JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Critical Analysis of "*Purishdhara Kala sa evum Asthidhara Kala*" with Special Reference to Calcium Absorption.

Dr . Ashish Bobade[1], Dr. Harshali Pimpalshende[2]

Assistant Professor, Department of Rachana Sharir, Somayya Ayurved Medical College & Hospital Bhadravti Chandrapur.

Assistant Professor Department of Panchakarma, Somayya Ayurved Medical College & Hospital Bhadravti Chandrapur.

Abstract

The Ayurvedic concepts of *Puriṣadhara Kala* and *Asthidhara Kala* represent vital functional membranes involved in digestion and tissue formation. This critical analysis explores these two *Kalas* in relation to calcium absorption and metabolism, integrating Ayurvedic principles with modern biomedical understanding. *Puriṣadhara Kala*, located in the colon, aligns with the mucosal lining of the large intestine where fermentation of dietary fibers by gut microbiota produces short-chain fatty acids (SCFAs), enhancing passive calcium absorption. *Asthidhara Kalā,* associated with bone tissue (*asthi dhatu*), corresponds to the sites of calcium deposition and bone remodeling processes governed by osteoblast activity and hormonal regulation. The study highlights the interconnectedness of gut health and skeletal strength, emphasizing that optimal functioning of both *Kalas* is essential for maintaining calcium homeostasis. This integrative approach underscores the relevance of classical Ayurvedic anatomy in understanding complex physiological processes such as mineral absorption and bone metabolism.

Keywords – Purishdhara Kala, Asthidhara Kala, Calcium absorption, oestoblast.

Introduction

The Ayurvedic doctrine of *Dhatuparinama* (tissue formation and transformation) details the progressive nourishment of *dhatus* from ingested food (*ahara rasa*). Essential to this process are the *kalas* — seven functional membranes described in Ayurveda that support and facilitate tissue nourishment[1]. Among these, *Puriṣadhara Kala* (related to fecal separation in the colon) and *Asthidhara Kala* (associated with bone tissue) are significant in the context of mineral absorption, particularly calcium. In modern science, calcium absorption occurs primarily in the small intestine, but a growing body of evidence shows that the colon also plays a role in residual calcium uptake. Ayurveda's systemic view, emphasizing digestion, assimilation, and tissue transformation through *agni* and *dhatvagni*, aligns well with this integrative understanding. This article critically analyses the role of *Puriṣadhara Kala* and *Asthidhara Kala*, integrating classical shlokas and modern nutritional science, with a focus on calcium metabolism.

Material and Methodology:

1. **Textual Review**: Classical Ayurvedic scriptures — *Susruta Samhita*, *Charaka Samhita*, and *Ashtanga Hṛidaya* — were reviewed for references to *kalas*, their structure, location, and function.
2. **Modern Literature Correlation**: Scientific research on gastrointestinal absorption, calcium bioavailability, and bone physiology was reviewed.

3. **Comparative Analysis**: Ayurvedic concepts were mapped to contemporary physiological functions to explore parallels and integrative interpretations.

1. Pūrīṣadhārā Kalā:

पक्वाशयेतुयाकलाशोषयेदम्बुशेषतः।
सा पुरीषधारा नाम पञ्चमी परिकीर्तिता [2]॥"

This is the fifth *kalā* described by Suśruta, associated with the large intestine (*pakvāśaya*), responsible for the separation of waste material (*pūrīṣa*) from digested food.
In the large intestine (*pakvāśaya*), the fifth *kalā*, known as *Pūrīṣadhārā Kalā*, is responsible for absorbing residual water and facilitating the formation and separation of feces (*pūrīṣa*).The colon's function of absorbing water and electrolytes aligns with this description. Additionally, studies indicate that the colon can absorb minerals like calcium under certain conditions, especially in the distal colon.

2. Asthidhārā Kalā:

अस्थिषुमध्येयादृष्टास्निग्धास्थिरतराशुभा।
सास्थिधारा स्मृता षष्ठी कला शुश्रूषतां सताम् [3]॥

The sixth *kalā* supports the *asthi dhatu* (bone tissue) and is located in bone cavities. It is understood to be the internal nourishing membrane that sustains bone integrity. In the marrow cavities of bones, the sixth *kala*, called *Asthidhara Kala*, is present. It is unctuous (*snigdha*), stable, and supports the structural integrity of bones.This can be correlated with the endosteum and periosteum, which play key roles in bone remodeling and calcium homeostasis, including the nourishment of osteoblasts.

