Ayurvedic Management of Gambhira Vatarakta (Avascular Necrosis of Femoral Head) through Panchakarma: A Case Report.

Abstract

Background: Avascular Necrosis (AVN) of the femoral head arises from disruption of the subchondral blood supply, resulting in osteocyte death and, if unchecked, progressive mechanical collapse of the joint. The femoral head's reliance on terminal retinacular vessels with limited collateral flow makes it especially susceptible. Conventional treatments — ranging from NSAIDs and core decompression to total hip arthroplasty (THA) — are costly, carry procedural risks, and offer variable long-term success, especially in younger patients. In classical Ayurvedic nosology, AVN aligns closely with Gambhira Vatarakta, a condition rooted in simultaneous vitiation of Vata Dosha and Rakta Dhatu, culminating in degeneration of Asthi (bone) and Sandhi (joint) tissues.

Case Summary: A 21-year-old female classical dancer and competitive athlete presented with a three-month history of bilateral groin pain (VankshanShool), lumbo-sacral discomfort (Katishoola), difficulty in walking (ChankramanKashata), and bilateral lower-limb pain from hip to foot (Ubhay Pada Shool), predominantly on the left side. MRI of both hip joints confirmed Avascular Necrosis. The patient's history included COVID-19 infection (2021) treated with corticosteroids, a fall injury in November 2022, and years of high-intensity physical training — together forming the triad of Abhighata, Raktadushti, and Vataprakopa.

Intervention: A sequentially structured four-stage treatment protocol was employed:

(1) Langhan/Pachan/Rukshan for Ama Pachana; (2) Raktaprasadana and Dhatooposhan after adequate Agnidipti; (3) Panchakarma procedures comprising Abhyanga, Patrapottali Sweda, and Tiktakshira Basti administered in two consecutive cycles; and (4) Rasayana Chikitsa for sustained tissue regeneration and relapse prevention.

Outcome: The patient showed notable improvement: VAS pain score declined from 7/10 to 3/10, bilateral hip range of motion improved measurably, gait was restored, and she was able to resume daily activities without any surgical intervention.

Conclusion: This case offers clinical support for the use of a systematic, staged Panchakarma protocol — especially Tiktakshira Basti — in arresting AVN progression, managing pain, and restoring joint function in young patients. Randomized controlled trials with standardized protocols and serial MRI assessment are needed to build on this evidence.

Keywords: Avascular Necrosis, Gambhira Vatarakta, Panchakarma, Tiktakshira Basti, Patrapottali Sweda, Katishoola, VankshanShool, Post-COVID AVN, Asthi Dhatu Kshaya.

1. Introduction

Avascular Necrosis (AVN), also known as osteonecrosis or ischemic bone necrosis, refers to the death of bone cells resulting from a compromised vascular supply to the subchondral region. The femoral head is the anatomical site most frequently involved, largely because of the end-arterial nature of its retinacular blood supply and limited collateral circulation [1]. The natural course of the disease tends to be progressive — beginning with subclinical ischaemia, advancing to subchondral fracture, and eventually leading to structural collapse of the femoral head with associated severe pain and joint destruction [2].

From an epidemiological standpoint, AVN is no longer limited to the elderly. A prevalence rate of approximately 8% has been recorded across an age range of 18 to 54 years [3]. In the wake of the COVID-19 pandemic, a striking rise in AVN incidence among young adults has been well-documented, largely attributed to high-dose corticosteroid therapy used during COVID-19 treatment, along with the virus's own capacity to trigger a hypercoagulable state, endothelial damage, and microvascular thrombosis [4,5,6]. A systematic review by Hassan et al. (Rheumatology International, 2023) found corticosteroid use in 13 out of 14 studies reviewed, with a mean prednisolone-equivalent dose of approximately 1238.5 mg and an average interval of 142 days between COVID-19 diagnosis and AVN detection [7]. This epidemiological shift — with previously healthy young individuals developing a condition historically associated with old age — highlights a major unmet need in modern orthopaedics.

Current treatment strategies, including NSAIDs, core decompression, vascularized bone grafting, and THA, are limited by significant cost, variable efficacy, and procedural morbidity — particularly challenging in bilateral cases among young patients who may need repeated procedures [8].

