

INTEGRATIVE MANAGEMENT OF AVASCULAR NECROSIS OF FEMORAL HEAD THROUGH AYURVEDA AND PANCHAKARMA: A CRITICAL REVIEW OF CURRENT EVIDENCE

**Dr. Om Prakash Chaudhary^{1*}, Prof. (Dr.) Gyan Prakash Sharma², Dr. Bhinya Ram³,
Dr. Neha Chauhan⁴**

¹PG Scholar, Department of Panchakarma, Post Graduate Institute of Ayurveda, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur, Rajasthan, India.

²Professor & Head of the Department, M.D, PhD. (Ayu- Panchakarma), Department of Panchakarma, Post Graduate Institute of Ayurveda, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur, Rajasthan, India.

³Ph. D. Scholar, Department of Shalyatrantra, National Institute of Ayurveda, Deemed to be University, Jaipur, Rajasthan, India.

⁴Assistant Professor, Government Ayurveda Yoga and Naturopathy College, Kekri, Ajmer, Rajasthan, India.

Article Received on 27 August 2026,
Article Revised on 17 Sept. 2026,
Article Published on 01 Oct. 2026

<https://doi.org/10.5281/zenodo.23032475>

*Corresponding Author

Dr. Om Prakash Chaudhary

PG Scholar, Department of
Panchakarma, Post Graduate
Institute of Ayurveda, Dr. Sarvepalli
Radhakrishnan Rajasthan Ayurved
University, Jodhpur, Rajasthan,
India.



How to cite this Article: Dr. Om Prakash Chaudhary^{1*}, Prof. (Dr.) Gyan Prakash Sharma², Dr. Bhinya Ram³, Dr. Neha Chauhan⁴ (2026). Integrative Management Of Avascular Necrosis of Femoral Head Through Ayurveda And Panchakarma: A Critical Review Of Current Evidence. World Journal of Pharmaceutical Research, 15(19), 80–107.

This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

Avascular necrosis (AVN), more precisely termed osteonecrosis of the femoral head (ONFH), is a progressive disorder caused by loss of blood supply to the subchondral bone, leading to osteocyte death, structural weakening, collapse of the femoral head and secondary osteoarthritis. It commonly affects younger adults and may result from corticosteroid exposure, excessive alcohol intake, trauma, sickle cell disease and several other systemic conditions. Early diagnosis is important because joint-preserving treatment becomes progressively less effective once subchondral fracture and femoral head collapse have occurred. Contemporary evidence supports magnetic resonance imaging as the most accurate imaging modality for early disease, while treatment is selected according to stage, lesion size, location, symptoms and patient factors.^[1,2] Ayurveda does not describe AVN as a single classical disease entity. Published Ayurvedic reports have

interpreted its clinical presentation through concepts such as *Asthi-Majjagata Vata*, *Asthivaha Srotodushti*, *Dhatu Kshaya* and *Vata Prakopa*.^[3] This correlation remains interpretative and

should not be considered an exact classical equivalent of ischemic osteonecrosis. Panchakarma-based management reported in case literature commonly includes *Rukshana*, *Snehana*, *Swedana*, *Basti*, *Ksheera Basti*, *Shashtika Shali Pinda Sweda* and internal medicines intended to address pain, stiffness and tissue depletion.^[3,4] The available Ayurvedic evidence is encouraging mainly with respect to symptomatic outcomes such as pain, gait, range of motion and quality of life. However, most publications consist of individual case reports or small uncontrolled studies, and convincing evidence that Ayurveda can reverse necrotic bone, restore vascular supply or prevent structural collapse is currently lacking. Modern joint-preserving treatments such as core decompression, with or without biological augmentation, remain important particularly in pre-collapse disease, while arthroplasty is often required after advanced collapse.^[5] This review critically examines the modern pathophysiology and staging of ONFH, its cautious Ayurvedic interpretation, the rationale for Panchakarma interventions, available clinical evidence and opportunities for integrative research. A safe integrative approach should aim to improve pain, function and quality of life while maintaining MRI-based staging and timely orthopedic referral. Future trials require standardized Ayurvedic protocols, validated functional outcomes, serial imaging and long-term follow-up before disease-modifying claims can be justified.

KEYWORDS: Avascular necrosis, osteonecrosis femoral head, Ayurveda, *Asthi-Majjagata Vata*, Panchakarma, *Basti*, *Ksheera Basti*, hip preservation, integrative medicine.

INTRODUCTION

Osteonecrosis of the femoral head is a disabling condition in which the blood supply to a portion of the femoral head becomes insufficient. The resulting ischemia causes death of bone and marrow cells. Over time, the necrotic region loses mechanical strength, subchondral fracture may develop and the spherical contour of the femoral head can collapse.

The disease is particularly important because it frequently affects young and middle-aged adults. Unlike primary osteoarthritis, which often occurs later in life, ONFH may compromise mobility during the most productive years.

The natural history can be unfavourable. A systematic review of untreated asymptomatic ONFH found progression to symptoms or collapse in approximately 59% of hips overall, although small medially located lesions had a substantially better prognosis.^[6] Lesion size and location therefore matter greatly when estimating risk.

Historically, the condition was often termed avascular necrosis, aseptic necrosis or ischemic necrosis. The term osteonecrosis of the femoral head is now preferred because several mechanisms may ultimately result in bone-cell death rather than complete absence of blood supply alone.

