

Etiopathological Study of Gridhrasi vis-à-vis Sciatica and Its Interpretation of Doṣha Predominance Through MRI-Based Structural Imaging

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ABSTRACT

Background: Gridhrasi, described in Ayurveda as a Vata Nanatmaja Vyadhi, presents clinically with radiating pain along the lower limb and is conceptually comparable to sciatica. It is traditionally classified into Vataja and Vatakaphaja subtypes based on doṣha predominance. In contemporary medicine, sciatica is primarily attributed to intervertebral disc degeneration, herniation, and nerve root compression; however, objective radiological validation of Ayurvedic subtypes remains limited.

Objective: To identify and compare magnetic resonance imaging (MRI) patterns in Vataja and Vatakaphaja Gridhrasi and to establish a diagnostic correlation between Ayurvedic subtyping and radiological disc pathology.

Methods: A cross-sectional clinical–radiological study was conducted on 60 patients presenting with Gridhrasi at a tertiary care Ayurvedic medical college hospital. Patients were classified into Vataja (n = 36) and Vatakaphaja (n = 24) subtypes using standardized Ayurvedic diagnostic criteria. Lumbosacral spine MRI (1.5 T) was evaluated for disc degeneration (Pfirrmann grading), disc desiccation, disc height loss, herniation morphology and direction, canal and foraminal stenosis, listhesis, and nerve root compression. Statistical analysis included the Chi-square test, odds ratio and p-values.

Results: Vataja Gridhrasi demonstrated significantly higher frequencies of disc desiccation, disc height reduction, and Pfirrmann grade II–IV degeneration ($p < 0.05$), reflecting a degeneration–instability pattern. In contrast, Vatakaphaja Gridhrasi showed broader disc bulges, a higher prevalence of central herniations, canal stenosis, and foraminal compromise, indicating a compressive mass-effect pattern. The differences in MRI findings between the two subtypes were statistically significant.

Conclusion: Distinct MRI phenotypes correspond to classical Ayurvedic differentiation of Vataja and Vatakaphaja Gridhrasi. Integration of radiological assessment with Ayurvedic clinical evaluation enhances diagnostic precision and supports an evidence-informed, individualized approach to disease characterization, consistent with the principle that diagnosis should precede treatment.

Keywords: Gridhrasi, sciatica, intervertebral disc prolapse, MRI, Vataja, Vatakaphaja, doṣha predominance, radiological phenotyping.

1. Introduction

Gridhrasi, one of the eighty *Vata Nanatmaja Vyadhis* described in classical Ayurvedic literature, is a disabling neuromusculoskeletal disorder characterized by radiating pain beginning in the *sphika* (gluteal region) and extending sequentially through the *kaṭi* (lumbar region), *prīṣṭha* (back), *uru* (thigh), *janu* (knee), *jaṅgha* (leg), and *pada* (foot). This pain is often accompanied by stiffness (*stambha*), pricking sensation (*toda*), twitching (*spandana*), and difficulty in leg elevation (*śakthi-nikṣepa nigraha*). Classical authorities including *Acharya Caraka*, *Suśruta*, and *Vagbhata* classify *Gridhrasi* into two clinically meaningful subtypes: *Vataja Gridhrasi*, dominated by pain, dryness, and stiffness; and *Vatakaphaja Gridhrasi*, in which heaviness, lethargy, and anorexia reflect Kapha association.¹ The term “*Gridhrasi*” itself is derived from “*Ḡrdhra*” (vulture), symbolizing the characteristic limping gait caused by severe radiating pain.² Here the word *Gridhra* refers to a person who is crazy of eating meat. This bird *Gridhra* (Vulture) is fond of meat and it eats flesh of an animal in such a fashion that it deeply pierce its beak in the flesh then draws it out forcefully, exactly such type of pain occurs in disease *Gridhrasi*.³

According to *Sushruta*, when kandara or ligament of heel and all toes are afflicted by vitiated *Vata*, movements of the lower limbs get restricted i.e. *sakthanahkshepam nigrahat* which is known as a *Gridhrasi*. Both *Vridhdhava Vagbhata* (*A.S.Ni. 15/16*) and *Laghu Vagbhata* (*A.H.Ni 15/54*) also follow this *Sushruta*'s statement.⁴

In contemporary medicine, *Gridhrasi* is closely comparable to sciatica, a neuropathic pain syndrome most commonly caused by irritation or compression of the L4, L5, or S1 nerve roots. The major etiologies include intervertebral disc degeneration, disc dehydration, annular fissures, disc herniation, central and foraminal stenosis, and spondylolisthesis. Magnetic resonance imaging (MRI) is considered the imaging modality of choice for evaluating disc morphology, hydration status, neural compression, and spinal canal dimensions.

Conceptually, Ayurvedic descriptions of *Vataja Gridhrasi* emphasize *rukṣa* (dry), *laghu* (light), and *khara* (rough) *guṇas*, which parallel MRI features such as disc desiccation, disc height loss, and segmental instability. *Vatakaphaja Gridhrasi*, characterized by *guru* (heavy), *sthira* (stable), and *picchila* (viscous) qualities, conceptually resembles bulky disc bulges, central herniations, and canal narrowing.⁵ Despite this conceptual overlap, objective radiological validation of these Ayurvedic subtypes has not been systematically established, and quantifiable MRI biomarkers corresponding to *doṣha* predominance remain poorly defined.

