



Review Article

A COMPREHENSIVE OVERVIEW ON PATHOGENESIS AND MANAGEMENT OF  
OSTEOARTHRITIS VIS-A-VIS SANDHIGATAVĀTA

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ABSTRACT

The most common joint condition encountered in clinical practice is osteoarthritis (OA) of the knee, which is a primary source of impairment in the elderly. It is a multifactorial chronic degenerative condition characterised by loss of articular cartilage, enlargement of bone at the borders, subchondral sclerosis, and a variety of biochemical and morphological changes to the synovial membrane and joint capsule. OA clinically similar to *Sandhigataavāta* of Ayurveda is one of the eighty types of *Nānātmaja Vātavyādhi*. The aetiopathogenesis, symptoms, and treatment of *Sandhigataavāta* found in a very concise format in classical texts. The authors have tried to put an emphasis on OA related to its prevalence, aetiology and pathogenesis based on *Sadkriyākāla* along with management by incorporating the knowledge of literary and data base resources in order to establish a guideline for the rational use of treatment modalities. The present approach may be useful for clinicians and researchers to plan appropriate strategy of management and research in the field of OA.

INTRODUCTION

Osteoarthritis (OA) is a degenerative joint disease characterized by degradation of joints, articular cartilage and sub-chondral bone.<sup>[1]</sup> It is one of the major health concerns in aged one in India, with a prevalence of 22 to 39%<sup>[2]</sup>. Obesity, diabetes mellitus, malnutrition, repeated trauma is also lead to develop OA in the people of early and middle age group. The aetiology and symptomatology of *Sandhigataavāta* are concisely explained in the Ayurvedic classics in the context of *Nānātmaja Vātavyādhi*, which is similar to OA of modern medicine. The aetiology of *Sandhigataavāta* is attributed to improper diet, lifestyle and old age, etc., leading to degeneration of body tissues (*Dhātuksaya*) which may lead to aggravation of *Vāta Doṣa* (humour responsible for all movements in the body) and reduction in *Śleṣaka Kapha Doṣa* (fluid present in joints).

The aggravated *Vāta* initiates degeneration, pain and inflammation in joints and reduced *Śleṣaka Kapha* may lead to decrease the joint spaces, crepitus and stiffness in the joint. Ayurveda has broadly categorised two types of pathological events of OA; primary one is initiated by degeneration of tissues (*Dhātuksaya*) that is commonly observed naturally in old age and secondary one is due obstruction in the body channels (*Mārgāvaraṇa*) carrying nutrients to the compartment of joints. Hence, the approach of management of primary one move towards pacification of *Vāta doṣa* and in secondarily one to counteracts first the associated disorders followed by use of antagonistic diet, drugs and nourishing therapy to replenish the degenerated tissues<sup>[3]</sup>.

According to 2016 Global Burden of Disease study, musculoskeletal disorders (MSDs) were the second highest contributor to the global disability. The burden of MSDs varies by age, however, 20%–33% of people across the globe live with a painful MSDs<sup>[4]</sup>. The economic burden of OA has risen by three times or higher specially among individuals with total knee replacement/total hip replacement<sup>[5]</sup>. In a study conducted in India, it was reported that disorders of joint/pain were respectively the second and fourth most common causes of outpatient clinic visits and out-of-pocket expenses among all non-communicable

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diseases<sup>[6]</sup>. Recent research in India found that the total frequency of knee OA was 28.7 percent. Female gender (prevalence of 31.6 percent), obesity, age and sedentary job were the related risk factors<sup>[7]</sup>. The burden of knee OA has been determined in several countries, however, epidemiological data among elderly in India is scarce. Also, there are limited data in India on the bearing of knee OA over the quality of life of elderly.

