

A COMPREHENSIVE STUDY OF UDAKVAHA SROTAS WITH SPECIAL REFERENCE TO APPROACH FOR STRUCTURAL DETERMINATION OF "KLOMA"

Dr. Archana Gautam^{*1}, Dr. Sanjiv Sexena²

¹P. G. Scholar, ²Assistant Professor

Department of Rachana Sharir, State Ayurvedic College & Hospital Lucknow, Maha Yogi
Guru Gorakhnath Ayush University, Uttar Pradesh, India.

Article Received on 15 July 2026,
Article Revised on 05 August 2026,
Article Published on 16 August 2026,

<https://doi.org/10.5281/zenodo.21915148>

*Corresponding Author

Dr. Archana Gautam

P. G. Scholar, Department of
Rachana Sharir, State Ayurvedic
College & Hospital Lucknow, Maha
Yogi Guru Gorakhnath Ayush
University, Uttar Pradesh, India.



How to cite this Article: Dr. Archana Gautam^{*1},
Dr. Sanjiv Sexena² (2026). A Comprehensive
Study Of Udakvaha Srotas With Special
Reference To Approach For Structural
Determination Of "Kloma". World Journal of
Pharmaceutical Research, 15(16), 554-571.

This work is licensed under Creative Commons
Attribution 4.0 International license.

ABSTRACT

Background: Ayurvedic classical literature describes Udakvaha Srotas as the channel system responsible for the regulation, distribution, and maintenance of fluid homeostasis in the human body. Talu (palate) and Kloma are identified as the Mula Sthana (root structures) of Udakvaha Srotas. While Talu has been correlated with the neurosensory perception of thirst, Kloma remains one of the most controversial and enigmatic organs in Ayurvedic anatomy, with no consensus on its precise structural identity. **Objective:** The present article aims to conduct a comprehensive review of Udakvaha Srotas with special emphasis on various approaches for the structural determination of Kloma, integrating classical Ayurvedic perspectives with contemporary anatomical and physiological understanding. **Methods:** A structured narrative review was conducted by systematically examining primary Ayurvedic

literature including Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya, along with commentaries by Chakrapani, Dalhana, Gangadhara, and Arunadatta. Modern biomedical literature was retrieved from PubMed, Scopus, and Google Scholar using keywords: "fluid homeostasis," "hypothalamic thirst centre," "microvascular exchange," "pancreas anatomy," "lymphatic system," and "pleural physiology." **Results:** Multiple hypotheses regarding the structural identity of Kloma have been proposed, including correlation with the pancreas, lungs, pharynx, trachea, lymphatic system, suprarenal glands, and neuroendocrine thirst

centres. The analysis reveals that Kloma may represent a functional conglomerate rather than a single discrete organ, integrating thoracic structures involved in fluid regulation.

Conclusion: The structural determination of Kloma requires a translational approach that transcends reductionist one-to-one correlation. Kloma appears to represent a functional anatomical zone encompassing the mediastinal structures involved in fluid balance, thirst regulation, and kapha metabolism, thereby positioning Udakvaha Srotas as a distributed macrovascular-microvascular regulatory network.

KEYWORDS: Udakvaha Srotas, Kloma, Srotomula, Talu, Fluid homeostasis, Translational anatomy, Ayurveda, Srotodushti.

1. INTRODUCTION

The concept of Srotas occupies a central position in Ayurvedic structural physiology. Derived from the Sanskrit root "sru" meaning to flow or secrete, Srotas are defined as the dynamic channels through which various substances are transported, transformed, and regulated throughout the body.^[1] Acharya Sushruta describes Srotas as tubular structures (abhivahanshila) possessing hollow spaces (avakash) that facilitate the circulation of fluid materials.^[2] Acharya Charaka further elaborates that Srotas are structures through which anything is conveyed or flows, emphasizing their functional rather than purely anatomical nature.^[3]

Among the various Srotas described in classical literature, Udakvaha Srotas holds particular significance due to its fundamental role in maintaining life itself. Water constitutes approximately 60% of the adult human body and serves as a construction material, lubricant, shock absorber, solvent, reaction medium, and transporter for nutrients and waste products.^[4] The regulation of water balance is therefore imperative for the preservation of health and life.

Udakvaha Srotas is specifically described as the channel responsible for the transport and transformation of Udaka (body fluids).^[5] According to Charaka Samhita and Sushruta Samhita, the Mula Sthana (root structures) of Udakvaha Srotas are Talu (palate) and Kloma.^[6,7] While Talu has been relatively well understood in terms of its anatomical location and functional correlation with the perception of thirst, Kloma remains one of the most controversial and debated organs in Ayurvedic anatomy.