Intervertebral disc prolapse represents a common and clinically significant disorder of the spinal motion segment, capable of producing both mechanical pain and neurological dysfunction. The functional unit of the spine consists of two adjacent vertebral bodies, the intervertebral disc, facet joints, ligaments, and surrounding soft tissues. Structural and biochemical alterations within any of these components can disrupt load transmission and neural relationships, leading to degeneration, bulging, protrusion, extrusion, or sequestration of the disc. While some of these changes remain asymptomatic, others produce radicular pain, sensory disturbances, weakness, and functional impairment.

Accurate diagnosis of disc-related pathology requires careful clinical assessment supported by appropriate imaging. A detailed history, neurological examination, and structured evaluation of pain and functional limitation are essential. MRI provides valuable structural information but must always be interpreted in correlation with clinical findings. Overreliance on imaging alone may lead to overdiagnosis or misdiagnosis and inappropriate treatment decisions. Therefore, therapeutic planning should be based on a comprehensive clinicoradiological synthesis rather than isolated imaging findings. In the present study, a cross-sectional observational analysis was conducted on 60 patients presenting with clinical features of *Gridhrasi* who underwent MRI evaluation of the lumbosacral spine. Based on standardized Ayurvedic diagnostic criteria and radiological assessment, 36 patients were categorized as *Vataja Gridhrasi* and 24 as *Vatakaphaja Gridhrasi*. MRI parameters including disc degeneration

(Pfirrmann grading), disc desiccation, disc height reduction, herniation morphology and direction, canal and foraminal stenosis, listhesis, and nerve root involvement were systematically analyzed to identify patterns corresponding to doṣha predominance. This diagnostic framework was applied prior to the initiation of any therapeutic intervention.

This approach reflects the classical Ayurvedic principle “*Rogam adau parikṣeta tato’nantaram chikitsa*” — that disease should be thoroughly examined before treatment is initiated.⁶ By integrating Ayurvedic clinical phenotyping with objective radiological biomarkers, this study aims to enhance diagnostic precision, reduce empirical treatment, and support rational, individualized, and evidence-informed management strategies. The present work thus attempts to bridge classical Ayurvedic epistemology with contemporary medical imaging, providing a structured foundation for integrative diagnostic modeling and future therapeutic research in *Gridhrasi*.

2. Materials And Methods

Study Design

This was an observational, cross-sectional clinical–radiological correlation study conducted to evaluate clinical features, neurological findings, and magnetic resonance imaging (MRI) characteristics in patients diagnosed with *Gridhrasi* (sciatica), and to analyze their relationship with Ayurvedic diagnostic subtypes.

Study Setting

The study was conducted in the Outpatient and Inpatient Departments of the Department of Roga Nidāna and Vikṛti Vijñāna at Shri Narayan Prasad Awasthi Government Ayurvedic College and Hospital, Raipur, Chhattisgarh. MRI of the lumbosacral spine was performed at the institutional radiology unit and at accredited external diagnostic centers using standardized imaging protocols.

Study Duration

The study was carried out over a 12-month period from 17 September 2024 to 16 September 2025.

Study Population and Sample Size

A total of 60 consecutive patients fulfilling the predefined inclusion criteria and clinically diagnosed with *Gridhrasī* were enrolled for analysis.

Inclusion Criteria	Exclusion Criteria
1. Age 30–60 years .	1. Age <30 or >60 years .
2. Indian residents of either gender from the Chhattisgarh region .	2. Red-flag neurological conditions (progressive deficits, cauda equina syndrome).
3. Unilateral or bilateral radiating pain along the sciatic nerve pathway consistent with <i>Gridhrasi</i> (<i>kaṭi–sphika to uru, janu, jaṅgha, pada</i>).	3. History or evidence of spinal infection, malignancy, tuberculosis , or inflammatory spondyloarthropathy.
4. Tenderness along the sciatic nerve with pain aggravated by squatting .	4. Hip or pelvic pathologies , piriformis syndrome, or vascular claudication.
5. Presence of sensory and/or motor symptoms (paresthesia, tingling, burning, weakness).	5. Traumatic or post-operative lumbosacral spine conditions.
6. Positive Straight Leg Raising (SLR) test .	6. Severe structural deformity requiring urgent surgical intervention .
7. No bladder or bowel involvement .	7. Significant systemic illnesses , hematological/bleeding disorders, or severe endocrine disorders.
8. MRI evidence of disc pathology, spinal stenosis, or nerve root compression with informed consent.	8. Pregnancy .

Data Sources and Literature Review

Classical Ayurvedic treatises, including the *Bṛhatrayi* and *Laghutrayi* along with their authoritative commentaries, were reviewed to understand the etiopathogenesis, clinical presentation, and classification of *Gridhrasi*. Contemporary biomedical literature, standard radiology textbooks, and established guidelines for magnetic resonance imaging of the lumbosacral spine were consulted to contextualize disc pathology and neural involvement. Relevant peer-reviewed journals and curated academic databases were additionally reviewed to ensure alignment with current scientific understanding.