Current treatment aims to preserve the native femoral head before collapse whenever possible. Once substantial collapse and secondary arthritic change have occurred, total hip arthroplasty often becomes the most reliable option.^[5]

Ayurvedic physicians have increasingly reported conservative management of AVN using Panchakarma and internal medication. The most frequently proposed classical framework is *Asthi-Majjagata Vata*, based on pain, restricted movement, weakness and involvement of deep bone and marrow tissue.³ Other authors emphasize *Asthivaha Srotodushti*, *Dhatu Kshaya*, *Vata-Kapha Dushti* and impaired nourishment of *Asthi Dhatu*.

These correlations are clinically interesting but require caution. AVN is a radiologically and pathophysiologically defined disorder involving ischemic bone death. It should not simply be renamed as *Asthi-Majjagata Vata*. The more scientifically defensible position is that ONFH represents a modern disease whose clinical features can be interpreted through selected Ayurvedic principles for the purpose of developing supportive interventions.

AIM

To critically evaluate the possible integrative management of osteonecrosis of the femoral head using Ayurveda and Panchakarma alongside contemporary orthopedic care.

OBJECTIVES

The objectives of this review are to:

1. Describe the modern pathophysiology, risk factors and staging of ONFH.
2. Explain the importance of early diagnosis and MRI-based evaluation.
3. Examine Ayurvedic interpretations involving *Asthi*, *Majja*, *Vata* and *Srotas*.
4. Review the rationale for Panchakarma interventions used in published AVN cases.
5. Critically assess available Ayurvedic clinical evidence.
6. Compare symptomatic improvement with true structural disease modification.
7. Propose a safe integrative model for clinical practice.
8. Identify priorities for future randomized and imaging-based research.

MATERIALS AND METHODS

A narrative review approach was adopted.

Modern literature was reviewed using publications concerning osteonecrosis of the femoral head, ARCO staging, MRI diagnosis, natural history, core decompression, biological augmentation, hip-preservation surgery and total hip arthroplasty.

Particular importance was given to the 2019 revised ARCO staging system and the 2026 international evidence-based clinical practice guideline for nontraumatic ONFH.^[1,2]

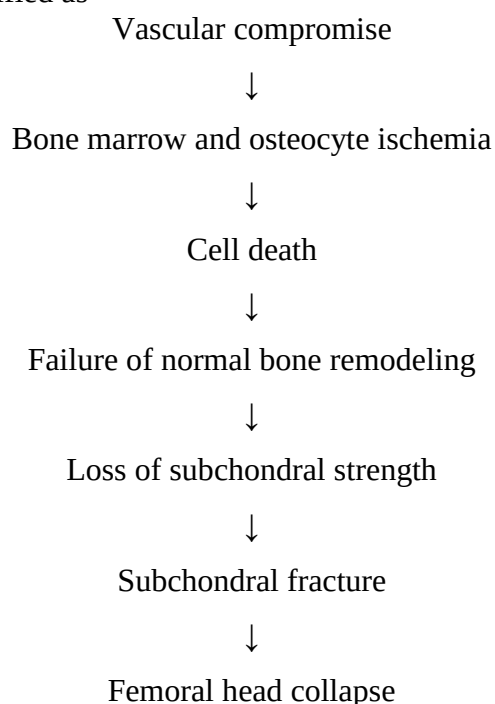
Ayurvedic literature was reviewed for published cases and reviews describing conservative management of AVN through *Rukshana*, *Snehana*, *Swedana*, *Basti*, *Ksheera Basti*, *Shashtika Shali Pinda Sweda* and internal medicines.

The two systems were compared cautiously. Ayurvedic concepts were treated as clinical frameworks and not as direct molecular equivalents of ischemia, osteocyte death or femoral-head collapse.

1. MODERN UNDERSTANDING OF OSTEONECROSIS

ONFH is the final result of processes that reduce blood flow or impair microvascular integrity within the femoral head.

The sequence can be simplified as





Secondary osteoarthritis

The transition from pre-collapse disease to structural collapse is clinically critical.

Before collapse, treatment may still aim to preserve the native joint.

After substantial collapse, the probability of successful conservative hip preservation decreases considerably.

2. ETIOLOGY AND RISK FACTORS

ONFH may be traumatic or nontraumatic.

Traumatic causes

These include

- femoral neck fracture,
- hip dislocation,
- disruption of the retinacular blood supply.

Nontraumatic causes

Important risk factors include

- systemic corticosteroid therapy,
- chronic excessive alcohol use,
- sickle cell disease,
- systemic lupus erythematosus,
- dysbaric disease,
- organ transplantation,
- coagulation abnormalities,
- selected metabolic conditions.

In some patients no clear cause is identified.

Modern guidelines emphasize documenting etiology because prognosis and treatment planning may differ according to the underlying condition.^[1]

3. CORTICOSTEROID-ASSOCIATED ONFH

Glucocorticoids are among the most recognized causes of nontraumatic ONFH.

The mechanism is probably multifactorial and may involve:

- altered lipid metabolism,
- marrow fat-cell enlargement,
- increased intraosseous pressure,
- endothelial dysfunction,
- microvascular thrombosis,
- osteocyte apoptosis.

Risk generally increases with cumulative dose and exposure intensity, although individual susceptibility varies considerably.

4. ALCOHOL-ASSOCIATED ONFH

Chronic excessive alcohol consumption is another major risk factor.

Proposed mechanisms include altered lipid metabolism, increased marrow adiposity, oxidative stress and impaired osteogenic function.