The National Institute for Health and Clinical Excellence, the American College of Rheumatology, and the European League Against Rheumatism all propose nondrug therapy for knee OA, including patient education, social support, physical activity, and weight loss.<sup>[8-10]</sup> Although nonsteroidal anti-inflammatory drugs (NSAIDs) are still used as the first line of treatment in primary care of joint pain and stiffness<sup>[11]</sup>. But these drugs are always associated with a number of adverse events, including upper gastrointestinal bleeding and renal failure<sup>[12]</sup> as well as myocardial infarction and stroke, particularly in the COX-2 inhibitor category<sup>[13]</sup>. With this background, we have tried laid down a comprehensive concept in the Pathogenesis and management of *Sandhigatavāta* (OA) by incorporating the classical and contemporary knowledge.

#### AIMS AND OBJECTIVES

- To put an emphasis on etiology and prevalence of OA.
- To develop a contemporary overview on pathogenesis based on *Sadkriyākāla*.
- To explore management strategy of *Sandhigatavāta* (OA) through Ayurveda.

#### MATERIAL AND METHODS

In order to put an emphasis on the *Samprapti* and the role of *Śodhana* and *Śamana* therapy enumerated in ancient Āyurvedic texts beneficial in the management of *Sandhigatavāta*; we used classical, non-classical, contemporary texts of Ayurveda, and other relevant modern books, published articles on *Sandhigatavāta* (OA), and the internet as sources. As the study is a review study, the available literature *Samhitā's* and other books are also searched for the disease and analysed the outcomes measures.

**Electronic Databases:** Complementary and Alternative Medicine (CAM), PubMed, Google scholar, MEDLINE etc, were searched.

**Nidāna (Aetiology):** The illness's aetiology has not been stated directly in the classical texts, but based on the *Nidāna* of *Vātavyādhi*<sup>[14]</sup> and the fact that it is a disease affecting joints and producing degeneration, *Asthivaha Srotosduṣṭi* causes have been analysed<sup>[15]</sup> and the following conclusion may be drawn:

**Nearest cause:** *Ativyāyāma* (excessive physical activity), *Abhighāta* (joint injury), *Marmāghata* (joint

injury at a key site), *Pradhāvana* (running) etc. are directly links with joint.

#### Remote causes

- Rasa-** Excessive consumption of *Kaśaya*, *Kaṭu*, *Tikta*
- Guṇa-** Excessive consumption of *Rūkṣa*, *Śīta*, *Laghu*
- Ahārakrama-** *Alpāhara*, *Viśamaśana*, *Adhyaśana*, *Pramitaśana*
- Mānasika-** Excessive fall in *Ciṃta*, *Śoka*, *Krodha*, *Bhaya*
- Vihāraja-** Excessive *Jāgaraṇa*, *Viśamopacāra*, *Ativyavāya*, *Srama*, *Divāsvapna*, *Vegasaṃdhāraṇa*
- Other Causes-** Living in *Jāṅgaladeśa* is another causative of *Vātaprakopa*<sup>[16]</sup>.

#### Samprapti (Pathogenesis)

*Vāta* is vitiated in body due to excessive affliction and indulgence with above said causative factors, after that *Vāta* is fully occupying preformed empty space i.e. *Rikta Srotasa*. *Vāta* after settling in *Rikta Srotasa*, it may produce localised or generalised *Vātavyādhi* related to that particular *Srotasa*.<sup>[17]</sup>

#### Disease Process According to Sadkriyākāla

The concept of *Kriyākāla* describe in Ayurveda, represents the mode and stages of the development of the disease and planning appropriate therapeutics. Each stage has its own characteristic symptoms to enable a treating physician to recognize the disturbance at the early stage of the disease. It also helps with prognosis and adopting preventive and curative measures.

#### Samcaya (Accumulation Doṣa at Own Site)

Normally, the *Doṣās* maintain a state of balance inside their respective *Āśaya*. *Nidāna sevana* causes the accumulation of the *Doṣās* at their own site beyond the physiological limit. This may be due to pre-pathological conditions 20. Due to *Vāta samcaya* at its *Mūla sthāna* i.e., defined place in the classics; it is possible to see the non-specific features with quantitative increment of *Vāta Doṣa* in the person who is going to develop *Sandhigatavāta* with minute observations<sup>[18]</sup>.

