



Unravelling Sandhigata Vata (Osteoarthritis): A Comprehensive Analysis of its Pathophysiology

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The article delves into the detailed analysis on concept of pathophysiology of the Sandhigata Vata. It explores how etiological factors imbalances the Dosha and the picture from imbalanced Doshas to development of features of Sandhivata which are impacting individual's daily lives, especially in old age. Classical Ayurvedic texts detail the symptoms of Sandhigata Vata, which bear resemblance to osteoarthritis. The modern lifestyle's stressors exacerbate Vata imbalances, contributing to the prevalence of this condition. This condition has become increasingly prevalent, affecting over 528 million people globally in 2019, an increase of 113% since 1990, with a notable increase since 1990. The knee is the most commonly affected joint, with 365 million individuals experiencing osteoarthritis in this area. Women and older adults are majorly impacted, with 60% of patients being female and 73% aged over 55. Understanding the pathogenesis of diseases like Sandhigata Vata is crucial for healthcare professionals to diagnose and address these ailments effectively. Through accurate identification of Sandhigata Vata's specific development path, Ayurvedic physicians can implement tailored treatment plans, leading to a significant improvement in the overall well-being of affected individuals.

Keywords: Sandhivata, Gata Vata, Vata Vyadhi, Degenerative Joint Disease, Ayurveda, Joint Pain

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Introduction

Samprapti, also known as pathogenesis, refers to the development of a disease. It details the entire process, beginning with causative factors to exposure of disease.[1]

These factors cause initial disturbances in the body and mind, eventually leading to the production of premonitory symptoms and the disease itself. This allows healthcare professionals to identify, name and diagnose the illness. Though *Vata* is one of the three fundamental *Doshas*[2], it is responsible for a greater number of diseases compared to *Pitta* and *Kapha* combined.[3]

Vatavyadhi (Diseases occur due to vitiation of *Vata dosha*) is a significant ailment categorized as one among eight major diseases *Ashtamahagada* (Eight major diseases).[4] *Sandhigata Vata*, a specific joint disorder arising from aggravated *Vata*, is extensively elaborated upon in classic Ayurvedic texts under *Vatavyadhi*. This condition remains a significant health concern in modern times. The contemporary lifestyle characterized by stress, irregular food habits and physical exertion exacerbates *Vata* imbalance, leading to a surge in *Sandhigata Vata* cases. This condition significantly impacts daily life, particularly in the old age, often resulting in disability. Classical Ayurvedic texts describe the characteristic signs and symptoms of *Sandhigata Vata* as *Vata Poornadhrithi Sparsha* (on palpation joint appears as leather bag inflated with air), *Sandhi Shotha* (oedema of joints), *Prasarana-Akunchana Vedana* (pain while making efforts for extensions and contraction of joints)[5], *Hanti Sandhi* (Diminution of movement of joints), *Sandhi Shoola* (Pain in joints)[6] and *Sandhi Atopa* (crepitus in joints).[7] *Sandhigata Vata* shares striking similarities with osteoarthritis. Osteoarthritis is a degenerative joint disease characterized by the breakdown of cartilage, leading to stiffness, swelling, pain and reduced mobility.[8]

This condition has become increasingly prevalent, affecting over 528 million people globally in 2019, an increase of 113% since 1990, with a notable increase since 1990. The knee is the most commonly affected joint, with 365 million individuals experiencing osteoarthritis in this area. Women and older adults are majorly impacted, with 60% of patients being female and 73% aged over 55.[9]

Aims and Objectives

Sandhigata Vata Understanding the pathophysiology of as described in ancient Ayurvedic texts can provide valuable insights for the effective management of joint disorders.

Materials and Methods

As the study is a review study, the available literature *Samhitas* and other books are searched for the disease and analysed to get a compendious concept in the Patho-physiology of *Sandhigata Vata*.

Electronic Databases: CAM, PubMed, Google scholar, MEDLINE etc, were searched

Observation

Pathophysiology explains process of disease development in the body which outlines the stage of disease formation beginning from imbalanced state of *Dosha* to manifestation of symptoms. To understand the pathophysiology of *Sandhigata Vata*, it is important to understand the following factors.

