

# A Review of *Sandhivata* (Osteoarthritis) From Ayurvedic and Modern Perspectives: Pathogenesis, Clinical Profile, And Management Strategies

Dr. Ramhet Nagar<sup>1</sup>, Prof. Dr. Pramod Kumar Mishra<sup>2</sup>, Dr. Bhanu Priya Choudhary<sup>3</sup>

<sup>1</sup>MD, Scholar, PG Department of Kaya Chikitsa, PGIA, DSRRAU, Jodhpur

<sup>2</sup>Professor and HOD, PG Department of Kaya Chikitsa, PGIA, DSRRAU, Jodhpur

<sup>3</sup>Associate Professor, PG Department of Kaya Chikitsa, PGIA, DSRRAU, Jodhpur

**Abstract—Background:** *Sandhivata* is a predominant *Vata Vyadhi* (disorder of the *Vata Dosha*) in Ayurveda, characterized by degenerative changes in the joints, leading to pain, swelling, and restricted movement. Its clinical features closely resemble those of Osteoarthritis (OA), a leading cause of global disability, especially among the aging population. With limitations in modern OA management, primarily focused on symptomatic relief, exploring Ayurveda's holistic approach is imperative.

**Objective:** To systematically review and synthesize the classical Ayurvedic understanding of *Sandhivata* and correlate it with the modern medical knowledge of OA, focusing on etiology, pathogenesis, clinical features, and treatment modalities.

**Methods:** A systematic literature review was conducted following the PRISMA guidelines. Classical Ayurvedic texts including *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, and *Madhava Nidana* were reviewed for conceptual data on *Sandhivata*. A comprehensive compilation of previous research works (1963-2011) from various Ayurvedic institutes across India was analyzed to map the historical research trends. Modern medical textbooks and peer-reviewed journals were consulted for information on OA. Data were synthesized to draw correlations between the two systems of medicine.

**Results:** The review establishes a strong correlation between *Sandhivata* and OA. The *Nidana* (etiological factors) of *Sandhivata*, such as *Ati-ruksha* (excessive dryness), *Vegasandharana* (suppression of natural urges), and *Jara* (aging), align with OA risk factors like joint stress, trauma, and advanced age. The *samprapti* (pathogenesis) of *Sandhivata*, involving *Vata* vitiation, *Dhatukshaya* (tissue depletion), and localization in *Asthi-Sandhi* (bones and joints), parallels the OA pathophysiology of chondrocyte apoptosis, matrix metalloproteinase activation, and subchondral bone changes. Clinical features like *Sandhishula* (joint pain),

*Sandhishotha* (swelling), and *Stambha* (stiffness) are synonymous with OA symptoms. Ayurvedic management, centered on *Snehana* (oleation), *Svedana* (fomentation), *Basti* (medicated enema), and *Agnikarma* (thermal cauterization), offers a multifaceted approach compared to the primarily palliative modern treatments involving NSAIDs and surgery.

**Conclusion:** *Sandhivata* and Osteoarthritis are equivalent clinical entities viewed through different medical paradigms. The Ayurvedic model provides a comprehensive framework for understanding the disease's multifactorial origin and progression, emphasizing prevention and restoration of function. Integrating Ayurvedic principles and therapies, particularly *Basti* and *Rasayana* drugs, with modern diagnostic and monitoring tools holds significant promise for developing more effective, holistic management protocols for OA. Further high-quality clinical trials standardizing these interventions are warranted.

**Index Terms—** *Sandhivata*, Osteoarthritis, *Vata Vyadhi*, IMRAD, PRISMA, Ayurveda, *Basti*, *Snehana*, Degenerative Joint Disease.

## I. INTRODUCTION

### 1.1. Background and Rationale

Musculoskeletal disorders represent a significant and growing burden on global health systems, with Osteoarthritis (OA) standing out as the most prevalent articular degenerative disease.[1] It is a leading cause of chronic pain, functional impairment, and diminished quality of life, particularly in the elderly population. The World Health Organization identifies OA as the second commonest musculoskeletal problem worldwide, with a reported prevalence in rural India ranging from 5% to 7.8%.[2] The current

management in modern medicine is predominantly palliative, focusing on pain relief with analgesics and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), which are often associated with significant adverse effects, particularly gastrointestinal and renal complications.[3] While surgical interventions like joint replacement are effective in advanced stages, they are invasive, costly, and not without risks.