The presence of both corticosteroid exposure and alcohol excess may further increase risk in susceptible individuals.

5. WHY THE FEMORAL HEAD IS VULNERABLE

The femoral head receives blood through a relatively limited arterial network.

The weight-bearing subchondral region must also tolerate substantial mechanical stress.

Thus, when bone viability becomes impaired, the affected segment may continue to bear load despite reduced capacity for remodeling.

This combination of vascular vulnerability and mechanical stress explains why structural collapse can follow osteonecrosis.

6. CLINICAL FEATURES

Early ONFH may be asymptomatic.

When symptoms develop, the most common complaint is hip pain.

Pain may be felt in

- groin,
- buttock,
- lateral hip,
- thigh,
- occasionally knee.

Patients may also develop:

- stiffness,
- painful rotation,
- reduced range of motion,
- limping,
- difficulty climbing stairs,
- difficulty sitting cross-legged,
- reduced walking tolerance.

Symptoms often worsen with weight bearing.

7. MRI AND EARLY DIAGNOSIS

Plain radiographs may remain normal in early-stage disease.

MRI is therefore particularly important.

A meta-analysis of 43 diagnostic studies reported pooled sensitivity of approximately 93% and specificity of approximately 91% for MRI in early ONFH.^[7]

The recent ARCO evidence review similarly found MRI to have the highest diagnostic performance among studied modalities.^[8]

MRI can identify:

- marrow abnormalities,
- necrotic boundaries,
- bone marrow edema,
- bilateral involvement,
- pre-collapse disease.

This makes MRI essential when AVN is clinically suspected despite normal X-ray findings.

8. ARCO STAGING

The 2019 revised ARCO system provides four major stages.^[2]

Stage I

Plain X-ray is normal, but MRI or bone scan is positive.

Stage II

X-ray shows changes such as sclerosis, osteoporosis or cystic lesions but without subchondral fracture or flattening.

Stage III

Subchondral or necrotic-zone fracture is present.

It is divided into:

- Stage IIIA: depression ≤ 2 mm
- Stage IIIB: depression > 2 mm.

Stage IV

Secondary osteoarthritis is present with joint-space narrowing, acetabular changes or joint destruction.

This staging has major implications for treatment selection.

Table 1: Simplified ARCO Staging and Clinical Implications.

ARCO stage	Major finding	General treatment concern
I	MRI positive, X-ray normal	Early hip preservation
II	X-ray abnormal, no collapse	Joint-preserving strategies
IIIA	Early collapse ≤ 2 mm	Selected preservation procedures
IIIB	Collapse > 2 mm	Preservation less predictable
IV	Secondary osteoarthritis	Arthroplasty often required

9. SIZE AND LOCATION OF THE NECROTIC LESION

Stage alone does not fully predict prognosis.

Large and laterally located lesions are more likely to collapse.

The natural-history review by Mont et al. found that small, medially located asymptomatic lesions had a collapse rate below 10%, whereas medium and large lesions progressed much more frequently.^[6]

This has an important implication for Ayurvedic research:

two patients labelled "AVN Grade II" may have very different structural prognoses.

Clinical trials should therefore record lesion size and location, not only stage.

10. CURRENT MODERN MANAGEMENT

Management depends upon:

- disease stage,
- lesion size,

- lesion location,
- symptoms,
- age,
- etiology,
- bilateral involvement,
- functional expectations.

The 2026 ARCO clinical practice guideline emphasizes evidence-based stage-specific management of nontraumatic ONFH.^[1]

Treatment options include conservative monitoring, joint-preserving surgery and arthroplasty.

11. CONSERVATIVE MANAGEMENT

Nonoperative measures may include:

- reduction of avoidable risk factors,
- limiting high-impact loading,
- use of walking aids where appropriate,
- analgesia,
- physiotherapy,
- management of underlying disease.

Conservative measures may improve symptoms but generally cannot be relied upon to reverse a large necrotic lesion.

Therefore, patients should not be kept indefinitely on symptomatic therapy while structural collapse progresses.

12. CORE DECOMPRESSION

Core decompression is one of the most established hip-preservation procedures for early-stage ONFH.

The procedure reduces intraosseous pressure and creates channels through which vascular and bone repair may occur.

Modern reviews generally support its greatest usefulness in pre-collapse disease.^[5]

A 2025 systematic review evaluating different core-decompression techniques confirmed its continuing role in early-stage disease, while biological augmentation appeared to improve some functional outcomes.^[9]

13. BIOLOGICAL AUGMENTATION

Core decompression may be combined with:

- bone marrow aspirate,
- mesenchymal stem cells,
- platelet-rich plasma,
- bone grafts.

A 2023 meta-analysis involving 1,257 hips reported that stem-cell augmentation of core decompression was associated with lower rates of collapse, radiographic progression and conversion to total hip arthroplasty in several analyses.^[10]

More recent meta-analyses similarly suggest possible benefit of cell-based augmentation, although study heterogeneity remains substantial.^[11]

This field continues to evolve and should not be presented as uniformly standardized treatment.

14. TOTAL HIP ARTHROPLASTY

Once substantial collapse and secondary arthritis develop, joint-preserving treatments become less predictable.

Total hip arthroplasty may then provide the most reliable pain relief and functional restoration.

This does not mean every AVN patient requires surgery.

It means that treatment decisions must be stage appropriate.

