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Conceptual study of *Shleshmadhara Kala* w.s.r to Synovial Membrane and its Applied Aspect - A Review

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ABSTRACT

Anatomy is the science that deals with study of the different structures of human body. *Kala Sharir* is one of the important concepts of *Ayurveda* anatomy which is mainly about the layers or membranes of the body. *Kala* is the term stated by *Acharya Sushruta* in relevance of sheath or beholding membrane of internal organs. Among the *Sapta Kalas*, *Shleshmadhara Kala* is fourth important *Kala* which is described by *Acharaya Sushruta* and other *Acharyas*. It is present specially in all the *Sandhi*. It could be correlate with the Synovial membrane of the joint as per modern Anatomy. Aim of this study is to determine the applied aspect of *Shleshmadhara Kala*. Objectives of this study are to compare the anatomical structure of *Shleshmadhara Kala* according modern anatomy and to evaluate the *Doshic* involvement in various ailments like Osteoarthritis, Rheumatoid arthritis and gout etc. in *Shleshmadhara Kala*. To fulfill such aim and objectives we have reviewed all the *Ayurvedic* classics, related literature and modern anatomy literature.

Key words: *Shleshmadhara Kala*, *Synovial membrane*, *Sushrutachrya*, *Kala Sharir*.

INTRODUCTION

Kala Sharir is one of the important aspects of *Ayurvedic Sharir Rachna Vijnyana* which mainly deals with the layers and membranes which covers various organs and tissues of the body. *Kala* is the term stated in *Ayurveda* for various purposes including unit of time and membrane etc., with respect to anatomical view it can be correlated with membranous structure. *Kala* is a unique concept explained by *Acharaya Sushruta* in "*Garbhavyakarana Sharir Adhyaya*." *Sushrutachrya* defined the *Kala* as separator between *Dhatu* (tissues) & its *Ashaya* (organ or viscera), here *Ashaya* described

as cavity that holds *Dhatu*.^[1]

During foetal development, *Kleda* or moisture present in between the *Dhatu* and its *Ashaya*, reacting to its own heat gets converted into *Kala*.^[2] *Kala Swaroop* (structure) described by *Acharaya* are the body parts covered by *Snayus*, enveloped *Jarayu* and smeared with *Kapha*.^[3] As per modern science it can be correlated with mucous membranes and epithelium. Therefore, *Kala* is membrane which protected by *Snayus* and secrets mucous; thus, *Snayu* and *Shleshma* are considered as components of *Kala*. The first *Kala* is known as *Mamsadhara*, the second is *Raktadhara*, the third is *Medodhara Kala*, the fourth is *Shleshmadhara Kala*, the fifth is *Purishdhara Kala*, the sixth is *Pittadhara Kala* and the seventh is *Shukradhara Kala*, thus the seven *Kala*.^[4]

A basic structure of *Sandhi* is described as union of *Asthi* (bony surfaces), presence of *Shleshmadhara Kala* (synovial membrane) and *Shleshak Kapha* (synovial fluid). Joint diseases as mentioned in modern science can be classified in to inflammatory or non-inflammatory (degenerative) diseases. According to *Ayurveda* diseases have to be justified as *Sama* or *Nirama* condition. Here an attempt is made to

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understand involvement of different *Doshas* in these inflammatory and non-inflammatory joint diseases in respect of *Shleshmadhara Kala*, it will evaluate the different *Sandhigat Vyadhi*, by compiling the existing evidences.

AIM AND OBJECTIVE

Aim of this study is to determine the applied aspect of *Shleshmadhara Kala*. Objectives of this study are to compare the anatomical structure of *Shleshmadhara Kala* with the Synovial membrane according modern anatomy and to evaluate the Doshic involvement in various ailments like OA, RA and gout etc. with respect to *Shleshmadhara Kala*.

MATERIALS AND METHODS

From various classical texts *Bruhatrayi* like *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Samgraha*, *Ashtanga Hrudaya* and *Laghutrayi* like *Madhav Nidan*, *Sharangadhara Samhita* etc and evidence based resources as scientific journals, books and data based information from various texts.

DISCUSSION

The body parts covered by *Snayus*, enveloped by *Jarayu* and smeared with *Kapha* are called *Kalas*. As per modern science it can be correlated with mucous membranes and epithelium. *Kala* separates hollow or lumen of Organ from its lining tissue, therefore mucous membranes of the hollow Organs can be considered as *Kala*. It is interposed structure between the *Dhatu* and its *Ashaya*.

Shleshmadhara Kala is layers which holds mucous, present in all bony joints. It has been compared like the lubricant (oil) in a wheel axis which permits the wheel to move round in a free manner. Similarly, the *Shleshma* secreted by the *Shleshmadhara Kala* allow all bony joints to move freely on their respective axis.^[5]

The Synovial membrane is a specialized connective tissue that lines the inner surface of capsules of synovial joints and tendon sheath. This synovial membrane is lubricated with synovial fluid secreted by it. The term synovium refers to the soft tissue lining the movable joints throughout the body. Synovial lining

secretes synovial fluid that lubricates and nourishes synovial joints.^[6]

The basic structure of *Sandhi* is described in short in classical texts. Structure of *Sandhi* is not elaborated in detail by *Sushrutachrya*. A basic structure of *Sandhi* is described as union of *Asthi* (bony surfaces), presence of *Shleshmadhara Kala* (synovial membrane) and *Shleshak Kapha* (synovial fluid). Modern science reveals the basic structure of synovial joint as consisting of synovial cavity, articular cartilage, fibrous articular Capsule, synovial membrane and ligaments.

