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Review Article

Synovial Fluid

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Conceptual Study of Shleshaka Kapha w.s.r. to Synovial Fluid

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Tridosha is the foundation of both health and illness in Ayurveda. Functions including strength, stability, lubrication, intelligence, and so forth are attributed to Kapha Dosha. Shleshaka Kapha, which lubricates joints and promotes fluid movements in an equilibrium state, is found in Sandhi Pradesh. Stiffness and discomfort may result from vitiated conditions. From a modern standpoint, it can be thought of as synovial fluid. Synovial joints in the body contain a fluid composed of hyaluronan, collagenase, lubricin, proteinase, prostaglandins, and other components. Its primary roles are to lubricate joints, support articular cartilage, and facilitate nutrient diffusion. The composition and quantity of synovial fluid can alter due to trauma, inflammation, and various pathological conditions. Both Shleshaka Kapha and synovial fluid share similarities in lubrication, nourishment, shock absorption, viscosity, stability, and immune function. This article aims to explore the concept of Shleshaka Kapha through the lens of modern physiology, particularly in relation to synovial fluid.

Keywords: Shleshaka Kapha, synovial fluid, Kapha Dosha, joints

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Introduction

The *Tridosha* theory serves as the foundational concept of *Ayurveda*, underpinning all other principles. The three *Doshas* are *Vata*, *Pitta*, and *Kapha*. Each of these *Doshas* is further divided into five types according to their location and function. **[1]** The activities of these *Tridoshas* can be observed at various levels of organization, such as cellular or systemic levels. A person is considered healthy when the *Tridoshas*, along with *Saptadhatu* and *Mala*, are in balance. Since it is a theoretical concept, no single structure or substance can consistently embody a *Dosha*.**[2]**

Each *Dosha* has specific qualities and roles. In its normal state, *Kapha* is described as *Bala* (strength), while in a disturbed state, it is referred to as *Mala*, leading to different health issues.**[3]** *Panchamahabhuta* composition of *Kapha Dosha* is *Jala* and *Prithvi*. Properties of *Kapha Dosha* are *Guru* (heavy), *Sheeta* (cold), *Mridu* (soft), *Shlakshna* (smooth), *Sthira* (immobile), *Picchila* (slimy) and it is subsided by food and drugs possessing qualities opposite to this.**[4]** Chest, head, neck, joints, stomach and fat are the general location of *Kapha Dosha.***[5]** Providing stability, binding structures, unctuous property in the body and maintenance of bulk, strength, higher mental functions are the normal physiological functions of *Kapha Dosha.***[6]** Based on specific location and function, *Kapha* is subdivided into five types namely *Avalambaka*, *Kledaka*, *Bodhaka*, *Tarpaka* and *Shleshaka*.

Shleshaka Kapha is found in the joints and serves to lubricate the spaces between the bones. It supports and preserves the structural integrity of the joints, allowing for flexibility and helping to avert damage due to friction. An imbalance in *Shleshaka Kapha* can result in stiffness and pain in the joints. This article aims to explore and deepen the understanding of the physiological role of *Shleshaka Kapha* while relating it to concepts in modern physiology.

Modern Correlation of *Shleshaka Kapha*

The location of *Shleshaka Kapha* is considered to be the joints, or *Sandhi*, serving the purpose of lubrication. This can be compared to the synovial fluid found in joints according to modern anatomical and physiological studies. Synovial fluid is described as the fluid found within the space of a joint.

It exists in synovial joints, which are the most prevalent types of joints in the human body, enabling load-bearing and minimizing friction.**[7]** Synovial fluid is a viscous liquid that is clear and straw-colored. It plays metabolic, regulatory, and biochemical roles. Primarily, it serves as a lubricant for the joint space and articular cartilage, while also assisting in the diffusion of nutrients to nearby structures like cartilage, meniscus, and labrum.**[8]** Synovial fluid is formed from ultrafiltrate of blood plasma along with other additional molecules secreted by cell lining.**[9]**

It consists of hyaluronan, collagenases, lubricin, prostaglandins, proteinase etc. It also comprises of soluble molecules namely morphogens, growth factor, cytokines mediating communication amidst cells in the joint. Major component-proteins are derived from plasma. The protein concentration and content are elevated in joint inflammation. The lubricating molecules are generated by synovial cell population. Characteristic alterations in lubricating macromolecules are noted in OA, RA, and trauma patients. Growth factors and cytokines are produced from plasma or released by synovial cells or other nearby tissues. In healthy conditions, their concentration is minimal, but in cases of joint injuries and diseases, it is significantly elevated.**[10]** Thus, the constituents within synovial fluid brings about some unique properties and maintains the joint homeostasis. Synovial fluid also serves as a shock absorber, facilitating smooth joint movements. Volume and contents of synovial fluid change physiologically in response to inflammation, trauma and penetrance by bacteria, fungi or virus. The composition and functions are altered in joint diseases and injury which may result in pain and dysfunction of synovial joints.

Materials and Methods

Several classic *Ayurvedic* literatures are used to study this subject. To gain a thorough understanding of the concept of *Shleshaka Kapha* in relation to synovial fluid, materials on *Shleshaka Kapha*, its significance, and other pertinent topics were gathered, reviewed, and discussed.

Discussion

Lubrication - both *Shleshaka Kapha* and synovial fluid provide lubrication to joints, facilitating smooth movements and reducing friction.

Nourishment - as *Kapha* is *Snigdha*, it nourishes and supports the joint structures along with cartilage and connective tissue. Synovial fluid also contributes in similar way.

Shock absorption - both the entities provide cushioning effect by absorbing shock and distributing pressure within joints.

Viscosity - Generally speaking, *Kapha* is sticky or viscous and serves as a protective coating for joint surfaces. Conversely, synovial fluid has a viscous viscosity that enables it to stick to joint surfaces and keep lubricating them.

Balance and stability - *Shleshaka Kapha* support joint stability and health by assisting in the maintenance of the *Dosha* within joints. Additionally, synovial fluid supports joint stability, function, and fluid balance.

Joint support - Because it creates a supporting environment for ligaments and tendons, synovial fluid helps to stabilize joints. This is where the *Sandhi Bandha* feature of *Kapha Dosha* might be associated.

Imbalance - The *Shleshaka* Heaviness, edema, or decreased joint mobility can result from a *Kapha* imbalance. Swelling and reduced range of motion can result from conditions like inflammation or inadequate synovial fluid, as modern research acknowledges.

Immunity - *Kapha* is often correlated with immunity; cytokines, proteoglycans, hyaluronan and complementary proteins present in synovial fluid regulate immune responses.

Conclusion

With *Jala* and *Prithvi Mahabhuta* predominating, *Kapha Dosha* handles things like coolness, lubrication, and nutrition, among other things. *Shleshaka Kapha* is located in *Sandhi* and serves the primary purpose of *Sandhi Samshleshana*, which is joint lubrication, in addition to other general purposes like immunity and nutrition. Many substances found in synovial fluid, including hyaluronan, collagenases, cytokines, and other proteins, help to accomplish these tasks. For a better knowledge of the human body in both health and illness, both entities can be connected. Further investigation is necessary for a thorough assessment.

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