



“ORTHOPEdic PRINCIPLES IN SUSHRUTA SAMHITA: CLASSICAL INSIGHTS AND MODERN RELEVANCE”

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ABSTRACT

Introduction: Orthopedics, the branch of medicine dealing with musculoskeletal injuries, fractures, and joint disorders, has roots that trace back to ancient surgical texts. The *Sushruta Samhita*, composed by Acharya Sushruta, is among the earliest and most comprehensive treatises on surgery, containing detailed descriptions of fractures (*bhagna*), dislocations (*sandhimukta*), and their management. **Methods:** This review is based on a systematic analysis of *Sushruta Samhita* and related Ayurvedic classics, along with modern literature indexed in PubMed, Scopus, and Google Scholar. Key search terms included “Sushruta Samhita,” “orthopedics in Ayurveda,” “bhagna,” “sandhimukta,” and “Ayurvedic fracture management.” Articles and references from 1980–2024 were included, with emphasis on peer-reviewed studies, clinical trials, and comparative analyses of Ayurvedic and modern orthopedic practices. **Results:** Sushruta classified fractures into twelve types and dislocations into six types, prescribing individualized treatments including immobilization (*koshtha-bandhana*), traction (*yantra*), massage (*abhyanga*), bandaging (*bandhana*), and internal administration of bone-healing formulations. Rehabilitation strategies like dietetic regimens, oil therapies, and physiotherapy-like measures were also recommended. Comparative analysis shows that many of these principles parallel modern orthopedic practices, such as traction, casting, and physiotherapy. Herbal formulations described for fracture healing, like *laksha*, *asthi-samhara*, and *ghrita preparations*, have demonstrated osteoprotective and bone-healing potential in experimental studies. **Discussion:** The orthopedic wisdom of Sushruta demonstrates remarkable foresight in fracture classification, surgical techniques, and holistic rehabilitation. While modern orthopedics benefits from technological advances in surgery and imaging, Sushruta’s holistic model emphasizes natural healing, nutrition, and functional recovery. Integrating classical insights with contemporary research may enrich current orthopedic practice, especially in the field of bone healing and rehabilitation.

KEYWORDS: Ayurveda, Bhagna, Orthopedics, Sushruta Samhita, Traditional surgery

INTRODUCTION

The field of orthopedics deals with the diagnosis and management of injuries and disorders of the musculoskeletal system, encompassing fractures, dislocations, and bone diseases^[1]. While orthopedic surgery today is driven by advanced diagnostic tools and surgical innovations, its foundations can be traced back to ancient surgical treatises^[2-3]. Among these, the *Sushruta Samhita* stands out as a pioneering work that systematically described surgical techniques, trauma care, and orthopedic interventions^[4].

Sushruta Samhita (circa 600 BCE) not only codified surgical methods but also emphasized holistic healing through proper diet, lifestyle, and rehabilitative measures^[5]. The text classifies fractures (bhagna) into twelve distinct categories and dislocations (sandhimukta) into six, offering precise diagnostic and treatment approaches^[6-7]. Methods such as immobilization, bandaging, traction, and surgical intervention highlight the scientific rigor and clinical acumen of Acharya Sushruta^[8].

The present review aims to critically analyze the orthopedic principles described in the *Sushruta Samhita*, correlate them with modern orthopedic knowledge, and highlight their continued relevance. The objectives are to (i) systematically review classical Ayurvedic descriptions of fractures, dislocations, and bone healing; (ii) compare them with modern orthopedic practices; and (iii) explore their integration in contemporary research and clinical applications^[9-10].

MATERIALS AND METHODS

This review employed a systematic approach, combining classical textual analysis with modern scientific literature.

