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RADIOLOGICAL INSIGHTS INTO AYURVEDIC DIAGNOSTICS: A SYSTEMATIC REVIEW BRIDGING SANDHIGATA VATA AND AMAVATA WITH MODERN IMAGING

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Abstract : This systematic review explores how radiological imaging can objectively support Ayurvedic diagnostics for *Sandhigata Vata* and *Amavata*, conditions clinically comparable to osteoarthritis (OA) and rheumatoid arthritis (RA). A structured PubMed search (2000–2024) identified studies correlating Ayurvedic descriptions with X-ray, MRI, CT, and ultrasound findings. Strong parallels emerged: degenerative changes in OA mirrored *Sandhigata Vata* features, while inflammatory markers in RA aligned with *Amavata*. Although imaging effectively validates Ayurvedic interpretations, its use in Ayurvedic research remains limited. Integrating radiology into diagnostic frameworks can enhance precision and strengthen evidence-based Ayurvedic practice.

Keywords: Ayurveda, Sandhigata Vata, Amavata, osteoarthritis, rheumatoid arthritis, radiology, integrative diagnostics

Introduction

Arthritis is a leading contributor to chronic pain and disability worldwide. **Osteoarthritis (OA)** is primarily a degenerative joint disorder characterised by progressive cartilage loss, osteophyte formation, subchondral sclerosis, and variable synovial inflammation. **Rheumatoid Arthritis (RA)** is a systemic autoimmune disease involving persistent synovitis, bone and cartilage erosion, and eventual joint deformity. In modern biomedicine, radiological imaging—particularly X-ray, MRI, CT, and musculoskeletal ultrasound—plays a central role in diagnosis, grading severity, monitoring progression, and evaluating treatment response.

In Ayurveda, analogous conditions are described as ***Sandhigata Vata*** and ***Amavata***. *Sandhigata Vata* is a Vata-dominant disorder of the *sandhi* (joint), manifested as **pain, stiffness, crepitus, swelling, and restriction of movement**. *Amavata* is a disorder arising from the interaction of ***Ama*** (undigested, toxic metabolic residue) with vitiated Vata, leading to **painful swollen joints, severe stiffness, heaviness, systemic weakness, and chronicity**. Clinically, *Sandhigata Vata* is frequently correlated with OA, while Amavata is compared with RA based on symptomatology and progression.

Ayurvedic diagnosis traditionally depends on **clinical examination, *dosha* and *dhatu* assessment, status of *Agni*, *Srotas* examination, *Prakriti*, and *Nadi Pariksha***. These methods provide a rich functional understanding but do not directly visualise structural changes in the joints. Radiology, on the other hand, provides clear objective images of degeneration, inflammation, and deformity.

In the present era of integrative medicine, there is a growing need to connect these two knowledge systems. Suppose radiological markers can be systematically correlated with Ayurvedic concepts such as *Vata vitiation, Ama accumulation, Srotodusti, and Dhatu kshaya*. In that case, they can provide a strong bridge between traditional diagnostic reasoning and modern evidence. This review attempts to summarise existing literature that correlates *Sandhigata Vata* with OA and *Amavata* with RA using radiological findings, and to identify gaps and future directions.

Aims and Objectives

Aim

To systematically review existing literature to correlate Ayurvedic diagnostic concepts of **Sandhigata Vata** and **Amavata** with radiological findings of **Osteoarthritis** and **Rheumatoid Arthritis**.

Objectives

1. To identify published studies that compare Sandhigata Vata with OA and Amavata with RA using radiological imaging.
2. To analyse how radiology (X-ray, MRI, CT, ultrasound) has been used as an objective tool in Ayurvedic research on joint disorders.
3. To delineate key similarities between classical Ayurvedic descriptions and modern radiological markers.
4. To highlight methodological gaps and limitations in current research.
5. To suggest future research directions for integrative diagnostic frameworks combining Ayurvedic assessment with radiology.

Methodology

This study is a **systematic narrative review** of literature examining correlations between Ayurvedic diagnostic concepts (Sandhigata Vata, Amavata) and radiological findings in OA and RA.

Search Strategy

A structured search was conducted on **PubMed** for the period **January 2000 to December 2024** using the following keywords and combinations:

- “Sandhigata Vata” OR “Sandhigatavata”
- “Amavata” OR “Aamavata”
- “Osteoarthritis”
- “Rheumatoid Arthritis”
- “Ayurveda” OR “Panchakarma”
- “Radiology”, “X-ray”, “MRI”, “CT”, “ultrasound”

Search strings such as:
(Sandhigata Vata OR osteoarthritis) AND (Amavata OR rheumatoid arthritis) AND (radiology OR X-ray OR MRI OR CT) AND Ayurveda
were used.