#### Prakopa (Vitiation of Doṣa at Own Site)

It is possible to develop *Prakopāvasthā* if proper precautions are not followed and the accumulation of the *Dosā's* is allowed to continue at its own site. During this stage, collected *Dosā's* are subjected to quantitative & qualitative changes and get vitiated. *Vāta* may be triggered, resulting in the manifestation of *Koṣṭhatoda* and *Koṣṭha sañcaraṇa*<sup>[19]</sup>. This state may be responsible for all pathological states if remission is not achieved in due course of time.

#### Prasara (Transmission through Body Channels)

If *Nidānas sevana* still continues, the exacerbated *Doṣās* emerge from their original location

and spread throughout the body, a process called as *Prasara*<sup>[20]</sup>. At this stage, *Vāta* gets rhythmic acceleration causing spread of morbid materials into the cardiovascular channels [Cha. Sa. Su 28/31] and enter into the tissues/organs/ systems of the body. Thus, this stage of disease manifestation is a turning point for the next phase of disease evolution.

**Sthāna Saṁśraya (Localization at Different Sites)**

It is possible that the illness process will enter in *Sthānasamśraya avasthā*, the vitiated *Vāta doṣa* interact with the defence mechanism of body (*Dhatus*) at the levels of transporting and transforming micro-channels of joint. Affected *Doṣā's* congregate at the site of *Khavaigunya*, which has already been initiated by the *Nidānas*, at this point in their development. It is possible that *Pūrvarūpa* of the illness will manifest itself at this point.<sup>[21]</sup>

**Vyakti (Manifestation)**

When no measures are taken to settle the vitiated *Doṣās* and *Nidāna sevana* is continued, the illness process progresses to the fifth stage, *Vyakti avasthā*. Located *Vāta doṣā* (morbid factor) vitiate

*Duṣyās* (defensive tissues) i.e., bone, joints, cartilages and develop the *Sandhigatavāta* as a result of invasive interaction of morbid factors into defensive healthy tissues (*Doṣa-duṣya saṁmūrchanā*) with its characteristic symptomatology. Symptoms of *Sandhigatavāta* such as *Sandhiśūla*, *Sandhiśoṭha*, *Hanti Sandhi* and *Ākuñcana Prasāraṇe vedanā* develop at this stage of the disease process.

**Bheda (Termination or Differentiation)**

*Bheda* is the last stage of the illness. In this stage, disease becomes sub-acute, chronic, or incurable. When disease further progresses, it may produce complications becoming incurable or severe complications leading to death. In *Sandhigatavāta*, this stage may lead to temporary/ permanent disability. Otherwise in self-limiting disorders, the disease may get cured itself by body and rehabilitation will be required. This is the last opportunity of the management, where all the possible management is to be applied.