Delaying orthopedic referral until severe collapse has occurred may remove opportunities for hip preservation.

15. AYURVEDIC INTERPRETATION

Ayurveda does not contain a direct description of femoral-head osteonecrosis caused by ischemia.

Nevertheless, several concepts are relevant to its clinical presentation.

Published Ayurvedic reports most commonly correlate AVN with:

- *Asthi-Majjagata Vata*,
- *Asthivaha Srotodushti*,

- *Vata-Kapha Dushti*,
- *Dhatu Kshaya*.

A 2016 case report specifically interpreted bilateral AVN through *Asthivaha Srotodushti* and chronic deep-seated *Vata-Kapha* disturbance.^[3]

More recent case reports have used the term *Asthimajjagata Vata*.^[4,12]

These interpretations are useful therapeutically but should remain conceptual.

16. ASTHI-MAJJAGATA VATA

Classical *Vata Vyadhi* descriptions include involvement of deeper tissues.

When *Vata* affects *Asthi* and *Majja*, pain, weakness and functional disturbances may develop.

This provides a plausible Ayurvedic framework for symptoms such as:

- deep hip pain,
- stiffness,
- restricted movement,
- difficulty walking.

However

Asthi-Majjagata Vata is not synonymous with MRI-confirmed osteonecrosis.

The first is a classical clinical concept; the second is a defined structural bone disease.

17. DHATU KSHAYA

Dhatu Kshaya is another concept often used to interpret degenerative conditions.

In AVN, the femoral head contains nonviable bone and impaired remodeling.

It may therefore be tempting to identify this directly as *Asthi Kshaya*.

Such a one-to-one correlation is too simplistic.

However, *Dhatu Kshaya* can provide a useful therapeutic framework for considering:

- poor tissue resilience,
- reduced functional strength,
- chronic disease,
- nutritional depletion.

This concept helps explain the frequent use of *Brimhana* and *Ksheera Basti* in published Panchakarma protocols.

18. SROTODUSHTI AND VASCULAR COMPROMISE

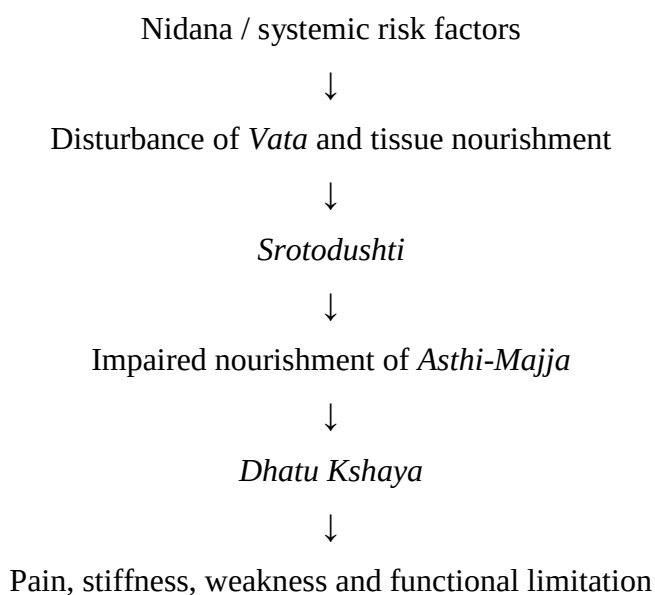
Because AVN develops from impaired blood supply, some Ayurvedic interpretations emphasize *Srotorodha*.

This comparison should again be cautious.

Medovaha or *Raktavaha Srotodushti* cannot simply be equated with microvascular occlusion. Nevertheless, impaired nourishment reaching *Asthi* through disturbed physiological pathways forms a conceptually relevant Ayurvedic model.

19. A PROPOSED AYURVEDIC PATHWAY

A simplified interpretative model may be:



This remains an Ayurvedic clinical model, not a substitute for the vascular pathology of ONFH.

20. PANCHAKARMA IN PUBLISHED AVN CASES

Panchakarma approaches vary considerably between reports.

Common procedures include:

- *Rukshana*,
- *Udvartana*,
- *Dhanyamla Parisheka*,
- *Patra Pottali Sweda*,
- *Shashtika Shali Pinda Sweda*,
- *Ksheera Basti*,
- *Kshara Basti*,
- *Sneha Basti*.

This diversity reflects individualized Ayurvedic treatment but creates a challenge for evidence synthesis.

It becomes difficult to determine which intervention actually produced benefit.

21. RUKSHANA

In patients interpreted as having *Kapha* or *Meda* involvement, some case protocols begin with *Rukshana*.

The 2016 published case used *Agnichikitsa Lepa*, *Dhanyamla Parisheka* and other measures before proceeding to *Shodhana* and *Brimhana*.^[3]

The authors reported limited improvement during the initial *Rukshana* phase and greater improvement during later treatment stages.^[3]

This illustrates why treatment components should be evaluated separately in future studies.

22. SNEHANA

Snehana is commonly used in *Vata*-dominant disorders.

Local *Abhyanga* may help:

- reduce stiffness,
- improve comfort,
- prepare tissues for *Swedana*.

However, there is currently no evidence that external oil application can restore femoral-head perfusion.

Its potential role should therefore be considered symptomatic and supportive.

23. SWEDANA

Several AVN reports use *Patra Pottali Sweda*, *Shashtika Shali Pinda Sweda* or other forms of fomentation.