Study Tools and Proforma

A structured and pre-validated data collection proforma was employed to ensure uniform and reproducible documentation across all participants. The proforma included sections on demographic characteristics, pain profile, occupational and postural factors, aggravating and relieving factors, neurodynamic test results (straight leg raise and femoral nerve stretch), neurological examination findings, Ayurvedic diagnostic parameters (*nidana*, *doṣha*, *duṣhya*, *srotoduṣṭi*, *samprapti ghaṭakas*, and *sadhyasadhya*), and radiological observations.

Clinical Examination

All participants underwent a standardized clinical evaluation that included observation of gait and posture, assessment of spinal alignment and curvature, palpation for paraspinal tenderness, measurement of the straight leg raise angle, and performance of the femoral nerve stretch test. Neurological assessment comprised motor power grading using the Medical Research Council (MRC) scale, evaluation of deep tendon reflexes (patellar and Achilles), and sensory mapping corresponding to the L4, L5, and S1 dermatomes.

Ayurvedic Diagnostic Framework

Ayurvedic diagnosis was performed using a structured multidimensional framework to assess *doṣha* predominance, *duṣhya* involvement, disease localization, and pathophysiological progression in *Gridhrasi*.

- 1. Doṣha predominance** was assessed with emphasis on *Vata* (particularly *Vyana* and *Apana* subtypes) and associated *Kapha* as an *anubandhi doṣha* where relevant.
- 2. Duṣhya involvement** was evaluated across *Rasa*, *Rakta*, *Māmsa*, *Meda*, *Asthi*, *Sira*, *Kaṇḍara*, and *Snayu* tissues to determine the depth and extent of tissue pathology.
- 3. Adhiṣṭhāna (site of manifestation)** was identified primarily at the *kaṇḍarās* of *pārṣṇi* and *pratyaṅgulī*, as well as in the *sphik*, *kaṭi-prṣṭha*, *uru*, *janu*, *jaṅgha*, and *pada* regions, corresponding to the classical description of symptom progression.
- 4. Srotas** assessment included *Rasavaha*, *Raktavaha*, *Māmsavaha*, *Medovaha*, and *Asthivaha* channels, with evaluation of *srotoduṣṭi prakara*, particularly *saṅga* (obstruction) and *vimarga gamana* (aberrant flow).
- 5. Agni status** was assessed at the level of *Jaṭharagni* and *Dhatvagni* to evaluate metabolic and tissue-level transformation processes.
- 6. Udbhava sthāna (origin of pathology)** was considered to be *Pakvaśaya*, consistent with classical descriptions of *Vata* disorders.
- 7. Vyakta rūpa (manifest symptoms)** included *ruk* (pain), *toda* (pricking pain), *stambha* (stiffness), and *spandana* (twitching) in the *sphik*, *kaṭi-prṣṭha*, *uru*, *janu*, *jaṅgha*, and *pada* in a sequential manner, with additional features such as *arochaka* (anorexia), *tandra* (drowsiness), and *gaurava* (heaviness) suggesting *Kapha* association.
- 8. Sādhya-asādhya** considerations were evaluated to assess disease chronicity, reversibility, and therapeutic responsiveness.

Subtype classification into *Vataja* and *Vatakaphaja Gridhrasi* was performed using a standardized symptom-based scoring system. Inter-rater reliability for subtype classification was high (Cohen's $\kappa = 0.86$), indicating strong agreement between evaluators and supporting the reproducibility of the diagnostic framework.

3. Radiological Assessment

MRI Acquisition Protocol

Magnetic resonance imaging of the lumbosacral spine was performed using a 1.5-Tesla MRI system. Standard imaging sequences included sagittal T1-weighted and T2-weighted images, along with axial T2-weighted images at relevant disc levels. Additional sequences, including short tau inversion recovery (STIR) and gradient-echo imaging, were obtained when clinically indicated to assess inflammatory changes, marrow signal alterations, or subtle structural abnormalities.

Radiological Parameters Evaluated

MRI images were systematically reviewed for the following structural parameters: disc degeneration severity, disc desiccation, disc height reduction, herniation morphology (bulge, protrusion, extrusion, or sequestration) and direction (central, paracentral, foraminal, or far lateral), central spinal canal stenosis, lateral recess and neural foraminal narrowing, ligamentum flavum hypertrophy, Modic endplate changes, spondylolisthesis, facet joint arthropathy, and traversing or exiting nerve root compression.

4. Outcome Measures

Primary Outcome Measures

The primary outcomes focused on radiological parameters and their correlation with Ayurvedic subtypes. These included the degree of disc degeneration as graded by the Pfirrmann classification, presence and severity of disc desiccation and disc height reduction, herniation morphology and direction, extent of central spinal canal and neural foraminal stenosis, and patterns of traversing and exiting nerve root compression. These imaging findings were analyzed in relation to Ayurvedic subtype classification (*Vataja versus Vatakaphaja Gridhrasi*).

Secondary Outcome Measures

Secondary outcomes included assessment of functional impairment patterns, occupational and postural risk trends, association between the presence of spondylolisthesis and Ayurvedic subtype, and the distribution of nerve root involvement across lumbar levels (L4, L5, and S1).