In this context, Ayurveda, the ancient Indian system of medicine, offers a profound and holistic perspective on similar disease conditions. *Sandhivata* is a classical Ayurvedic entity that bears a striking resemblance to OA in its clinical presentation, pathological progression, and predilection for the elderly. The term "*Sandhivata*" is a compound of "*Sandhi*" (joint) and "*Vata*" (the biological humor governing movement and nervous functions), literally translating to a disorder where vitiated *Vata* localizes in the joints.[4] Described in seminal texts like *Charaka Samhita* and *Sushruta Samhita*, *Sandhivata* is characterized by symptoms such as *Sandhishula* (joint pain), *Sandhishotha* (joint swelling), and *Stambha* (stiffness), mirroring the cardinal features of OA. [5, 6]

The Ayurvedic approach to *Sandhivata* is not merely symptomatic but is rooted in correcting the underlying systemic imbalance (*Dosha* vitiation) and promoting tissue rejuvenation (*Dhatu Prasadana*). Treatments involve a combination of detoxification (*Shodhana*), palliative therapies (*Shamana*), dietary modifications (*Pathya-Apathya*), and lifestyle regimens, offering a comprehensive strategy that may address the disease's root cause and slow its progression.[7]

### 1.2. Objective

This paper aims to conduct a systematic review of the literature on *Sandhivata* and its correlation with Osteoarthritis.

The specific objectives are:

1. To delineate the Ayurvedic concept of *Sandhivata*, including its etymology, etiology (*Nidana*), pathogenesis (*Samprapti*), and clinical features (*Rupa*).
2. To review the modern medical understanding of Osteoarthritis, encompassing its epidemiology, risk factors, pathophysiology, and clinical diagnosis.

3. To systematically map and synthesize the research conducted on *Sandhivata* across various Ayurvedic institutes in India.
4. To draw a comprehensive correlation between *Sandhivata* and Osteoarthritis, establishing their equivalence as a clinical entity.
5. To compare and contrast the management principles of both systems and explore potential integrative approaches.

### 1.3. Research Question

How does the classical and contemporary Ayurvedic understanding of *Sandhivata*, including its pathogenesis and management, correlate with the modern medical model of Osteoarthritis, and what insights can this correlation provide for developing more effective integrative treatment protocols?

## II. METHODS

This systematic literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a transparent and comprehensive reporting process.[8]

### 2.1. Information Sources and Search Strategy

A multi-pronged search strategy was employed to gather data from two primary domains:

#### 1. Ayurvedic Literature:

Primary sources included classical Sanskrit texts such as *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Ashtanga Sangraha*, *Madhava Nidana*, *Bhava Prakasha*, *Harita Samhita*, and *Bhela Samhita*. Key terms searched within these texts and their commentaries included "*Sandhivata*", "*Sandhigata Vata*", "*Vata Vyadhi*", "*Nidana*", "*Samprapti*", and "*Chikitsa*".

#### 2. Modern Medical Literature:

Electronic databases (PubMed, Scopus, Google Scholar) were searched for peer-reviewed articles and textbooks on Osteoarthritis. Search terms included "Osteoarthritis", "pathophysiology", "epidemiology", "risk factors", "clinical features", "diagnosis", and "management".

### 3. Previous Research Works:

The extensive compilation of research works from institutes like IPGT & RA (Jamnagar), Government Akhandanand Ayurveda College (Ahmedabad), Banaras Hindu University (Varanasi), and others, as provided in the document (Tables 1-14), served as a primary data source for mapping historical research trends in *Sandhivata*.

### 2.2. Eligibility Criteria

#### Inclusion Criteria:

- Classical Ayurvedic texts describing *Sandhivata* or *Sandhigata Vata*.
- Clinical trials, observational studies, and pharmacological studies on *Sandhivata* or OA from the compiled list of research works (1963-2011).
- Modern medical textbooks and review articles providing foundational knowledge on OA.
- Articles published in English or Hindi.

#### Exclusion Criteria:

- Articles or texts not directly related to *Sandhivata* or OA.
- Duplicate publications or studies with insufficient methodological details.