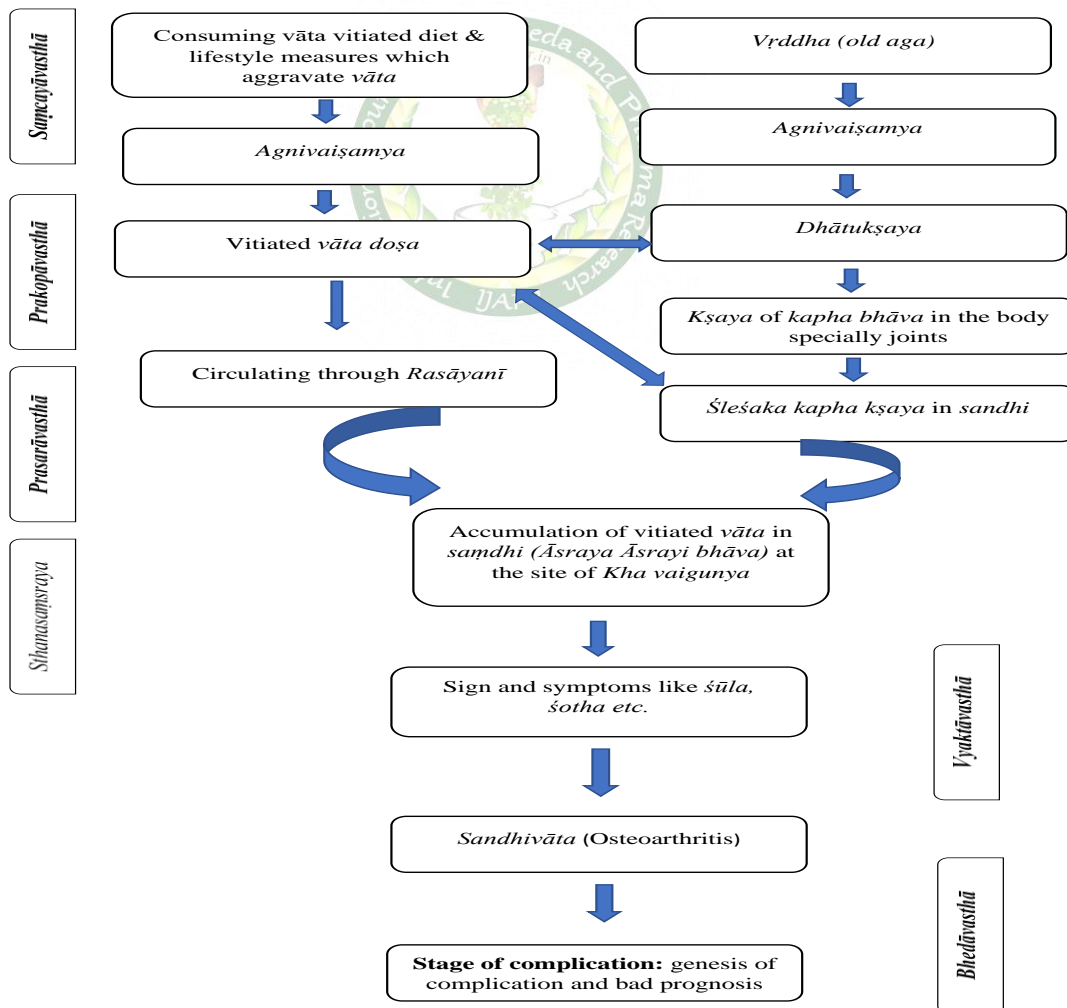


Figure 1: *Samprāpti* Flow chart (Pathogenesis of *Sandhigatavāta*)

**Pathogenetic component**<sup>[22]</sup>

<i>Doṣa</i>	<i>Vāta- Vyāna Vṛiddhi</i> <i>Kapha Śleṣaka kapha Kṣaya</i>
<i>Dūsyā</i>	<i>Rasa, Rakta, Asthi</i>
<i>Adhiṣṭhana</i>	<i>Asthi Sandhi</i>
<i>Srotas</i>	<i>Asthivaha, Majjāvaha</i>
<i>Srotoduṣṭi Prakara</i>	<i>Sanḡa, Granthi, Vimārgagamana</i>
<i>Agni</i>	<i>Viṣamāgni</i>
<i>Roga Marga</i>	<i>Madhyama</i>
<i>Udbhavasthāna</i>	<i>Pakvaśaya</i>
<i>Vyādhisvabhāva</i>	<i>Cirakārī</i>
<i>Sādhyā-Asādhyata</i>	<i>Kaṣṭasadhyā</i>

**Clinical Features** <sup>[23-25]</sup>

The clinical features of the disease from different Āyurvedic treatises are explained in detail as below.