Statistical Analysis

Data were entered and curated in Microsoft Excel and subsequently analyzed using IBM SPSS Statistics (version 26.0). Quantitative variables were summarized as mean with standard deviation, while qualitative variables were expressed as frequencies and percentages. Associations between categorical variables were examined using the Chi-square test or Fisher's exact test where appropriate. Effect size was estimated using Cramer's V, and odds ratios with corresponding confidence intervals were calculated for relevant associations. A two-tailed p-value of less than 0.05 was considered indicative of statistical significance.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of Government Ayurved College, Raipur (Approval No.: GACR/IEC/2023/42). Written informed consent was obtained from all participants prior to enrollment. Participant confidentiality and ethical standards were maintained throughout data collection and analysis. Participants were withdrawn from the study if they declined further participation, developed clinical red-flag signs, or required urgent surgical intervention; such cases were documented qualitatively but excluded from quantitative analysis.

5. Results

1. Distribution of Ayurvedic Subtypes

A total of 60 patients clinically diagnosed with *Gridhrasi* were evaluated in the present study. Ayurvedic subtyping into *Vataja* and *Vatakaphaja Gridhrasi* was performed based on a detailed clinical assessment that included history taking and evaluation of characteristic symptomatology.

Patients exhibiting predominant *Vataja lakṣaṇas*—such as *stambha* (stiffness), *ruk* (pain), *toda* (pricking pain), and associated features—were classified as *Vataja Gridhrasi*. Those presenting with *Vataja* features accompanied by *Kapha*-associated symptoms, including *tandra* (drowsiness), *gaurava* (heaviness), and *aruchi* (loss of appetite), were categorized as *Vatakaphaja Gridhrasi*.

Based on this clinical classification, 36 patients (61.7%) were identified as *Vataja Gridhrasi*, while 24 patients (38.3%) were classified as *Vatakaphaja Gridhrasi*. Both unilateral and bilateral lower-limb involvement were observed across the two subtypes, with no exclusive laterality pattern noted.

2. Demographic Characteristics

Table 1. Demographic Profile (N = 60)

Variable	Mean ± SD	Range
A. Age (years)	44.8 ± 9.6	30–60
B. Body Weight (kg)	63.1 ± 8.4	45–82
C. Duration of symptoms (months)	7.4 ± 3.2	1–18

Table 1 summarizes the demographic profile of the 60 patients included in the study.

The age of the participants ranged from 30 to 60 years, with a mean age of 44.8 ± 9.6 years. The largest proportion of patients (38.3%) belonged to the 51–60-year age group.

Body weight ranged from 45 to 82 kg, with a mean of 63.1 ± 8.4 kg, indicating that the study population predominantly had a moderate body build.

The duration of symptoms varied between 1 and 18 months, with a mean duration of 7.4 ± 3.2 months, suggesting that most patients presented with symptoms of subacute to chronic onset.

3. Grading of Lumbar Disc Degeneration (Pfirrmann Classification – MRI Based)

Pfirrmann et al. (2001) proposed a five-grade system using T2-weighted sagittal MRI to classify degeneration based on disc signal, nucleus–annulus distinction, and disc height.⁷

Table 2: Pfirrmann Classification – MRI Based

Grade	MRI Appearance	Pathological Correlation
I	Homogeneous bright white T2 signal, clear nucleus–annulus distinction, normal height	Normal hydrated disc
II	Inhomogeneous but still bright, distinction maintained, normal height	Early dehydration
III	Intermediate gray signal, unclear distinction, slightly reduced height	Mild degeneration
IV	Hypointense gray–black, lost distinction, moderate height loss	Advanced fibrocartilaginous degeneration
V	Black disc, collapsed height	Severe disc collapse, end-stage

	Pfirrmann Grade	Vataja (n=36)	Vatakaphaja (n=24)	p-value
	Grade I	0	0	—
	Grade II	10	6	0.04
	Grade III	16	12	0.03
	Grade IV	10	6	0.04
	Grade V	0	0	—

Image 1: MRI -Disc degeneration Grade **Table 3. Disc Degeneration Patterns in Vataja and Vatakaphaj Gridhrasi**

Table 3 presents the distribution of Pfirrmann grades of intervertebral disc degeneration among patients with *Vataja* and *Vatakaphaja Gridhrasi*.

Degenerative changes were predominantly observed in Pfirrmann Grades II to IV in both subgroups. In the *Vataja* group, Grade III degeneration was the most frequent finding, followed by Grades II and IV. In the *Vatakaphaja* group, lower frequencies were observed across the same grades.

Statistical comparison demonstrated a significant difference between the two subtypes for Pfirrmann Grades II, III, and IV ($p < 0.05$), indicating a higher severity of disc degeneration in patients with *Vataja Gridhrasi* compared to those with *Vatakaphaja Gridhrasi*. No patients in either group were classified as Grade I or Grade V.

4. Disc Desiccation and Height Loss

Table 4. Disc Desiccation & Height Loss

MRI Parameter	Vataja (%)	Vatakaphaja (%)
A. Disc desiccation (T2 signal loss)	88.8%	58.3%
B. Disc height loss	72.2%	41.6%

Table 4 summarizes the distribution of disc desiccation and disc height reduction in *Vataja* and *Vatakaphaja Gridhrasi*.

