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Narrative Review with Case Illustration

Ayurvedic Bhasma in the Management of Pakṣāghāta (Hemiplegia): Clinical and Pharmacological Perspectives

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Abstract

Introduction: Pakṣāghāta, described in Ayurveda as a Vāta-pradhāna Nanātmaja Vyādhi characterised by Ekadeśa-Stambha, Karmahāni, Gati-Saṅga, and Vakrikaraṇa, clinically correlates with hemiplegia, defined in contemporary medicine as paralysis of one side of the body due to an upper motor neuron lesion. Bhasma-based Rasauṣadhis are traditionally advocated in Vātavyādhi for their Sūkṣma, Tīkṣṇa, Yogavāhī, Rasāyana, and Vāta-śāmaka properties; however, scientific evidence supporting their neurotherapeutic role remains limited.

Methods: A narrative review was undertaken using classical Ayurvedic texts, published analytical studies, experimental pharmacological research, and available clinical observations. Particular emphasis was placed on Swarna, Rajata, Abhraka, Loha, Hartala, and Mānaśilā Bhasmas. Additionally, one case of Abhighātajanya Pakṣāghāta managed with Pañcakarma and selected Rasauṣadhis was analysed to demonstrate clinical application.

Results: Classical texts describe these Bhasmas as Medhya, Balya, Rasāyana, and Vāta-hara. Analytical studies indicate nano/submicron particle size, formation of organometallic complexes, and incorporation of phytoconstituents from the Śodhana–Māraṇa processes. Preclinical data suggest antioxidant, adaptogenic, and neuroprotective potential in specific preparations, although findings are heterogeneous and preparation-dependent. The clinical case demonstrated improvement in motor power, mobility, and sensory function under integrative management.

Discussion: While Ayurvedic literature provides a theoretical basis for using Bhasmas in Vātavyādhi including Pakṣāghāta, current scientific validation is insufficient to confirm clinical efficacy in hemiplegia. Improvement observed in the case likely reflects the combined influence of Pañcakarma procedures, physiotherapy, and natural neurological recovery. Rigorous pharmacological studies, standardised analytical characterisation, and controlled clinical trials are essential to substantiate traditional claims and define safety–efficacy profiles.

Keywords: Pakṣāghāta; Hemiplegia; Bhasma; Rasauṣadhi; Pañcakarma; Neuroprotection; Vāta Vyādhi.

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Introduction

Pakṣāghāta is described in the classical Ayurvedic treatises—including the Caraka Saṃhitā (Cikitsā 28/55–60), Mādhava Nidāna (22/25–32), and Cakradatta under Vātavyādhi—as a Vāta-pradhāna Nanātmaja Vyādhi characterised by Ekadeśa-Stambha (localised stiffness), Balahāni (loss of strength), Karma-Hāni (functional impairment), and derangement of voluntary and sensory functions affecting one half (Pakṣa) of the body. Owing to the deep-seated vitiation of Vāta, its prognosis is described as Kṛcchra-Sādhya, necessitating potent, long-term, multi-dimensional therapeutic strategies.[1–3]

In contemporary medicine, Pakṣāghāta correlates with **hemiplegia**, a clinical condition defined by paralysis of one side of the body due to upper motor neuron lesions. The most common etiologies include ischemic stroke, hemorrhagic stroke, traumatic brain injury, and degenerative neurological disorders. With rising global and national incidence of stroke, hemiplegia represents a major cause of long-term disability, prompting increased interest in integrative and complementary rehabilitation strategies to supplement conventional neurorehabilitation, which may not always achieve complete functional recovery in all patients.[4-7]

Within Ayurvedic therapeutics, Rasauṣadhis—particularly Bhasmas—are traditionally emphasised in Vātavyādhi due to attributes such as Sūkṣma (fine particle size), Tīkṣṇa (penetrating potency), Yogavāhī (enhancing bioavailability), Āśukārī (rapid action), Rasāyana (rejuvenative property), and Vāta-Śāmaka (Vāta-pacifying effect).[8,9]

Modern analytical studies further demonstrate nano/submicron particle sizes, organometallic complexes, and phytochemical residues developed through Śodhana, Bhāvanā, and Māraṇa procedures—features that have stimulated renewed scientific interest in exploring their neuropharmacological potential. However, systematic evaluation of their mechanisms, safety, and therapeutic applicability in neurological disorders remains limited.