3. Calcium Absorption & the Gut-Colon Relationship :

Calcium absorption primarily occurs in the small intestine, especially the duodenum and jejunum, through two pathways: 1. Active transport (vitamin D-dependent) 2. Passive diffusion (concentration gradient-driven)

The gut microbiota, especially in the colon, can indirectly influence how much calcium gets absorbed—even though the colon is not the main site of calcium uptake.

Fermentation of Fibers into Short-Chain Fatty Acids (SCFAs):

Gut bacteria (especially in the colon) ferment non-digestible carbohydrates (like insulin, FOS, GOS) into SCFAs (e.g., acetate, butyrate, propionate). SCFAs lower colonic pH, making calcium more soluble and therefore more absorbable in the colon. This is particularly helpful when calcium intake is low or absorption in the small intestine is impaired.

A healthy gut microbiome maintains the **intestinal barrier** and reduces **inflammation**[4].

Inflammation or dysbiosis[5] (imbalance of microbes) can impair calcium absorption by:

- Damaging the intestinal lining
- Affecting vitamin D metabolism
- **Improving gut health** via diet (fiber-rich foods, pro-biotics) can **enhance calcium absorption**, which is key for :
    - Preventing osteoporosis
    - Supporting adolescent growth
    - Mitigating bone loss in menopause or aging.

Result & Discussion

The Ayurvedic understanding of tissue nourishment through *kalas* provides a unique and layered insight into systemic nutrition and mineral absorption.

Purişhadhara Kala and Calcium Salvage:

While not a primary site of nutrient absorption, the colon has been shown to participate in the absorption of minerals like calcium, especially under conditions where small intestinal absorption is compromised. This supports the idea that *Purişhadhara Kala*, while mainly eliminating waste, also contributes to nutrient salvage and systemic mineral balance[6].

In Ayurveda, maintaining colon health is critical for overall metabolism, further evidenced in concepts like *grahaṇi doṣha*, where mal-absorption leads to tissue depletion.

Asthidhara Kala and Bone Metabolism:

The *Asthidhara Kala* represents the dynamic interface within bone tissue responsible for nourishment. Calcium, absorbed and metabolized through *rasa*, *rakta*, and *meda* dhatus, ultimately reaches *asthi dhatu* through *asthi dhatvagni*. Dysfunction here results in *asthi-kṣhaya* (bone degeneration), osteoporosis-like conditions, and *sandhi-shula* (joint pain).

Interventions in Ayurveda such as:

- ***Tikta rasa***[7] **(bitter substances)** for bone strengthening,
- ***Ghṛta* (ghee)** as an anupāna (vehicle) for calcium assimilation,
- Use of **herbs like *Laksha, Arjuna, Ashwagandha***[8], and
- ***Bhasma* preparations** (e.g., *Pravala bhasma*, *Shankha bhasma*) are directed at supporting the function of *Asthidhārā Kalā* and enhancing bone density.

Conclusion

The concepts of *Pūrīṣadhārā Kalā* and *Asthidhārā Kalā* reflect highly functional anatomical and physiological realities, which, when interpreted through the lens of modern science, align well with known mechanisms of water, electrolyte, and mineral absorption and bone maintenance. An integrative approach combining Ayurvedic understanding of *agni*, *dhatvagni*, *kalā*, and *dhātu poshana*, with modern insights into calcium metabolism can provide effective strategies for managing calcium deficiency and bone disorders. The Ayurvedic framework provides a holistic view of nutrient absorption and tissue formation through the lens of *Kalās*, which correspond well with functional anatomical systems**.** Modern research validates the role of the colon in calcium absorption**,** especially when gut microbiota and fiber intake are optimized—emphasizing the importance of *Pūrīṣadhārā Kalā***.** *Asthidhārā Kalā* plays a parallel role in ensuring that absorbed calcium is effectively utilized for bone strengthening and remodeling .Dysfunctions in either system—gut dysbiosis or poor bone metabolism—can result in hypocalcemia**,** osteopenia, or osteoporosis**,** showing the integrative value of both *Kalās* in maintaining calcium balance.

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