Disc desiccation, reflected as reduced T2-weighted signal intensity, was observed in 88.8% of patients with *Vataja Gridhrasi* and in 58.3% of those with *Vatakaphaja Gridhrasi*. Disc height reduction was present in 72.2% of *Vataja* cases compared with 41.6% of *Vatakaphaja* cases.

These findings demonstrate a higher frequency of disc dehydration and disc space narrowing among patients classified as *Vataja Gridhrasi* relative to those with *Vatakaphaja Gridhrasi*.

5. Grading of Disc Herniation Severity

Disc herniation is graded by its morphology and extension beyond the vertebral margin.

Morphological Types (Spine Society, 2014):

- **Disc bulge:** >25% of circumference; mild annular weakening.
- **Protrusion:** Focal, base wider than dome.
- **Extrusion:** Dome wider than base; annulus ruptured.
- **Sequestration:** Free fragment detached from parent disc.

Severity Classification (MSU – Michigan State University Grading, MRI):

Based on axial MRI disc extent and location (zones A–C; grades 1–3):

- **Grade 1:** <math><1/3</math> canal diameter
 - **Grade 2:** - **Grade 3:**
- This allows standardized reporting and surgical correlation.⁸

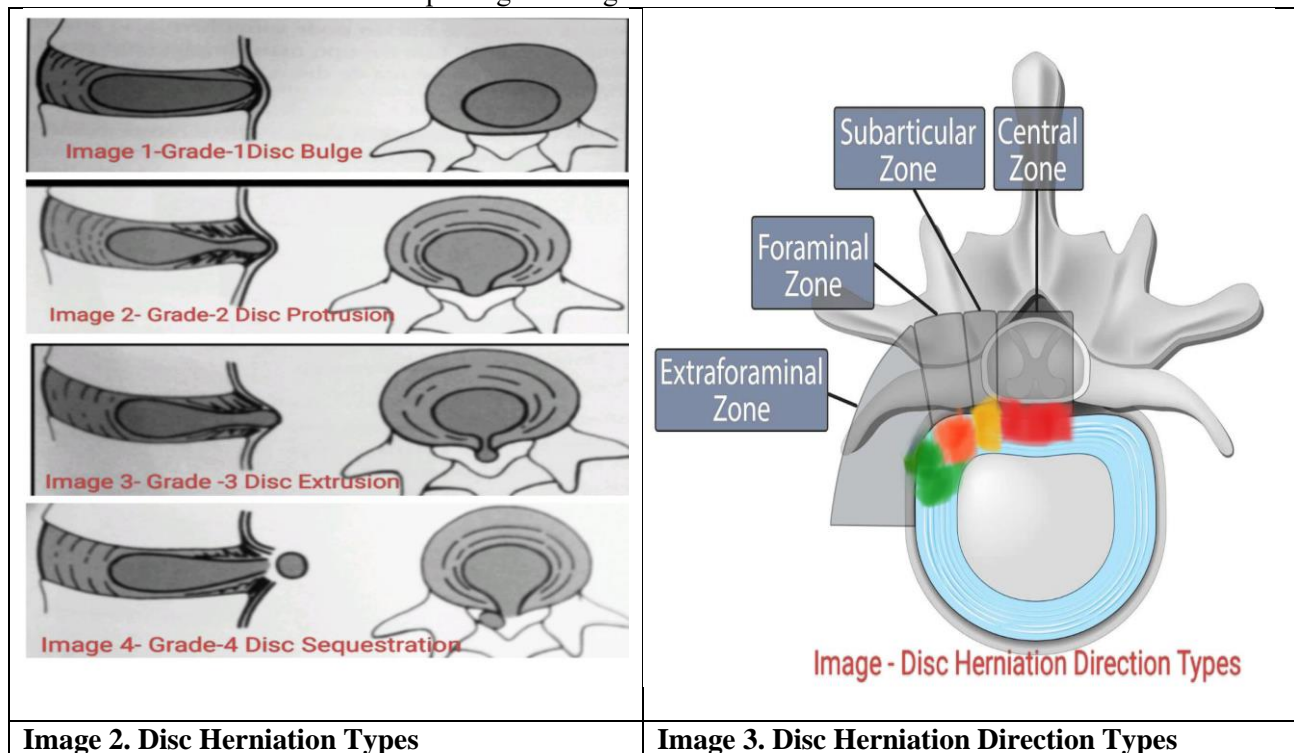


Table 5. Disc Herniation and Direction Types

Parameter	Category	Vataja (n=36)	Vatakaphaja (n=24)	p-value
1.Morphology	Bulge	6 (16.6%)	10 (41.6%)	0.01*
	Protrusion	20 (55.5%)	8 (33.3%)	0.04*
	Extrusion	10 (27.7%)	6 (25.0%)	0.81
	Sequestration	0	0	—
2.Direction	Central	4 (11.1%)	10 (41.6%)	0.008*
	Paracentral	20 (55.5%)	8 (33.3%)	0.02*
	Foraminal	12 (33.3%)	6 (25.0%)	0.11

Vatakaphaja cases showed more broad-based bulges, while Vataja cases showed more protrusions and extrusions. Vatakaphaja subtype was predominantly associated with central herniation, whereas Vataja subtype showed paracentral dominance.