Aim and Scope:

This paper aims to review classical references, analytical characteristics, pharmacological findings, and available clinical evidence for major Bhasmas used in Pakṣāghāta, and to illustrate their practical application through a case of Abhighātajanya Pakṣāghāta managed using an integrative Ayurvedic approach.

Rationale For Using Bhasmas In Pakṣāghāta

Pakṣāghāta, being a Vāta-pradhāna disorder, requires therapeutic

agents with Vāta-Śāmaka, Balya, Rasāyana, Medhya, and Dīpana–Pācana properties as described in classical Ayurvedic literature.[1–3] These attributes are intended to restore Vāta Gati, enhance tissue nourishment, and improve neuromuscular coordination.

Bhasmas and Rasauṣadhis have traditionally been described with several qualities that may support their relevance as adjuncts in the management of Pakṣāghāta:

- Sūkṣma — very fine nature facilitating deeper systemic access
- Yogavāhī — capacity to potentiate the action of co-administered medicines
- Rasāyana — rejuvenative effect supporting long-term tissue repair
- Balya / Ojo-Vardhana — strengthening and vitality-enhancing properties
- Vāta-Śāmaka — pacifying aggravated Vāta, the central pathological factor

These classical characteristics suggest a potential role for Bhasma-based Rasauṣadhis as adjuncts in the integrative management of Pakṣāghāta, aimed at restoring Vāta Gati and supporting tissue-level recovery, particularly when used alongside Pañcakarma, physiotherapy, and lifestyle measures. Nevertheless, scientific validation remains preliminary and preparation-specific, highlighting the need for controlled pharmacological and clinical studies to substantiate traditional claims.[10,11]

Pharmacokinetics Of Bhasmas

Although classical Ayurvedic texts explain Bhasma behaviour through concepts such as Sūkṣma, Yogavāhī, Āśukārī, and Rasāyana, modern pharmacokinetic understanding remains in an early developmental stage. Analytical and experimental studies on selected preparations provide preliminary and preparation-specific insights into absorption, distribution, metabolism, and elimination, but the available data remain limited and heterogeneous.[12,13]

Table: Pharmacokinetic Overview (Ayurvedic and Modern Perspectives)

Parameter	Ayurvedic Insight	Modern Interpretation
Absorption	Enhanced by suitable Anupāna such as ghee, honey, or black pepper; enters Rasa–Rakta Dhātu.	Selected preclinical studies report nano/submicron fractions that may be internalised through cellular uptake mechanisms; findings depend on metal type, particle size, and processing method.

Distribution	Selective tissue affinity explained through Khale–Kapota Nyāya.	Trace-level tissue distribution has been observed in some analytical models, though results vary widely with preparation and methodology.
Metabolism	Undergoes transformation at Dhātu level with minimal Doṣa aggravation.	Metallic or organometallic particles may remain relatively stable; complete biotransformation pathways are not fully characterised and appear metal-specific.
Elimination	Gradual removal through Mala and Mutra.	Trace excretion has been documented, but comprehensive pharmacokinetic profiling is lacking.

While classical Ayurvedic principles attribute deep and sustained action to Bhasmas, current scientific evidence is insufficient for definitive conclusions. The preliminary findings reinforce the need for:

- standardised preparation and processing techniques,
- reproducible analytical characterisation,
- in-vivo biodistribution and mechanistic studies, and
- long-term toxicological evaluation.

Available physico-chemical and biocompatibility studies on **selected** Bhasmas and related metallic preparations suggest the possibility of relatively rapid absorption, tissue-specific distribution, and prolonged trace-level bioavailability. Nonetheless, the data are limited, heterogeneous, and preparation-dependent, and questions of long-term safety and standardisation require continued investigation.[14,15]

Major Bhasmas Used In Pakṣāghāta

This section summarises major Bhasmas traditionally indicated in Vātavyādhi, along with available analytical and preclinical evidence. Classical indications and modern findings are kept distinct to maintain academic clarity.

1. Swarna Bhasma

Classical Indications

Described as Rasāyana, Medhya, Balya, Smṛti-Vardhaka and Vāta-Śāmaka in texts such as Rasa Taraṅgiṇī, Rasa Jala Nidhi, Rasavaśeṣika Bhūṣaṇa, and Rasacūḍāmaṇi.[13–15]

Analytical Characteristics

Analytical studies on selected samples report:

- gold nanoparticles and submicron particles,
- organic coatings derived from Śodhana and Bhāvanā,
- particle size distributions spanning nanoscale to larger

aggregates,
depending on preparation technique [13].