- **Sandhiśūla:** Śūla is a main observed symptom of Sandhigata Vāta since inception. Pain usually increases during movements of joints because of Vāta prakopa and same may again vitiate Vāta doṣa. It is also said to be worst in evening because of the tendency of Vāta and in aged one, which naturally aggravates at evening period and in old age.
- **Sandhiśoṭha:** Śoṭha in this disease has been described by all Acāryas. Srotorodha occurs due to Vāta-sanḡa, which is responsible for Śoṭha. Being a Vātaja type, on palpation the swelling is felt like a leather bag filled with air.
- **Sandhihanti:** It is the stage of structural and functional Vikṛti of joints that leads to impairment of its normal function. Dalhaṇa and Gayadāsa has explained it as inability of function i.e. inability to flexion and extension and other motor activity. In the later stage of the disease this feature appears and may be associated with Stambha (stiffness) caused by Śitagaṇa of Vāta and other associated climatic conditions.
- **Ākuñcana Prasāraṇa Janya Vedanā:** Painful movement of the joint. Due to changed structural properties of joints pain occurs while flexing and extending the joint. This is the sign of advancement of the disease and involvement of other related structures such as Maṃsa, Snāyu, Kanḍarā etc.
- **Vāta Pūrṇa Dṛti Sparśa:** Sandhi when palpated feels like a leather bag filled with air. When this swollen part is pressed by finger, the swelling easily get moved on the other side as happens in a balloon.
- **Āṭopa:** Only Ācārya Mādhava has described this feature. This may be comparable with the palpable and audible crepitus during the joint movement. It

is usually found in the later stage of disease. It is due to more Kṣaya of Śleṣaka kapha in the Sandhi by the increasing Rūkṣa gaṇa of Vāta.

**Ayurvedic Approach of Management:** Non-pharmacologic, pharmacologic, and surgical modalities are all evidence-based techniques for treating knee osteoarthritis (OA). Treatments that alter the course of the illness have not met the regulatory threshold for approval, despite the fact that certain experimental medicines appear to halt structural progression<sup>[26]</sup>. A double-blind RCT found no effect from glucosamine and chondroitin in mild knee osteoarthritis<sup>[27]</sup>. Many complementary and alternative medicine therapies have been tried with mixed results. These supplements have been sold as disease-modifying possibilities since the 1990s. The purpose of Ayurvedic management is to restore Doṣa balance, rectify Srotorodha, and enhance metabolic activity and enhancement of nourishment at the Dhātu level<sup>[28]</sup>.

The given approaches are helpful in altering the basic matrix of diathesis of OA and improve the quality of life in patients by reducing pain and stiffness of joint.

**Nidāna Parivarjana (Avoidance of Causative Factor)**

Nidāna Parivarjan is the initial therapy option, which is useful in all the stage of Kriyakala. A healthy lifestyle and food are critical in all circumstances for therapeutic effectiveness<sup>[29]</sup>.

**Samśaman Cikitsa (Conservative Line of Management)**

Conservative management (Samśaman Cikitsa) is effective in person has optimal symptoms and it also imparts nourishing effect and check the associated comorbid clinical conditions<sup>[30]</sup>. Srotośodhana, Agnidīpan, and managing bowel abnormalities all contribute to the effectiveness of medication and diet. People with Sandhigatavāta can be treated with use drugs that have properties like Śothahara, Vātahara, Vedānasthāpaka and Rasāyana (rejuvenates).

**Samśodhana Cikitsa (Bio-Purificatory Therapy)-Pancakarma** (the fivefold therapy) is the process of removing Ama (autotoxins and free radicals) and vitiated Doṣa (body humour). If a patient exhibits mostly all of the symptoms of a sickness, the severity of the symptoms is significant, and the patient's strength is adequate, *Samśodhana Cikitsa* should be chosen<sup>[31]</sup>.

**a) Abhyāṅga (Massage):** *Abhyāṅga* with medicated oil is a technique that involves manipulating the body parts. Hands, fingers, elbows, knees, forearms, and feet are frequently used in *Abhyāṅga* practices. *Abhyāṅga* is used to alleviate physical and mental tension or discomfort, joint stiffness and pain, aid nourishment and lubricates the joints.

**b) Svedana** (Sweating/Fomentation Therapy): *Svedana* is a pre-*Pancakarma* technique that induces sweating. Several varieties of *Svedana* such as *Nādi Sveda*, *Prastara Sveda*, *Samkara Sveda*, *Patrapīṇḍa sveda*<sup>[32]</sup> are mentioned in the context of management of *Vātavyādhi*. Due to sweating effect, it improves cellular metabolism, facilitate better circulation and cellular transportation of nutrients and flushed out the toxins. If, it performed after *Abhyāṅga*, it promotes joint mobility, alleviates pain, stiffness, and oedema, strengthens and rejuvenates the joints, and facilitates movement.