6. Central Canal Stenosis & Foraminal Narrowing

A. Central Canal Stenosis Grading (Schizas MRI Classification)

This system evaluates morphological crowding of cauda equina and dural sac on axial T2 MRI.

Grade	Description
A1-A4	CSF visible between nerve roots (mild)
B	Partial CSF obliteration; nerve roots occupy >50% dural sac
C	No CSF; roots still distinguishable
D	No CSF; roots indistinguishable (“bundle of spaghetti” appearance)

Grades C–D are considered severe stenosis, often correlating with neurogenic claudication⁹

B. Foraminal Stenosis Grading (Lee Classification)

Developed for sagittal oblique MRI images, grading depends on the degree of nerve-root impingement and perineural fat obliteration.¹⁰

1. Central Canal Stenosis Severity	Severity	Vataja	Vatakaphaja	p-value
	Mild	20	8	0.03
	Moderate	10	10	0.04
	Severe	6	6	0.09
2. Foraminal Narrowing Severity	Mild	12	4	0.04
	Moderate	16	12	0.30
	Severe	8	8	0.21

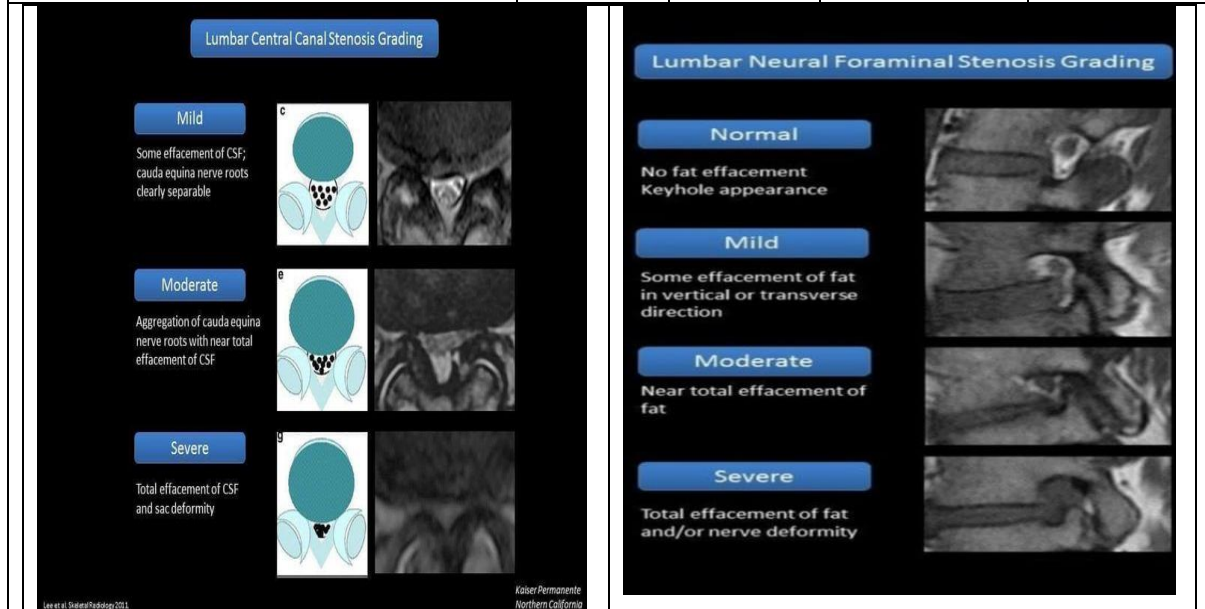


Image 4. Grading of Lumbar Central Canal Stenosis & lumbar Neural foraminal stenosis Severity

Grade	Findings
0 (Normal)	Root and perineural fat intact
1 (Mild)	Slight perineural fat obliteration, root not deformed
2 (Moderate)	Root contact or displacement without compression
3 (Severe)	Root collapse or distortion, complete fat loss

Moderate-to-severe canal stenosis was more prominently associated with *Vatakaphaja* presentations. Both subtypes showed significant foraminal compromise, with *Vatakaphaja* tending toward more compressive patterns.

6. Discussion

The present study offers a structured MRI-based evaluation of the classical Ayurvedic subtyping of *Gridhrasi* into *Vataja* and *Vatakaphaja* forms. By integrating detailed clinical phenotyping with standardized radiological grading systems, this work contributes to an improved understanding of how traditional doṣha-based classifications may correspond to objective structural changes observed on MRI. This integrative approach supports the conceptual alignment between Ayurvedic pathophysiology and contemporary imaging biomarkers and provides a framework for more precise diagnostic stratification.

Comparative Analysis of *Vātaja* and *Vātakaphaja* *Gridhrasī* Based on Radiological and Clinical Findings

The comparative analysis of radiological and clinical parameters revealed consistent and subtype-specific patterns between *Vataja* and *Vatakaphaja* *Gridhrasi*, suggesting distinct structural and functional phenotypes corresponding to classical Ayurvedic descriptions.