Inclusion Criteria

- Articles published in English between 2000–2024.
- Studies correlating Sandhigata Vata with OA and/or Amavata with RA.
- Use of at least one radiological modality (X-ray, MRI, CT, or ultrasound) for diagnosis or outcome assessment.
- Clinical trials, observational studies, and conceptual or review articles with clear diagnostic correlation.

Exclusion Criteria

- Studies without radiological data.
- Articles unrelated to Ayurveda, Sandhigata Vata, or Amavata.
- Purely experimental animal or in-vitro studies.

- Isolated case reports without structured imaging assessment.

Study Selection

- Total records identified: **70**
- After title/abstract screening for relevance: **56**
- Full-text assessment for Ayurvedic conceptual correlation: **39**
- Studies using radiology as an objective parameter: **9**

Results

Correlation between Sandhigata Vata and Osteoarthritis

Across the reviewed literature, **Sandhigata Vata** showed a strong conceptual and clinical overlap with **Osteoarthritis**:

- Classical features: *Sandhi shoola* (joint pain), *Sandhi shotha* (joint swelling), *Akunchana-prasārana vedana* (pain during flexion and extension), *Sandhi shabda* (crepitus), stiffness and reduced range of movement.
- Radiological features in OA:
  - Joint space narrowing
  - Osteophyte formation
  - Subchondral sclerosis
  - Irregular articular surfaces

These radiological markers were interpreted in Ayurvedic terms as expressions of aggravated **Vata** causing **rukshata** (dryness), **kshaya** (tissue depletion), and **dhatu saithilya** (weakening of supporting structures).

figure 2. comparative features of osteoarthritis and sandhigata vata

Correlation between Amavata and Rheumatoid Arthritis

Amavata shared significant similarity with **Rheumatoid Arthritis**:

- Ayurvedic features: multiple joint pain, swelling, marked morning stiffness, heaviness, fatigue, and chronic progressive course.
- Radiological RA features reported:
    - Peri-articular soft tissue swelling and joint effusion
    - Synovial hypertrophy (especially on MRI/ultrasound)
    - Marginal erosions
    - Peri-articular osteopenia and later joint deformities

These were understood as reflective of **Ama** deposited in the joints, obstructing Vata and causing inflammatory swelling (*shotha*), heaviness (*gourava*), and stiffness (*stabdhata*).

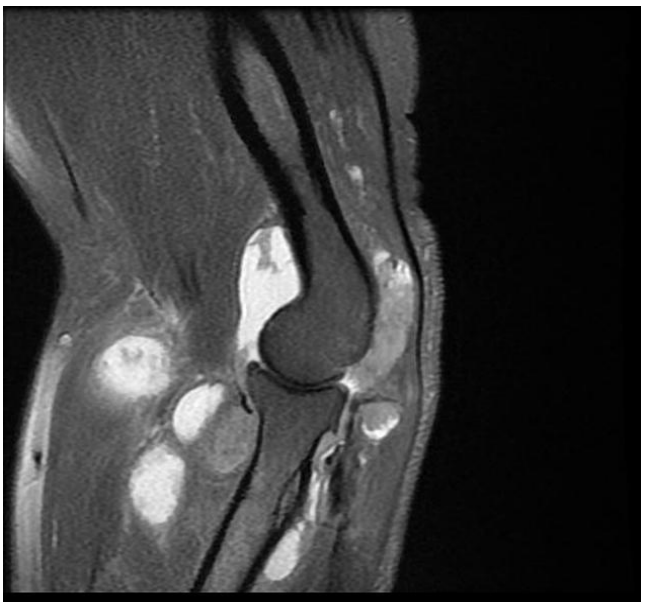

figure 3. radiological changes in rheumatoid arthritis (e.g., ra elbow) corresponding to amavata

Use of Radiology in Ayurvedic Interventional Studies

Among the nine radiology-integrated studies:

- Several evaluated classical Ayurvedic interventions such as **Panchakarma procedures (e.g., Basti), internal formulations (Aamavatavidhwansa Rasa, Shatavari Guggulu, Panchatikta Ghrita Guggulu), and Marma therapy**.
- Most reported significant **symptomatic relief** using subjective scoring systems.
- Only a few documented **pre- and post-treatment radiological changes**, such as reduction in effusion or stabilisation of joint space narrowing.
- Standardised radiological grading (e.g., Kellgren–Lawrence for OA, sharp scores for RA) was seldom applied.