*Upanāha Sveda* by its *Ūṣṇa* and *Snigdha Guna* possess of *Vātaśamaka* effect and alleviate pain, oedema, and joint stiffness. Due to hot potency, it improves blood circulation and thus eliminates the local metabolic waste via the sweat.

**c) Mṛiduvirecana:** It cleanses the body to re-establish the patency of the *Srotas*, which facilitates the delivery of therapeutic material, check the precipitating factors and sustenance to the body's constituents. Additionally, this aids in maintaining or restoring *Tridoṣa's* optimal balance<sup>[33]</sup>. The oil of *Eraṇḍa Bija* is utilised for *Mṛiduvirecana* because it has *Bhedana* (purgative), *Srotośodhana* (channel cleansing), and *Anulomana* (corrects the *Apana Vayu* imbalance) properties. It is effective in *Sandhigatavāta* due to its *Vātahara* activity.

**d) Vasti (Enema):** *Vasti karma* is active in the *Pakvāśaya* (large intestine). It is the principal location of *Vāta doṣa*. As a result, *Vasti* is most beneficial for treating vitiated *Vāta Doṣa* and its associated disorders. It nourishes the body, strengthens it, and alleviates *Vāta* -related muscular and bone disorders. *Vasti* is referred to as half of *Āyurveda's* treatment<sup>[35]</sup>.

**e) Jānubasti:** In this procedure, medicinal oil is poured into a pool-like arrangement over the knee joint for a certain amount of time. It is excellent for knee joint discomfort and oedema.

**f) Agnikarma (cauterization):** *Agni's Ūṣṇa* (hot) *Guna* pacifies *Vāta's Śīta* (cold) *Guṇa*, efficiently eliminates the *Āvaraṇa*, stabilises *Vāta's* movement, and decreases the joint pain and stiffness.

## DISCUSSION

Osteoarthritis is increasing at an alarming rate around the world. It is estimated that approximately four out of 100 people are affected by it. It is most common disease in elderly people that begins asymptotically in the 2<sup>nd</sup> & 3<sup>rd</sup> decades of life. It is the commonest form of articular disorder confined to joint. *Sandhigatavāta* of *Ayurveda* is a type of *Vātika* disorders initiated by degenerative and some obstructive pathologies that limits the day-to-day activities. It is comparable of OA of contemporary medicine.

In *Ayurveda*, generally two type's etiopathogenesis is observed in *Sandhigatavāta*, which is based on the basis vitiation of *Vāta doṣa*. The first one begins as a result of *Dhātuḥśaya* that is considered as *Nirupastambhita Vāta vyādhi*, specially observed in old age and is initiated by *Vāta* provoking diet and lifestyle measures and the second one begins as result of *Marga-avarāṇa* that is also known as *Upstambhita Vātavyādhi*. It is outcome of repeated trauma over joint and certain disorders such as obesity, diabetes mellitus etc. that directly provoked *Vāta Doṣa* at the site of joints, which is commonly occurs in early age group.

In this context we have conceptualized six stages of disease pathogenesis of *Sandhivāta* as seen in figure 1 that is known as *Sadkriyākāla*. The *Kriyākāla* describes the mode and stages of the development of the disease and planning of appropriate therapeutics. Each stage has its own characteristic symptoms to enable a treating physician to recognize the disturbance at the early stage of the disease. It also helps with prognosis and adopting preventive and curative measures. *Ayurveda* advocates that if the deranged *Doṣa* is checked or subdued in their primitive evolutionary phase (*Cayāvasthā*), they may not be able to proceed with subsequent changes. However, if left unresolved, they may gain strength and intensity. Therefore, good knowledge of the concept of *Kriyākāla* is necessary for the recognition of the disease process at an early stage to arrest further developments. It is presented in a table as below with its conventional correlates.