Patients classified as *Vataja Gridhrasi* demonstrated a predominance of degeneration-instability patterns on MRI. These included higher frequencies of disc desiccation, disc height reduction, and Pfirrmann grade II–III degeneration, along with narrow, focal protrusions or extrusions and relatively less severe central canal compromise. Listhesis and multilevel degenerative changes were more commonly observed in this group, reflecting a pattern of segmental instability rather than mass effect. Clinically, *Vataja* patients more often presented with sharp, shooting pain, variable symptom intensity, and comparatively less rigidity and heaviness.

In contrast, *Vatakaphaja Gridhrasi* was characterized by a compressive mass-effect dominant phenotype. MRI findings in this group more frequently included broad-based and bulky disc protrusions, central and multilevel herniations, moderate-to-severe central canal and foraminal stenosis, ligamentum flavum thickening, and more pronounced facet joint arthropathy. Nerve root compression, particularly at the L4–L5 and L5–S1 levels, was more frequent and more severe in *Vatakaphaja* patients. Clinically, this group exhibited more persistent symptoms, greater stiffness, heaviness, and functional limitation, along with a higher tendency toward chronicity.

The distribution of herniation direction further differentiated the subtypes. Paracentral and foraminal herniations were more frequent in *Vataja Gridhrasi*, whereas central and multidirectional herniations predominated in *Vatakaphaja Gridhrasi*. Similarly, foraminal stenosis and soft tissue hypertrophy were more prevalent and more severe in the *Vatakaphaja* group.

Laterality patterns did not show statistically significant differences between the subtypes, although bilateral involvement was common in both groups. However, the overall MRI severity scores were significantly higher in *Vatakaphaja Gridhrasi*, indicating a greater burden of structural compromise. Taken together, these findings suggest that *Vataja Gridhrasi* is predominantly associated with dehydration-driven degenerative and instability-type changes, whereas *Vatakaphaja Gridhrasi* exhibits bulk-related, compressive, and stenotic changes. This radiological distinction aligns with classical Ayurvedic concepts of *Vata*-dominant degeneration versus *Kapha*-associated obstruction and mass effect, and supports the clinical relevance of Ayurvedic subtyping in *Gridhrasi*.

Summary of Key Comparative Findings

Vataja Gridhrasi shows a degeneration-instability dominant pattern with disc dehydration, disc height loss, and milder compressive features.

Vatakaphaja Gridhrasi demonstrates a compressive mass-effect dominant pattern with bulky herniations, greater stenosis, nerve root compression, and higher overall severity.

Clinical symptom profiles parallel these structural patterns, with *Vataja* presenting as more dynamic and variable, and *Vatakaphaja* as more persistent and functionally limiting.

Summary of Key Findings

Vataja Gridhrasi was primarily associated with features of disc degeneration and segmental instability. This subtype showed a higher prevalence of disc desiccation, disc height reduction, and Pfirrmann grade II–IV degeneration. Radiologically, disc herniations in this group were more often narrow, focal protrusions or extrusions, and occasional retrolisthesis was observed, suggesting a tendency toward instability-driven pathology.

In contrast, *Vatakaphaja Gridhrasi* was characterized by bulky, broad-based annular bulges, a predominance of central disc herniations, and greater degrees of central canal and foraminal stenosis. This subtype demonstrated a higher frequency of mass-effect-related neural compression, reflected by more substantial compromise of the thecal sac and nerve roots.

These radiological patterns parallel the classical descriptions of *Vataja* as a *rukṣa-laghu-khara-chala* dominant state associated with degeneration and instability, and *Vatakaphaja* as a *guru-sthira-picchila* dominant state associated with bulk, obstruction, and compression.

Comparison with Prior Literature

Previous radiological studies have consistently identified reduced T2 signal intensity as an early marker of disc degeneration, Pfirrmann grade III–IV changes as indicators of advanced disc disease, central herniation as a contributor to spinal canal stenosis, and paracentral herniation as a frequent cause of radiculopathy at the L5–S1 level.

While these structural patterns are well documented in contemporary literature, prior studies have not examined their relationship to Ayurvedic *doṣha*-based clinical subtypes. The present findings are consistent with established radiological observations and extend them by demonstrating that degeneration-dominant changes are more frequent in *Vataja Gridhrasi*, whereas compressive and bulk-related changes are more prominent in *Vatakaphaja Gridhrasi*.

Ayurveda–Radiology Concordance

The observed correspondence between Ayurvedic descriptors and MRI findings suggests a conceptual alignment between classical *guṇa* theory and modern imaging phenotypes.

In *Vataja Gridhrasi*, classical attributes of *rukṣa* (dry), *laghu* (light), *khara* (rough), and *chala* (mobile) were reflected in MRI features such as disc desiccation, disc height reduction, annular fissuring, sharper protrusions or extrusions, and occasional retrolisthesis.

In *Vatakaphaja Gridhrasi*, attributes of *guru* (heavy), *sthira* (stable), *picchila* (viscous), and *avarāṇa* (obstruction of Vāta by Kapha) were reflected in bulky annular bulges, central herniations with canal stenosis, foraminal narrowing, and greater mass-effect–related nerve root compression.

Mechanistic Interpretation (Ayurveda–MRI Interface)

From a mechanistic perspective, the *Vataja* phenotype appears to correspond to biochemical and structural degradation processes, including reduced proteoglycan content, decreased disc hydration, loss of elasticity, annular weakening, and increased susceptibility to extrusion. These changes parallel the Ayurvedic concepts of *dhatu kṣhaya* and *rukṣa–laghu–khara–chala guṇas*.

Conversely, the *Vatakaphaja* phenotype appears to correspond to mass-effect–driven processes, including relative preservation or increase in disc volume, annular swelling, central displacement of disc material into the spinal canal, and resultant stenosis and neural compromise. These features parallel the Ayurvedic concepts of *guru–sthira–picchila guṇas* and *avarāṇa* pathogenesis.

Together, these observations suggest that *doṣha*-based physiological concepts, when interpreted in terms of tissue hydration, mechanical stability, and mass distribution, may offer a complementary framework for understanding patterns of disc pathology observed on MRI.

Clinical Implications

The differentiation of *Gridhrasi* into *Vataja* and *Vatakaphaja* subtypes based on combined clinical and radiological characteristics has practical implications for individualized management, prognosis, and interdisciplinary care.

Subtype-specific management:

Vataja Gridhrasi, characterized predominantly by degenerative and instability-type changes, may benefit from therapeutic strategies aimed at counteracting dryness, degeneration, and tissue depletion. These include *snehana* (oleation), *svedana* (sudation), *brumhāṇa* (nourishing therapies), *basti* (medicated enemas), and regenerative approaches.

Vatakaphaja Gridhrasī, associated with bulky, compressive, and obstructive pathology, may benefit from Kapha-*śamana* and *lekhana* approaches, mildly *rūkṣa svedana*, and decompressive strategies to reduce tissue bulk and neural compression.

Prognostic considerations:

Degeneration-dominant *Vataja* cases may follow a more chronic but relatively stable course and may respond favorably to consistent restorative therapy. *Vatakaphaja* cases with marked stenosis and mass effect may be more prone to acute exacerbations, functional limitation, and neurological compromise, and therefore may require closer monitoring and, in selected cases, surgical consultation.

Interdisciplinary communication:

Integrating Ayurvedic subtyping with radiological interpretation may enhance interdisciplinary dialogue. Radiologists can be sensitized to functional phenotypes underlying imaging patterns, while Ayurvedic clinicians can contextualize MRI findings within doṣha frameworks, promoting more coherent and patient-centered care.

Strengths of the Study

This study has several methodological and conceptual strengths. It applies standardized and widely accepted MRI grading systems to Ayurvedic phenotyping, enabling objective structural correlation. The use of a structured and reproducible Ayurvedic diagnostic framework with high inter-rater reliability strengthens internal validity. The statistical approach included not only significance testing but also measures of effect size, enhancing interpretive rigor. In addition, the study proposes a coherent mechanistic interface between Ayurvedic *guṇa* theory and disc biomechanics, offering a clinically applicable integrative model.

Limitations

The findings should be interpreted in light of certain limitations. The single-center observational design limits generalizability, and the sample size, although adequate for exploratory analysis, could be expanded in multicenter studies. MRI was performed using a 1.5-Tesla system; higher-field imaging and advanced techniques may detect subtler structural or biochemical changes. Although Ayurvedic phenotyping was standardized, some degree of clinician subjectivity is inherent. The absence of biochemical or inflammatory markers limits deeper exploration of molecular mechanisms underlying the observed structural patterns.

Future Directions

Future research may focus on developing a quantitative Ayurveda–MRI diagnostic scoring system for *Gridhrasi*, integrating multiple radiological and clinical variables. Machine learning approaches could be explored to map doṣha phenotypes onto complex imaging patterns. Longitudinal interventional studies are needed to evaluate changes in MRI parameters in response to subtype-specific Ayurvedic therapies. Integration with gait analysis, nerve conduction studies, and patient-reported outcome measures may provide a more comprehensive functional assessment. The use of advanced MRI techniques such as T2 mapping and diffusion imaging may further enhance early detection and mechanistic understanding of subtype-specific disc pathology.

7. Conclusion

The present study demonstrates that the classical Ayurvedic subtypes of *Gridhrasi*—*Vataja* and *Vatakaphaja*—are associated with distinct and quantifiable patterns on magnetic resonance imaging. *Vataja Gridhrasi* is predominantly characterized by disc desiccation, higher Pfirrmann grades of degeneration, disc height reduction, narrower and sharper protrusions or extrusions, and features suggestive of degenerative instability such as retrolisthesis. These findings parallel Ayurvedic descriptions of *rukṣa*, *laghu*, *khara*, and *chala guṇas* and a *dhatu kṣhaya*–dominant pathological state. In contrast, *Vatakaphaja Gridhrasi* is more frequently associated with broad-based annular bulges, central disc herniations, greater degrees of spinal canal and foraminal stenosis, and increased nerve root compression, reflecting mass-effect–dominant pathology. These structural patterns correspond conceptually to *guru*, *sthira*, and *picchila guṇas* and to *avarāṇa-type pathogenesis described in Ayurvedic texts*.

By integrating structured Ayurvedic phenotyping with objective radiological biomarkers, this study contributes to the development of an evidence-informed diagnostic interface between Ayurveda and

modern imaging. This integrative framework has the potential to support more precise subtype-specific diagnosis, guide individualized management strategies, and inform future interdisciplinary research in *Gridhrasi*.

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