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A Critical Review on Current Diagnostic Modalities of Frozen Shoulder with Special Reference to Avabahuka

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Abstract: *Frozen shoulder, or adhesive capsulitis, is a disabling shoulder disorder marked by progressive pain and global restriction of both active and passive shoulder movements. The condition predominantly affects middle-aged individuals and is commonly associated with systemic disorders such as diabetes mellitus and thyroid dysfunction. Early and accurate diagnosis is vital to differentiate frozen shoulder from other shoulder pathologies and to initiate timely management. Frozen shoulder is a common musculoskeletal condition that is more common in people between the ages of 40 and 60, especially in women and those with thyroid conditions or diabetes mellitus.*

In classical Ayurvedic literature, a clinically comparable condition is described under Avabahuka, a Vata-predominant disorder localized to the Amsa Sandhi (shoulder joint) and characterized by Shoola (pain), Stambha (stiffness) and Sankocha (restricted movement) — features that closely parallel the freezing, frozen and thawing stages recognized in conventional medicine. This review integrates current biomedical diagnostic modalities with the Ayurvedic diagnostic framework of Nidana Panchaka and Dosha-Dushya analysis, aiming to highlight the clinical relevance, complementary value, and limitations of both systems in the comprehensive evaluation of frozen shoulder/Avabahuka.

The application of diagnostic modalities to eliminate differential diagnosis and increase diagnostic accuracy. The purpose of this review is to highlight the clinical relevance and appreciate any limitations in the current diagnostic modalities used in the evaluation of frozen shoulder,and to explore how an integrative Ayurveda-biomedicine approach may enhance early recognition and staging of the disease.

Keywords: Frozen shoulder, Musculoskeletal Disorder, Adhesive Capsulitis, Ayurveda, Vata Vyadhi, Nidana Panchaka

I. INTRODUCTION

Frozen shoulder (adhesive capsulitis) is a common musculoskeletal condition characterized by chronic shoulder pain and progressive stiffness due to inflammation and fibrosis of the glenohumeral joint capsule. The prevalence of frozen shoulder in the general population is estimated to be 2–5%[1], with higher incidence observed in individuals with diabetes mellitus, thyroid disorders, and prolonged shoulder immobilization[2].

Clinically, frozen shoulder progresses through three stages: the painful (freezing) stage, the stiff (frozen) stage, and the recovery (thawing) stage. Each stage presents distinct clinical features, making accurate diagnosis essential for appropriate treatment planning[3].Misdiagnosis or delayed diagnosis may result in prolonged disability and reduced quality of life. Therefore, a systematic diagnostic approach combining clinical evaluation with imaging and laboratory investigations is crucial. This review focuses on current diagnostic modalities specific to frozen shoulder and their

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clinical relevance. As there are symptoms like pain associated with marked restriction of elevation and external rotation.

This disease affects one's productivity and the pain is so severe that it disturbs sleep and quality of life. The shoulder is tender to palpation and both active and passive movement are restricted.

Although clinical history and physical examination remain the cornerstones of diagnosis, imaging modalities—including plain radiography, ultrasound (US), and magnetic resonance imaging (MRI)—are increasingly used to confirm diagnosis and rule out differential pathology.

Interestingly, the clinical picture of frozen shoulder finds a close classical parallel in *Avabahuka*, a condition described in Ayurvedic compendia under the broader umbrella of *Vata Vyadhi* (disorders of the Vata Dosha). *Avabahuka* is characterized by localized *Sandhigata Vata* affecting the *Amsa Sandhi*, producing pain, stiffness and progressive restriction of shoulder movement in a manner that mirrors the staged progression of adhesive capsulitis.Since Ayurveda emphasizes a structured clinical diagnostic method (*Nidana Panchaka*) even in the absence of imaging technology, examining frozen shoulder through this dual lens may add diagnostic depth, particularly in settings where advanced imaging is inaccessible, and may inform an integrative approach to early identification and staging.[4]

The purpose of this review is to summarize the **current diagnostic modalities** for frozen shoulder, including **advanced imaging** and the classical Ayurvedic diagnostic approach to *Avabahuka*, and to discuss their respective roles, strengths, limitations, and potential for integration.