In Ayurvedic medicine, AVN maps closely onto Gambhira Vatarakta — a deep-tissue variant of Vatarakta characterized by concurrent vitiation of Vata and Rakta Dhatu. Acharya Charaka describes this as a mutually obstructing cycle: Vata blocked by vitiated Rakta becomes further aggravated, which in turn worsens Rakta vitiation, driving pathology progressively deeper into tissues (Charaka Chikitsa Sthana 29/10-11). When this cascade involves Asthi and Sandhi Dhatus, the result is Gambhira Vatarakta — manifesting as deep bone pain, joint stiffness, reduced mobility, and eventual osseous structural damage (Ca.Ci.29/19). This clinical picture closely mirrors the stages of femoral head AVN.

The present case report documents the Ayurvedic management of bilateral femoral head AVN in a 21-year-old female patient using a staged Panchakarma protocol guided by classical Gambhira Vatarakta Chikitsa principles. This report aims to contribute to the growing evidence base supporting Panchakarma as a viable conservative intervention in early-to-moderate AVN.

2. Case Presentation

2.1 Patient Profile

A 21-year-old female (OPD No. 216) presented to the Panchakarma OPD of PDEA's AyurvedRugnalaya and Snowbell Multi Speciality Hospital, Pune, with the following chief complaints:

1. VankshanShool — bilateral groin pain
2. Katishoola — lumbo-sacral pain
3. Ubhay Pada Shool — bilateral hip-to-foot pain (left > right) — duration 3 months
4. ChankramanKashata — pain and difficulty during ambulation
5. Difficulty in stair climbing

6. GI complaints: Udara Gaurava, Adhmana, Asamyak Malapravartan
7. Anubandha Lakshana: Dakshina Janusandhi Shool (right knee joint pain)

2.2 History of Present Illness

The patient was an active Bharatnatyam dancer and competitive athlete undergoing daily intensive training, including long-distance running and classical dance practice involving sustained extreme hip postures. She had been hospitalized for COVID-19 in 2021 and received allopathic treatment including corticosteroids. She subsequently contracted Dengue fever in August 2021. In November 2022, she sustained a fall injury, after which hip pain progressively worsened. MRI of bilateral hip joints was performed at an allopathic facility, and AVN was confirmed in December 2022. After one month of oral medications and physiotherapy without adequate improvement, she sought Ayurvedic care at ARSMH.

2.3 Aetiological Analysis (Nidana Panchaka)

Three distinct but interacting causative factors were identified, each corresponding to established mechanisms of Vata-Rakta Dushti:

a) Post-COVID Corticosteroid Therapy: Corticosteroids administered during COVID-19 treatment are now recognized as a primary risk factor for femoral head AVN in young adults. Their role involves lipid metabolism disruption, adipocyte hypertrophy, fat embolism, and direct endothelial toxicity — all of which impair bone microcirculation [6]. Simultaneously, COVID-19 itself promotes systemic hypercoagulability and microvascular thrombosis, compounding the risk [5]. In Ayurvedic terms, this mechanism corresponds to Medodushti-mediated Rakta SrotasAvarodha — obstruction of blood-carrying channels — a central feature of Vatarakta pathogenesis.

b) Trauma (Abhighata): The November 2022 fall is classified as Abhighata in Ayurveda — a well-established cause of both Vata vitiation and Rakta Dushti. Trauma disrupts local hemodynamics and can precipitate fat embolism, both of which are recognized contributors to femoral head ischaemia. Moya-Angeler et al. describe intraosseous extravascular compression following injury as an established AVN-inducing mechanism [9].

c) Sustained High-Intensity Physical Training: The patient's intense daily classical dance practice and athletic training subjected the hip joints to repeated extreme loading and postural stress — constituting Atiyoga (excessive utilization) in Ayurvedic terms. Chronic mechanical overload promotes microvascular insult and bone fatigue, accelerating Vataprakopa and hastening Dhatu Kshaya.