**Six Stages of Disease Evaluation and Therapeutic Intervention**

Stages	Modern correlates	Initiative factors	Location	Clinical manifestation	Management
<i>Samcaya</i>	Subclinical	<i>Doṣa</i>	Gastrointestinal + <i>Sandhi</i>	Heaviness of joint	Anti- <i>Vāta</i> measures
<i>Prakopa</i>	Subclinical	<i>Doṣa</i>	Gastrointestinal + <i>Sandhi</i>	Variable Pain in joint	Pacification <i>Vāta</i>
<i>Prasara</i>	Preclinical	<i>Doṣa</i> + Vascular system	<i>Sandhi</i> + Blood vessels	Shifting pain in joint	Care of <i>Vāta</i> and <i>srotas</i>
<i>Sthana-saṁshraya</i>	Prodromal features	<i>Doṣa</i> + synovial fluid & Membrane	Joint structures	Preclinical features	Early diagnosis & treatment
<i>Vyakta</i>	Manifestation	Cartilages	Deeper tissues & bones	Clinical features of OA	Disease specific treatment and limit disability
<i>Bheda</i>	Differentiation or complications or prognosis	Ligament, tendon and bone	<i>Jānumarma</i>	Deformed joint & disability	Restore disability, seize complication and rehabilitation

*Sandhigatavāta* in Āyurveda is treated by increasing *Śleṣaka kapha* in joints and pacifying vitiated *Vāta Doṣa*. *Snehana* is prescribed to alleviate discomfort and restore joint *Mṛdutva* (softness). It also pacifies the *Vāta*, softens the body and eliminates the accumulated morbid factors. *Swedana* relieves the stiffness, heaviness and coldness of the body and produce sweating. It acts as *Vāta śāmaka* and *vedanāhara* due to its hot potency. By the process of *Snehana* and *Swedana* the blood vessels of skin become dilated and local circulation of blood will be increased. The medicine applied locally in the form of *Upanāha* (poultice) is also absorbed by the skin and exerts its effects locally. Oleous drug like *Eraṇḍa taila* is used in OA for *Virechana* removal of wastes and before the administration of *Vasti* therapy. Oil and decoction based *Vasti* therapies are considered as best one for such types of disorders. It strengthened the joints and rejuvenates the tissues and removes toxins from the body.

*Jānubasti* alleviates discomfort and oedema associated with osteoarthritis of the knee joint. *Agnikarma* successfully eliminates *Āvaraṇa*, stabilises *Vāta's* movement, and alleviates joint pain and stiffness in the case of *Sandhigatavāta*. Along with these therapeutic choices, *Vātahara*, *Śothahara*, *Śūlahara*, *Balya* and *Rasāyana* drugs are used for the achievement of goals of therapy. Many *Rasāyana* drugs are proven to be effective in managing the degenerative joint disorders.

The data gathering described above is critical for prevention and management of *Sandhigatavāta*. Āyurveda has described numerous therapeutic strategies such as *Śodhana* (purification), *Śamana* (palliative) and local therapies [such as *Upanāha*

(poultice application) and *Agnikarma* (cautery)] for their management. But these drugs and measure should be utilized by assessing an individual's pathophysiological condition and constitution. Different therapy modules must be implemented depending on the illness stage and other evaluation characteristics.

**CONCLUSION**

*Sandhigatavāta* has a strong correlation with ageing and other associated clinical conditions. It is a significant source of pain, and disability in the elderly. As the elderly population grows, so does the number of cases of OA. The concept of the six stages (*Sadkriyākāla*) of disease is one of the most vital components of disease evaluation and for management. It is distinguishing Āyurveda from Allopathy. The first four stages of disease symptoms may be subtle or non-existent. In Āyurveda, the physician can identify the imbalance at an early stage and treat accordingly by changing lifestyle and intervention of therapies. Managing the disease is a challenge for medical professionals, and a cure of the disease is still a long way off. Āyurvedic interventions can prevent OA if employed in its early stages and slow the progression of the illness.

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