Modern Evidence

Preclinical studies suggest possible immunomodulatory and neuroprotective influences, but these findings are preliminary, preparation-dependent, and limited to animal or in-vitro models [13–15].

2. Rajata Bhasma

Classical Indications

Traditionally mentioned as Vātahara, Medhya, Hṛdya, and indicated in Unmāda and Apasmāra in texts such as Rasa Taraṅgiṇī and Yoga Ratnākara.[15]

Analytical Characteristics

Reported findings include:

- major phases such as silver sulfide (Ag_2S),
- smaller proportions of silver chloride and silver silicate,
- nano-to-submicron particle fractions.[15]

Modern Evidence

Some in-vitro and animal studies suggest anti-inflammatory and neurocalming potentials.[15]

3. Abhraka Bhasma

Classical Indications

Described as Medhya, Rasāyana, Tridoṣahara, and Balya in Rasa Taraṅgiṇī, Rasa Jala Nidhi, Rasa Prakāśa Sudhākara, and Rasāmitram.[2,14]

Analytical Characteristics

Studies identify:

- nanocrystalline mica-derived structures,
- particle sizes ranging from ~20 nm to several microns,
- elemental composition including Si, Mg, Al, Fe, Ca [20].

Modern Evidence

Animal and biochemical models suggest antioxidant and tissue-supportive actions.

Potential neurological relevance remains hypothetical, requiring controlled studies.

4. Loha Bhasma

Classical Indications

Classical texts such as Rasa Prakāśa Sudhākara and Ayurveda Prakāśa describe it as Rasāyana, Agnidīpana, Balya, and useful in conditions of depletion and metabolic insufficiency.[17]

Analytical Characteristics

Reported features include:

- mixed phases of magnetite (Fe_3O_4) and hematite (Fe_2O_3),
- presence of trace minerals (Si, Al, Ca, K, Mg, P, S).[17,18]

Modern Evidence

Widely studied for hematinic properties .[16,17]

5. Hartala Bhasma

Classical Indications

Mentioned in Rasa Ratna Samuccaya and Rasa Prakāśa Sudhākara as Kapha–Vāta-

Śāmaka, Lekhana, and Rasāyana, with occasional reference in Unmāda and Apasmāra.[14]

Analytical Characteristics

Findings typically show:

- arsenic–sulphur phases (primarily As_2S_3),
- alkaline pH,
- trace mineral content, with safety closely dependent on correct Śodhana.[14]

Modern Evidence

Only limited preclinical investigations exist.[14]

6. Mānaśilā Bhasma

Classical Indications

Described as Rasāyana, Lekhanīya, Kapha–Vāta-Hara, and Sattva-Vardhaka in Rasa Taraṅgiṇī, Rasa Prakāśa Sudhākara, and Bhaiṣajya Ratnāvali.[18-20]

Analytical Characteristics

Reported characteristics include:

- arsenic disulfide (As_2S_2),
- organic residues from Śodhana,
- particle refinement through repeated Māraṇa cycles.[14–16]

Modern Evidence

Some preliminary models indicate neurocalming effects. Further detailed analytical and toxicological studies are essential.

Case Study

Presenting Complaint and History

A 46-year-old male patient (Mr. B) presented following a fall from height, resulting in sudden-onset weakness of both lower limbs, difficulty gripping objects, and sensory impairment below the level of the injury. He reported severe back pain and inability to stand or walk without assistance.

MRI imaging revealed C3–C4 vertebral fracture with cord edema and intramedullary hemorrhage, indicating significant cervical spinal cord involvement.

Although Pakṣāghāta classically denotes hemiplegia, this presentation was interpreted as Abhighātajanya Vātavyādhi manifesting in a Pakṣa-like pattern, characterised by Gati-Stambha, Bala-Hāni, Māṃsa-Daurbalya, and reduced neuromuscular control. In Ayurvedic clinical practice, such traumatic presentations are sometimes considered within the conceptual framework of Abhighātajanya Pakṣāghāta when features of unilateral or bilateral motor impairment arise due to severe Vāta derangement.

Examination

Neurological Examination

- **Motor power (baseline):**
  - Upper limbs: Grip weak, shoulder/elbow movement reduced (approx. Grade 3/5).

  - Lower limbs: Severe weakness, unable to lift legs against gravity (Grade 1–2/5).
- **Reflexes:** Diminished in lower limbs.
- **Sensory examination:** Reduced sensation below C5 dermatome, with patchy hypoesthesia.
- **Functional status:**
  - Unable to stand independently.
  - Required assistance for sitting balance.
  - Dependent for activities of daily living (ADLs).