Possible practical effects include:

- temporary reduction in stiffness,
- muscle relaxation,
- improved movement,
- pain modulation.

The 2026 case report involving bilateral AVN used local oleation and *Patra Pottali Swedana* as part of a 16-day Panchakarma programme and reported improvement in pain, range of motion and Harris Hip Score.^[4]

Because multiple therapies were given together, however, individual treatment effects cannot be separated.

24. BASTI AS A CENTRAL PANCHAKARMA INTERVENTION

Basti is frequently considered the principal Panchakarma intervention for *Vata Vyadhi*.

Published AVN protocols have used several types

- *Manjisthadi Kshara Basti*,
- *Manjisthadi Ksheera Basti*,
- *Tikta Ksheera Basti*,
- medicated *Sneha Basti*.

The choice is usually based on the proposed balance between *Shodhana*, *Vatahara* action and *Brimhana*.

25. KSHEERA BASTI

Milk-based *Basti* has particular relevance to the concept of *Dhatu Kshaya* and *Brimhana*.

The 2016 case report used *Manjisthadi Ksheera Basti* during the nourishing phase and reported marked improvement in stiffness and limb movement.^[3]

Other case publications have used *Tikta Ksheera Basti* with similar symptomatic objectives.^[13]

These observations justify further investigation but do not establish structural regeneration of necrotic bone.

26. SHASHTIKA SHALI PINDA SWEDA

Shashtika Shali Pinda Sweda combines warmth, massage and a nourishing external medium.

It is frequently used in chronic weakness and *Vata*-dominant conditions.

Within AVN care, its potential role is more likely to involve:

- muscle relaxation,
- reduction in stiffness,
- improved confidence in movement,

- general rehabilitation support.

Its effect on femoral-head viability remains unproven.

27. INTERNAL AYURVEDIC MEDICINES

Published AVN case reports use a wide range of formulations.

Examples include:

- *Guggulu Tikta Kashaya*,
- *Maharasnadi Kwatha*,
- *Yogaraja Guggulu*,
- *Punarnavadi Guggulu*,
- *Arogyavardhini Vati*,
- *Rasapachaka* formulations.

The therapeutic reasoning varies according to the author's interpretation of *Ama*, *Kapha*, *Vata*, *Meda* or *Dhatu Kshaya*.

Such heterogeneity makes direct comparison difficult.

Future trials should use clearly standardized formulations and report complete composition and dose.

28. CLINICAL EVIDENCE FROM AYURVEDA

The available clinical literature consists mainly of case reports.

The 2016 report by Shukla et al. described bilateral femoral-head AVN treated through staged *Rukshana*, *Shodhana* and *Brimhana*. The authors reported marked improvement in pain, tenderness, stiffness and gait without worsening of radiological grade during follow-up.^[3]

A 2020 case report from the All India Institute of Ayurveda similarly described bilateral AVN treated with *Udvaartana*, *Shodhana*, *Brimhana*, *Patra Pinda Swedana* and *Manjishadi Ksheera Basti*, reporting improvements in gait, pain and tenderness.^[12]

In 2026, Bhaidkar et al. reported bilateral AVN treated with Panchakarma and oral medication for three months. Pain, stiffness, range of motion, Harris Hip Score and quality-of-life measures improved.^[4]

These reports are clinically encouraging but remain low-level evidence.

29. THE MAIN LIMITATION: SYMPTOM IMPROVEMENT IS NOT BONE REVASCULARIZATION

This distinction is crucial.

A patient may report

- less pain,
- easier walking,
- improved range of motion,
- better quality of life.

These are meaningful outcomes.

However, they do not prove

- restoration of femoral-head blood supply,
- reversal of necrotic tissue,
- reduction in lesion size,
- prevention of collapse.

Such claims require serial MRI, radiographic follow-up and preferably objective quantitative imaging.

30. WHY PAIN MAY IMPROVE WITHOUT STRUCTURAL REVERSAL

Pain in ONFH does not arise solely from necrotic bone.

It may also involve

- bone marrow edema,
- synovial irritation,
- muscle spasm,
- altered gait,
- mechanical stress.

Therefore, therapies that improve muscle relaxation or reduce pain can improve function without altering the underlying necrotic lesion.

This is one reason patient-reported improvement and structural outcomes should be measured separately.

31. MODERN AND AYURVEDIC TREATMENT SHOULD NOT BE COMPETITORS

An integrative model should not force patients to choose between Panchakarma and orthopedics.

A better approach is

MRI-based diagnosis and staging

- risk-factor control
- orthopedic assessment
- joint-preserving surgery where indicated

Ayurvedic supportive care for pain, stiffness and rehabilitation

This protects patients from delayed surgery while allowing complementary symptom management.

32. PATIENT SELECTION FOR INTEGRATIVE CARE

Patients most suitable for research may include:

ARCO I-II

Pre-collapse disease offers the greatest opportunity to study whether integrative care improves symptoms and influences progression.

Stable early IIIA

Selected patients may receive supportive care while remaining under close orthopedic supervision.

Advanced III or IV

Ayurvedic care may help with symptoms, sleep and general function but should not be presented as a substitute for arthroplasty when structural destruction is severe.

33. RED FLAGS REQUIRING ORTHOPEDIC REVIEW

Urgent or early orthopedic reassessment is appropriate when there is

- rapidly increasing pain,
- sudden functional deterioration,
- new inability to bear weight,
- radiographic progression,
- subchondral fracture,
- femoral-head flattening,
- advanced secondary osteoarthritis.