Importance of *Vata*

Vata Dosha governs all bodily functions. The ability to provide other bodily entities, such as other *Dosha*, *Dhatu* and *Mala* mobility belongs to the *Vata Dosha* in the human body. *Vata* is responsible for all motion, so this *Dosha* is also known as life in living beings. *Vayu* is life, *Vayu* is strength, *Vayu* maintains living organism, the same *Vayu* is verily the universe.[10]

Role of *Vata* in health

When non-vitiated *Vayu* is at its abode with unobstructed movement, is responsible for long lifespan of hundred years devoid of diseases.[11]

Role of *Vata* in causing diseases

When dislodged or impaired, *Dosha* harm the body by diseases according to their respective site and function, and may even lead to instantaneous death.[12]

Gatavata

Vata, influenced by *Aharaja* (dietary), *Viharaja* (lifestyle) or *Manasika* (psychological) factors, can become imbalanced within the body. When this vitiated *Vata* accumulates in a specific region,

It disrupts normal function of that particular site, this condition is known as *Gatavata*. [13]

Gata- situated in or gone to any state or condition or fallen into.

When *Doshas* are in a state of imbalance due to an underlying pathological condition they exhibit aberrant patterns in their movement, distribution, localization and manifestation within the body. This irregular behaviour is a hallmark of disease and distinguishes it from the normal, harmonious state of the *Doshas*.

Sandhigata Vata

Common causes include factors such as excessive physical exertion, irregular daily routines, exposure to cold and windy environments, consumption of dry and light foods, lack of proper rest, obesity etc. These factors can disrupt the balance of *Vata Dosha* in the body, leading to imbalance in *Vata Dosha* [14] which vitiates *Asthi*, as *Asthi* is the *Ashraya* for *Vata Dosha*.

General pathogenesis of *Vatavyadhi* is outlined in Ayurvedic literature as, aggravated *Vata* caused by depletion of *Dhatu* occupies empty channels in the body, leading to localized or generalised ailments. [15] Other author further opines on this by explaining that *Dhatukshaya* (depletion of *Dhatu*) creates these empty channels, allowing *Vata* to circulate freely, does accumulation and obstruction, ultimately disrupting normal function. [16]

The pathogenesis of *Sandhigata Vata* can likely be understood within this framework by understanding two ways of aggravation of *Vata* they are *Dhatukshayajanya* (due to depletion of *Dhatu*) and *Margavarodhajanya* (due to obstruction of channels). *Dhatukshayajanya Samprapti* of *Sandhigata Vata* / *Nirupastambhita Sandhigata Vata*: *Dhatu* nourishes and sustains the body.

By various aetiology *Kshaya* (depletion) of *Dhatu* will be seen. Mostly in old age, *Vata* predominance occurs with decreased and impaired *Agni* (digestive and metabolic fire) further leads to depletion of *Dhatu* quantitatively and qualitatively. As *Kapha* is decreased the *Shleshaka Kapha* which resides in joints and *Shleshmadhara Kala* also get affected and corresponds to depletion of *Asthisandhi*. This depletion of *Dhatu* leads to aggravation of *Vata* give rise to further depletion of *Sandhi*.

Further indulging in *Vata* aggravating factors does *Rukshata* (Dryness), *Parushata* (Hardness) and *Kharata* (Roughness) of *Asthivaha Srotas* leads to the *Riktata* of *Asthivaha Srotas* (emptiness of channels). Aggravated *Vata* fills up the *Asthivaha Srotas* and *Sthana Samshraya* (Localization) of aggravated *Vata* takes place in *Khavaigunayayukta Sandhi* (joints susceptible for pathological changes), impairs the normal functioning of that particular joint.