Ayurvedic Assessment

Findings were interpreted as:

- Abhighātajanya Vātavyādhi manifesting with Vāta Prakopa and Mārga-Āvarana.
- Functional impairment of Snāyu, Marmas, and Śirā.
- Presence of Gati-Stambha, Bala-Hāni, and Māṃsa-Daurbalya.

Treatment objectives included: Vāta-Anulomana, reduction of stiffness and pain, nourishment of neuromuscular tissues, and gradual functional restoration.

Investigations

- **MRI cervical spine:**
  - C3–C4 fracture
  - Cord edema
  - Intramedullary hemorrhage
  - Suggestive of traumatic cervical myelopathy

Routine blood tests were within normal limits.

Treatment Protocol

1. Pañcakarma Interventions

A staged regimen was administered:

a. Abhyanga

Daily medicated oil massage to reduce Vāta and improve joint mobility.

b. Svedana

Bāṣpa Sveda followed by Patra Piṇḍa Sveda for neuromuscular relaxation and enhanced circulation.

c. Basti Therapy

Administered over a planned schedule (approx. 8–10 days):

- Nirūha Basti: for Vāta-Anulomana and functional restoration
- Anuvāsana Basti: for tissue nourishment and lubrication

d. Physiotherapy

Included assisted strengthening exercises, mobilization, range-of-motion therapy, and gait-training support.

2. Rasauṣadhi Administration

Medicines were given sequentially (not simultaneously), with dosage adjusted per tolerance:

1. **Bṛhat Vāta Cintāmaṇi Rasa**
   - Rasāyana, Balya

- Used for systemic support and vitality enhancement. [11]

2. **Ekaṅgavīra Rasa**
    - Traditionally indicated in Pakṣāghāta, Hanu-Stambha, and Vātavyādhi.[10]
3. **Rāsarāja Rasa**
    - Used for Medhya support and reduction of stiffness/discomfort.[13]
4. **Samīra-Pannaga Rasa**
    - Administered for persistent neuromuscular tightness and rigidity.[16]

Each medicine was given under close supervision, with monitoring of vitals, bowel/bladder function, and tolerance.

Follow-Up and Outcome

Improvement was assessed over several weeks. Although formal neurological scales were not used, functional milestones were documented:

Motor & Sensory Recovery

- **Upper limb:** Improved grip strength and coordination; able to hold objects for longer durations.
- **Lower limb:**
    - Regained ability to lift legs against gravity
    - Initiated knee flexion and partial weight-bearing
- **Sensation:** Partial return of lower-limb sensations.

Mobility

- Initially unable to sit independently → progressed to sitting without support for several minutes.
- Later able to stand with assistance and perform assisted step initiation.

Pain & Rigidity

- Significant reduction in back pain and muscular stiffness.

General Function

- Improved appetite, sleep, mood, and overall sense of well-being.

These improvements likely reflect the combined effects of Pañcakarma, Rasaūṣadhis, physiotherapy, and natural neurological recovery, rather than a single therapeutic modality.[16–17]

Ethical Considerations

Written informed consent was obtained from the patient for publication of anonymised clinical details. As this report documents routine clinical management of a single patient without experimental intervention, formal institutional ethics committee approval was exempt according to local guidelines.

Integration Of Nanotechnology Concepts In Bhasma Science

Analytical studies on selected Bhasmas have reported nano- and submicron-sized particles, often accompanied by organic residues derived from Śodhana, Bhāvanā, and Māraṇa procedures.[13–

15] These findings have encouraged scholars to explore whether certain traditional Ayurvedic descriptors—such as Sūkṣma, Tīkṣṇa, and Yogavāhī—may, in part, be interpreted through the lens of modern nanoscience, which recognises the influence of particle size, surface area, and surface chemistry on biological interactions.

Ayurvedic and Scientific Perspectives

Classical Ayurveda attributes the following qualities to Bhasmas:

- **Sūkṣma** — extremely fine nature
- **Tīkṣṇa** — penetrating potency
- **Yogavāhī** — ability to potentiate the action of co-administered substances
- **Rasāyana** — nourishing and rejuvenative properties

Modern analytical observations—such as reduced particle size, increased surface reactivity, and the presence of complex inorganic particles with organic coatings or associations—have led some authors to propose conceptual parallels between these features and the traditional qualities described above.