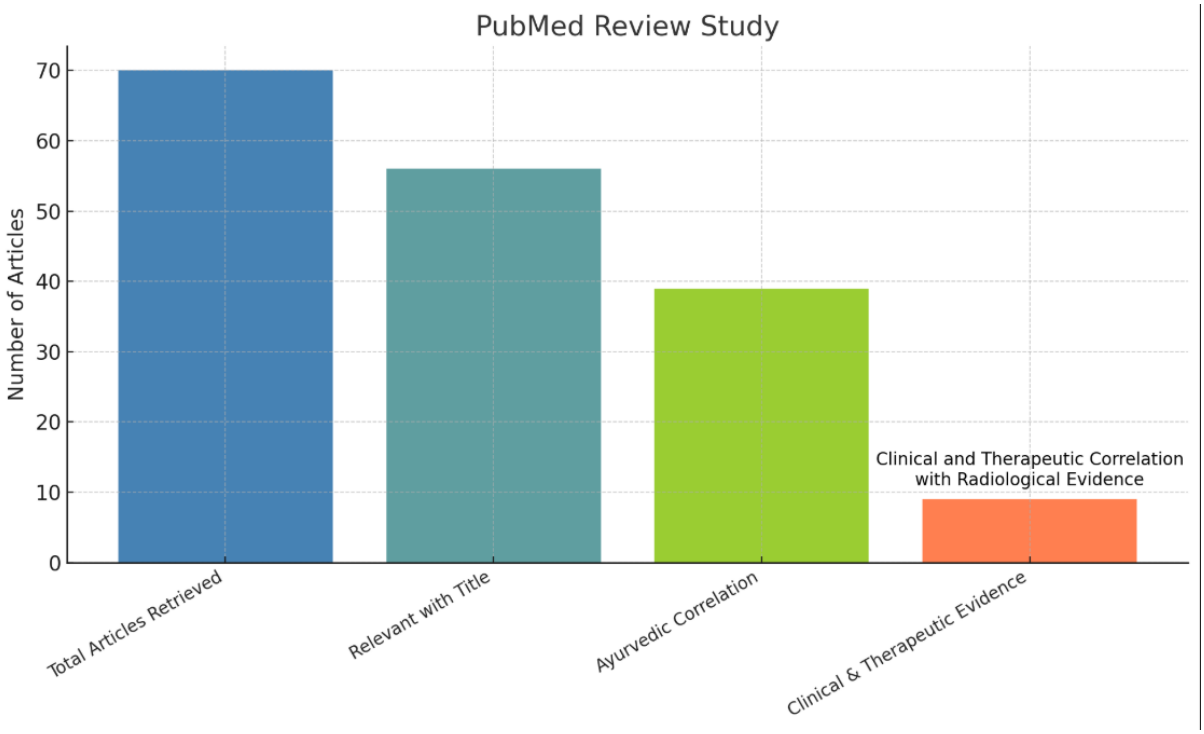

Figure 3 – statistics of pubmed review

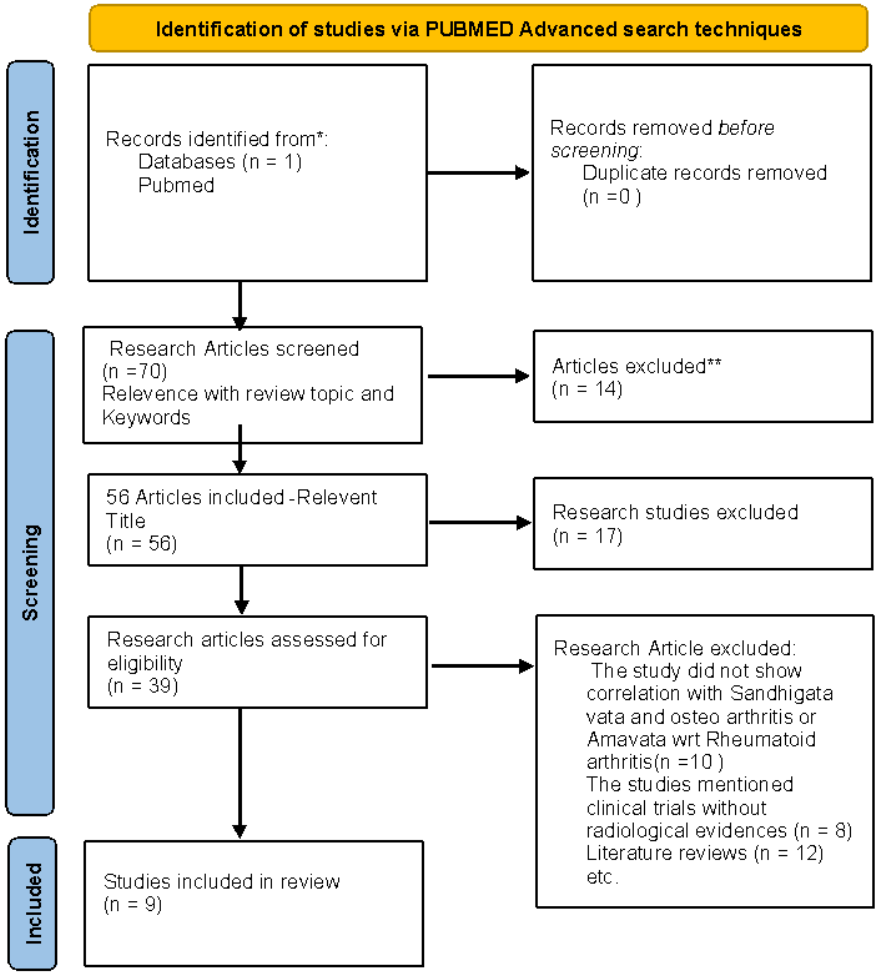

figure 4- prisma diagram of the review process depicting outcomes.

Discussion

The present review suggests that radiology can meaningfully **support and visualise Ayurvedic diagnostic concepts**.

- In **Sandhigata Vata**, degeneration attributed to aggravated Vata translates well into OA imaging findings such as joint space loss, osteophytes, and sclerosis.
- In **Amavata**, the presence of Ama and Vata obstruction in joints is reflected in imaging as synovial thickening, joint effusion, inflammatory pannus, and erosions characteristic of RA.

Radiology thereby provides an **objective structural counterpart** to the functional descriptions found in classical Ayurvedic texts. This strengthens the clinical confidence of Ayurvedic practitioners when correlating traditional diagnoses with modern disease entities.

However, the review also reveals important **gaps**:

- Radiology is still **infrequently used** as a primary outcome measure in Ayurvedic clinical trials.
- Imaging is often limited to baseline diagnosis, with no systematic follow-up.
- There is minimal exploration of **Prakriti-wise or Dosha-dominant imaging patterns**.
- Standardised scoring systems and blinded radiological assessment are rarely implemented.

For Ayurveda to be more widely accepted in integrative clinical settings, future research should be designed with:

- Clear Ayurvedic diagnostic criteria + modern radiological definitions.
- Baseline and post-treatment imaging in all major trials on joint disorders.
- Collaboration between Ayurvedic physicians and radiologists.
- Analytical models linking doshic predominance, **Agni** status, and radiological progression.

Conclusion

Radiological imaging offers a powerful and objective way to **visualise and validate** Ayurvedic diagnostic principles for ***Sandhigata Vata*** *and* ***Amavata***. The reviewed literature demonstrates strong conceptual and clinical overlap between *Sandhigata Vata* and OA, and between Amavata and RA, supported by imaging findings of degeneration and inflammation. Radiological science offers a powerful lens through which the structural realities of *Sandhigata Vata and Amavata* can be