

REAPPRAISAL OF SUSHRUTOKTA TWAK SHARIR THROUGH HISTOMORPHOLOGICAL FINDINGS IN DADRU KUSTHA

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ABSTRACT

Twak Sharir is an important component of Ayurvedic anatomy. Sushruta describes seven layers of *Twak* and associates specific disorders with different levels. *Dadru Kustha* is characterized by circular, raised, pruritic and spreading lesions and has been clinically correlated with superficial dermatophytosis, particularly tinea corporis. A narrative literature-based analysis was undertaken using classical Ayurvedic texts, published scholarly interpretations and contemporary literature on skin histology, tinea corporis and dermatophyte-associated histopathological changes. Classical descriptions of the seven layers of *Twak* and *Dadru* were compared with documented epidermal, stratum corneum and superficial dermal findings. Sushruta describes *Avabhasini*, *Lohita*, *Shweta*, *Tamra*, *Vedini*, *Rohini* and *Mamsadhara* as seven successive layers of *Twak*. *Dadru* is characterized by *Mandala*, *Kandu*, elevation and

spreading morphology. In contemporary dermatopathology, tinea corporis predominantly involves keratinized superficial tissue and may demonstrate hyperkeratosis, parakeratosis, spongiosis, acanthosis and superficial inflammation. Septate fungal hyphae may be demonstrated by PAS or GMS staining. These findings provide useful points of comparison with the superficial disease expression described in Ayurveda; however, direct equivalence between individual Ayurvedic layers and modern histological strata cannot be established. Histomorphology can strengthen the contemporary understanding of *Sushrutokta Twak*

Sharir when used as a comparative rather than literal anatomical framework. Prospective clinicopathological studies integrating Ayurvedic phenotyping with mycological and histopathological assessment are required for further validation.

KEYWORDS: *Twak Sharir; Dadru Kustha; Sushruta Samhita*; histomorphology; dermatophytosis; tinea corporis.

INTRODUCTION

Twak occupies an important position in Ayurvedic anatomy because it is described not merely as an external covering but as a structure with distinct layers, developmental origin, sensory significance and disease-specific relationships. Sushruta presents seven layers of *Twak* and describes their relative thickness and the disorders that tend to manifest at particular levels. This account is particularly important for the interpretation of skin diseases because it provides a depth-oriented model in which clinical expression is linked with the level of tissue involvement.^[1,2]

Among the disorders described under *Kustha*, *Dadru* is clinically distinctive. Sushruta describes *Dadru* as a spreading, raised and circular lesion associated with itching and a tendency to persist before becoming fully manifest. He places *Dadru* among *Mahakustha* and associates it predominantly with *Kapha* in the classical classification.^[1] Modern authors have commonly compared *Dadru* with dermatophytosis, especially tinea corporis, because of the overlap in annular configuration, pruritus, peripheral activity and superficial involvement.^[3,4] The correlation is clinically useful but should remain a comparative interpretation rather than an assertion that the two diagnostic systems are identical.

Contemporary dermatopathology offers an additional perspective. Tinea corporis is a superficial infection of keratinized skin caused predominantly by dermatophytes of the genera *Trichophyton*, *Microsporum* and *Epidermophyton*. Typical lesions are sharply circumscribed, annular, scaly plaques with an active peripheral margin and variable central clearing. Confirmation can be obtained by potassium hydroxide (KOH) examination of skin scrapings, fungal culture and, when biopsy is performed, histological examination with fungal stains.^[5,6]

The value of histology in superficial dermatophytosis lies not only in identifying fungal elements but also in characterizing the tissue reaction. Reported findings include compact

hyperkeratosis, parakeratosis, spongiosis, acanthosis, neutrophils in the stratum corneum or superficial epidermis and variable papillary dermal inflammation. PAS and GMS stains increase the visibility of fungal elements, although the histological reaction pattern itself is not pathognomonic.^[7-10] Therefore, a histomorphological reappraisal of *Dadru* can potentially clarify which components of the classical description have meaningful morphological parallels and which belong to a different conceptual framework.

The present article therefore aims to reassess Sushrutokta *Twak Sharir* through the lens of the histomorphology reported in *Dadru*-like dermatophytosis. The purpose is not to force a modern anatomical equivalence upon the classical seven-layer model, but to establish a disciplined dialogue between classical Ayurvedic anatomy and contemporary pathology.

MATERIALS AND METHODS

This article was designed as a narrative textual and literature-based reappraisal rather than as a report of original biopsy data. The primary classical source was Sushruta Samhita, particularly Sharira Sthana and Nidana Sthana, supported by published translations and secondary scholarly discussions of the seven layers of *Twak* and *Dadru*.^[1,2,11] Contemporary literature was reviewed for the clinical morphology, diagnosis and histopathology of tinea corporis and superficial dermatophytosis.^[5-10,12]

The conceptual analysis was performed in four stages. First, the classical description of the seven layers of *Twak*, their stated thickness and their associated disorders was extracted. Second, the classical description of *Dadru* was reviewed with attention to lesion configuration, colour, elevation, itching and spread. Third, contemporary histomorphological findings of tinea corporis were organized according to the epidermal, stratum corneum and dermal compartments. Finally, the two frameworks were compared at the level of morphology, depth, function and disease expression.

Because the present work is not based on a defined patient series, no numerical histopathological frequency, treatment response or diagnostic accuracy is claimed. The term histomorphological correlation is therefore used to denote comparison with findings documented in contemporary literature. Any future original study should use prospectively defined clinical criteria, adequate biopsy sampling, H&E examination, PAS or GMS staining and microbiological confirmation wherever feasible.

SUSHROUTOKTA TWAK SHARIR: CLASSICAL FOUNDATION

Sushruta describes seven layers of *Twak* formed during embryonic development and deposited successively in a manner compared with layers formed during the boiling of milk. The seven layers are *Avabhasini*, *Lohita*, *Shweta*, *Tamra*, *Vedini*, *Rohini* and *Mamsadhara*.^[1,2] The description is notable because each layer is associated with a characteristic name, an approximate thickness expressed in relation to *Vrihi* and a group of disorders.

Avabhasini is the outermost layer and is associated with reflection of colour and surface appearance. Sushruta assigns *Sidhma* and *Padmakantaka* to this level. *Lohita* is the second layer and is associated with conditions such as *Tilakalaka*, *Nyaccha* and *Vyanga*. *Shweta* is the third layer and is associated with *Ajagalli*, *Charmadala* and *Masaka*. *Tamra* is the fourth layer and is described as the site of *Kilasa* and *Kustha*. *Vedini* is the fifth layer and is associated with *Kustha* and *Visarpa*. *Rohini* is the sixth layer and is related to deeper proliferative lesions such as *Granthi*, *Apachi* and *Arbuda*. *Mamsadhara* is the seventh and deepest layer, associated with conditions including *Bhagandara*, *Vidradhi* and *Arsha*.^[1,2]

The distribution is important for the present discussion because *Kustha* appears in relation to both *Tamra* and *Vedini*. This suggests that *Kustha* should not be interpreted as a disorder confined to one narrowly defined anatomical depth. Instead, the classical text allows a range of tissue-level expression. The model is therefore better regarded as a layered clinicopathological framework in which external appearance, sensation and progressive tissue involvement are integrated.

A further feature of the classical description is that the thickness values should not be read as direct modern measurements in millimetres. Sushruta expresses the dimensions in fractions of a *Vrihi*, and the text itself limits the applicability of these measurements to the skin of fleshy parts of the body.^[1] Thus, converting these units mechanically into modern histological thickness would create a false precision.

DADRU KUSTHA IN THE AYURVEDIC FRAMEWORK

Sushruta includes *Dadru* among the *Mahakustha* and describes it as a raised, circular and pruritic lesion with a spreading tendency. The lesion is described as having the colour of *Atasi* flower or copper and as being accompanied by *Pidaka*-like elevations. The

characteristic combination of *Mandala*, *Kandu*, elevation and spread makes *Dadru* a clinically recognizable phenotype within the classical *Kustha* group.^[1]

The Ayurvedic interpretation of *Dadru* is also influenced by *Dosha* predominance. Sushruta associates *Dadru* with *Kapha* predominance, while other classical descriptions emphasize the involvement of *Pitta* and *Kapha*. Contemporary Ayurvedic literature commonly describes *Dadru* as a *Kaphapitta*-dominant condition.^[3,4] Such variation should be acknowledged rather than concealed, because classical nosology is interpreted through different textual traditions and commentarial approaches.

The correlation of *Dadru* with *tinea corporis* is primarily based on morphology. *Tinea corporis* typically produces an annular, erythematous, scaly plaque with a more active peripheral edge, central clearing and pruritus. Dermatophytes preferentially colonize keratinized tissues, and the infection generally remains superficial unless complicated by follicular or deeper invasion.^[5,6] These features overlap substantially with the classical external description of *Dadru*.

However, morphology alone cannot establish etiological identity. An annular lesion may occur in several inflammatory, infectious and immune-mediated dermatoses. Conversely, dermatophytosis can develop atypical morphology after corticosteroid exposure or other forms of treatment. Therefore, *Dadru*-*tinea* correlation is strongest when classical clinical characterization is combined with contemporary mycological confirmation.

CONTEMPORARY HISTOLOGY OF NORMAL SKIN

Modern histology divides the skin into epidermis and dermis, with the subcutaneous tissue lying beneath the dermis. The epidermis is a stratified squamous keratinized epithelium composed principally of keratinocytes and organized into recognizable strata. From deep to superficial, these include the basal, spinous, granular and cornified layers, with an additional lucid layer in thick skin. The dermis contains papillary and reticular components and includes collagen, elastic fibres, blood vessels, nerves, glands and hair follicles.

This organization provides a structural basis for understanding superficial dermatophytosis. The stratum corneum is composed of terminally differentiated keratinocytes embedded in a lipid-rich extracellular matrix and represents the principal superficial barrier. Dermatophytes utilize keratin as a nutrient source and generally remain within keratinized tissues. This

superficial biological behaviour is particularly relevant when comparing tinea corporis with the classical depth-oriented description of *Twak*.

HISTOMORPHOLOGICAL FEATURES OF DADRU-LIKE DERMATOPHYTOSIS

Histology of tinea corporis is variable and may be non-specific. Common epidermal findings include hyperkeratosis or compact orthokeratosis, parakeratosis, acanthosis and spongiosis. Neutrophils may accumulate within the stratum corneum or superficial epidermis. Papillary dermal oedema and a predominantly chronic inflammatory infiltrate may also be present.^[7-10] The most diagnostically valuable feature is the demonstration of fungal elements. Septate, branching hyphae may be identified within the stratum corneum. On H&E staining they can be inconspicuous, whereas PAS and GMS stains improve detection.^[7,8] In one histopathological study of PAS-positive tinea, compact stratum corneum, parakeratosis, mild spongiosis and neutrophils were frequent findings, but no single histological feature was sufficiently specific to establish dermatophytosis without appropriate fungal demonstration.^[9]

The so-called sandwich sign, in which fungal elements are seen between layers of compact and basket-weave keratin, has been proposed as a useful clue. Nevertheless, it is not present in every case. Histological studies have shown that many lesions are diagnosed only after special staining because the clinical suspicion may be absent and the H&E findings may resemble common inflammatory dermatoses.^[7,9]

KOH microscopy remains an important practical method for superficial dermatophytosis. Scrapings should preferentially be taken from the active margin, where fungal elements are more likely to be detected. Fungal culture provides species-level information and is particularly useful in chronic, recurrent, extensive or diagnostically uncertain disease.^[5,6,12] Histopathology is generally not required for routine tinea corporis, but it becomes valuable when the clinical diagnosis is uncertain, when inflammatory patterns are unusual or when deeper dermatophyte infection is suspected.

REAPPRAISAL OF THE SEVEN LAYERS THROUGH HISTOMORPHOLOGY

The central question is whether the seven layers of *Twak* can be mapped directly onto modern histological strata. A strict one-to-one mapping is not justified by the available evidence. Contemporary authors have proposed approximate correspondences, but these remain interpretive models rather than demonstrated anatomical identities.^[2,13]

Avabhasini may be conceptually related to the superficial visible properties of skin because Sushruta associates it with colour and external appearance. This makes the layer relevant to the clinically visible scaling, erythema and surface alteration of *Dadru*. However, it should not automatically be equated with the stratum corneum.

Lohita and *Shweta* similarly contain descriptive terms related to colour and visible tissue characteristics. Modern skin colour is influenced by melanin, haemoglobin, carotenoids, optical scattering and vascular factors across several tissue compartments. Consequently, a simple histological translation of these classical names into individual modern strata would be reductive.

Tamra and *Vedini* are especially relevant to *Kustha*. Sushruta assigns *Kustha* to both layers, and modern dermatophytosis produces epidermal and superficial inflammatory changes rather than a lesion restricted to a single microscopic level. *Tamra* may therefore be discussed as part of the classical disease-localization framework for *Kustha*, while *Vedini* can be interpreted with caution as indicating deeper functional or sensory involvement.

Vedini has particular conceptual importance because the name itself is related to sensation. Modern skin sensation is mediated by specialized sensory receptors and free nerve endings distributed through the epidermis and dermis. A dermatophyte infection of the superficial keratin layer can produce pruritus through inflammatory and neurocutaneous mechanisms without requiring destruction of deeper neural structures. Therefore, the classical association of *Vedini* with *Kustha* should not be interpreted as evidence that every case of superficial tinea invades the sensory nerves.

Rohini and *Mamsadhara* represent progressively deeper levels in the classical sequence. Routine tinea corporis usually does not extend into these deep compartments. When dermatophytes invade follicles or deeper tissue, conditions such as Majocchi granuloma may occur, producing perifollicular and dermal inflammation. This provides an interesting modern example of how increasing depth of fungal involvement can change the histopathological pattern, although it should not be claimed as a direct validation of Sushruta's layer sequence.

HISTOMORPHOLOGICAL CORRELATION OF DADRU WITH TWAK SHARIR

A useful correlation can be constructed at four levels: surface morphology, tissue depth, inflammatory response and sensory expression.

First, the surface morphology of *Dadru* corresponds well with the superficial manifestations expected in a disorder involving the outer functional domain of *Twak*. Annularity, scaling, erythema and raised margins are visible changes and are readily appreciated clinically. Modern tinea corporis also begins and remains predominantly within keratinized superficial tissue.

Second, the histological depth of ordinary tinea is limited compared with deep inflammatory or neoplastic dermatoses. Fungal elements are predominantly identified within the stratum corneum. This supports a cautious interpretation in which *Dadru*-like superficial disease can be studied in relation to the outer portions of the classical *Twak* model, particularly *Avabhasini* and the levels traditionally associated with *Kustha*. It does not establish that *Avabhasini* equals stratum corneum.

Third, the inflammatory response provides a bridge between clinical symptoms and tissue morphology. Spongiosis, parakeratosis and neutrophilic accumulation may accompany fungal colonization. These microscopic changes can contribute to erythema, scaling and pruritus. Thus, *Kandu* in *Dadru* can be considered clinically compatible with inflammatory and neurocutaneous responses associated with superficial infection, while its Ayurvedic interpretation remains within the framework of *Dosha* and *Kustha*.

Fourth, the presence or absence of deeper involvement provides a possible research marker. If a patient clinically diagnosed with *Dadru* has only superficial fungal elements in the stratum corneum, the lesion represents a superficial phenotype. If follicular invasion, perifollicular inflammation or granulomatous reaction is identified, the pathology is deeper and the modern diagnostic category may change. Such distinctions could be incorporated into future Ayurvedic clinicopathological studies.

AYURVEDIC AND MODERN CONCEPTUAL INTEGRATION

The strength of an integrative approach lies in complementarity rather than forced equivalence. Ayurveda classifies disease through a network of *Dosha*, *Dhatu*, *Srotas*, *Agni*, clinical morphology and symptom complexes. Modern pathology classifies disease through cellular architecture, causative organisms, inflammatory pathways and molecular mechanisms. These are different explanatory levels.

For *Dadru*, the Ayurvedic description contributes a structured clinical phenotype: *Kandu*, *Mandala*, elevation, colour change and spread within the broader category of *Kustha*. Modern dermatology adds direct demonstration of dermatophytes, species identification and histological characterization. Neither framework needs to replace the other for a comparative study to be scientifically useful.

Histomorphology is particularly valuable because it occupies an intermediate level between bedside appearance and laboratory identification. It can document epidermal reaction patterns and the precise location of fungal elements. PAS and GMS can make otherwise subtle hyphae visible. This creates an opportunity to examine whether particular Ayurvedic phenotypes are associated with reproducible histological patterns.

A future study could classify clinically diagnosed *Dadru* according to standardized Ayurvedic features and simultaneously record KOH positivity, culture results, H&E findings, PAS positivity and the depth of fungal localization. Statistical analysis could then determine whether particular clinical features correlate with particular histological patterns. Such a design would move the discussion from conceptual analogy toward testable clinicopathological evidence.

PROPOSED HISTOMORPHOLOGICAL STUDY FRAMEWORK

For an original postgraduate study, patients presenting with lesions clinically compatible with *Dadru* could undergo systematic documentation of lesion number, size, morphology, border activity, scaling, *Mandala*, *Kandu*, *Raga* and other predefined Ayurvedic parameters. A KOH examination from the active margin should be considered as an initial mycological test. Culture may be performed in recurrent, atypical or treatment-resistant cases.^[6,12]

Where clinically justified and ethically approved, a punch biopsy may be obtained from the active margin. H&E sections should document the stratum corneum, epidermal thickness, spongiosis, acanthosis, parakeratosis, neutrophils, papillary dermal changes and inflammatory cell pattern. PAS or GMS should be used to identify fungal hyphae. The location of fungal elements should be recorded as superficial stratum corneum, follicular infundibulum or deeper tissue.

The study should avoid treating an Ayurvedic layer and a modern histological layer as interchangeable variables. Instead, correlations should be expressed as associations between

clinically defined phenotypes and objectively measured histological features. For example, the presence of prominent superficial scaling could be tested against hyperkeratosis and parakeratosis; severe *Kandu* could be explored in relation to inflammatory density; and atypical or recurrent disease could be assessed for follicular or deeper involvement.

Appropriate statistical analysis would depend on the research question. Categorical variables may be compared using chi-square or Fisher's exact test, while continuous histological measurements may be compared using parametric or non-parametric tests after assessment of distribution. Inter-observer agreement for histological grading could be quantified using kappa statistics or intraclass correlation, depending on the variable. This would make the study reproducible and reduce subjective interpretation.

DISCUSSION

The seven-layer description of *Twak* remains one of the most distinctive contributions of Sushruta to the conceptual anatomy of skin. Its value for contemporary research does not depend upon demonstrating that each named layer corresponds exactly to a modern microscopic stratum. In fact, the classical description contains features that extend beyond structural histology. It includes visible colour, sensation, disease localization, depth and developmental formation. A purely anatomical translation would therefore omit important aspects of the original framework.

Dadru is particularly suitable for reappraisal because its clinical expression is superficial and morphologically distinctive. The overlap with tinea corporis is substantial: both descriptions emphasize circular or annular lesions, pruritus, elevation and peripheral progression. Contemporary evidence confirms that dermatophytes principally inhabit keratinized tissue and that the histological changes are concentrated in the stratum corneum and epidermis, with variable superficial dermal inflammation.^[5-10]

At the same time, the literature warns against overconfidence in histological pattern recognition. Parakeratosis, spongiosis, acanthosis and intracorneal neutrophils can occur in several inflammatory dermatoses. Even findings considered suggestive of dermatophytosis may be absent in a proportion of confirmed cases. The fungal organism therefore remains the critical morphological target, and special stains can materially increase detection.^[7-10]

This observation has methodological importance for Ayurvedic research. If *Dadru* is investigated only through clinical morphology, diagnostic misclassification is possible. If it is investigated only through modern mycology, the distinctive Ayurvedic phenotype is lost. A robust study should therefore preserve both layers of information. Clinical Ayurvedic characterization should be recorded before laboratory results are known whenever feasible, while fungal confirmation should be performed independently.

The relationship of *Dadru* to the classical seven layers also illustrates why modern equivalents should be presented as approximate. Published comparative tables sometimes assign individual Sushruta layers to the epidermis, dermis and subcutaneous tissue. Such mappings may be pedagogically useful, but they are not directly demonstrated by the classical text or by modern histology. Sushruta's layer thicknesses are expressed in traditional units and are embedded in a conceptual anatomy that does not use the modern histological vocabulary of epidermis, dermis and hypodermis.^[1,2]

A more defensible interpretation is therefore functional and relational. *Avabhasini* can be discussed in relation to surface appearance; *Vedini* in relation to sensation; *Tamra* and *Vedini* in relation to the classical localization of *Kustha*; and deeper layers in relation to progressive tissue involvement. This preserves the internal logic of the classical system while allowing modern pathology to describe the actual tissue changes observed in contemporary specimens. The histomorphology of tinea also supports a graded view of disease depth. Ordinary tinea corporis is superficial, whereas follicular invasion and granulomatous inflammation represent deeper disease patterns. Such gradation can be useful in future comparative work, provided that the modern pathological categories are not retroactively imposed upon the Ayurvedic text. The appropriate research question is not whether Sushruta predicted modern histology in exact terminology, but whether the classical depth-oriented framework can generate clinically meaningful hypotheses that are testable by modern methods.

LIMITATIONS

The present article is a narrative reappraisal and does not present an original series of biopsies. Therefore, no prevalence of histological findings, diagnostic sensitivity, specificity or statistical association can be inferred. The *Dadru*-tinea correlation is supported by clinical and literature-based similarity but cannot be considered universal. Differences among classical texts and commentarial traditions also require careful interpretation. Finally, any

proposed correspondence between Sushruta's layers and modern tissue compartments remains conceptual unless supported by a dedicated prospective clinicopathological study.

FUTURE RESEARCH DIRECTIONS

Future research should combine standardized Ayurvedic assessment with contemporary dermatological investigation. A prospective study may recruit clinically diagnosed *Dadru* cases and record Ayurvedic features before KOH and culture results are disclosed. Biopsy specimens, where indicated, may be assessed by H&E and PAS or GMS staining. Digital histomorphometry could quantify epidermal thickness, stratum corneum thickness and inflammatory cell density. Microbiological methods could establish the dermatophyte species.

CONCLUSION

Sushrutokta *Twak Sharir* provides a layered and clinically oriented model of skin that integrates structure, appearance, sensation and disease localization. *Dadru*, described as a raised, circular and pruritic *Kustha*, offers an appropriate clinical model for examining this framework through contemporary histomorphology.

Modern tinea corporis is predominantly a superficial dermatophyte infection. Histological findings may include hyperkeratosis, parakeratosis, spongiosis, acanthosis and superficial inflammatory changes, while fungal hyphae can be demonstrated by PAS or GMS staining. These findings provide meaningful points of comparison with the classical description but do not establish a direct one-to-one identity between Sushruta's seven layers and modern histological strata.

The most scientifically appropriate approach is therefore one of cautious correlation. Sushruta's model should be preserved as a classical anatomical-clinical framework, while modern histology should be used to document objectively the tissue changes associated with *Dadru*-like dermatophytosis. A prospective clinicopathological study integrating Ayurvedic phenotyping, KOH microscopy, culture and standardized histomorphology would be the logical next step for validating the proposed framework.

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