Panchakarma should not delay stage-appropriate orthopedic management.

34. ROLE OF PHYSIOTHERAPY

Rehabilitation is important in both conservative and postoperative ONFH management.

Goals include

- preserving hip movement,
- strengthening surrounding muscles,
- improving gait,
- maintaining function without excessive joint loading.

An integrative programme could combine carefully selected Panchakarma interventions with structured physiotherapy.

This combination may be more rational than using passive therapies alone.

35. LOAD MODIFICATION

Mechanical loading influences collapse risk.

Patients with painful pre-collapse disease may benefit from temporary reduction of excessive loading according to orthopedic advice.

However, prolonged complete inactivity can cause:

- muscle wasting,
- stiffness,
- reduced cardiovascular fitness.

Therefore, activity should be individualized rather than simply prescribing long-term bed rest.

36. PROPOSED INTEGRATIVE MANAGEMENT MODEL

Stage 1: Confirm Diagnosis

MRI

+

X-ray

+

ARCO staging

+

lesion size/location

+

etiology assessment.

Stage 2: Orthopedic Decision

Observation

or

hip-preserving procedure

or

arthroplasty depending on stage.

Stage 3: Ayurveda Assessment

Evaluate:

- *Vata* predominance,
- *Ama*,
- *Agni*,
- *Dhatu Kshaya*,
- *Asthi-Majja* involvement,
- functional status.

Stage 4: Supportive Panchakarma

Selected:

- *Snehana*,
- *Swedana*,
- *Basti*,
- *Ksheera Basti*,
- *Shashtika Shali Pinda Sweda*.

Stage 5: Rehabilitation

Exercise

+

gait training

+

weight management

+

risk-factor modification.

Stage 6: Objective Follow-Up

Pain

+

Harris Hip Score

+

quality of life

+

serial imaging.

37. OUTCOME MEASURES FOR FUTURE STUDIES

High-quality studies should use standardized outcomes.

Clinical outcomes

- Visual Analogue Scale,
- Harris Hip Score,
- WOMAC,
- range of motion,
- walking distance,
- analgesic requirement.

Quality of life

- SF-36,
- EQ-5D,
- disease-related functional measures.

Imaging

- ARCO stage,
- lesion volume,
- subchondral fracture,
- femoral-head depression,
- marrow edema,
- progression to collapse.

Hard outcomes

- need for core decompression,
- conversion to total hip arthroplasty.

These are more meaningful than symptom improvement alone.

38. PROPOSED RANDOMIZED CLINICAL TRIAL

A multicentre trial could recruit patients with ARCO I-II nontraumatic ONFH.

Group A

Standard orthopedic conservative management.

Group B

Standard orthopedic care + standardized Panchakarma programme.

The Panchakarma protocol should be fixed in advance rather than individualized beyond predefined limits.

Possible primary outcomes

- Harris Hip Score at six months,
- progression on MRI at 12 months.

Secondary outcomes

- pain,
- range of motion,
- quality of life,
- conversion to surgery,
- adverse events.

This design would test whether Panchakarma adds benefit without withholding standard care.

39. MRI-BASED RESEARCH IS ESSENTIAL

Future Ayurveda trials should not rely only on pre- and post-treatment pain scores.

Serial MRI can determine:

- whether lesion size changes,
- whether edema changes,
- whether collapse develops,
- whether structural progression is delayed.

This is necessary before making statements about disease modification.

40. BIOMARKER RESEARCH

Experimental studies could additionally assess:

- bone turnover markers,
- inflammatory markers,
- lipid profiles,
- coagulation parameters,
- oxidative stress.

However, biomarker changes should remain secondary outcomes.

The most clinically important endpoint is preservation of the femoral head.

41. POTENTIAL MECHANISTIC RESEARCH ON AYURVEDIC INTERVENTIONS

Modern translational research could evaluate whether selected interventions influence:

- osteoblast differentiation,
- osteoclast activity,
- angiogenesis,
- endothelial function,
- inflammation,
- bone remodeling.

These studies should begin with standardized extracts or formulations.

The goal should be to identify actual biological effects rather than assigning mechanisms retrospectively.

42. RESEARCH GAPS

The current Ayurvedic evidence has several major limitations.

1. Most studies are individual case reports.
2. Sample sizes are extremely small.
3. Interventions are heterogeneous.
4. Multiple therapies are administered simultaneously.
5. Control groups are generally absent.
6. MRI outcomes are inconsistently reported.
7. Long-term collapse rates are rarely studied.
8. Conversion to surgery is rarely reported.
9. Lesion size and location are often not documented.
10. Adverse-event reporting is limited.

These weaknesses mean that current evidence supports feasibility and symptom improvement, not definitive disease modification.

43. CRITICAL APPRAISAL OF CURRENT EVIDENCE

The modern evidence base for ONFH is far stronger than the Ayurvedic one.

The revised ARCO classification provides standardized staging,² while the international 2026 guideline offers evidence-based recommendations for diagnosis and treatment.^[1] Recent systematic reviews also support MRI as the best early diagnostic modality and continue to evaluate core decompression and cell-based therapies.^[8,9]

By contrast, Ayurvedic literature mainly reports symptomatic outcomes from single patients. This imbalance must be acknowledged openly.

Doing so does not weaken the role of Ayurveda.