3. Clinical Examination

3.1 General Examination

- **Gait:** Normal at presentation
- **Deformity:** Slight limp noted in left hip
- **Tenderness:** Absent
- **Stiffness:** Present bilaterally in hip joints
- **Warmth:** Absent
- **Crepitus:** Present in left hip
- **Skin Changes:** No specific findings

3.2 Range of Motion (ROM) — Before Treatment

Pre-treatment hip ROM was measured and documented as shown in Table 1 below:

Table 1: Pre-Treatment Range of Motion (Bilateral Hip Joints)

Movement	Left Hip	Right Hip
Flexion	110°	120°
Adduction	20°	10°
Abduction	20°	40°
Internal Rotation	30°	20°
External Rotation	20°	20°

3.3 Pain Assessment

VAS Scale (Pre-treatment): 7 / 10

3.4 Systemic Examination

- **Musculoskeletal:** As documented above
- **Central Nervous System:** No abnormality detected
- **Cardiovascular System:** S1, S2 audible; no murmurs
- **Respiratory System:** Normal vesicular breath sounds bilaterally

4. Dashavidha Pariksha

The complete tenfold constitutional assessment was performed and the findings are summarized in Table 2:

Table 2: Dashavidha Pariksha Findings

Pariksha Parameter	Observed Finding
Prakriti (Constitution)	Vata-Pitta
Vikriti (Current Imbalance)	Vata-Rakta
Sara (Tissue Excellence)	Madhyam
Samhanana (Physique)	Madhyam
Pramana (Anthropometry)	Madhyam
Satmya (Adaptability)	Madhyam
Satva (Mental Strength)	Madhyam
Aharashakti (Digestive Capacity)	Madhyam
Vyayamashakti (Exercise Tolerance)	Avara (Reduced)
Vaya (Age Group)	Yuva (Young Adult)

5. Samprapti (Pathogenesis)

5.1 Samprapti Ghatak (Pathogenic Components)

The detailed breakdown of each pathogenic element contributing to the disease process is presented in Table 3:

Table 3: Samprapti Ghatak (Pathogenic Components)

Ghatak (Component)	Details
Dosha	Vata (Vyana + Apana) + Pitta (Pachaka) + Rakta Dushti
Dushya	Asthi Dhatu, Sandhi, Majja (secondary), Rakta
Srotas	Asthivaha, Raktavaha, MajjavahaSrotas
Srotodusti	Sanga (obstruction) + Vimargagamana
Agni	JatharagniMandya + DhatvagniMandya (Asthidhatvagni)
Ama	Sama Vata-Rakta (early stage)
Udbhava Sthana	Pakwashaya (Vata) + Hridaya/RaktavahaSrotas (Rakta)
Sanchara Sthana	Madhyama Rogamarga (Asthi, Sandhi, Majja)
Adhisthana	Sandhis (bilateral hip joints)
VyaktiSthana	Vankshana, Kati, Ubhaya Pada
Roga Marga	Madhyama

5.2 SampraptiKramasaha (Sequential Pathological Progression)

Nidana Sevana (Corticosteroids + Abhighata + Atiyoga) → Vataprakopa and Raktadushti → Anyonyavarana (mutual obstruction) → Srotodushti in Raktavaha and AsthivahaSrotamsi → DhatvagniMandya at the Asthi Dhatu level → impaired Asthi formation and nourishment → Asthi Dhatu Kshaya → structural collapse of the femoral head → clinical manifestation as Gambhira Vatarakta.

6. Differential Diagnosis

The following Ayurvedic conditions were systematically considered and excluded before arriving at the final diagnosis, as outlined in Table 4:

Table 4: Differential Diagnosis with Basis for Exclusion

Condition Considered	Reason for Exclusion
Gudhrasi (Sciatica)	No Chimchimayan (paresthesia/tingling); gait preserved; radicular pain pattern absent
Sandhigata Vata (Osteoarthritis)	Younger age group; Vata-purna-driti-sparshaha sign absent.
Asthimajjagata Vata	Absence of Asthi-ParvanamBheda; Santata Ruk not present; Rakta vitiation confirms Vatarakta over pure Vatavyadhi

Final Diagnosis: **Gambhira Vatarakta (Bilateral Avascular Necrosis of the Femoral Head)**

7. Investigations

7.1 Haematological and Biochemical Profile

All routine blood investigations and biochemical parameters were within normal reference ranges.