The localized *Vayu* due to its *Ruksha* (dry), *Laghu* (Light), *Khara* (Rough) qualities results in *Sandhigata Vata*. The *Guna* of *Vata* are exactly opposite to that of *Kapha* and hence results in diminishing *Shleshaka Kapha* which helps in *Samshleshana* of *Sandhi*. *Margavarodhajanya Samprapti* of *Sandhigata Vata* / *Upastambhita Sandhigata Vata*: *Vata* also get aggravated by occlusion of channels.

Vata, *Pitta*, and *Kapha* move in all the channels of the body. Usually, *Sandhigata Vata* occur in weight bearing joints. In patients with obesity, sedentary life style *Meda Dhatu* produced in excess which causes obstruction in the channels and does not nourish the forth coming *dhatu*s. The excessive fat will cause *Avarana* of *Vata* (Obstruction) leads to the *Vimargagamana* (Altered movement) of *Vata*. This vitiated *Vata* when settle down in joints will further develops *Sandhigata Vata*. *Sandhi* is classified as one of the *Marma* (Vital point) in the body. In addition to the pathogenesis due to *Dhatukshaya* and *Margavarodha*, *Vata* vitiation cause due to any external injuries, referred to as *Marmaghata* may leads to *Sandhigata Vata*.

Samprapti Ghataka

Dosha - *Vata* especially *Vyana Vata* and *Shleshaka Kapha*

Dushya - *Asthi*, *Majja*, *Meda*, *Rasa*

Srotas - *Asthivaha*, *Majjavaha*, *Medovaha*

Srotodushti - *Sangha*, *Vimarga Gamana*

Agni - *Mandagni*

Udbhava Sthana - *Pakvashaya*

Adhishtana - *Sandhi Pradesha*

Vyakta Sthana - *Asthi Sandhi*

Dosha marga - *Marmasthi Sandhi*

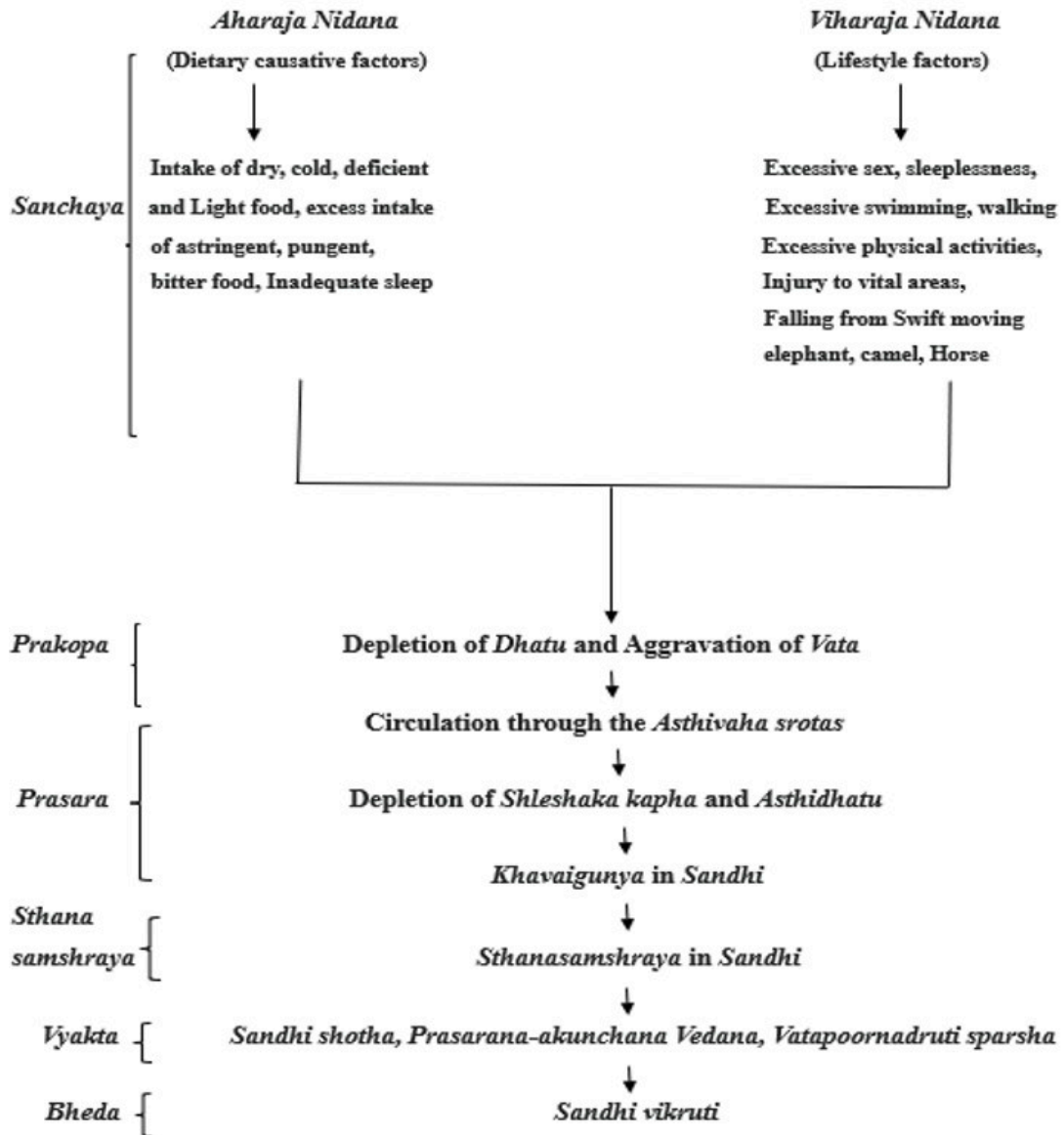
Rogamarga - *Madhyama*

Vyadhi Swarupa - *Chirakari*