II. AIM AND OBJECTIVE

To review and analyze current diagnostic modalities used in Frozen Shoulder, with special reference to the Ayurvedic understanding and diagnostic approach to *Avabahuka*.

III. MATERIAL & METHODS

This narrative review is based on published literature including review articles, clinical guidelines, orthopedic textbooks, and peer-reviewed journals related to the diagnosis of frozen shoulder, along with classical Ayurvedic texts (*Brihattrayi* and allied Samhitas) describing *Avabahuka* and *Vata Vyadhi*. Emphasis was placed on clinically relevant and commonly employed diagnostic modalities.

A. IMAGING MODALITIES IN FROZEN SHOULDER

1)Plain Radiography (X-RAY) -

Standard shoulder X-rays are often obtained as part of initial evaluation, not to diagnose frozen shoulder perse, but to **exclude structural abnormalities** such as:

- glenohumeral osteoarthritis,
- fractures,
- calcific tendinitis,
- tumors, or spur formation.

In adhesive capsulitis, X-ray findings are usually **normal** without specific pathognomonic signs.[5]

Limitations:

• Does not visualize capsular pathology

2) CT Scan

CT has a limited role in frozen shoulder and is primarily used to assess bony abnormalities when suspected.[6]

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3) Ultrasound (US)

Musculoskeletal ultrasound offers a **safe, cost-effective, and accessible** imaging option. Features linked with frozen shoulder include -

- Thickening of the coracohumeral ligament and inferior glenohumeral ligament,
- rotator interval changes, and
- increased vascularity in early stages.[7]

Ultrasound is particularly useful for ruling out rotator cuff tears and biceps tendon pathology and can be used dynamically during shoulder movement assessment.[8]

While ultrasound is affordable, radiation-free, and dynamic, the reported evidence shows heterogeneous findings with variable diagnostic reliability. US is particularly useful in excluding other shoulder pathology, though its use as a stand-alone diagnostic tool without clinical correlation remains debated.[9]

Limitations:

• Operator dependent

MRI (Magnetic Resonance Imaging)

- Gold standard imaging modality for frozen shoulde
- Findings include:
  - ❖ capsular thickening greater than 4 mm
  - ❖ obliteration of the rotator interval
  - ❖ thickened coracohumeral ligament, and
  - ❖ reduced volume of the axillary recess.[10]

MRI also helps in staging the disease, evaluating associated intra-articular pathology, and excluding other differential diagnosis such as labral tears or synovitis.[11]

Limitations:

• High cost

• Limited availability & contraindication of MRI - Pacemaker,Pregnancy etc.

5) Advanced Imaging Techniques -

MR arthrography may provide enhanced visualization of capsular adhesions and synovial inflammation, though its routine use is limited due to invasiveness and higher cost.[12]Hence, it is reserved for complex or atypical cases.

6) Quantitative MRI and Functional Imaging -

Advanced MRI techniques such as T2 mapping provide objective assessment of capsular fibrosis and inflammation, enabling early detection and treatment monitoring

5) Laboratory Investigations

- Laboratory tests do not confirm frozen shoulder but are useful in identifying associated systemic conditions.
- ESR and CRP are usually normal or mildly elevated
- Blood glucose levels, Hba1c help identify diabetes mellitus
- Thyroid function tests are recommended due to strong association
- Rheumatoid factor and ANA may be used to exclude inflammatory arthritis.[13]
- Metabolic tests – serum calcium, vitamin D,serum uric acid

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C. Ayurvedic Perspective: *Avabahuka*

1. Conceptual Overview

This review is based on Classical Ayurvedic texts including *Sushruta Samhita, Ashtanga Hridaya, and Madhava Nidana.*