7.2 Imaging

MRI Hip Joints: Revealed bone contusion in the medial and lateral femoral condyles and osteochondritis of the lateral femoral condyle. Findings were consistent with bilateral Avascular Necrosis of the femoral head.

MRI Right Knee: Demonstrated moderate joint effusion extending into the medial and supralateral recess, along with a complex tear of the posterior body, posterior horn, and posterior root attachment of the lateral meniscus.

These multi-site findings are consistent with the Ayurvedic concept of Madhyama Rogamarga involvement, with ongoing Asthi Dhatu Kshaya across multiple skeletal sites.

8. Treatment Protocol

Treatment was designed in accordance with the classical Ayurvedic authority:

"अस्थ्याश्रयाणां व्याधीनांपञ्चकर्माणिभेषजम् |
बस्त्यःक्षीरसर्पींषितिक्तकोपहितानिच ||"

— Charaka Sutrasthana 28/27

“निर्हरेद्वामलंतस्यसघृतैःक्षीरबस्तिभिः|

नहिबस्तिसमंकिञ्चिद्वातरक्तचिकित्सितम्॥८८॥

बस्तिवङ्क्षणपार्श्वोरुपर्वास्थिजठरार्तिषु|

उदावर्तेचशस्यन्तेनिरूहाःसानुवासनाः||८९||

दद्यात्तैलानिचेमानिबस्तिकर्मणिबुद्धिमान्|”

नस्याभ्यञ्जनसेकेषुदाहशूलोपशान्तये||९०||

— Charaka Chikitsa Sthana 29/88

8.1 Four-Stage Treatment Protocol

Stage 1 — Langhan / Pachan / Rukshan (Ama Pachana Phase)

Before any nourishing or oleating therapy could be commenced, it was essential to address the underlying Agni Mandya and accumulated Ama. Deepana-PachanaDravyas

HingvasthakChurna Apane 500mg with goghrut for 5 daysthen Raktapachak Vati 500 mg + Dhanwantar Kashay 20ml & Cap Gandhatail od for 15 days

was administered to restore Jatharagni and Dhatvagni&vatanuloman. Rukshana procedures helped counteract the Snigdha quality of Sama Dosha. This preparatory phase is indispensable — initiating Brimhana therapies in the presence of Ama would only deepen Srotavarodha.

Stage 2 — Raktaprasadana and Dhatooposhan (Post-Agnidipti Phase)

Once adequate Agni function was re-established, blood-purifying and tissue-nourishing formulations were introduced for 15 days

Kaishor Guggul 2 bd

MahamanjishthadiKadha 15 ml bd

This stage directly targeted the Rakta Dushti component of Vatarakta by deploying RaktaprasadanaDravyas and initiating supplementation for Dhatu-level restoration.

Stage 3 — Panchakarma Chikitsa (Core Therapeutic Phase)

(a) Abhyanga (Medicated Oil Massage): Performed usingMurivenna+ Balaguduchyadi Tail. Abhyanga enhances local circulation, reduces Vata-driven stiffness and pain, and facilitates transdermal delivery of active medicinal constituents to deeper tissues.

(b) Patrapottali Sweda (Leaf Bolus Sudation): A form of Sankara Sweda involving heated boluses of medicinal leaves (Erand, Nirgundi, Shigru) processed with Murivennaoil, applied directly to the affected joints. The procedure provides targeted joint-level Pachana, reduces Avarana, promotes local vasodilation, and carries medicinal constituents into the Sandhi and Asthi Dhatu. It is particularly suited to conditions involving combined Vata-Rakta vitiation with Dhatu Kshaya at the joint level [10].

(c) Tiktakshira Basti (Medicated Milk Enema) — 2 Cycles: This formed the centerpiece of the treatment plan, administered in two complete cycles. Tiktakshira Basti (PanchatiktaKsheera Basti) is the foremost Basti preparation for AsthiPradoshajaVikaras, combining:

- **Tikta Rasa Dravyas:** Neem (Azadirachta indica), Patola, Guduchi, Vasa, Kantakari — each possessing Deepana, Pachana, Srotoshodhana, and Raktaprasadana actions
- **Ksheera (Milk):** Snigdha, Madhura, and directly Asthi-Vardhaka (bone-nourishing) per classical Ayurvedic pharmacology
- **Ghrita (Clarified Butter):** Serves as a lipophilic medium for fat-soluble constituents, facilitates tissue penetration, and exerts Vata-Pitta Shamana effects

Along with this Sariva, Shatavari was added.