### 2.3. Data Extraction and Synthesis

Data were extracted into a standardized template covering: (a) Ayurvedic concepts (etymology, *nidana*, *samprapti*, *rupa*, *chikitsa*); (b) Modern medical concepts (definition, epidemiology, pathology, diagnosis, treatment); (c) Research data from tables (author, year, title, institute, department, intervention). A narrative synthesis was performed, integrating data from Ayurvedic and modern perspectives to draw correlations. The pathogenesis was mapped according to the *Shatkriyakala* (six stages of disease progression) model, and treatments were categorized and analyzed.

## III. RESULTS

### 3.1. The Ayurvedic Perspective on *Sandhivata*

#### 3.1.1. Historical and Etymological Review

The review of classical literature reveals that *Sandhivata* has been recognized as a distinct clinical entity since the post-Vedic era. While not explicitly mentioned in the core Vedas, references to *Sandhiroga* and *Sandhivishlesha* are found in the *Atharvaveda*. [9]

*Charaka Samhita* provides the first detailed description in the chapter on *Vata Vyadhi Chikitsa*, though interestingly, it is not listed among the 80 types of *Nanatamaja Vata Vikara*. [5] *Sushruta Samhita* and *Ashtanga Hridaya* further elaborate on its symptoms and treatment. [6, 10] The term "*Sandhivata*" is derived from "*Sandhi*" (meaning joint, union, or junction) and "*Vata*" (from the root '*va gati gandhanayoh*', meaning to move, to blow, to enlighten, or to hurt). Thus, *Sandhivata* signifies the provoked state of *Vata* located specifically in the joints. [4]

#### 3.1.2. Etiology (*Nidana*)

No separate etiology is mentioned exclusively for *Sandhivata*; the general causative factors of *Vata Vyadhi* are applicable. These can be categorized as: [5]

- Dietary (*Aharaja*): Excessive intake of dry (*Ati-ruksha*), cold (*Ati-shita*), light (*Ati-laghu*), or insufficient food (*Abhojana*).
- Lifestyle (*Viharaja*): Over-exertion (*Ativyayama*), improper posture, suppression of natural urges (*Vegasandharana*), excessive jumping, trauma (*Marmaghata*), and staying awake late at night (*Atiprajagarana*).

- Psychological (*Manasika*):

Excessive worry (*Atichinta*), grief (*Ati-shoka*), and fear (*Ati-bhaya*).

These factors directly vitiate *Vata Dosha*, which, due to its dynamic and pervasive nature, affects the integrity of the joints.

#### 3.1.3. Pathogenesis (*Samprapti*)

The pathogenesis of *Sandhivata* can be understood through the lens of *Samprapti Ghataka* (pathogenetic factors) and the *Shatkriyakala* (six stages of disease progression).

*Samprapti Ghataka*: [5, 6, 11]

- Dosh: Predominantly *Vata*, especially *Vyana Vayu*. *Shleshaka Kapha*, which normally lubricates the joints, is diminished.
- Dushya: *Asthi* (bone), *Majja* (bone marrow), *Medas* (adipose tissue), and *Mamsa* (muscle).
- Srotas: *Asthivaha*, *Majjavaha*, *Medovaha* Srotas (channels transporting bone, marrow, and fat tissues).

- Srotodushti: Sanga (obstruction) type.
- Agni: Mandagni (low digestive fire).
- Udbhava Sthana: Pakvashaya (colon, the primary seat of Vata).
- Vyakti Sthana: Asthi-Sandhi (bony joints).

*Shatkriyakala* (Stages of Disease Progression):

1. *Sanchaya* (Accumulation):

*Vata* accumulates in its primary site, the colon. Subtle signs of *Vata* aggravation may be present.

2. *Prakopa* (Aggravation):

The accumulated *Vata* becomes vitiated and intensified.

3. *Prasara* (Spread):

The aggravated *Vata* disseminates throughout the body.

4. *Sthana Samshraya* (Localization):

The circulating *Vata* localizes in sites of weakness (*Khavaigunya*), which, in this case, are the joints (*Asthi-Sandhi*). This stage may be asymptomatic or present with prodromal features (though classical texts mention no specific *Purvarupa* for *Sandhivata*).

5. *Vyakti* (Manifestation):

The localized *Vata* vitiates the joint tissues (*Dushya*), leading to the manifestation of clear clinical symptoms. This is the stage of diagnosis.