There are two types of *Sandhi*, *Chal* (movable) and *Achal* (immovable).^[7] The joints of extremities, temporomandibular joint and joints of waist are movable and rest all are immovable. According to *Sushrutachrya* joints are of eight types namely *Kor*, *Udukhal*, *Samudga*, *Tunnasevani*, *Vayastunda*, *Mandal*, *Shankhavarta*.^[8] According to modern science joints are classified into three basic types as fibrous, cartilaginous and synovial joints depending on the material composing the joint and presence or absence of a cavity in the joint.^[9]

Joint diseases as mentioned in Ayurveda or modern science can be classified into inflammatory or non-inflammatory (degenerative) diseases. Ayurveda mentioned the diseases in which joints are affected mainly includes *Sandhigat Vata*, *Asthimajjagata Vata*, *Amavata*, *Vatarakta*, *Abhyantar Phiranga*, *Kroshtuk Shirsha*, *Vatakantak*. Amongst these in first five diseases all the joints are involved whereas in last two diseases knee joint and ankle joint are involved respectively.

Modern science distinguished the joint diseases into two principal categories inflammatory diseases having inflammation as a Principal set of signs or symptoms. Rheumatoid arthritis, bursitis, infective arthritis is the examples of inflammatory joint diseases. Traumatic joint diseases, degenerative joint diseases likely Osteo arthritis, congenital abnormalities are the example of non-Inflammatory diseases.^[10]

According to *Acharya Charak* cardinal sign of *Sandhigat Vat* are painful movement of joint especially large joint, inflammation and tenderness.^[11] In this disease

degeneration occurs in large joints due to geriatric changes or obstructive pathogenesis. Similarly in osteoarthritis usually degeneration in synovial membrane and in cartilage occurs, which leads to painful joint movement and inflammatory joint condition.

In *Asthimajjagat Vata Vyadhi* continuous pain especially in small joints and bones are found.^[12] In such condition *Vata dosha* extensively aggravates with *Pitta* and *Kapha Doshas* and affects *Asthi* and *Majja Dhatu*. Such kind of situation are seen in Avascular necrosis of hip joint.^[13]

According to *Madhavnidan* when *Ama* affects site of *Shleshma* with vitiated *Vata* it causes *Amavata*. *Amashaya*, *Sandhi*, *Shirah Pradesh* etc are the chief sites of *Shleshma*. Out of it *Sthula Sandhi* which are commonly affect in *Amavata*. *Shotha* and *Vrushchika Danshavata Vedana* are cardinal sign which found in *Amavata*.^[14] In advance stage of Rheumatic arthritis synovitis, pannus formation, cartilage and bone erosion occurs which leads to joint space narrowing.^[15]

As per *Acharya Charak* in *Gambhir Vatarakta Shotha*, *Kathinya*, *Daha* and *Sandhivakrata* are found. Some times which lead to deformity also.^[16] In such conditions *Shleshmadharakala* also get inflamed and become hard. Similarly in Gouty arthritis due to deposition of urate crystals in joint tissue causes acute inflammation, restricted joint movement and tophy formation. When symptoms reside in the skin and muscle the condition known as *Uttan Vatarakta*. On the other hand, symptoms spread to all the tissue and manifested sever pain in the joints, swelling, having ulcers is the *Gambhir Vatarakta* which very much resembles to Psoriatic arthritis.^[17]

Here we are discussed about the diseases *Sandhigat Vata*, *Asthimajjagata Vata*, *Amavata*, *Vatarakta* and *Kroshtuk Sheersh*. This can be compared with Osteoarthritis, AVN hip joint, Rheumatoid arthritis and Psoriatic Arthritis and Pseudogout respectively. After comparing the symptoms, it is observed that *Sandhishul* (joint pain) and *Sandhishoth* (inflammation) is seen in almost all joint diseases. *Sandhigat Vata* show a unique symptoms called *Atop* (crepitus). But in

Amavata the severity of pain is high and it shift from one joint to other. Only in *Vatarakta* pain begins from smaller joints whereas in rest larger joints affected first. *Vata Dosha* is the main vitiated dosha in all the joint diseases. In *Amavata* it is associated with *Ama* and in *Vatarakta* it is associated with *Pitta* and *Rakta*.^[18]

Kroshtuksheersha is an acute joint condition which specially affects knee joint. It can be correlate with Pseudogout. In this acute arthritic attack extreme pain, swelling and stiffness in joints found. Pathophysiology caused by breakdown of calcium pyrophosphate crystals, an insoluble calcium salt, from bone that has been accumulated in ligaments and joint spaces especially in knee joint. Similarly, in ayurvedic pathogenesis it is caused by vitiation of *Vata Dosha* due to *Kshaya* of *Shleshma* property of *Shleshmadhara Kala*.^[19]

CONCLUSION

Shleshmadhara Kala or synovial membrane plays an important role in all movable joints. Disease in which *Shleshmadhara Kala* is affected by *Vata Dosha* only leads to degenerative changes in the joints and mobility of the joint gets affected. Whereas *Vata Dosha* aggravated with the *Pitta* or *Rakta Dosha* in inflammatory joint diseases causes pain and inflammation in the synovial membrane. Third condition where *Vata Dosha* is aggravated with *Kapha* or *Ama*, Pain and restricted joint movement are predominant sign. In such condition *Shleshmadhara Kala* get inflamed which causes severe pain.

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