It identifies where Ayurveda can make the strongest contribution at present:

- pain management,
- stiffness,
- functional rehabilitation,
- quality of life,
- supportive care.

The more ambitious claim that Panchakarma can regenerate necrotic femoral-head bone requires much stronger evidence.

44. DISCUSSION

Osteonecrosis of the femoral head is a progressive structural bone disorder with a potentially narrow window for joint preservation.

This makes early diagnosis essential.

MRI can detect pre-radiographic disease with high diagnostic accuracy.^[7] ARCO staging then provides a clinically useful framework for assessing structural progression.^[2] The size and lateral extent of the necrotic lesion further influence collapse risk.^[6]

Modern treatment therefore focuses strongly on stage.

Core decompression remains an important joint-preserving option in early disease, and biological augmentation may improve certain outcomes.^[9,10] Recent evidence suggests that

cell-based augmentation can reduce the likelihood of treatment failure in selected populations, although heterogeneity remains substantial.^[11]

Ayurvedic treatment must be interpreted within this context.

Published case reports suggest that Panchakarma programmes can reduce pain, stiffness and functional limitation.^[3,4] These are meaningful clinical benefits, particularly in young patients facing chronic disability.

The Ayurvedic framework of *Asthi-Majjagata Vata* is reasonable as a functional interpretation because ONFH affects deep bone structures and produces pain and impaired movement. The additional concepts of *Dhatu Kshaya* and impaired tissue nourishment provide a rationale for *Brimhana* and *Ksheera Basti*.

However, these concepts cannot replace the vascular and biomechanical pathophysiology of osteonecrosis.

A major problem in current literature is the tendency to use symptomatic improvement as evidence that AVN itself has been reversed.

Pain improvement should be celebrated, but it should not be confused with biological restoration of necrotic bone.

Serial MRI is therefore indispensable for future research.

The most promising direction is integrative rather than alternative management. Ayurveda may provide symptom control and rehabilitation while orthopedic assessment protects the patient from delayed joint-preserving or reconstructive treatment.

Such collaboration is especially important in early disease, when femoral-head preservation remains possible.

45. FUTURE DIRECTIONS

Future research should progress through three stages.

Stage 1: Standardization

Develop one or two reproducible Panchakarma protocols.

Stage 2: Controlled clinical trials

Compare standard care with standard care plus Ayurveda.

Stage 3: Disease-modification research

Use serial MRI and long-term follow-up to determine whether structural progression is altered.

A research network involving

- Panchakarma physicians,
- orthopedic surgeons,
- radiologists,
- physiotherapists,
- biostatisticians

would provide much stronger evidence than isolated case publications.

CONCLUSION

Osteonecrosis of the femoral head is a progressive disease characterized by ischemic death of bone and marrow tissue, followed by loss of mechanical strength, subchondral fracture and eventual femoral-head collapse in susceptible patients.

Modern management depends heavily on early MRI diagnosis, ARCO staging, lesion characteristics and timely orthopedic intervention.^[1,2] Core decompression remains an important hip-preserving procedure in pre-collapse disease, while biological augmentation continues to show promise.^[9,10] Advanced collapse and secondary osteoarthritis frequently require total hip arthroplasty.

Ayurveda does not provide an exact classical equivalent of ONFH. Nevertheless, *Asthi-Majjagata Vata*, *Asthivaha Srotodushti*, *Vata Prakopa* and *Dhatu Kshaya* offer useful clinical frameworks for understanding pain, stiffness, weakness and deep tissue involvement.

Published Ayurvedic case reports using *Rukshana*, *Swedana*, *Basti*, *Ksheera Basti*, *Shashtika Shali Pinda Sweda* and internal medicines have reported improvements in pain, gait, range of motion and quality of life.^[3,4] These results justify further research but remain insufficient to establish structural reversal of osteonecrosis.

The most scientifically appropriate role of Ayurveda at present is as a carefully monitored adjunct to stage-appropriate orthopedic management.

Future research must distinguish between symptom relief and true disease modification. Standardized Panchakarma protocols should be evaluated using validated functional scores, MRI-based progression, lesion size, femoral-head collapse and conversion to surgery.

An evidence-based integrative model may ultimately help patients obtain the strengths of both systems: modern imaging and joint-preservation strategies to protect femoral-head structure, together with Ayurveda and Panchakarma to address pain, mobility, rehabilitation and quality of life.

REFERENCES

1. Cheng EY, Mirzaei A, Goodman SB, Cui Q, Mont MA, Jones LC, et al. Nontraumatic osteonecrosis of the femoral head: an international evidence-based clinical practice guideline. *J. Bone. Joint. Surg. Am.*, 2026; 108(12): 903-906. doi:10.2106/JBJS.25.01616.
2. Yoon BH, Mont MA, Koo KH, Chen CH, Cheng EY, Cui Q, et al. The 2019 revised version of Association Research Circulation Osseous staging system of osteonecrosis of the femoral head. *J Arthroplasty.*, 2020; 35(4): 933-940. doi:10.1016/j.arth.2019.11.029.
3. Shukla V, et al. Role of Ayurveda in the conservative management of avascular necrosis of the femoral head: a case study. *Anc. Sci. Life.*, 2016; 35(3): 173-177.
4. Bhaidkar KN, Sawarkar P, Wargantiwar V. Ayurvedic management of avascular necrosis through Panchakarma and oral medication: a case report. *J. Clin. Diagn. Res.*, 2026; 20(5): JD01-JD03. doi:10.7860/JCDR/2026/80442.23322.
5. Tripathy SK, Goyal T, Sen RK. Management of femoral head osteonecrosis: current concepts. *Indian J. Orthop.*, 2015; 49(1): 28-45.
6. Mont MA, Zywiell MG, Marker DR, McGrath MS, Delanois RE. The natural history of untreated asymptomatic osteonecrosis of the femoral head: a systematic literature review. *J Bone Joint Surg. Am.*, 2010; 92(12): 2165-2170. doi:10.2106/JBJS.I.00575.
7. Zhang YZ, Cao XY, Li XC, Chen J, Zhao YY, Tian Z, et al. Accuracy of MRI diagnosis of early osteonecrosis of the femoral head: a meta-analysis and systematic review. *J. Orthop. Surg. Res.*, 2018; 13: 167.
8. Cheng EY, et al. Diagnosis and treatment of nontraumatic osteonecrosis of the femoral head: a systematic review and meta-analyses for the ARCO clinical practice guideline development workgroup. 2026.