- **Sources of Literature:** Primary Ayurvedic texts including *Sushruta Samhita*, *Charaka Samhita*, and *Ashtanga Hridaya* were examined. Commentaries by Dalhana and Chakrapani were used for contextual clarity^[11].
- **Databases:** PubMed, Scopus, Web of Science, Google Scholar, and AYUSH Research Portal were searched^[12].
- **Keywords:** “Sushruta Samhita,” “orthopedic Ayurveda,” “bhagna,” “fracture Ayurveda,”

“sandhimukta,” “Ayurvedic bone healing.”^[13]

- **Inclusion Criteria:** Peer-reviewed articles, clinical trials, pharmacological studies on Ayurvedic herbs related to bone healing, and reviews (1980–2024)^[14].
- **Exclusion Criteria:** Non-scientific sources, anecdotal reports without references, and texts unrelated to orthopedics^[15].
- **Type of Studies Reviewed:** Textual analyses, experimental pharmacological studies, clinical trials, and comparative historical reviews.

OBSERVATION AND RESULTS

1. Classical Descriptions of Orthopedic Principles in Sushruta Samhita

Sushruta Samhita, regarded as the foundational text of surgery in Ayurveda, provides systematic descriptions of orthopedic conditions under the umbrella of Bhagna (fractures) and Sandhimukta (dislocations). *Sushruta* classified fractures into twelve types, such as Karkata (comminuted), Ashwakarna (oblique), Atipatita (compound), and Churnita (crushed), based on morphology and severity. Similarly, six types of dislocations were described depending on displacement of joints.

The text also highlights the pathophysiology of bone and joint trauma, explaining how Vata dosha aggravation plays a central role in fracture displacement and pain. Additionally, principles of bone healing were outlined, emphasizing that proper alignment (Samya sthapana), stabilization (Bandhana), and nourishment through diet and medication are essential for recovery.

This demonstrates that *Sushruta* had not only a diagnostic framework but also a biomechanical understanding of trauma much before the modern era.

2. Therapeutic Interventions and Management Techniques

Sushruta prescribed a stepwise approach to orthopedic management, which bears resemblance to current practices. The classical management of fractures (Bhagna chikitsa) is explained through four key principles:

1. **Avagahana (immersion or fomentation)** – reducing swelling and preparing tissues for manipulation.

2. **Traction (Aakarshana)** – using manual or instrumental methods to restore anatomical alignment.
3. **Manipulation (Pratyagamana)** – correcting deformity and restoring functional position.
4. **Immobilization (Bandhana)** – application of splints, bamboo sticks, or cloth bandages for stability.

Sushruta further recommended different Bandhana (bandaging techniques) tailored to fracture sites, such as Kosha (cylindrical bandage for limbs), Sthagika (layered bandage for swelling), and Anuvellita (spiral bandage). He also described Yantras (orthopedic instruments) like pulleys and splints, which parallel modern orthopedic devices.

For dislocations, Sushruta advised manual reduction, traction, and specific supportive therapies to restore joint stability. He emphasized rehabilitation through massage (Abhyanga), exercise (Vyayama), and fomentation (Swedana) to regain mobility and prevent contractures.

3. Dietary and Medicinal Support for Bone Healing
In addition to mechanical stabilization, Sushruta stressed the importance of Ahara (diet) and Aushadha (medicine) in promoting fracture healing. A protein-rich and unctuous diet, particularly milk, ghee, and meat soup, was recommended to strengthen bones. Herbs like Asthishrinkhala (*Cissus quadrangularis*), Laksha (*Laccifer lacca*), and Arjuna (*Terminalia arjuna*) were prescribed for accelerating bone union and reducing pain.

Modern pharmacological research validates many of these herbs. For example, *Cissus quadrangularis* has been shown to stimulate osteoblast proliferation and enhance callus formation, supporting Sushruta's ancient recommendations. Similarly, Arjuna bark extract has demonstrated osteoprotective activity.

4. Modern Correlations with Orthopedic Science

When compared with contemporary orthopedic principles, the parallels are striking:

- **Classification of fractures:** Sushruta's twelve-fold classification corresponds conceptually to modern classifications (e.g., transverse, oblique, comminuted, compound).
- **Reduction and fixation:** His methods of traction, manipulation, and immobilization

are direct precursors to today's reduction techniques, casting, and splinting.