6. *Bheda* (Complication/Chronicity):

If untreated, the disease becomes chronic, leading to joint deformities and disability.

The core pathogenesis involves vitiated *Vata*, due to *nidana sevana*, occupying the empty channels (*Rikta Srotas*) of the body. The joints, being naturally porous and active sites, become vulnerable. The *ruksha* (dry), *khara* (rough), and *shita* (cold) properties of *Vata* degrade the *Shleshaka Kapha*, depleting the joint's natural lubrication and shock-absorbing capacity. This leads to degeneration of the articular surfaces, manifesting as *Sandhivata*. [5]

3.1.4.3.1.4 Clinical Features (*Rupa*)

The classical symptoms of *Sandhivata* are:

- *Sandhishula*: Pain in the joints, a cardinal symptom of *Vata* aggravation. [12]

- *Sandhishotha*: Swelling in the joints, which on palpation feels like an air-filled bag (*Vatapurna Driti Sparsha*). [5]

- *Hanti Sandhi / Stambha*: Loss of or restricted movement, stiffness, and immobility of the affected joint. [6, 13]

- *Akuñcana Prasaraṇayoḥ Vedana*: Pain specifically during flexion and extension of the joints. [5]

- *Sandhisphotana*: *Crepitus*, a cracking sound from the joint during movement. [13]

3.1.5. Diagnosis and Differential Diagnosis (*Sapeksha Nidana*)

Diagnosis is primarily clinical, based on the presence of the characteristic *Rupa*. Ayurvedic texts provide a clear differential diagnosis to distinguish *Sandhivata* from other similar conditions like *Amavata* (Rheumatoid Arthritis), *Vatarakta* (Gout), and *Kostrukashirsha* (a specific knee disorder). Key differentiating factors include the absence of fever and systemic toxicity in *Sandhivata*, the nature of the pain and swelling, and the specific joints involved (Table 1 in the provided document).

3.1.6. Principles of Management (*Chikitsa Sutra*)

The treatment of *Sandhivata* is based on pacifying *Vata* and nourishing the depleted tissues. The main modalities include: [6, 7, 14]

- *Snehana* (Oleation Therapy):

Internal (*Snehapana*) and external (*Abhyanga*) administration of medicated oils to counteract the dryness of *Vata*.

- *Svedana* (Sudation Therapy):

Application of heat to relieve stiffness and improve mobility. *Upanaha* (medicated poultice) is a specific type mentioned for joints.

- *Basti* (Medicated Enema):

Considered the prime treatment for *Vata* disorders. *Matra Basti* (oil enema) and *Anuvasana Basti* (oil-based nutritive enema) are highly emphasized for their *Vata*-pacifying and rejuvenating effects.

- *Agnikarma* (Thermal Cauterization):

Local application of heat to specific points around the joint for instant pain relief.

- *Shamana Aushadhi* (Palliative Drugs):

Oral administration of herbs and formulations with *Vata*-pacifying and analgesic properties. Commonly used drugs include *Rasna* (*Pluchea lanceolata*), *Shallaki* (*Boswellia serrata*), *Guggulu* (*Commiphora wightii*), *Ashwagandha* (*Withania somnifera*), and *Nirgundi* (*Vitex negundo*).

- *Pathya-Apathya* (Dietary and Lifestyle Regimen):

A *Vata*-pacifying diet (warm, moist, unctuous, sweet, sour, salty) and lifestyle (adequate rest, stress avoidance, gentle exercise) are integral to management.

### 3.2. The Modern Medical Perspective on Osteoarthritis

#### 3.2.1. Definition and Epidemiology

Osteoarthritis is defined as a chronic degenerative disorder characterized by focal loss of articular cartilage, subchondral bone sclerosis, and osteophyte formation.[15] It is the most common form of arthritis and a leading cause of pain and disability worldwide. Its prevalence increases dramatically with age, affecting over 30% of the population above 65 years. [1, 2] Risk factors include advanced age, female sex, obesity, genetic predisposition, major joint trauma, repetitive stress, and congenital/developmental defects.

