Pakvashaya*. *Amashaya* contains partially digested food, while *Pakvashaya* is where complete digestion occurs.

*Modern Correlations of Pittadhara Kala*:

The pancreas has both exocrine and endocrine functions, producing digestive enzymes and insulin, respectively. The liver, covered by Glisson's capsule, processes nutrients and produces bile.

7. *Shukradhara Kala :*

In *Ayurveda*, *Shukradhara Kala* is described as a membranous layer surrounding *Shukra*, the vital essence for reproduction. This pervades the whole body of all human beings. Due to this fact, it has been said that *'Shukra'* pervades the whole body of human being as *Ghrut* is present in the milk & juice in the sugarcane and gets discharged at the time of sexual indulgence.[17]

This layer serves protective and functional roles in the reproductive system, aiding in the movement and storage of reproductive elements for both genders.

***Modern Correlations of Shukradhara Kala***: From a modern histological viewpoint, *Shukradhara Kala* is akin to protective components found in the reproductive organs.

*In Males*: *Testicular Membranes* : *Shukradhara Kala* correlates with the tunica albuginea and tunica vaginalis, which protect the testes and support spermatogenesis. *Tunica Albuginea*: This fibrous tissue envelops the testes, maintaining their structure and function while serving as a barrier for seminiferous tubules. The wall of the vas deferens has several layers: an outer loose connective tissue, a thick middle layer of smooth muscle, and an inner mucosal layer. At the duct's start, near the epididymis, there's an additional longitudinal muscle layer. In contrast, the ejaculatory ducts have thinner walls, with a fibrous outer layer that thins near the prostate, a thin smooth muscle layer with circular and longitudinal orientations, and a mucosa lined with columnar epithelium.[4] In the Epididymis and Seminal Vesicles: These areas are crucial for sperm maturation, storage, and transport. The epididymal epithelium facilitates fluid absorption and sperm concentration, resembling the supportive role of *Shukradhara Kala*. The seminal vesicles contribute to semen fluid, vital for sperm motility.

*In Females*: *Shukradhara Kala* corresponds to the structures protecting the ovaries, fallopian tubes, and uterus. The peritoneal coverings and ovarian layers (similar to the tunica albuginea) protect reproductive tissues. Ovarian follicles, which mature into eggs, can also be viewed within this framework.

The comprehensive review and analytical comparison of Ayurvedic descriptions and modern histological structures revealed significant parallels between the *Sapta Kala* described by Acharya Sushruta and various anatomical and histological layers recognized in contemporary science.

Each Kala demonstrated distinct anatomical and physiological roles with clear modern correlations:

- **Mamsadhara Kala** corresponds to **fascia and connective tissue layers**, providing structural support and nourishment to muscles.
- **Raktadhara Kala** aligns with **vascular endothelium and sinusoidal linings** of the liver and spleen, reflecting its function in blood regulation.
- **Medodhara Kala** shows similarity to **adipose tissue**, functioning in energy storage, insulation, and metabolic regulation.
- **Shleshmadhara Kala** correlates with the **synovial membrane**, ensuring lubrication and smooth joint movements.
- **Purishadhara Kala** resembles the **intestinal mucosa and submucosa**, emphasizing its role in waste separation and excretion.
- **Pittadhara Kala** is comparable to the **gastric and intestinal linings**, indicating its involvement in digestion and assimilation through digestive secretions.
- **Shukradhara Kala** aligns with **reproductive epithelial and connective coverings**, such as tunica albuginea and ovarian membranes, highlighting its role in fertility and reproduction.

The results affirm that Sushruta's conceptualization of *Kala Sharir* offers a foundational understanding of human anatomy

that parallels modern histological organization. The comparison establishes the **scientific validity and clinical applicability** of Ayurvedic structural concepts, suggesting that Kala Sharir can be understood as the ancient equivalent of various **membranous, epithelial, and connective tissue systems** in the human body.

The concept of *Kala Sharir* from the *Sushruta Samhita* provides a structured understanding of the human body through seven *Kalas*, which support the *Dhatus* (tissues) and *Ashayas* (body cavities). When aligned with modern histology, these Kalas show similarities to epithelial layers, connective tissues etc emphasizing Ayurveda's anatomical insights. This integration highlights the clinical relevance of *Kala Sharir* in metabolism, musculoskeletal health, digestion, and reproduction. For example, *Medodhara Kala* explains metabolic disorders, *Shleshmadhara Kala* relates to arthritis and joint function, *Purishadhara Kala* reflects the large intestine's waste elimination role, and *Shukradhara Kala* connects to reproductive membranes, emphasizing its importance in fertility. By bridging *Ayurvedic* and modern medical perspectives, this analysis validates ancient knowledge and suggests practical applications in diagnostics and treatment. Ultimately, *Kala Sharir* fosters a comprehensive approach to health, reinforcing the timeless relevance of *Ayurveda* in contemporary medicine.

**Source of Support:** Nill

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