objectively visualised, affirming long-standing Ayurvedic diagnostic principles. The degenerative signatures captured in osteoarthritis—joint space narrowing, osteophytes, and subchondral changes—reflect the classical Vata-prakopa, dhatu-kshaya, and *rukshata* described in *Sandhigata Vata*. Likewise, inflammatory features of rheumatoid arthritis—synovial hypertrophy, effusion, erosions—parallel the Ayurvedic constructs of Ama-sanchaya, srotorodha, and Vata-*avarana* that define *Amavata*.

This convergence demonstrates that Ayurveda's functional and doshic interpretations align meaningfully with modern structural biomarkers. Yet radiology remains underutilised in Ayurvedic research. The future of integrative diagnostics lies in systematically applying imaging not as a supplementary tool but as an essential objective counterpart to classical Ayurvedic reasoning. When radiology is embedded within Ayurvedic clinical trials, Prakriti-based studies, and Panchakarma evaluations, it can significantly elevate the precision, credibility, and global acceptance of Ayurvedic medicine.

By bridging ageless Ayurvedic insights with contemporary imaging modalities, this review highlights that the two systems do not merely coexist—they complement and enrich one another. Radiology provides visual affirmation to Ayurvedic concepts, while Ayurveda offers a functional, doshic, and systemic framework to interpret disease beyond what images alone can convey. Together, they form a robust, evidence-driven pathway toward more precise, holistic, and patient-centred musculoskeletal care.

Limitations

- The review is limited to **PubMed-indexed** literature and English language sources.
- Many Ayurvedic clinical studies lacked detailed methodology or radiological grading.
- Heterogeneous study designs prevented quantitative meta-analysis.

Future Scope

- Designing **Prakriti-specific** and **Dosha-specific** imaging studies.
- Developing **Ayurveda-friendly radiological reporting formats** (e.g., mapping radiological features to Vata/Ama dominance).
- Using AI-assisted pattern recognition to correlate dosha imbalance with imaging biomarkers.
- Incorporating radiology in clinical trials on Panchakarma and Rasoushadhi for OA and RA.

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