#### 3.2.2. Pathophysiology

OA involves the entire "osteochondral unit." The primary pathology begins in the articular cartilage, where an imbalance between catabolic and anabolic activity occurs. Key processes include:

- **Chondrocyte Dysfunction:** Chondrocytes, the only cells in cartilage, become hyperactive but produce immature collagen and proteoglycans.
- **Matrix Degradation:** Enzymes like Matrix Metalloproteinases (MMPs) and Aggrecanases break down the collagen-proteoglycan matrix. Pro-inflammatory cytokines like IL-1 and TNF- $\alpha$  drive this catabolic process.[16]
- **Subchondral Bone Changes:** The subchondral bone becomes sclerotic (eburnation), and cysts may form. The bone-cartilage interface undergoes active remodeling.
- **Synovial Inflammation:** Low-grade synovitis is common, contributing to pain and swelling.

- **Osteophyte Formation:** Bony outgrowths form at the joint margins as a failed repair response.

#### 3.2.3. Clinical Features and Diagnosis

The hallmark symptoms are joint pain (worse with activity, better with rest), morning stiffness (<30 minutes), stiffness after inactivity (gelling), bony enlargement, crepitus, and restricted movement. Diagnosis is primarily clinical and radiological. X-rays show joint space narrowing, osteophytes, subchondral sclerosis, and cysts. Laboratory tests are typically normal and used to rule out other inflammatory arthritides.

#### 3.2.4.3.2.4 Management

Modern management is multidisciplinary and focuses on symptom control:[17]

- **Non-Pharmacological:**

Patient education, weight loss, physical therapy (muscle strengthening, aerobic exercise), and assistive devices.

- **Pharmacological:**

Acetaminophen, NSAIDs, COX-2 inhibitors, topical analgesics (e.g., Capsaicin), and intra-articular corticosteroid injections. Supplements like glucosamine and chondroitin sulfate are popular but evidence of efficacy is mixed.

- **Surgical:**

For end-stage disease, options include osteotomy, arthroscopy, and joint replacement (arthroplasty).

### 3.3. Synthesis of Previous Research Works on *Sandhivata* (1963-2011)

Analysis of the compiled research data (Tables 1-14) reveals distinct trends in Ayurvedic research on *Sandhivata*:

- **Chronological and Geographical Spread:**

Research has been consistently conducted since the 1960s, with major contributions from premier institutes like IPGT & RA, Jamnagar, and Banaras Hindu University, Varanasi.

- **Departmental Focus:**

The majority of research (over 80%) originated from the *Kayachikitsa* (Internal Medicine) department,

followed by *Shalya Tantra* (Surgery) and *Panchakarma*.

- Therapeutic Interventions:

A wide array of interventions were studied:

- Single/Compound Drugs:

*Shallaki*, *Guggulu* (in various forms like *Yogaraja*, *Trayodashanga*, *Sinhanaada*), *Ashwagandha*, *Rasna*, *Parijata*, *Ajamodadi* compounds.

- *Panchakarma* Procedures:

*Basti* (especially *Matra Basti*, *Ksheera Basti*, *Tikta Ksheera Basti*) was the most extensively researched procedure. *Agnikarma* was a key focus in surgical departments. *Janu Basti* (localized oil pooling for the knee) was a popular localized therapy.

- Comparative Studies:

Many studies compared the efficacy of different drug formulations or compared *Shamana* (palliative) therapy with *Shodhana* (purification) therapy.

- Outcomes Measured:

Studies primarily assessed outcomes based on reduction in pain, swelling, stiffness, and improvement in joint function, aligning with the core symptoms of both *Sandhivata* and OA.

#### IV. DISCUSSION

This systematic review establishes a robust correlation between the Ayurvedic entity *Sandhivata* and the modern disease Osteoarthritis. The parallels are evident across all domains of the disease.

##### 4.1. Correlation of Etiology and Risk Factors

The *nidana* of *Sandhivata* perfectly encapsulates the risk factors for OA. *Jara* (aging) and *Dhatukshaya* (tissue depletion) are the fundamental concepts explaining the higher prevalence of OA in the elderly. *Ativyayama* (over-exertion) and *Marmaghata* (trauma) correspond directly to "repetitive joint stress" and "major joint trauma." The concept of *Sthaulya* (obesity), though a *Kapha*-dominant condition, is recognized as a major *Vata* aggravator in the joints due to excessive mechanical load, mirroring the strong link between obesity and knee OA.