9. Konarski W. Effectiveness of different types of core decompression in early-stage osteonecrosis of the femoral head: a systematic review and meta-analysis. *Med. Sci., (Basel)*. 2025; 13(4): 258. doi:10.3390/medsci13040258.
10. Li X, Xu X, Wu W. Stem cell therapy combined with core decompression versus core decompression alone in the treatment of avascular necrosis of the femoral head: a systematic review and meta-analysis. 2023.
11. Wei Y, Yuan S, Feng X, Qi Y, Shi J, Xu W. Efficacy of autologous stem cell at different doses combined with core decompression in the treatment of osteonecrosis of the femoral head: a systematic review and network meta-analysis. 2026.
12. Kabra D, Jena S, Bhatted SK, Dharmarajan P. Avascular necrosis of femoral head—Ayurveda management: a case study. *Int. J. Health Sci. Res.*, 2020; 10(11): 22-27.
13. Pawar A, Suryawanshi P. Management of avascular necrosis through Ayurveda—a case study. *J Ayurveda Holist. Med.*, 2023; 11(2). doi:10.70066/jahm.v11i2.652.
14. Behra MK, Jose FP. Ayurvedic approach in the management of avascular necrosis of the femoral head: a case report. *J. Ayurveda Integr. Med. Sci.*, 2026; 11(3). doi:10.21760/jaims.11.3.74.
15. Zhao D, Zhang F, Wang B, Liu B, Li L, Kim SY, et al. Guidelines for clinical diagnosis and treatment of osteonecrosis of the femoral head in adults (2019 version). *J. Orthop. Translat.*, 2020; 21: 100-110.
16. Mont MA, Cherian JJ, Sierra RJ, Jones LC, Lieberman JR. Nontraumatic osteonecrosis of the femoral head: where do we stand today? A ten-year update. *J Bone Joint Surg. Am.*, 2015; 97(19): 1604-1627.
17. Moya-Angeler J, Gianakos AL, Villa JC, Ni A, Lane JM. Current concepts on osteonecrosis of the femoral head. *World J. Orthop.*, 2015; 6(8): 590-601.
18. Koo KH, Kim R, Kim YS, Ahn IO, Cho SH, Song HR, et al. Risk period for developing osteonecrosis of the femoral head in patients on steroid treatment. *Clin. Rheumatol.*, 2002; 21(4): 299-303.
19. Weinstein RS. Glucocorticoid-induced osteonecrosis. *Endocrine.*, 2012; 41(2): 183-190.
20. Glueck CJ, Freiberg RA, Wang P. Role of thrombosis in osteonecrosis. *Curr. Hematol. Rep.*, 2003; 2(5): 417-422.
21. Hernigou P, Beaujean F. Treatment of osteonecrosis with autologous bone marrow grafting. *Clin. Orthop. Relat. Res.*, 2002; (405): 14-23.
22. Hauzeur JP, Gangji V. Phases 1-3 clinical trials using adult stem cells in osteonecrosis and nonunion fractures. *Stem Cells Int*. 2010; 2010: 410170.

23. Sen RK. Management of avascular necrosis of femoral head at pre-collapse stage. *Indian J. Orthop.*, 2009; 43(1): 6-16.
24. Sharp T, Davies N, Greiner JJ. Osteonecrosis of the femoral head: evolution of contemporary management strategies. *Curr. Rev. Musculoskelet. Med.*, 2026. doi:10.1007/s12178-026-10048-5.
25. Agnivesha. *Charaka Samhita*, revised by Charaka and Dridhabala, with *Ayurveda Dipika* commentary of Chakrapanidatta. Acharya YT, editor. Varanasi: Chaukhambha Surbharati Prakashan; relevant sections concerning *Vata Vyadhi*, *Asthi-Majja* and *Basti*.
26. Sushruta. *Sushruta Samhita*, with *Nibandhasangraha* commentary of Dalhana. Acharya YT, Acharya NR, editors. Varanasi: Chaukhambha Sanskrit Sansthan; relevant sections concerning *Asthi*, *Majja*, *Vata Vyadhi* and *Basti*.
27. Vagbhata. *Ashtanga Hridaya*, with *Sarvangasundara* commentary of Arunadatta and *Ayurveda Rasayana* commentary of Hemadri. Paradakara HS, editor. Varanasi: Chaukhambha Surbharati Prakashan; relevant sections concerning *Vata Vyadhi*, *Basti* and *Brimhana*.