First and last Matra basti was given with Til Tail 60 ml.

Tiktakshira Basti simultaneously achieves Shodhana (detoxification) and Brimhana (nourishment) without requiring alternation — making it especially suitable for chronic Asthi Dhatu disorders where both purification and rebuilding are concurrently needed [11]. Modern pharmacological studies support systemic absorption of active phytoconstituents via the haemorrhoidal venous plexus following rectal administration [12,13].

Stage 4 — Rasayana Chikitsa / Apunarbhav (Long-Term Regenerative Phase)

Following clinical stabilization, Rasayana formulations were introduced to support long-term tissue regeneration, immune modulation, and relapse prevention (Apunarbhav).

Bruhat Vat Chintamani 60mg 1 rasayankale for 15 days.

Singh SK et al. (2023) reported MRI-confirmed AVN grade regression over a 23-month follow-up period using Rasayana therapy alongside PanchatiktaKsheera Basti, supporting the role of this phase in structural bone recovery [14].

9. Observations and Results

The patient was monitored over an extended follow-up period and demonstrated progressive, sustained clinical improvement.

9.1 Range of Motion — Pre vs Post Treatment Comparison

Hip ROM was reassessed following the completion of treatment. Table 5 presents a comparative summary of pre- and post-treatment findings:

Table 5: Comparison of Hip Range of Motion — Pre vs Post Treatment

Movement	Left Hip (Pre)	Left Hip (Post)	Right Hip (Pre)	Right Hip (Post)
Flexion	110°	120°	120°	125°
Adduction	20°	10°	10°	0°
Abduction	20°	30°	40°	40°
Internal Rotation	30°	30°	20°	10°
External Rotation	20°	20°	20°	10°

9.2 Pain Assessment

Pre-treatment VAS Score: 7/10 **Post-treatment VAS Score:** 3/10

9.3 Functional Outcomes

- Gait fully restored to normal
- All activities of daily living performed independently
- No surgical intervention was required at any point
- Overall quality of life markedly improved
- Patient was able to resume moderate physical activity under appropriate guidance

10. Discussion

10.1 Aetiological Correlation — Modern and Ayurvedic Perspectives

Post-COVID Corticosteroid Use: The COVID-19 pandemic has led to an unprecedented rise in early-onset AVN in young adults. Corticosteroids administered during COVID-19 illness impair bone microcirculation via adipocyte hypertrophy, fat embolism, and endothelial toxicity, while the viral infection itself amplifies endothelial dysfunction and microvascular thrombosis [5,6]. Sakellariou et al. (2024) confirmed the synergistic role of steroid therapy and COVID-19-associated vascular injury in AVN development [4]. In Ayurvedic pathophysiology, this aligns with Medodhatu-vitiation-mediated Rakta SrotasAvarodha and Raktadushti — the primary mechanism underlying Vatarakta.

Trauma (Abhighata): Direct hip trauma ruptures the retinacular vessels to the femoral head, causing immediate ischaemia. In Ayurvedic pathology, Abhighata is a potent driver of both Vata vitiation and Rakta Dushti. The concurrent presence of corticosteroid-mediated and trauma-mediated vascular insult created compounding conditions for AVN in this patient.

Sustained Physical Overload: The repetitive extreme hip joint loading involved in classical dance and competitive athletics constitutes Atiyoga — excessive use leading to Dhatu Kshaya. Sports medicine literature

confirms that high-impact activities predispose to subchondral microfracture and vascular compromise in the femoral head.

10.2 Rationale for the Treatment Protocol

Langhan-Pachan as a Prerequisite: The early-stage Sama Dosha features in this patient (digestive irregularity, bloating, heaviness) indicated active Ama formation. Classical Ayurvedic doctrine holds that nourishing therapies should never be initiated in the presence of Ama, as this would solidify the Ama and worsen Srotavarodha. Deepana-Pachana was therefore essential before any oleating or Brimhana intervention.