अंसदेशस्थितो वायुः शोषयित्वांऽसबन्धनम् ॥
सिराश्चाकुञ्च्य तत्रस्थो जनयत्यवबाहुकम् ॥८२॥
सु.नि.१/८२[14]

अंसमूलस्थितो वायुः सिराः संकोच्य तत्रगाः ।
बाहुप्रस्पन्दितहरं जनयत्यपबाहुकम् ॥४५॥
अ.सं१५/४५[15]

सिराश्चाकुंच्य तत्रस्थो जनयेदवबाहुकम्।
मा.नि.२२/६४[16]

Vata localised in the region of the shoulder, getting aggravated, dries up the bindings (ligaments) of the shoulders, constricts the *siras* (veins) present there and produces *Avabahuka*[14].

Classical descriptions locate the disease at the *Amsa Sandhi*/*Amsa Moola* (shoulder joint/root), where localized vitiation of *Vata* obstructs normal joint function by drying the *Amsabandhana* and constricting the Sira of that region. *Avabahuka* is not classified by *Acharya Charaka* among the eighty *Vataja Nanatmaja Vyadhi*; its earliest description is attributed to Sushruta, and it is discussed as a *Vatavyadhi* by *Sushruta*, *Vagbhata* and *Madhavakara*.[17] Commentators debate whether *Avabahuka* is purely *Vataja* or *Vata-Kaphaja*; *Dalhana's* commentary on *Sushruta* clarifies that, because the *Amsa Sandhi* is a *Kapha*-predominant site, the *Vata* acting there produces a *Vata-Kapha Sammurchana* rather than a pure *Vataja* process.

2. *Nidana* (Etiological Factors)

Classical texts do not enumerate a disease-specific *Nidana* for *Avabahuka*; as a *Vatavyadhi*, the general causative factors of *Vata prakopa* described by *Acharya Charaka* are applied.[13]

रूक्ष शीत अल्प लघुन्न व्यवायाति प्रजागरैः |
विषमादुपचाराच्च दोषासृक् स्त्रवणादति ।
लङ्घन प्लवनात्यध्व व्यायामातिविचेष्टितैः ||
धातूनां सङ्क्षयाच्च चिन्ता शोकरोगातिकर्षणात् ।
दुःख शय्यासनात् क्रोधाद् दिवास्वप्नाद्भयादपि |
वेगसन्धारणाद्रामादभिघातादभोजनात् |
मर्माघातात् गजोष्ट्अश्वशीघ्रयानापतंसनात ॥ च.चि. २८।१५-१७[18]

These include *Ruksha* (dry), *Sheeta* (cold), *Alpa* (scanty) and *Laghu* (light) *ahara sevana*; *Ati Vyavaya* (excess sexual indulgence); *Prajagarana* (excess night-waking) and *Diwaswapna* (daytime sleep); *Vishama Upachara* (improper Panchakarma); *Ati Dosha Sravana* and *Ati Asruk Sravana* (excess purificatory/bloodletting therapy); *Ati Plavana* (excess swimming); *Ati Langhana* (excess fasting); *Atyadhva* (long-distance walking); and *Ati Vyayama* (excess exercise).[18] To these, local *Abhighata* (trauma or repetitive overuse of the shoulder) and *Sthanika Kapha Sanchaya* — more frequently observed in *Prameha* (diabetes-like states) and *Kapha*-predominant systemic conditions such as hypothyroidism — are conventionally added by later authors discussing *Avabahuka* specifically.[19]

3. *Samprapti* (Pathogenesis)[20]

Continued exposure to the above *Nidana* leads to *Vata prakopa*. The vitiated *Vata*, situated at the *Amsa Desha*/*Amsa Moola*, dries up the *Amsabandhana* (the *Kapha*-rich binding structure of the shoulder) and constricts the *Sira* located

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there, producing *Avabahuka*. This *Dosha-Dushya Sammurchana* afflicting *Sira, Snayu* and *Sandhi* manifests as *Shoola* (pain), *Stambha* (stiffness) and *Sankocha* (restricted movement) — a sequence that parallels the synovial inflammation, capsular fibrosis and progressive stiffness described in the conventional staging of adhesive capsulitis.