- **Asepsis and wound management:** Sushruta stressed wound cleansing with herbal decoctions, oil application, and suturing, which aligns with the modern principles of preventing infection in compound fractures.
- **Rehabilitation:** The emphasis on physiotherapy-like measures—massage, exercise, fomentation—mirrors today's physical therapy protocols for regaining mobility.

Thus, Sushruta's framework not only matches but also anticipates core principles of modern trauma and orthopedic surgery.

5. Case Studies and Historical Applications

Ancient texts record multiple instances of battlefield injuries and their successful management through these orthopedic principles. Sushruta Samhita mentions warriors recovering from severe fractures after receiving traction and splinting. In later centuries, medieval Ayurvedic practitioners continued these methods, often blending them with emerging surgical innovations.

Recent case series from Ayurvedic colleges in India report the successful use of *Cissus quadrangularis* with immobilization in uncomplicated fractures, showing early callus formation compared to standard care. Other studies have documented Ayurvedic bandaging and oil massage therapies for joint dislocations and ligament injuries, supporting the practical utility of classical guidelines.

6. Integration with Contemporary Practice

In modern integrative medicine, Ayurvedic orthopedic practices are being explored as complementary interventions. For example:

- Herbal formulations (like Lakshadi guggulu) are used alongside modern casting.
- Oil-based therapies (Panchakarma modalities) are incorporated for pain management and rehabilitation.
- Non-invasive methods like fomentation and massage are employed as adjuncts to physiotherapy.

This integrative approach underscores the timeless relevance of Sushruta's orthopedic wisdom.

DISCUSSION

The *Sushruta Samhita* reveals sophisticated

orthopedic principles that anticipated many modern practices. Its detailed classification of fractures and dislocations demonstrates a nuanced understanding of biomechanics and trauma. The management strategies—reduction, immobilization, bandaging, and rehabilitation—show striking parallels with contemporary orthopedic science^[16].

Modern orthopedics benefits from advanced diagnostic imaging, surgical hardware, and biomaterials, while Sushruta's model emphasized natural healing through diet, lifestyle, and herbal therapies. Herbs like *Cissus quadrangularis* and *Laksha* continue to attract research interest for their osteogenic and anti-inflammatory potential^[17].

However, certain gaps exist. While Sushruta provided qualitative descriptions, quantitative diagnostic tools and standardized protocols were absent. Moreover, while modern surgery excels in acute trauma management, it often overlooks the holistic rehabilitation (nutrition, psychology, and lifestyle) that Sushruta emphasized. Bridging these approaches could offer a more integrative orthopedic model^[18-19].

Future prospects include clinical trials of Ayurvedic formulations in fracture healing, development of standardized protocols for integrative rehabilitation, and validation of classical therapies through modern biomechanical and pharmacological studies^[20].

CONCLUSION

Orthopedic principles in the *Sushruta Samhita* exemplify the depth of ancient Indian surgical wisdom. The systematic classification of fractures and dislocations, clear diagnostic criteria, and structured treatment protocols demonstrate a scientific approach that resonates with modern orthopedics. Principles of reduction, immobilization, traction, bandaging, and rehabilitative care described by Sushruta remain foundational to orthopedic practice even today.

The incorporation of dietetics, lifestyle regulation, and herbal formulations highlights the holistic perspective of Ayurveda, where fracture management extends beyond structural correction to include nourishment, immunity, and functional recovery. Modern research has begun to validate several Ayurvedic remedies, particularly *Cissus quadrangularis* and *Laksha*, which show promising osteogenic and anti-inflammatory properties.

While modern orthopedics excels in surgical innovation, it often underutilizes natural healing methods and rehabilitation principles. An integrative approach that blends the evidence-based practices of Ayurveda with contemporary orthopedic advancements may enrich fracture management and enhance patient recovery.

Thus, revisiting the orthopedic insights of the *Sushruta Samhita* not only honors the legacy of Ayurveda but also provides valuable directions for modern integrative healthcare.

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