Patrapottali Sweda for Local Srotoshodhana: Beyond systemic Ama Pachana, vitiated Doshas entrenched within the Sandhi and Asthi Dhatu needed targeted local clearance. Patrapottali Sweda provides precisely this — the thermal stimulus induces vasodilation at the joint level, mobilizes lodged Doshas, and the lipid carrier medium drives medicinal constituents transdermally into the Sandhi and Asthi Dhatu. A clinical study by Cherian and Krishna (2024) confirmed significant VAS and Oxford Hip Score improvement following Panchakarma procedures incorporating Sweda in AVN patients [16].

Tiktakshira Basti — Mechanisms of Action: Multiple converging mechanisms account for the clinical efficacy of Tiktakshira Basti in Gambhira Vatarakta:

8. Vata Shamana: Snigdha and Madhura qualities of Ksheera and Ghrita counteract the Ruksha quality of aggravated Vata; Tikta Rasa performs Srotoshodhana to relieve Anyonyavarana
9. Rakta Prasadana: Guduchi, Neem, and Vasa demonstrate well-documented anti-inflammatory, immunomodulatory, and haemostatic properties addressing Rakta Dushti
10. Asthi Dhatu Nourishment: Ksheera is Asthi-Vardhaka; Thankachan et al. (2025) confirmed statistically significant improvement in serum calcium and bone-related markers with PanchatiktaKsheera Basti [40]
11. Systemic Absorption via Rectal Route: The rectum's rich venous plexus allows systemic uptake of active phytoconstituents, enabling effects on distant bone tissues
12. Yapana Properties: Simultaneous Shodhana and Brimhana without alternation — ideal for Gambhira Vatarakta where both Ama elimination and tissue rebuilding are simultaneously required [11]

10.3 Comparison with Published Literature

The outcomes documented in the present case are consistent with emerging peer-reviewed evidence. Singh SK et al. (2023) reported MRI-confirmed AVN grade regression — from Grade III-B to Grade II in the left hip, and Grade IV-A to Grade III in the right hip — following 23 months of Ayurvedic management including PanchatiktaKsheera Basti and Rasayana, with complete resolution of pain and normalized ROM [14]. Chaturvedi et al. (PMC, 2016) similarly demonstrated substantial functional gains in bilateral hip AVN through a Panchakarma-based protocol [17]. The concurrent approach of Asthi Dhatu nourishment and Vata-Rakta pacification appears mechanistically coherent and clinically effective.

11. Conclusion

This case report provides clinically meaningful evidence supporting a systematically staged Panchakarma protocol for the management of Gambhira Vatarakta (Bilateral Avascular Necrosis of the Femoral Head) in a young, physically active patient with a complex multifactorial background — including post-COVID corticosteroid exposure, traumatic Abhighata, and sustained physical overload. The four-stage protocol — Ama Pachana, Raktaprasadana, Panchakarma, and Rasayana — embodies the classical Ayurvedic principle of simultaneously addressing the root pathology (Vata-Rakta Anyonyavarana) and its tissue-level consequence (Asthi Dhatu Kshaya).

Tiktakshira Basti emerged as the central, most impactful intervention — consistent with classical injunctions (Ch.Chi.29/88) and supported by a growing body of Ayurvedic research. The VAS score reduction from 7/10 to 3/10, measurable bilateral hip ROM improvement, restoration of gait, and return to daily activities — all without surgical intervention — highlight Panchakarma's potential as a cost-effective, conservative strategy in early-to-moderate AVN, particularly in the context of post-COVID epidemiology.

Large-scale randomized controlled trials incorporating serial MRI with AVN grading are urgently warranted to establish standardized protocols, optimal Basti formulations and cycle frequencies, and evidence-based patient selection criteria for Panchakarma.