Discussion

The management of Vātavyādhi, particularly Pakṣāghāta, is traditionally regarded as demanding therapies capable of addressing the deep, rapid, and pervasive nature of aggravated Vāta. Classical commentaries such as the Mādhukośa ṭīkā on Mādhava Nidāna describe Vāta-induced disorders as Duḥsādhya (difficult to treat) due to their tendency to penetrate deeply, progress swiftly, and impair multiple structural and functional pathways.[1–3]

The referenced verse: “vāyor atibalatvena āśukāritvena ca gambhīras tvāt tadvikārāṇāṃ duḥsādhyatvād āśu eva anyathā karatvāt.” may be translated as:

“Because of the great strength, rapid activity, and deep-seated nature of aggravated Vāta, disorders arising from it are difficult to treat and require timely and specific therapeutic measures.”

While the verse does not explicitly refer to Rasaśāstra, some clinicians interpret its description of the qualities required for managing Vāta-dominant disorders as conceptually aligning with attributes traditionally ascribed to Bhasmas and Rasauṣadhis. These formulations—described as Sūkṣma, Tīkṣṇa, Yogavāhī, Āśukārī, and Rasāyana—may be interpreted as meeting many of these traditional therapeutic requirements, though such correlations remain hypothetical and interpretive.

Modern analytical studies reporting nano- and submicron-sized fractions in selected Bhasmas provide a preliminary empirical framework for examining how Sūkṣma and related

attributes might operate. Some authors propose that smaller particle size and organic coatings may contribute to penetrative or sustained activity, but evidence is preliminary, preparation-specific, and insufficient to establish mechanistic or clinical significance. Nanotechnology thus offers a conceptual lens—not validation—for understanding possible pharmacodynamic behaviour.

Overall, improvements observed in clinical contexts, including the presented case, likely arise from integrative management involving Pañcakarma, physiotherapy, supportive care, and natural neurorecovery, rather than from any single intervention.

Challenges And Future Prospects

1. Standardisation

- There is an urgent need for validated Standard Operating Procedures (SOPs) for Śodhana, Bhāvanā, and Māraṇa.
- Pharmacopeial monographs, batch-to-batch reproducibility, and inter-laboratory concordance remain essential unmet requirements.

2. Toxicity and Safety

- Robust toxicological profiling—acute, sub-chronic, chronic, reproductive, and genotoxic studies—is needed, especially for metal- and arsenic-based Bhasmas.
- Structured pharmacovigilance and adverse-event reporting systems must be strengthened.

3. Clinical Validation

- Prospective, controlled, ideally multicentre trials are required to compare integrative (Ayurveda + physiotherapy) protocols with physiotherapy alone.
- Clear outcome measures (neurological, functional, and quality-of-life indices) should be employed.

4. Nanomedicine Integration

- Collaboration with materials scientists and pharmacologists is needed to investigate:
    - particle size distribution and morphology,
    - surface chemistry and organic associations,
    - in-vivo biodistribution, metabolism, and excretion,
    - long-term accumulation and biocompatibility.

5. Cost and Health Economics

- Noble-metal Bhasmas (e.g., Swarna Bhasma) may have significant cost implications.
- Health-economic evaluations should assess cost–effectiveness, accessibility, and benefit-to-burden ratios in chronic neurorehabilitation.

Conclusion

Bhasma-based Rasauṣadhi hold an important place in the classical Ayurvedic approach to managing Pakṣāghāta, supported by traditional descriptions of Vāta-Śāmana, Balya, Medhya, and Rasāyana actions. Modern analytical studies reporting nano- and submicron-sized particles with complex inorganic–organic associations have generated scientific interest, but these findings remain preliminary, preparation-specific, and insufficient to define pharmacological mechanisms or clinical efficacy.

The case presented in this review demonstrated functional improvement within an integrative therapeutic framework incorporating Pañcakarma, Rasauṣadhi, physiotherapy, and supportive measures. These outcomes are best interpreted as the result of multimodal synergy and natural recovery, rather than evidence for the isolated effect of any single intervention. To meaningfully evaluate the therapeutic potential of Bhasmas in contemporary neurorehabilitation, there is a clear need for:

- robust standardisation of preparation and quality-control procedures,
- detailed analytical and toxicological profiling, and
- well-designed, controlled clinical studies.

Future progress will depend on interdisciplinary research that brings together Rasaśāstra, neurology, pharmacology, and nanoscience to explore how traditional insights and modern scientific methodologies can be integrated responsibly and rigorously. Such collaboration is essential for defining the safe, evidence-based role of Bhasma as potential adjuncts in the management of Pakṣāghāta.

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