##### 4.2. Correlation of Pathogenesis

The *Samprapti* of *Sandhivata* provides a holistic model that explains not only the local joint pathology but also the systemic metabolic dysfunction underlying OA.

- *Dosha-Dushya* Interaction:

The vitiation of *Vata* and diminution of *Shleshaka Kapha* leading to joint degeneration is analogous to the catabolic dominance (driven by MMPs, IL-1) over anabolic processes (chondrocyte repair, proteoglycan synthesis) in OA.

- *Agni* and *Ama*:

The involvement of *Mandagni* (low digestive fire) and the potential formation of *Ama* (metabolic toxins) in some complex cases of *Sandhivata* offers an explanatory model for the systemic low-grade inflammation and metabolic syndrome often associated with generalized OA.[18]

- *Srotodushti*:

The *Sanga* (obstruction) type of channel pathology correlates with the impaired diffusion of nutrients through the dense cartilage matrix and the compromised microcirculation in the subchondral bone.

##### 4.3. Correlation of Clinical Features

The symptomatology is nearly identical:

- *Sandhishula* = Joint Pain
- *Sandhishotha* = Joint Swelling
- *Stambha* = Stiffness
- *Akuñcana Prasaraṇayoḥ Vedana* = Pain on movement/flexion
- *Sandhisphotana* = Crepitus

The description of swelling with a "bag of air" sensation (*Vatapurna Driti Sparsha*) is a unique clinical observation that may correspond to the feeling of synovial effusion or boggy synovial thickening.

##### 4.4. Analysis of Management Strategies

The Ayurvedic approach to *Sandhivata* is fundamentally different from and complementary to the modern approach.

- Holistic vs. Palliative:

While modern medicine focuses heavily on pain relief and end-stage surgical correction, Ayurveda aims to

restore the functional integrity of the joint by correcting the underlying *Doshic* imbalance and promoting tissue regeneration (*Dhatu Poshana*).

- *Basti* as Cornerstone Therapy:

The extensive research on *Basti*, particularly *Matra Basti* and *Anuvasana Basti*, underscores its importance. *Basti* acts directly on the primary seat of *Vata* (*Pakvashaya*), facilitating systemic *Vata* pacification. This may have systemic anti-inflammatory and rejuvenating effects, potentially slowing the disease progression, a claim that warrants rigorous investigation.

- *Rasayana* (Rejuvenation) Therapy:

The use of drugs like *Ashwagandha*, *Shallaki*, and *Guggulu* points towards a regenerative strategy. *Boswellia serrata* (*Shallaki*), for instance, has modern scientific validation for its anti-inflammatory and anti-arthritic properties via the inhibition of 5-LOX and pro-inflammatory cytokines.[19]

- Integrative Potential:

An integrative model could leverage modern diagnostic tools (e.g., MRI for early detection) while employing Ayurvedic *Panchakarma* and *Rasayana* therapies in the early to moderate stages to potentially modify the disease course, reducing the long-term dependence on NSAIDs and delaying the need for surgery.

## V. CONCLUSION

This systematic review conclusively demonstrates that *Sandhivata* and Osteoarthritis are the same clinical entity, described through the distinct yet complementary lenses of Ayurveda and modern medicine. The Ayurvedic paradigm offers a profound understanding of the disease's multifactorial origin, its staged progression, and a comprehensive, multi-modal treatment strategy that extends beyond symptomatic palliation.

The synthesis of previous research highlights a rich history of clinical inquiry within Ayurveda, with a strong focus on *Panchakarma* (especially *Basti*) and specific herbal formulations. The correlation drawn herein provides a solid foundation for future research. There is a compelling need for well-designed,

randomized controlled trials that standardize Ayurvedic interventions (e.g., a specific *Basti* protocol or a validated polyherbal formulation) and assess their efficacy and safety using modern, validated outcome measures for OA. Exploring the molecular and biochemical correlates of Ayurvedic concepts like *Dhatukshaya* and the action of *Rasayana* drugs could open new frontiers in understanding and managing this debilitating degenerative disease. Integrating the holistic, restorative principles of Ayurveda with the diagnostic precision of modern medicine holds the promise of revolutionizing OA care, shifting the focus from managing disability to promoting sustained joint health.

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