References

1. Norman L. Browse. Bailey & Love's Short Practice of Surgery, 25th Edition. Chapter: Hip and Knee. 2008; pp. 515–516.
2. Kunyakham W, Foocharoen C, et al. Prevalence and risk factors for symptomatic avascular necrosis in Thai SLE patients. Asian Pac J Allergy Immunol. 2012;30(2):152–157.
3. Konarski W, Poboży T, et al. Avascular necrosis of femoral head — overview and current state of the art. Int J Environ Res Public Health. 2022;19(12):7348.
4. Sakellariou E, Argyropoulou E, et al. A Comprehensive Review of COVID-19- and Steroid-Associated Bone Avascular Necrosis. Diagnostics (Basel). 2024;14(3):247.
5. Assad SK, Sabah M, Kakamad FH, et al. Avascular necrosis of femoral head following COVID-19 infection. Ann Med Surg (Lond). 2023;85(9):4206–4210.
6. Agarwala S, Vijayvargiya M, Sawant P. COVID-19 outcomes of hip AVN — retrospective analysis of 212 hips. Cureus. 2024.
7. Hassan AAA, Khalifa AA. Femoral head avascular necrosis in COVID-19 survivors: systematic review. Rheumatol Int. 2023;43(9):1583–1595.
8. Al-Omari AA, Aleshawi AJ, et al. Avascular necrosis of femoral head after single steroid intra-articular injection. Eur J OrthopSurgTraumatol. 2020;30(2):193–197.
9. Moya-Angeler J, Gianakos AL, et al. Current concepts on osteonecrosis of the femoral head. World J Orthop. 2015;6(8):590–601.
10. Singh SK, Rajoria K, Sharma S. Ayurveda approach in management of AVN of bilateral hip joint — a case report. J Ayurveda Integr Med. 2023;14(5):100792.
11. Marsoniya SS, Gandhi RS. Critical Analysis of Basti action on AVN of Femoral Head — Case Series. Int J Ayurveda Case Rep. 2023.
12. Gurjar RS, Gokhale MV. Mode of action of PanchtiktaKsheera Basti in DhatukshayajanyaSandhigata Vata. World J Pharm Res. 2024.
13. Buzruk DP, Deshpande SV, et al. Evaluation of PanchatiktaKsheer Basti in Asthikshayaw.s.r. Osteopenia/Osteoporosis. Citefactor.org. 2020.
14. Singh SK, Rajoria K, Sharma S. (Rasayana outcome data — full reference same as Reference 10.)
15. Chaturvedi A, Kumar MA. Role of Ayurveda in conservative management of femoral head AVN. J Ayurveda Integr Med. 2016;PMC4850778.
16. Cherian V, Krishna A. Ayurveda in management of Avascular Necrosis of Femoral Head. Int J Ayurveda Pharma Res. 2024.
17. Gauttam J, Jamir A, Verma P, et al. Management of Asthi-Majjagata Vata w.s.r. AVN of Femoral Head Stage 3 by Panchakarma. Int J Ayurveda Pharma Res. 2019.
18. Thomas A, Giri RV. Ayurvedic management of Avascular Necrosis of Femoral Head. J Ayurveda Integr Med Sci. 2022;7(5):150–152.
19. Pavithra BJ, Guruprasad KP, Borannavar S. Therapeutic Effect of Panchakarma in Bilateral AVN of Femoral Head. AYUSHDHARA. 2024.
20. Thankachan JV, Patil A, Kutte Y, et al. Effect of PanchatiktaKsheera Basti and Praval Panchamrut Vati in Asthikshaya. Int J Ayurvedic Med. 2025;16(1):164–170.
21. Charaka Samhita. Chikitsasthana, Chapter 29, Verses 10-11, 19, 88-90. Chaukhambha Orientalia, Varanasi. Reprint 2014.
22. Charaka Samhita. Sutrasthana, Chapter 28, Verse 27. Chaukhambha Orientalia, Varanasi.
23. Snowden GT, Clement ND, Zhang S, et al. Orthopaedic long COVID — pandemic of AVN following COVID-19? Bone Joint Res. 2022;11(1):10–11.
24. Shetty GM. Double trouble — COVID-19 and corticosteroids: are we staring at an osteonecrosis epidemic? Indian J Orthop. 2022;56(2):226–236.
25. Kingma TJ, Hoch V, Johnson C, Chaudhry B. Avascular necrosis of the hip: a post COVID-19 sequela. Cureus. 2022;14(10):e29976.