4. *Purvarupa* (Prodrome and Cardinal Features)

A separate *Purvarupa* is not enumerated for *Avabahuka* in classical texts; per the general principle for *Vata Vyadhi*, its *Avyakta* (mild/unmanifest) *Lakshana* — occasional stiffness or discomfort on shoulder movement — is taken as its prodrome.

1. *Alpa Stabdhata* (mild stiffness on shoulder)
2. *Alpa Shoola* (vague pain in the shoulder)
3. Restricted movement of *Ansa sandhi*.

5. *Rupa* (Clinical Features) – [21]

- *Bahu Praspandana Hara*
- *Amsa Shoola*
- *Stambha*
- *Amsa Shosha*

6. Upashaya – Anupashaya

Upashaya: *Snehana* (oleation) and *Nasya* are explicitly recommended in *Avabahuka*; *Anupashaya*: cold exposure and *Rukshana* (drying) measures aggravate the condition

7. Ayurvedic Diagnostic Methodology

Beyond *Nidana Panchaka*, classical Ayurveda diagnoses *Vata Vyadhi* such as *Avabahuka* through *Trividha Pariksha* — *Darshana* (inspection), *Sparshana* (palpation) and *Prashna* (interrogation) — and, more broadly, *Ashtavidha/Dashavidha Pariksha*, including *Nadi* (pulse) and *Akriti* (built), to assess the involved *Dosha* and the patient's *Prakriti* (constitution). *Dosha-Dushya Sammurchana* analysis — identifying *Vata* (with *Kapha Avarana* at the *Amsa Sandhi*) as the *Dosha* and *Sira*, *Snayu* and *Sandhi* as the *Dushya* — guides both diagnosis and the subsequent line of management, which classical texts describe as *Nasya* and *Uttarabhaktika Snehapana* rather than *Siravedha* (venesection), the latter being contraindicated in pure *Dhatukshayajanya Avabahuka*.

IV. DISCUSSION

The diagnosis of frozen shoulder is primarily **clinical**, while diagnostic modalities such as **X-ray, ultrasound, and MRI** play an important role in confirming the diagnosis and excluding other shoulder pathologies. Among these, **MRI** is the most sensitive modality for detecting capsular changes, whereas ultrasound offers a cost-effective dynamic assessment. From an Ayurvedic perspective, ***Nidana Panchaka*** provides a systematic clinical framework by assessing etiological factors, prodromal features, and characteristic symptoms of ***Avabahuka***, which closely correlate with the clinical stages of frozen shoulder. However, Ayurvedic assessment alone cannot replace imaging for structural confirmation or disease staging. Therefore, integrating ***Nidana Panchaka*** with modern imaging techniques may improve early diagnosis, accurate staging, and comprehensive clinical evaluation of *Avabahuka* (frozen shoulder).

V. CONCLUSION

Accurate diagnosis of frozen shoulder requires integration of clinical evaluation with selective use of imaging and laboratory investigations. While clinical assessment remains the cornerstone, MRI provides the highest diagnostic yield, and ultrasonography serves as a practical adjunct. Laboratory screening aids in detecting associated systemic disorders.

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The Ayurvedic construct of *Avabahuka*, diagnosed through the *Nidana Panchaka* framework and *Dosha-Dushya* analysis, offers a clinically coherent and accessible complementary perspective that parallels the staged progression recognized in conventional medicine. A comprehensive, integrative diagnostic strategy — combining modern imaging modalities with classical Ayurvedic clinical assessment — may facilitate earlier diagnosis, more individualized management, and improved functional outcomes in patients with frozen shoulder/*Avabahuka*.

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