Sadhyasadhyata - *Naveena- Sadhya*, *Jirna- Kruchra*

Sadhya.

Understanding *Shatkriyakala* of *Sandhigata Vata*



Discussion

As vitiated *Vata* alone isn't directly involved in *Sandhigata Vata*, it's not described under the 80 types of *Nanatmaja Vikara* of *Vata*. However, it's elaborated upon in the context of *Vatavyadhi Chikitsa*. It is possible that the role of *Vyana vayu* is crucial in categorizing *Sandhigata Vata* under *Vatavyadhi*. The exact cause of *Sandhigata Vata* isn't mentioned, but factors causing *Vatavyadhi* and *Asthi Sroto Dushti* (bone channel vitiation) can be considered. Various causative elements lead to the aggravation of *Vata* which occurs through processes such as *Dhatukshaya* (tissue depletion) and *Margavarodha* (channel blockage) ultimately resulting in *Sandhigata Vata*.

These pathological developments can be understood as *Vishista Samprati* indicating a specific pathogenesis for *Sandhigata Vata*. This condition is frequently compared to degenerative joint diseases such as osteoarthritis, which predominantly affects individuals over the age of 55. Approximately 73% of people living with osteoarthritis are in this age group primarily due to the degeneration of cartilage and bone.[17] Classical texts note that *Shareera Dhatukshaya* (tissue depletion) typically occurs at old age, contributing to the condition known as *Kalaja Nidana* in *Sandhivata*. Cartilage is primarily composed of chondrocytes, which exist within a cell matrix rich in proteoglycans. As individuals age, the degeneration of cartilage reduces the joint space, resulting from the damaging effects on chondrocytes.