The ambiguity surrounding Kloma has significant implications for clinical practice, research methodology, and the integration of Ayurvedic principles with modern biomedical science. The present article attempts to address this gap by conducting a comprehensive study of Udakvaha Srotas with special reference to various approaches for the structural determination of Kloma.

2. MATERIALS AND METHODS

2.1 Study Design

This study was conducted as a narrative translational anatomical review to correlate the Ayurvedic concepts of **Udakvaha Srotas** and **Kloma** with modern anatomy and physiology.

2.2 Data Sources

Classical Ayurvedic texts (Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya, Ashtanga Sangraha, Kashyapa Samhita, Bhavaprakasha, and Sharngadhara Samhita) and modern literature from PubMed, Scopus, Google Scholar, and standard physiology textbooks were reviewed.

2.3 Analytical Framework

The analysis used textual, anatomical, physiological, and systems-based approaches to compare classical descriptions with modern scientific concepts.

3. REVIEW OF LITERATURE

3.1 Etymological and Semantic Analysis

The term "Udaka" is derived from the Sanskrit root "undi kledane," implying that which moistens or wets.^[8] Synonyms of Udaka include Apa, Vari, Salila, Kamala, Jala, Payas, and Ambu.^[9] The term "Vaha" means carrier or transporter, while "Srotas" refers to the channels of circulation. Thus, Udakavaha Srotas literally translates to "water-carrying channels."

The synonyms of Srotas are numerous and reveal the multidimensional nature of these channels: Sira, Dhamani, Rasayani, Rasavahini, Nadi, Pantha, Marga, Sharirachhidra, Samritasavritta, Sthana, Ashaya, Niketa, and Yogvahi.^[10] This semantic diversity suggests that Srotas are not merely physical tubes but represent functional pathways that integrate structure and physiology.

3.2 Classical Descriptions of Udakvaha Srotas

3.2.1 Charaka Samhita

Acharya Charaka describes Udakavaha Srotas as channels originating from Talu and Kloma.^[11] He states that when these channels are vitiated, specific signs appear: dryness of the tongue, palate, lips, throat, and Kloma, accompanied by excessive thirst (pipasa).^[12] This description establishes a direct connection between Udakavaha Srotas dysfunction and the clinical manifestation of thirst.

Charaka further enumerates the causes of Udakavaha Srotodushti (vitiation of water channels) - Aushnyat (exposure to heat), Aamavat (indigestion), Bhayat (fear), Panat (excessive alcohol intake), Arishuksha anna sevanat (consumption of excessively dry food), Trishnaya atipidanat (suppression of thirst).^[13]

3.2.2 Sushruta Samhita

Acharya Sushruta provides a more structural definition, stating: "Udaka vahe dve, tayoho moolam taalu kloma cha. Tatra viddhasya pipaasaa sadhyo maranam cha".^[14] This translates to: "The Udakavaha Srotas are two in number, and their roots are the Talu and Kloma. Injury to these causes thirst and immediate death."

The mention of "sadhyo maranam" (immediate death) upon injury to Udakavaha Srotas underscores the critical importance of fluid homeostasis for survival. This observation aligns with modern physiological understanding that severe dehydration or fluid imbalance can rapidly lead to organ failure and death.

3.2.3 Ashtanga Hridaya and Ashtanga Sangraha

Acharya Vagbhata synthesizes the descriptions of earlier authorities, maintaining Talu and Kloma as the Mula Sthana of Udakavaha Srotas.^[15] The Laghutrayi commentaries (Arunadatta, Hemadri, and others) provide additional insights into the location and function of Kloma, though with considerable variation in interpretation.

3.3 Etiological Factors and Pathological Manifestations

The vitiation of Udakavaha Srotas leads to characteristic clinical manifestations collectively termed Udakavaha Srotodushti. The four primary modes of Srotodushti described in classical texts are.^[16]

1. Sanga (Obstruction/Stagnation)

2. Atipravritti (Excessive flow/Expansion)
3. Vimarga Gamana (Misdirection/Aberrant flow)
4. Siragranthi (Structural distortion/Nodular changes)

The pathological changes of **Udakavaha Srotodushti** reflect disturbances in fluid balance, affecting both the quantity and movement of body fluids. Clinically, it presents with Pipasa (excessive thirst), Shosha (dehydration and dryness), dryness of the tongue, palate, lips, throat, and Kloma (Jihva, Talu, Oshtha, Kantha, and Kloma Shosha), Glaani (fatigue), Trishna (thirst disorders), and Shareera Shaithilya (generalized laxity or weakness of the body tissues).^[17]

4. CONCEPTUAL ANALYSIS OF UDAKVAHA SROTAS

4.1 Udakavaha Srotas as a Regulatory Network

Contemporary physiological understanding recognizes fluid homeostasis as an imperative property of coordinated macrovascular circulation, microvascular exchange, interstitial compliance, lymphatic return, and renal-neuroendocrine control.^[18] Rather than being a single structural channel, Udakavaha Srotas appears to represent a distributed regulatory network governing systemic fluid equilibrium.

The structural components of this network can be mapped as follows.

Table 1: Structural-Functional Mapping of Udakavaha Srotas.

Classical Concept	Functional Description	Modern Correlation
Udakavaha Srotas	Systemic fluid balance pathway	Cardiovascular-interstitial-renal network
Mula (Talu)	Primary site of thirst perception	Hypothalamic osmo-receptors, palate sensation
Mula (Kloma)	Secondary regulatory hub; kapha sthana; thirst centre	Mediastinal structures, pancreas, or lymphatic system
Sanga	Obstruction/stagnation	Venous congestion, lymphatic obstruction
Atipravritti	Excessive flow	Hypervolemia, capillary leak syndrome
Vimarga Gamana	Misdirection	Endothelial hyper-permeability, edema
Siragranthi	Structural distortion	Fibrosis, ECM remodeling

4.2 The Mula Sthana Concept

The concept of Mula Sthana (root site) in Ayurveda is not merely anatomical but also functional. The Mula represents the origin point from where the Srotas derives its functional

authority and where the earliest signs of pathology manifest.^[19] For Udakavaha Srotas, both Talu and Kloma serve as Mula Sthana, suggesting a dual-control system for fluid regulation. Talu, as the primary Mula, correlates with the initial perception of thirst. The sensation of dryness first manifests in the palate, followed by the lips, gums, and throat.^[20] This hierarchical manifestation pattern indicates a neurosensory mechanism that aligns with the modern understanding of the hypothalamic thirst centre and osmoreceptor function.^[21]

Kloma, as the secondary Mula, represents a deeper regulatory structure. Its controversial nature stems from the limited and scattered descriptions in classical texts, necessitating a systematic approach to its structural determination.

5. APPROACHES FOR STRUCTURAL DETERMINATION OF KLOMA

5.1 Approach I: Textual and Etymological Analysis

5.1.1 Etymology of Kloma

The term "Kloma" (क्लोम) has been subject to various etymological interpretations. Some scholars suggest derivation from the root "klam" meaning fatigue or exhaustion, indicating the distress caused by thirst.^[22] Others propose connection with "kleda" (moisture), suggesting its role in fluid regulation. The synonym "Tilaka" (तिलक) mentioned in some texts may refer to its appearance or shape.

5.1.2 Textual References

Kloma is mentioned across a wide spectrum of Sanskrit literature.

- Vedic texts: Atharva Veda, Vajasaneya Samhita, Brihad Aranyaka Upanishad.
- Smritis: Vishnu Smriti, Yajnavalkya Smriti.
- Puranas: Agni Purana.
- Classical Ayurvedic texts: Charaka, Sushruta, Vagbhata, Bhela, Kashyapa, Madhava, Sharngadhara, Bhavaprakasha.^[23]

The Vajasaneya Samhita mentions Varuna as the deity associated with Kloma, reinforcing its connection with water and fluid regulation.^[24] This mythological association provides cultural context for understanding Kloma's perceived function.

5.1.3 Structural Descriptions in Texts

Analysis of textual descriptions reveals the following characteristics attributed to Kloma.

- It is a Kosthanga (internal organ located within the trunk).^[25]

- It is a Matrija Avayava (organ derived from maternal factors).^[26]
- It is the Mula Sthana of Udakavaha Srotas and Jalavahini Sira.^[27]
- It is described as a site of Kapha (Pipasa Sthana and Kapha Sthana).^[28]
- It is mentioned in the context of Abhyantara Vidradhi (internal abscess).^[29]

5.2 Approach II: Anatomical Location-Based Correlation

This approach attempts to determine the structure of Kloma based on its described anatomical location. Various commentators and modern scholars have proposed different correlations.

Table 2: Anatomical Location-Based Correlations of Kloma.

Proposed Correlation	Supporting Evidence
Right Lung (Phuphusa)	Brihad Trayi descriptions; location near heart; right-sided placement mentioned by Arunadatta ^[30]
Pancreas (Agnayashaya)	Kapha sthana; digestive secretions; location near stomach; some commentators equate with Pittashaya/Agnayashaya ^[31]
Pharynx/Cricopharynx	Junction of throat and chest (Gangadhara); passage for fluids; proximity to Talu ^[32]
Trachea	Tubular structure in thorax; air and fluid passage; some structural similarities ^[33]
Gall Bladder (Pittashaya)	Some texts mention proximity to liver; storage of fluid (bile) ^[34]
Lymphatic System/Nodes	Fluid regulation; kapha metabolism; distributed network; thoracic duct ^[35]
Suprarenal Glands	Endocrine regulation; near kidneys; some modern correlations ^[36]
Mediastinum	Central thoracic compartment; contains heart, great vessels, thymus, trachea, esophagus; functional integration ^[37]
Pleura/Pleural Space	Fluid-filled potential space; kapha association; respiratory correlation ^[38]
Hypothalamus/Thirst Centre	Chakrapani's "Hridayastha Pipasa Sthana"; neuroendocrine control of thirst ^[39]
Jejunum/Mesentery	Dr. Hebbar's correlation; fluid absorption; kapha involvement ^[40]

5.2.1 The Right Lung Hypothesis

The Brihad Trayi (Charaka, Sushruta, Vagbhata) descriptions give an impression of Kloma being the right lung^[41] Sushruta's enumeration of organs in the context of Vidradhi places Kloma after the heart, liver, and spleen but separately from the lungs (Phuphusa). However, the description of Kloma as "Tilaka" (mark or spot) and its association with Kapha supports the lung correlation, as the lungs are the primary seat of Kapha in the body.

5.2.2 The Pancreas Hypothesis

The pancreas hypothesis is supported by Kloma's description as a Kapha Sthana and its involvement in fluid secretion. The pancreas produces digestive enzymes and bicarbonate-

rich fluid, contributing significantly to the body's fluid and electrolyte balance^[42] Some commentators have equated Kloma with Agnayashaya (pancreas) or Pittashaya (gall bladder), though these correlations remain controversial.

5.2.3 The Pharynx/Hypopharynx Hypothesis

Gangadhara Roy opined that Kloma may be the organ at the junction of the throat and thorax (Kantha-Uras Sandhi).^[43] This location aligns with the cricopharynx and upper esophageal region, which serves as a transitional zone between the upper respiratory/digestive tracts and the thoracic cavity. The proximity to Talu (palate) also supports this hypothesis.

5.2.4 The Lymphatic System Hypothesis

The lymphatic system represents a distributed network of fluid-carrying channels that closely parallels the Ayurvedic concept of Srotas. The thoracic duct, cisterna chyli, and mediastinal lymph nodes are involved in fluid regulation and immune surveillance.^[44] Kloma's description as the Mula of Jalavahini Sira (fluid-carrying vessels) supports this correlation.

5.3 Approach III: Functional Physiology-Based Correlation

This approach determines the structure of Kloma based on its described functions rather than anatomical location alone.

5.3.1 Kloma as Pipasa Sthana (Thirst Centre)

Chakrapani explicitly describes Kloma as "Hridayastha Pipasa Sthana" (the site of thirst located near the heart).^[45] This functional description strongly correlates with the hypothalamic thirst centre, which is located in the brain—an organ considered "Hridayastha" (central/core) in Ayurvedic conceptualization. The hypothalamus contains osmoreceptors that detect changes in plasma osmolarity and trigger the sensation of thirst.^[46]

The mechanism of thirst regulation involves.

- Osmoreceptors in the anterior hypothalamus detecting plasma osmolarity
- Release of arginine vasopressin (AVP/ADH) from the posterior pituitary
- Activation of the renin-angiotensin-aldosterone system (RAAS)
- Integration of baroreceptor signals from the great vessels.^[47]

5.3.2 Kloma as Kapha Sthana

Classical texts describe Kloma as a site of Kapha, the dosha responsible for cohesion, lubrication, and fluid balance.^[48] Structures that produce or regulate mucus and serous fluids include.

- Respiratory tract mucosa (goblet cells, submucosal glands)
- Pleural membranes (producing pleural fluid)
- Pericardium (producing pericardial fluid)
- Peritoneum (producing peritoneal fluid)
- Salivary glands
- Pancreatic duct epithelium

The association of Kloma with Kapha metabolism suggests structures involved in the production or regulation of bodily fluids.

5.3.3 Kloma in Fluid Secretion and Absorption

The description of Kloma as the Mula of Udakavaha Srotas and Jalavahini Sira indicates its role in fluid secretion, absorption, or distribution. Structures involved in these functions include: Gastrointestinal tract (absorption of water and electrolytes), Renal tubules (reabsorption and secretion), Salivary glands (secretion), Exocrine pancreas (secretion), Sweat glands (Svedavaha Srotas correlation).

5.4 Approach IV: Systems-Based Integrative Correlation

The systems-based approach represents the most comprehensive method for structural determination. Rather than seeking a one-to-one correlation with a single modern organ, this approach views Kloma as a functional anatomical zone or system.

5.4.1 The Mediastinal Complex Hypothesis

The mediastinum is the central compartment of the thoracic cavity, bounded by the pleural sacs laterally, the sternum anteriorly, the vertebral column posteriorly, the thoracic inlet superiorly, and the diaphragm inferiorly.^[49] It contains: Heart and pericardium, Great vessels (aorta, pulmonary trunk, superior and inferior vena cava), Trachea and main bronchi, Esophagus, Thymus, Thoracic duct and lymph nodes, Phrenic and vagus nerves, Mediastinal fat and connective tissue.

The mediastinum represents a functional zone where multiple systems intersect—cardiovascular, respiratory, lymphatic, digestive, and nervous. This integrative nature aligns with the Ayurvedic concept of Kloma as a regulatory hub for fluid balance.

5.4.2 The Neuro-Endocrine-Thoracic Axis

Modern physiology recognizes that fluid homeostasis is regulated by a complex interplay of neural, endocrine, and vascular mechanisms.^[50]

- Neural: Hypothalamic osmoreceptors, baroreceptors, thirst centre.
- Endocrine: ADH, aldosterone, natriuretic peptides, renin-angiotensin system.
- Vascular: Capillary hydrostatic pressure, oncotic pressure, endothelial permeability.
- Lymphatic: Interstitial fluid clearance, immune surveillance.

Kloma may represent the Ayurvedic conceptualization of this integrated axis, with Talu representing the sensory/neural component and Kloma representing the deeper regulatory structures.

5.4.3 The Distributed Network Model

Drawing from network medicine and systems physiology, Udakavaha Srotas with its Mula at Talu and Kloma can be understood as a distributed regulatory network rather than a discrete anatomical pathway.^[51]

In this model.

- Talu represents the sensory input node (thirst perception)
- Kloma represents the central processing and regulatory node
- The Srotas itself represents the distributed transport network (vascular, lymphatic, interstitial)

Table 3: Integrative Model of Udakavaha Srotas and Kloma.

Ayurvedic Component	Modern Integrative Correlation
Talu (Mula)	Oral mucosa, hypothalamic osmoreceptors, thirst perception centre
Kloma (Mula)	Mediastinal structures, neuroendocrine thirst centres, pancreatic/pleural/lymphatic integration
Udakavaha Srotas	Macrovascular circulation, microvascular exchange, interstitial fluid, lymphatic drainage, renal-neuroendocrine feedback loops
Sanga	Venous congestion, lymphatic obstruction, heart failure, renal failure
Atipravritti	Hypervolemia, SIADH, fluid overload, capillary leak syndrome
Vimarga Gamana	Edema, ascites, pleural effusion, anasarca
Siragranthi	Fibrosis, scleroderma, lymphatic filariasis, chronic venous insufficiency

6. CLINICAL IMPLICATIONS OF KLOMA DETERMINATION

6.1 Diagnostic Significance

The structural determination of Kloma has direct implications for clinical diagnosis. If Kloma is correlated with the mediastinal structures or pancreas, conditions affecting these organs may manifest as Udakavaha Srotodushti. For example.

- Pancreatitis may present with dehydration and thirst due to fluid shifts.
- Mediastinal tumors may cause superior vena cava syndrome with facial and upper extremity edema.
- Pleural effusion represents Vimarga Gamana of Udakavaha Srotas.
- Cardiac tamponade (pericardial effusion) represents Sanga.^[52]

6.2 Therapeutic Implications

Ayurvedic management of Udakavaha Srotodushti includes.

- Snehana (oleation) to counter dryness
- Svedana (sudation) to regulate fluid balance
- Virechana (therapeutic purgation) for Atipravritti
- Basti (medicated enema) for deep-seated fluid disorders
- Tarpana (hydration therapy) for Trishna.^[53]

Understanding Kloma's structural identity helps in selecting appropriate treatment modalities. For instance, if Kloma represents the pancreatic function, treatments targeting Agni (digestive fire) and Kapha metabolism would be prioritized.

6.3 Prognostic Considerations

Sushruta's warning that injury to Udakavaha Srotas causes "sadhya maranam" (immediate death) highlights the critical prognosis of severe fluid imbalances.^[54] Modern medicine recognizes that.

- Severe dehydration (>10% body weight loss) is life-threatening
- Acute fluid overload can cause pulmonary edema and cardiac failure
- Electrolyte imbalances secondary to fluid disorders can cause fatal arrhythmias
- Septic shock with capillary leak syndrome has high mortality.^[55]

7. DISCUSSION

7.1 The Controversy of Kloma: A Methodological Analysis

The persistent controversy surrounding Kloma's structural identity can be attributed to several factors.

First, the descriptions in classical texts are phenomenological rather than morphological. Ayurvedic anatomy emphasizes function (karma) over form (rupa), making direct structural correlation challenging.^[56]

Second, the term Kloma may have been used to describe different structures by different authorities or in different contexts. The Brihad Trayi, Laghutrayi, and Nighantus may refer to different anatomical entities under the same name.

Third, the evolution of anatomical knowledge over centuries may have led to shifts in the application of the term. What was clearly understood in Vedic times may have become ambiguous due to loss of contextual knowledge.^[57]

Fourth, the attempt to force a one-to-one correlation with modern organs represents a reductionist approach that may be incompatible with the holistic Ayurvedic framework. Kloma may represent a functional zone or system rather than a single discrete organ.

7.2 Translational Anatomy: Bridging Classical and Modern Concepts

Translational anatomy seeks to establish structural-functional dialogues between traditional and modern anatomical concepts without reducing one to the other.^[58] In the case of Kloma, this approach acknowledges that.

- Classical descriptions capture regulatory relationships rather than morphological details.
- Modern anatomy provides precise structural knowledge but may miss functional integrations apparent to classical observers.
- A synthesis can enrich both systems without compromising either.

The proposed distributed network model for Udakavaha Srotas and the integrative zone concept for Kloma exemplify this translational approach. Rather than asking "What is Kloma?" in terms of a single organ, we should ask "What functions does Kloma represent?" and "What structures mediate these functions?"

7.3 Kloma as a Functional Zone: The Synthesis

Based on the comprehensive analysis of textual, anatomical, functional, and systems-based approaches, the most coherent interpretation is that Kloma represents a functional anatomical zone within the thoracic cavity, integrating multiple structures involved in fluid regulation.

1. The pleuropulmonary unit (lungs, pleura, bronchial tree) for gas exchange and fluid secretion.

2. The pericardial unit (heart, pericardium, great vessels) for hemodynamic regulation.
3. The mediastinal lymphatic unit (thoracic duct, lymph nodes) for fluid clearance.
4. The neuroendocrine unit (hypothalamic-pituitary axis, autonomic innervation) for regulatory control.
5. The upper digestive-respiratory junction (pharynx, esophagus, trachea) for passage and secretion.

This functional zone interpretation explains why different commentators correlated Kloma with different organs—each was identifying a component of the same functional system.^[59]

7.4 Validation Through Clinical Correlation

The functional zone hypothesis can be validated through clinical correlation.

- Conditions affecting the lungs (pneumonia, pulmonary edema) cause fluid imbalance and thirst.
- Cardiac failure causes systemic fluid congestion (Atipravritti/Sanga).
- Lymphatic obstruction causes edema (Vimarga Gamana).
- Hypothalamic lesions cause diabetes insipidus or adipsia.
- Pancreatic disorders cause dehydration through fluid shifts and vomiting.

These clinical observations support the integrative nature of Kloma rather than a single-organ correlation.^[60]

8. CONCLUSION

The structural determination of Kloma represents one of the most challenging and intellectually rewarding endeavours in Ayurvedic anatomical research. The present comprehensive study of Udakvaha Srotas reveals that.

1. **Udakvaha Srotas** is best understood as a distributed macrovascular-microvascular regulatory network governing systemic fluid homeostasis, rather than a discrete anatomical channel.
2. **Talu**, as the primary Mula Sthana, correlates with the neurosensory mechanisms of thirst perception, including the hypothalamic osmoreceptors and oropharyngeal sensory inputs.
3. **Kloma**, as the secondary Mula Sthana, cannot be reduced to a single modern anatomical organ. Instead, it represents a functional anatomical zone within the thoracic cavity, integrating pleuropulmonary, cardiovascular, lymphatic, and neuroendocrine structures involved in fluid regulation.

4. The various proposed correlations—lung, pancreas, pharynx, lymphatic system, mediastinum—each capture a component of Kloma's functional reality but none exhaustively define it.
5. The four modes of Srotodushti (Sanga, Atipravritti, Vimarga Gamana, Siragranthi) demonstrate remarkable conceptual consistency with modern pathophysiological mechanisms of fluid dysregulation, including venous congestion, hypervolemia, capillary leak, and fibrotic remodeling.
6. A translational anatomical approach that respects the epistemological integrity of both Ayurvedic and modern systems offers the most promising path forward for understanding Kloma and Udakvaha Srotas.

Future research should focus on

- Multi-modal imaging studies to identify thoracic structures activated during thirst and fluid regulation.
- Biomarker studies correlating classical Srotodushti patterns with modern parameters (serum osmolality, natriuretic peptides, endothelial glycocalyx markers).
- Computational modeling of fluid regulatory networks using Ayurvedic parameters.
- Interdisciplinary collaboration between Ayurvedic scholars, anatomists, physiologists, and clinicians.

The mystery of Kloma, rather than representing a failure of classical Ayurvedic anatomy, may instead reflect its sophisticated understanding of functional integration—an understanding that modern systems physiology is only now beginning to appreciate.

Conflict of Interest: Nill.

REFERENCES

1. Sushruta. Sushruta Samhita, Sharira Sthana, Chapter 9, Verse 13. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
2. Dalhana. Nibandha Sangraha commentary on Sushruta Samhita, Sharira Sthana 9/13. Varanasi: Chaukhambha Orientalia, 2014.
3. Agnivesha, Charaka, Dridhabala. Charaka Samhita, Sutra Sthana, Chapter 30, Verse 12. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
4. Guyton AC, Hall JE. Textbook of Medical Physiology. 14th ed. Philadelphia: Elsevier, 2020; 348-362.

5. Bhojani MK, Tanwar AK. Udakavaha Srotas. Charak Samhita Research, Training and Development Centre, ITRA, Jamnagar, 2023. DOI: 10.47468/CSNE.2023.e01.s09.156
6. Charaka Samhita, Vimana Sthana, Chapter 5, Verse 9. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
7. Sushruta Samhita, Sharira Sthana, Chapter 9, Verse 12. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
8. Vachaspathyam. Sanskrit-Hindi Dictionary. Varanasi: Chaukhambha Sanskrit Series, 2002; 1245.
9. Sharma PV. Dravyaguna Vijnana. Vol. 2. Varanasi: Chaukhambha Bharati Academy, 2005; 678.
10. Charaka Samhita, Vimana Sthana, Chapter 5, Verse 9. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
11. Charaka Samhita, Vimana Sthana, Chapter 5, Verse 7. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
12. Charaka Samhita, Vimana Sthana, Chapter 5, Verse 8. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
13. Charaka Samhita, Vimana Sthana, Chapter 5, Verse 11. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
14. Sushruta Samhita, Sharira Sthana, Chapter 9, Verse 12. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
15. Vagbhata. Ashtanga Hridaya, Sutra Sthana, Chapter 1. Edited with Sarvangasundara commentary of Arunadatta and Ayurveda Rasayana commentary of Hemadri. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
16. Charaka Samhita, Sutra Sthana, Chapter 28. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
17. Sushruta Samhita, Sutra Sthana, Chapter 24. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
18. Tripathi N, Patil SR, Kakde RP, Tekawade UV, Menon A. Udakvaha Srotas as a Macrovascular and Microvascular Regulatory Network: A Translational Anatomical Review. Int J Drug Deliv Technol, 2026; 16(43s): 789-795. DOI: 10.25258/Ijddt.16.43s.80
19. Dwivedi LD. Sharira Kriya Vigyana. Varanasi: Chaukhambha Krishnadas Academy, 2010. p. 234-245.

20. Raghuram YS. Udakavaha Srotas: Channels of water transport, Signs of damage, Treatment. Easy Ayurveda [Internet]. 2019 Oct 28. Available from: <https://www.easyayurveda.com/udakavaha-srotas-dushti-chikitsa/>
21. McKinley MJ, Denton DA. The neurobiology of thirst. *Nat Rev Neurosci*, 2006; 7(8): 601-614. DOI: 10.1038/nrn1943
22. Padmane SB, Jagtap M. A Review of Controversies of Kloma. *J Emerg Technol Innov Res*, 2024; 11(8): 468-473.
23. Sharma RK, Dash B. Agnivesha's Charaka Samhita: Text with English Translation. Varanasi: Chowkhamba Sanskrit Series, 2014; 567-569.
24. Vajasaneya Samhita, Madhyandina Shakha. Translated by Griffith RT. Varanasi: Chowkhamba Sanskrit Series, 2004.
25. Charaka Samhita, Sharira Sthana, Chapter 7. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
26. Sushruta Samhita, Sharira Sthana, Chapter 4. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
27. Kashyapa Samhita, Sharira Sthana. Edited with Vidyotini Hindi commentary. Varanasi: Chaukhambha Sanskrit Sansthan, 2012.
28. Bhavaprakasha, Madhya Khanda, Chapter 5. Edited with Vidyotini Hindi commentary. Varanasi: Chaukhambha Sanskrit Sansthan, 2013.
29. Sushruta Samhita, Nidana Sthana, Chapter 9. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
30. Arunadatta. Sarvangasundara commentary on Ashtanga Hridaya, Sutra Sthana, Chapter 1. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
31. Gananath Sen. Pratyaksha Shariram. Calcutta: Author; 1923; 145-148.
32. Gangadhara Roy. Jalpakalpataru commentary on Charaka Samhita, Vimana Sthana, Chapter 5. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
33. Warriar PS. Indian Medicinal Plants. Vol. 3. Madras: Orient Longman; 1995; 234-236.
34. Vinodal Sen. Sharira Rachana. Calcutta: Author; 1912; 89-92.
35. Standring S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 42nd ed. London: Elsevier, 2021; 67-89.
36. Saraswati A. Commentary on Ashtanga Sangraha. Varanasi: Chaukhambha Sanskrit Sansthan, 2010; 234-237.
37. Moore KL, Dalley AF, Agur AMR. Clinically Oriented Anatomy. 8th ed. Philadelphia: Wolters Kluwer, 2018; 78-102.

38. Boron WF, Boulpaep EL. Medical Physiology. 3rd ed. Philadelphia: Elsevier, 2017; 456-478.
39. Chakrapani. Ayurveda Dipika commentary on Charaka Samhita, Vimana Sthana, Chapter 5, Verse 8. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
40. Hebbar S. Conceptual Study of Kloma with Reference to Modern Perspective. [Internet]. 2020. Available from: <https://www.easyayurveda.com>
41. Sushruta Samhita, Sharira Sthana, Chapter 7. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.
42. Costanzo LS. Physiology. 6th ed. Philadelphia: Elsevier, 2018; 234-256.
43. Gangadhara Roy. Jalpakalpataru commentary on Charaka Samhita, Vimana Sthana, Chapter 5. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
44. Standring S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 42nd ed. London: Elsevier, 2021; 89-105.
45. Chakrapani. Ayurveda Dipika commentary on Charaka Samhita, Vimana Sthana, Chapter 5, Verse 8. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
46. Verbalis JG. Brain volume regulation in response to changes in osmolality. Neuroscience. 2010; 168(4): 862-870. DOI: 10.1016/j.neuroscience.2010.02.035
47. Stricker EM, Sved AF. Thirst. Nutrition. 2000; 16(10): 821-824. DOI: 10.1016/S0899-9007(00)00423-1
48. Charaka Samhita, Sutra Sthana, Chapter 20. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
49. Moore KL, Dalley AF, Agur AMR. Clinically Oriented Anatomy. 8th ed. Philadelphia: Wolters Kluwer, 2018; 89-95.
50. Guyton AC, Hall JE. Textbook of Medical Physiology. 14th ed. Philadelphia: Elsevier, 2020; 362-378.
51. Barabasi AL. Network Medicine: From Obesity to the Diseasesome. N Engl J Med. 2007; 357(4): 404-407. DOI: 10.1056/NEJMr0702322
52. Harrison TR, Fauci AS. Harrison's Principles of Internal Medicine. 21st ed. New York: McGraw-Hill, 2022; 1789-1802.
53. Charaka Samhita, Chikitsa Sthana, Chapter 22. Edited with Ayurveda Dipika commentary of Chakrapani. Varanasi: Chaukhambha Sanskrit Sansthan, 2014.
54. Sushruta Samhita, Sharira Sthana, Chapter 9, Verse 12. Edited with Nibandha Sangraha commentary of Dalhana. Varanasi: Chaukhambha Orientalia, 2014.

55. Dellinger RP, Levy MM, Rhodes A, et al. Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock. *Crit Care Med.*, 2013; 41(2): 580-637. DOI: 10.1097/CCM.0b013e31827e83af
56. Lad V. Textbook of Ayurveda: Fundamental Principles. Albuquerque: Ayurvedic Press, 2002; 123-145.
57. Mehta SR. Introduction to Ayurveda: Basic Concepts and Their Modern Correlation. Delhi: Chaukhamba Publications, 2015; 67-89.
58. Tripathi N, Patil SR, Kakde RP, Tekawade UV, Menon A. Udakvaha Srotas as a Macrovascular and Microvascular Regulatory Network: A Translational Anatomical Review. *Int J Drug Deliv Technol.* 2026; 16(43s): 789-795.
59. Unveiling the Mystery of Kloma: A Comprehensive Study in the Context of Udakavaha Srotas. *The International Medicine Journal* [Internet]. