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Review Article:

Deciphering Ashmari: An Integrative Translational Analysis of Classical Ayurvedic Pathophysiology, Renal Calculogenesis and Calculus Physicochemistry

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Abstract :

Background: *Ashmari* is described in the classical Ayurvedic texts as a disorder of *Mutravaha Srotas* centred on *Basti*, with *Vataja*, *Pittaja*, *Kaphaja* and *Shukraja* types in the *Brihatrayi*. Contemporary urology classifies calculi by mineral phase, aetiology and urinary context. Proposed equivalences between the two systems occur mainly in teaching and educational material.

Objective: To compare the two frameworks critically and to grade each proposed correlation by the strength of its evidence.

Methods: A critical narrative review of classical textual accounts, secondary Ayurvedic material and modern biomedical literature, supported by targeted web-based verification searches on 1 November 2026.

Results: Classical morphology supports a proposed morphological comparison of *Vataja Ashmari* with selected calcium oxalate calculi and a partial comparison of *Kaphaja Ashmari* with calcium phosphate calculi. The pairing of *Pittaja Ashmari* with uric acid calculi is a hypothesis requiring biochemical validation. *Shukraja Ashmari* belongs to a separate seminal tract category. Struvite, cystine, xanthine, 2,8-dihydroxyadenine, drug-induced and mixed calculi have no defensible classical counterpart.

Conclusion: None of the correlations is validated. Colour, shape and symptoms cannot establish mineral identity; prospective studies pairing classical phenotype with infrared spectroscopy or X-ray diffraction are needed.

Keywords: *Ashmari; Mutravaha Srotas; urolithiasis; renal calculi; calcium oxalate; uric acid; calculus physicochemistry; translational Ayurveda*

INTRODUCTION

Ashmari is among the oldest recognised urinary disorders in Ayurveda. The *Sushruta Samhita* devotes a chapter of *Nidanasthana* to its causes, premonitory features and types [1], whereas the *Charaka Samhita* describes it within *Mutrakrichchhra* in *Trimarmiya Chikitsa* [2]. The *Ashtanga Hridaya*, *Ashtanga Sangraha* and *Madhava Nidana* treat it under *Mutraghata* [3-5]. Across these sources the disorder centres on *Basti* and *Mutravaha Srotas*, with *Vata* is regarded as the factor responsible for drying urine and its associated components. [2].

Contemporary urology approaches the same entity differently. Nephrolithiasis is regarded as a pathophysiologically heterogeneous, systemic condition in which dietary and environmental exposures interact with genetic predisposition [6]. Stones form when urine becomes supersaturated, leading to crystal formation, growth, aggregation and retention [7]. They are classified by aetiology and mineral composition, and a single calculus is often a mixture [8]. Mineralogical studies show that human stones record repeated cycles of crystallisation, dissolution and recrystallisation [9].

Attempts to bridge the two systems exist mainly in teaching material and postgraduate theses. A clinical presentation, for example, pairs *Vataja Ashmari* with calcium oxalate, *Pittaja Ashmari* with uric acid and *Kaphaja Ashmari* with phosphate stones [10]. Such mappings are attractive but rest largely on colour, surface and symptom descriptions, which cannot establish mineral identity. This review therefore asks three questions: what do the classical texts state, what does modern stone science establish, and how strong is the evidence for each proposed correlation? The article proceeds from classical concept to modern classification, comparative method, correlation findings, physicochemical interpretation, critical discussion, clinical relevance and research gaps.

LITERATURE REVIEW

Classical sources and classification

Sushruta Samhita Nidanasthana chapter 3 is titled *Ashmari Nidana* and describes four types: *Vataja*, *Pittaja*, *Kaphaja* and *Shukraja* [1,11]. 26th chapter of *Charaka Chikitsa Sthana* serves as a foundational reference for understanding this concept. In the digitised edition consulted, verse 36 attributes formation to *Vata* drying semen and urine together with *Pitta* and *Kapha* lodged in *Basti*, and verse 37 lists forms resembling a *Kadamba* flower, stone, smooth, three-layered or soft [2]. That passage does not assign these forms to four *Dosha* types. A secondary review chapter further reports a *Mridu* and *Kathina* division attributed to *Charaka*, with *Vataja Ashmari* placed under *Kathina* [11]. This could not be confirmed in the edition consulted, and *Chakrapani*'s commentary was not examined; it is therefore treated as a secondary-source-reported classification and kept separate from *Sushruta*'s fourfold scheme.

Sharkara is described in verse 39 as fragments of an *Ashmari* broken by *Vata* and passed with urine [2]. *Sikata* and *Bhasmakhya* could not be verified from the sources consulted and are not interpreted. Chapter locations in the *Ashtanga Hridaya*, *Ashtanga Sangraha* and *Madhava Nidana* were confirmed from published tables of contents; [3-5].

Samprapti and Samprapti Ghataka

The pathogenesis as a sequence: *Nidana Sevana*, *Khavaigunya* in *Mutravaha Srotas*, *Kapha*-predominant *Dosha Sanchaya*, *Vata* and *Kapha Prakopa*, *Pratiloma Gati* of *Vayu*, *Agnimandya* with *Ama*, *Dosha-Dushya Sammurchana*, *Sthanasamshraya* in *Basti*, and finally *Mutra Dushti* with progressive solidification [12]. Its *Samprapti Ghataka* are *Kapha*-predominant *Tridosha*, *Mutra* as *Dushya*, *Mutravaha* as *Srotas*, *Sanga* as *Srotodushti*, *Jatharagni Mandya* and *Basti* as *Adhishthana* [12]. Also reads *Kapha* as an adhesive, matrix-like component, *Vata* as a drying and consolidating influence, and *Pitta* as altering the consistency of *Mutra* through *Ushna* quality [12]. This is an interpretive analogy, not a demonstrated biochemical equivalence.

Modern calculogenesis and classification

Nephrolithiasis is most often calcium oxalate, commonly mixed with calcium phosphate. Calcium oxalate stones are frequently driven by hypercalciuria, hyperoxaluria, hypocitraturia and low urine volume, whereas uric acid and calcium phosphate stones are commonly linked to urinary pH [6,7]. The EAU groups stones by aetiology into non-infection, infection, genetic and drug stones, and lists mineral phases separately: whewellite (COM), weddellite (COD), apatites, brushite, uricite, struvite and others [8,13]. Stones are also classified by location, from calyx and pelvis to ureter and bladder, and bladder stones have a separate guideline chapter [8]. Seminal vesicle calculi are rare, with 213 cases reported between 1928 and 2016 in one systematic review [14]. A single case report described large bilateral calculi presenting with spermolithiasis [15], and a small retrospective series noted that the cause of stone formation was unclear [16].

Existing correlations and the research gap

The only explicit mapping in the secondary material available is a clinical presentation pairing *Ashmari* types with stone chemistry and listing dehydration, obstruction, infection, gout and hypercalciuria as clinical contexts [10]. No source examined tests these pairings against laboratory stone analysis. That gap is addressed here.

RESEARCH METHODOLOGY

Study design: A critical narrative review with an attribute-level comparative framework. It is not a systematic review; PRISMA methodology was not followed, and no counts of records identified, screened or included are reported.

Classical sources: The primary texts were the *Sushruta Samhita*, *Charaka Samhita*, *Ashtanga Hridaya*, *Ashtanga Sangraha* and *Madhava Nidana*. *Acharya Sushruta's* refrence was checked against an English translation, and Acharya *Charaka* content against a digitised Sanskrit-English edition with verse numbers [1,2]. The other three texts were verified at chapter level only [3-5]. Commentaries were not examined directly; the attribution of the *Nibandhasangraha* to *Dalhana* and of the *Ayurveda Dipika* to *Chakrapani* was confirmed from bibliographic records. Secondary Ayurvedic material comprised a Review of Literature chapter, a postgraduate thesis and a clinical presentation from the author's research collection [10-12]. Their content was drawn from a research data bank prepared from those materials; the original files were not independently inspected.

Modern literature search: Searches were run on 1 November 2026 through a general web search tool, which retrieved PubMed, PubMed Central, publisher

and EAU web pages. Scopus and Google Scholar were not searched, and PubMed was not queried through its own interface. Search terms were: kidney stone disease risk factors pathophysiology management; human kidney stones biomineralization; EAU guidelines on urolithiasis 2026 stone composition; EAU guidelines diagnosis and treatment of urolithiasis; kidney stones supersaturation nucleation aggregation retention; seminal vesicle calculi diagnosis management; seminal vesicle calculi stone composition infrared; and queries for the chapter locations of *Ashmari* in each classical text.

Selection and appraisal: Peer-reviewed reviews, guidelines and primary studies on stone composition, mineralogy, calculogenesis and seminal tract calculi were included. Commentary used for mechanistic claims, and publications reporting only treatment outcomes without composition data, were excluded. One case report [15] was used only for the case it describes; broader statements on seminal vesicle calculi rest on the systematic review [14]. Each source was appraised for type and authority, and every modern citation was matched to its publisher, PubMed or guideline page. Evidence was weighed in the order classical texts, peer-reviewed literature and EAU guidelines, secondary Ayurvedic material, and educational presentations.

Synthesis: Classical parameters (*Dosha*, colour, shape, size, texture, consistency, symptoms) were tabulated against modern parameters (mineral phase, imaging behaviour, urinary pH, metabolic or infective context). Each pairing received one label: proposed correlation, partial morphological correlation, pathophysiological similarity, hypothesis requiring biochemical validation, insufficient evidence or not directly comparable. Morphology and mineral composition were treated as different levels of description.

RESULTS

CLASSICAL FINDINGS

Table 1 summarises the four types by Acharya *Sushruta*. *Vataja Ashmari* is dark, rough, hard and thorn-like, with severe pain at micturition. *Pittaja Ashmari* varies from reddish-yellow to black or honey-coloured and is accompanied by burning features. *Kaphaja Ashmari* is white, large, smooth and unctuous, with heaviness and cold in *Basti*. *Shukraja Ashmari* is linked to *Shukra* in adults [1,11,12]. Colour, shape and consistency were not specified for *Shukraja* in the sources consulted.

Table 1. Classical Ayurvedic classification of *Ashmari* according to *Sushruta* (sources: [1,11,12]). *Charaka* (Chikitsasthana 26, verses 36-39) lists forms without assigning them to these four types [2].

Type	Dosha	Colour	Shape and surface	Size, texture, consistency	Clinical features
Vataja	*Vata*	*Shyava* (dusky, dark)	*Vishama*; thorn-like projections resembling *Kadamba Pushpa*	*Parusha* (rough, coarse); hard	Severe pain at micturition, teeth clenching, pressure around umbilicus, rubbing of genitalia, crying out
Pittaja	*Pitta*	*Rakta*, *Pita*, *Krishna* or *Madhu*	Resembles *Bhallataka* seed or bone	Not specified	*Dushana*, *Chushana*, *Dahana*, *Pachana*
Kaphaja	*Kapha*	*Shweta*; *Madhuka Pushpa*-like	Resembles *Kukkutanda*	*Mahat* (large), *Snigdha* (unctuous)	*Daalana*, *Bhedana*, *Nisthoda* pain; heaviness and coldness in *Basti*
Shukraja	*Vata* drying retained *Shukra*	Not specified	Not specified	Not specified	Adults; dysuria, bladder-region pain, testicular or scrotal swelling

MODERN CLASSIFICATION

Table 2 lists the modern categories. COM and COD are distinct phases, calcium phosphate comprises several minerals, and struvite is a separate infection-associated magnesium ammonium phosphate [8].

Table 2. Modern classification of renal calculi (sources: [6-11]). Entries marked "not characterised in sources" could not be verified from the sources consulted. COM, calcium oxalate monohydrate; COD, calcium oxalate dihydrate.

Stone type	Chemical composition	Crystal and imaging features	Colour and morphology	Urinary pH association	Major pathophysiological factors
COM	Whewellite, $CaC_2O_4 \cdot H_2O$	Monohydrate; radiopaque; particularly hard [8]	Dark, rough, spiky [11]	Not pH-defined in sources	Hypercalciuria, hyperoxaluria, hypocitraturia, low urine volume [6]
COD	Weddellite, $CaC_2O_4 \cdot 2H_2O$	Dihydrate; radiopaque; hydrate phases may interconvert [8,9]	Not separable from COM by appearance	Not pH-defined in sources	As for COM; distinguished by composition analysis [8]
Calcium phosphate	Carbonate apatite, hydroxyapatite, brushite ($CaHPO_4 \cdot 2H_2O$), whitlockite	Radiopaque; brushite is hard and high-risk [8]	Dirty white [11]	Higher pH may promote formation [8]	Disorders of calcium metabolism; infection for highly carbonated apatite [8]
Uric acid and urate	Uricite, $C_5H_4N_4O_3$; ammonium and sodium urates	Radiolucent on plain film [8]	Yellow to dark brown [11]	Linked to urinary pH [6]; dissolves at pH 7.0-7.2 [8]	Purine metabolism; gout [10]
Struvite	Magnesium ammonium phosphate hexahydrate	Poor radiopacity [8]	Not characterised in sources	Not characterised in sources	Infection-associated [8]
Cystine	Cystine	Poor radiopacity; particularly hard [8]	Not characterised in sources	Not characterised in sources	Genetic cystinuria [8]
Xanthine	Xanthine	Radiolucent [8]	Not characterised in sources	Not characterised in sources	Genetic xanthinuria [8]
2,8-Dihydroxyadenine	2,8-Dihydroxyadenine	Radiolucent [8]	Not characterised in sources	Not characterised in sources	Genetic APRT deficiency [8]
Drug-induced	Active compound or metabolite, for example indinavir [8]	Radiolucent; indinavir stones are not detected on non-contrast CT [8]	Varies	Varies	Crystallisation of drug in urine [8]
Mixed	Two or more components	Common; for example calcium oxalate with calcium phosphate [7,8]	Layered; composition varies within one stone [9]	Varies	Several concurrent mechanisms

INTEGRATED CORRELATION

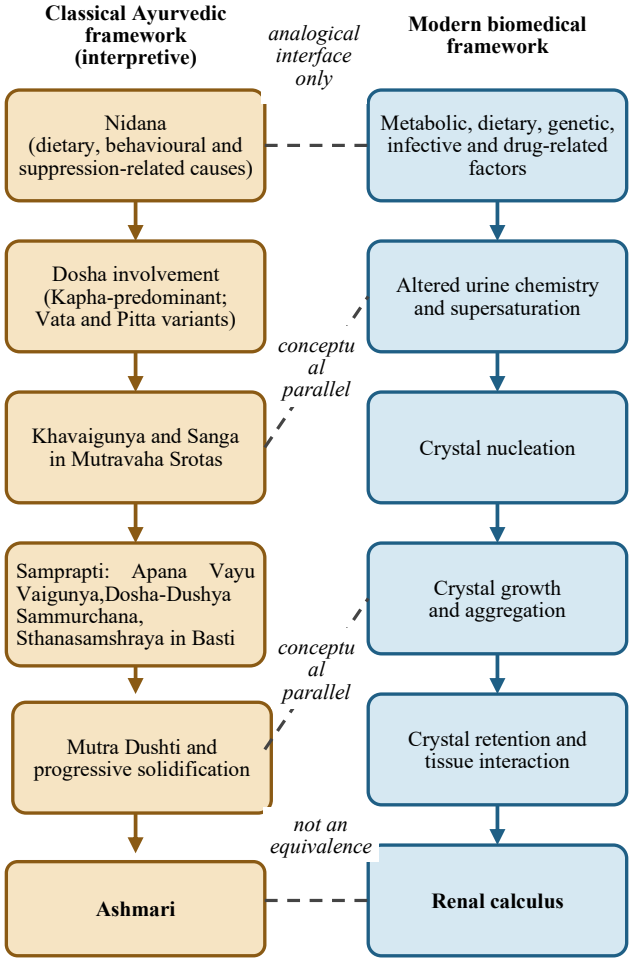
Table 3 grades each comparison. One classical type received a proposed morphological correlation, one a hypothesis status requiring biochemical validation, one a partial morphological correlation and one a separate anatomical category. Six modern categories had no defensible classical counterpart.

Table 3. Integrated Ayurvedic-modern correlation matrix. Correlations are proposals for testing, not established equivalences (sources: [1,8-12,14,16]).

Ayurvedic type	Classical attributes	Proposed modern correlation	Supporting similarities	Contradictions and limitations	Evidence status
Vataja	Dark, rough, hard, irregular, thorn-like; severe pain [1]	Selected calcium oxalate calculi; COM and COD distinct [10]	Calcium oxalate stones described as dark, rough, spiky [11]; COM particularly hard [8]	Colour and roughness do not fix mineral type; COM and COD not separable by appearance; brushite and cystine also hard [8]; *Vata* has no biochemical counterpart	Proposed morphological correlation
Pittaja	Reddish-yellow, black or honey colour; *Bhallataka*-like; burning [1]	Uric acid calculi [10]	Yellow to dark brown stones [11]; gout as clinical context [10]	Colour variable; burning not composition-specific; *Pitta* cannot be equated with urinary pH	Hypothesis requiring biochemical validation
Kaphaja	White, large, smooth, unctuous; *Kukkutanda*-like [1]	Calcium phosphate and other phosphate-containing calculi [10]	Phosphate stones often dirty white [11]; *Kapha*-matrix analogy [12]	Whiteness non-specific; calcium phosphate and struvite chemically distinct [8]; matrix analogy interpretive	Partial morphological correlation
Shukraja	Retained *Shukra*; dysuria; scrotal swelling [1,11]	Seminal tract calculi (seminal vesicle, prostatic utricle) [14,16]	Retention theme in classical account; a small series of seminal vesicle and/or prostatic utricle calculi reported mainly calcium oxalate and carbonate apatite [16]	Different organ and secretion; series included both sites, so composition cannot be attributed to seminal vesicle calculi alone [16]; not a renal stone	Not directly comparable; separate anatomical category

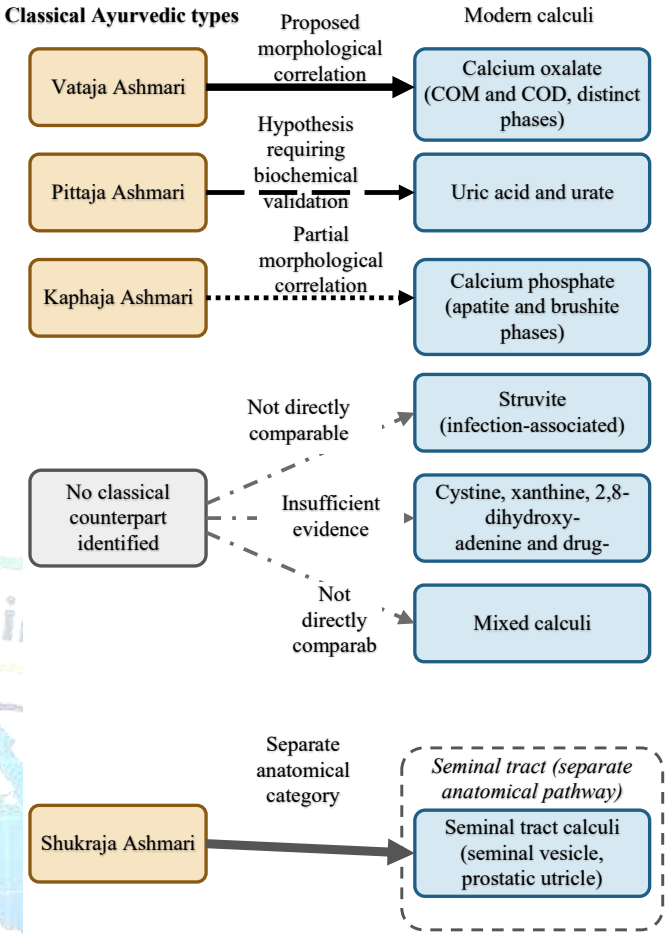
INTEGRATED FIGURES

Figure 1 sets the two explanatory frameworks side by side. The classical sequence runs from *Nidana* through *Dosha* involvement and disturbance of *Mutravaha Srotas* to *Samprapti* and *Ashmari* [2,12]. The modern sequence runs from metabolic, infective, genetic and drug-related factors through supersaturation, nucleation, growth, aggregation and retention to calculus formation [7]. Figure 2 maps each classical type to modern categories using the evidence labels of Table 3, with *Shukraja Ashmari* kept on a separate seminal tract pathway.



Note: Dashed lines: conceptual parallels only. Dosha are not molecular entities and do not correspond to specific minerals or biochemical pathways.

Figure 1. Integrated Ayurvedic-modern conceptual flowchart. *Left:* classical sequence from *Nidana* to *Ashmari* [12] and consistent with the *Charaka* passage [2]. *Right:* contemporary calculogenesis [7]. Dashed lines mark conceptual parallels or an analogical interface only. *Dosha* are not molecular entities and have no direct biochemical counterpart. The modern pathway is simplified; several mechanisms interact and the sequence is not strictly linear.



Note: Line style indicates evidence status only (as in Table 3); arrows do not imply biochemical equivalence between Dosha and any mineral phase. COM, calcium oxalate monohydrate; COD, calcium oxalate dihydrate.

Figure 2. Integrated Ayurvedic-modern *Ashmari* correlation map. Heavy solid arrow: proposed morphological correlation. Dashed arrow: hypothesis requiring biochemical validation. Dotted arrow: partial morphological correlation (calcium phosphate). Dash-dot arrows: no classical counterpart (not directly comparable, or insufficient evidence). Thick grey arrow: separate anatomical category. *Shukraja Ashmari* follows a separate seminal tract pathway [14,16]. Evidence status follows Table 3; arrows do not imply biochemical equivalence.

DISCUSSION

Classical understanding and contemporary relevance

The classical account is a clinical-pathological narrative organised around site, channel, substance and *Dosha*. The verified *Charaka* passage explains formation by *Vata* drying urine and semen with *Pitta* and *Kapha* in *Basti* [2], and the thesis elaborates the same theme as a *Samprapti* sequence [12]. This parallels the modern emphasis on a susceptible environment in which crystals are retained [7,9], but the parallel is structural, not mechanistic.

Aharaja and Viharaja Nidana in relation to modern risk factors

Classical Ayurvedic accounts of *Ashmari* and *Mutrakrichchhra* emphasize dietary (*Aharaja*) and behavioural/lifestyle (*Viharaja*) factors alongside omission of seasonal purification (*Asamshodhanasheela*). *Aharaja* contributors-such as *Madhura*, *Guru*, *Snigdha* and *Abhishyandi* foods, *Adhyashana* (over-eating), *Ajirna Bhojana* (eating before digestion of a previous meal), *Matsya* and *Anupa Mamsa* (marshy/aquatic animal flesh), and *Madya*-broadly correspond in lifestyle terms to high-caloric, purine-rich or sodium/oxalate-dense diets, irregular meal habits, and dehydration or fluid imbalance. Similarly, *Viharaja* factors such as *Divaswapna* (daytime sleep), sedentary habits or *Ati Vyayama* (excessive exertion), *Drutaprishthayana* (jostling/riding on animals or vehicles), and *Bharavahana* (heavy weight-bearing) align conceptually with physical inactivity, insensible fluid loss from exertion or heat exposure, and mechanical/stasis-related triggers rather than direct biochemical causation. While these parallels illustrate overlapping lifestyle vulnerabilities across traditions, *Nidana* descriptions do not specify metabolic pathways such as hypercalciuria, hyperoxaluria, hypocitraturia, or genetic transporter defects, and should therefore be framed as behavioural and environmental risk analogies rather than mechanistic equivalents.

Interpreting Dosha-based classification

Acharya Sushruta's scheme classifies by predominant *Dosha*, whereas modern classification rests on mineral phase and aetiology [1,8]. The two answer different questions, so a *Dosha* cannot be assigned to a mineral or metabolic pathway. The *Charaka* passage lists forms without a *Dosha* key [2], and the *Mridu-Kathina* division reported by a secondary source remains unverified [11]. Classical classification was therefore not uniform. The defensible use of *Dosha* categories is as phenotype descriptors to be tested against laboratory data.

Vataja Ashmari and calcium-based calculi

Dark colour, roughness, hardness and thorn-like projections [1] resemble descriptions of calcium oxalate stones as dark, rough and spiky [11]. COM is a particularly hard stone [8]. Yet the *Kadamba* analogy appears in *Charaka* for stones in general [2], colour and roughness occur across mineral types, and COM and COD cannot be separated by appearance. Brushite and cystine stones are also particularly hard [8], so hardness does not single out calcium oxalate. The resemblance supports a proposed morphological correlation, not identity.

Pittaja Ashmari and uric acid calculi

The pairing has some basis. *Pittaja* stones are described as reddish-yellow, black or honey-coloured [1], uric acid stones as yellow to dark brown [11], pure uric acid stones are radiolucent on plain radiography [8], and the clinical presentation links them with gout [10]. However, urinary acidity is a measurable pH parameter and cannot be equated with *Pitta*, and burning micturition is not specific to uric acid stones. Uric acid stones dissolve when urine is alkalinised to pH 7.0-7.2 [8], which offers a testable handle: urinary pH, uric acid excretion and stone analysis in patients classed as *Pittaja*. Until then the pairing is a hypothesis requiring biochemical validation.

Kaphaja Ashmari and phosphate-based calculi

White, large, smooth, unctuous stones [1] may resemble the dirty-white phosphate stones described in the secondary review chapter [11]. The *Kapha*-organic matrix analogy [12] is interpretive, not a proven biochemical equivalence. Calcium phosphate comprises distinct phases, including apatite and brushite, and brushite stones are a high-risk type [8]. Struvite is magnesium ammonium phosphate and an infection-associated stone [8]; it must not be absorbed into *Kaphaja Ashmari* merely because both may be pale and large. Because most stones contain calcium oxalate mixed with calcium phosphate [7], a one-to-one mapping is further limited.

Struvite calculi and Kapha–Pitta-predominant Dosha Dushti: critical appraisal

Struvite (magnesium ammonium phosphate hexahydrate) stones arise when urease-producing bacteria hydrolyse urea into ammonia and carbon dioxide, markedly alkalinising urine (typically above pH 7.2–7.5), damaging the protective urothelial glycosaminoglycan layer, promoting bacterial biofilm formation, and driving rapid precipitation of struvite and carbonate apatite. From a translational standpoint, one might loosely compare *Kapha* with mucoid/biofilm-like stasis and *Pitta* (*Ushna*/*Tikshna* qualities) with local inflammatory/infectious irritation in the urinary tract. However, this pairing remains an interpretive analogy rather than a validated pathophysiological equivalence: classical *Ashmari* pathogenesis centres on *Dosha* and *Mutravaha Srotas* dysfunction without identifying urease-positive bacterial infection as the obligatory driver, and struvite stones are clinically defined by urinary tract infection, urinary stasis, and alkaline pH rather than a *Kapha–Pitta* phenotype. Accordingly, in Table 3 and Figure 2, struvite calculi are best retained under **No classical counterpart / Not directly comparable** unless future clinical studies explicitly test whether specific symptom clusters correlate with infection-related stones.

Shukraja Ashmari and seminal tract concretions

The classical account ties *Shukraja Ashmari* to *Shukra* in adults [1,11]; in *Charaka*, obstruction of urine by semen is described separately from *Ashmari* itself [2]. Seminal vesicle calculi are rare [14]. A single case report of large bilateral calculi presenting with spermolithiasis

illustrates one presentation only and supports no general statement [15]. The available composition data come from a small retrospective series of 27 patients with seminal vesicle calculi, prostatic utricle calculi or both, in whom stone composition was analysed by infrared spectroscopy in 19 [16]. The analysed calculi were mainly calcium oxalate dihydrate (8 of 19) and carbonate apatite (4 of 19), with mixed compositions in the remainder [16]. Because the series included both anatomical sites and the composition data available to this review are not separated by site, these findings cannot be attributed exclusively to seminal vesicle calculi. Mineral overlap with renal stones does not establish equivalence, because the organ, secretion and clinical context differ. *Shukraja Ashmari* therefore remains a separate anatomical category, and any comparison with modern seminal tract calculi is tentative.

Classical morphology and modern physicochemistry

Classical descriptors are macroscopic observations of colour, shape, texture and size. Modern classification rests on mineral phase, determined preferably by infrared spectroscopy or X-ray diffraction, with polarisation microscopy giving equivalent results [8]. Stones are often mixtures [8] and may be layered records of repeated crystallisation, dissolution and recrystallisation [9], so surface appearance reflects only part of their history. Morphology cannot substitute for composition analysis.

Randall's plaque and papillary calculogenesis

Beyond free-solution supersaturation alone, Randall's plaque provides a key histopathological mechanism for idiopathic calcium oxalate stone attachment. In this model, suburothelial interstitial deposits of calcium phosphate (predominantly carbonated apatite) initiate along the basement membranes of the thin loops of Henle and vasa recta in the renal papilla, potentially involving local oxidative stress, inflammatory signalling, and osteogenic-like cellular responses. Once urothelial integrity is disrupted, these exposed interstitial plaques serve as an anchored nidus onto which calcium oxalate crystals can adhere and grow in the calyceal urine. Including Randall's plaque highlights that stone retention and growth can begin at a fixed tissue interface rather than solely via free-floating crystal aggregation in the urinary stream an insight that underscores why surface morphology alone cannot reconstruct internal stone history.

Similarities and contradictions

Similarities include hard, dark, spiky stones and pale, large stones in both accounts, retention as a recurring theme, and a multifactorial origin. Contradictions are equally clear: the fourfold scheme cannot accommodate genetic, drug-induced, infection-associated or mixed stones [8]; *Sushruta* and *Charaka* do not present the same scheme [1,2]; and the classical texts offer no composition data against which morphology could be checked.

Limitations of existing correlations

The classical evidence is partly secondary. Verse-level verification was possible only for *Charaka*, no commentary was examined, and the thesis, review chapter and presentation [10-12] were accessed through a data bank, not as original files. The presentation is educational, and classical observations were uncontrolled. The seminal tract composition data [16] come from a small retrospective series that included prostatic utricle calculi and were checked at abstract level only. This review is narrative, its searches were web-based, and it presents no new experimental data.

Possibilities for translational research

Classical phenotype documentation can be paired with imaging, urinary pH and biochemistry, and laboratory-confirmed stone composition. A blinded, prospective design could test whether classical types predict mineral class beyond chance. The results may also show that classical categories track clinical severity, infection or consistency rather than mineral type, which would itself refine the framework.

CLINICAL IMPLICATIONS

Urinary pH, stone chemistry, and symptom overlap

Urinary pH strongly influences the solubility and crystallisation of specific stone minerals, yet it does not map cleanly onto classical *Dosha* categories or produce pathognomonic symptoms. Lower (more acidic) urinary pH favours uric acid precipitation and cystine stone formation, whereas persistently elevated (alkaline) urinary pH favours calcium phosphate and infection-induced struvite crystallisation. Clinically, symptoms such as burning micturition (*Daha*), dysuria (*Mutrakrichchhra*), flank or suprapubic pain (*Shoola*), urgency, frequency, or haematuria (*Raktamutrata*) reflect urothelial irritation, obstruction, passage of crystals or calculi, or superimposed urinary tract infection rather than a single mineral phase or urinary pH value. Accordingly, objective dipstick pH measurement, urinalysis, and culture provide essential physicochemical context that bedside symptoms alone cannot establish.

CONCLUSION

Pathogenesis of *Ashmari* described in *Ayurveda* demonstrates certain conceptual similarities with the contemporary understanding of urolithiasis. Ayurveda explains *Ashmari* through *Dosha Prakopa*, particularly involvement of *Kapha, Vata and Pitta*, resulting in *Mutravaha Srotodushti* and formation of hard concretion with in urinary system. Modern medicine explains urinary calculus formation through urinary super saturation, crystal nucleation, growth, aggregation and retention. The progressive accumulation and hardening

described in the *Samprapti* of *Ashmari* in Ayurveda can be conceptually compared with the stages of crystal formation and stone enlargement in modern pathophysiology. Similarly the clinical manifestations described in Ayurveda, such as *Shoola, Mutrakrichra* and *Raktamutrata* have clinical counterpart in renal colic, dysuria and hematuria. How ever these similarities represent comparative interpretations rather than identical pathological mechanisms.

FUTURE SCOPE

Future research may be directed towards the systematic evaluation of *Dosha*-pacifying properties of various formulations indicated in *Ashmai.* Their action may be assessed based on classical *Ayurvedic* pharmacological principles and supported by appropriate experimental investigations. Subsequently, patients may be selected based on the predominant *Dosha* involved in *Ashmari* and the corresponding *Dosha* pacifying *Kashaya* may be administered to the respective groups. Clinical studies can be conducted to evaluate the therapeutic response and establish the relevance of *Dosha* specific treatment in *Ashmari.* Such clinical trials may provide a scientific basis for individualized *Ayurvedic* management and contribute towards developing more specific and evidence based treatment protocols.

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