This degeneration leads to increased bone hardness, a condition referred to as sclerosis, which may contribute to osteoporosis. This sequence of events can be hypothetically characterized as *Tarunasthi Dhatukshaya* in older adults, subsequently leading to further aggravation of *Vata* due to the interplay of *Ashraya-Ashrayi Bhava*. A study exploring the intersection of aging and inflammation in osteoarthritis has suggested that the condition was once understood solely as cartilage degradation. However, contemporary understanding recognizes the involvement of inflammaging originating from the synovium, cartilage, and subchondral bone. Inflammaging, a term describing chronic, low-grade inflammation associated with aging, contributes to osteoarthritis by elevating levels of reactive oxygen species and inflammatory cytokines, which are linked to age-related diseases such as cancer and diabetes. Both innate and adaptive immune responses are activated, resulting in increased cytokines that damage cartilage. Additionally, antigens from damaged joints can activate inflammasomes, while aging can impair the regulatory functions of B and T lymphocytes, exacerbating self-reactivity and worsening joint damage.[18] For individuals who lead a sedentary lifestyle and are obese *Srotoavarodha* (channel obstruction) by *Meda* may lead to vitiation of *Vata*, which adversely affects the bones and aggravates *Vata*. Studies investigating the onset of osteoarthritis in sedentary adults have established that a lack of physical activity contributes to a phenomenon known as stagnant cartilage syndrome. This term reflects the difficulties associated with maintaining thick cartilage under physiological stress. The hypothesis suggests that physical inactivity can foster knee osteoarthritis by creating a stagnant diffusion barrier at the synovial fluid-cartilage interface, which can limit the nutrient supply and promote waste accumulation, thus disrupting cellular homeostasis and leading to progressive tissue degradation.[19] In acute cases of *Sandhigata Vata* the typical stages of *Sanchaya* (accumulation), *Prakopa* (aggravation) and *Prasara* (manifestation) may be expedited resulting in a more rapid manifestation of the disease. Conversely, in slow and chronic conditions while *Vata* aggravation may occur still it may not be sufficient to elicit the clinical symptoms associated with *Sandhigata Vata*. *Vata* as a *Dosha*, is fundamentally associated with *Gatyatmak* (movement).

However, alterations in its movement can occur due to the influence of its subtypes or the interaction with other *Doshas* or *Dhatu*s. In the case of *Sandhigata Vata*, there is an increase in the qualities of *Rukshata* (roughness), *Kharata* (grittiness) and *Shitata* (coldness) which are manifestations of *Vata*'s increased properties. Consequently, the *Dosha* tends to remain confined within the body during the stages of *Sanchaya*, *Prakopa* and *Prasara Avastha*. Further exacerbation of *Vata* due to additional causative factors can lead to the manifestation of *Shula* (pain) which arises from aggravated *Vata*. *Shopha* (Swelling) occurs as a result of *Srotorodha* and the accumulation of disturbed *Rasa* along with an imbalance in *Kapha*. This swelling is not typically tense; thus, palpation may reveal characteristics of *Vatapurnadhriti* (a condition of fullness). *Atopa* or sounds produced due to friction within the tissues, results from the increased *Kharaguna* in the *dhatu*s, which is often associated with *Shleshmakshaya* (deterioration of *Kapha*). *Hanti Sandhi* or joint dysfunction, manifests at later stages, often due to the destruction and alteration of other joint structures, including variations in *Snayu* (ligaments) and *Asthi* (bone) leading to marked impairments in joint articulation.

Conclusion

Sandhigata Vata or joint disease, manifests primarily through two distinct pathophysiological mechanisms. When triggered by etiological factors such as *Adhyashana* (overeating), *Divashayana* (excessive daytime sleep) and *Vegavidharana* (suppression of natural urges), the disease primarily progresses through the obstruction or blockage of channels. Conversely, *Sandhigata Vata* arising from a lifestyle characterized by *Ruksha ahara-vihara* (dryness), *Sheeta ahara-vihara* (cold exposure), *Vishamashana* (irregular eating), and *Chinta, Shoka, Bhaya, Rogatkarshanata* (emotional distress) predominantly develops through tissue depletion or *Dhatukshaya*. A comprehensive understanding of the causative factors and their corresponding disease processes is essential for the formulation of effective and timely treatment plans tailored to individual patient conditions. In the realm of Ayurveda, therapeutic intervention is fundamentally centred around disrupting the pathogenesis itself, a principle known as '*Samprapti Vighatana*'.

By accurately diagnosing the specific pathway through which *Sandhigata Vata* has developed, Ayurvedic physicians can employ targeted therapeutic strategies, ultimately enhancing the quality of life for individuals afflicted with this condition

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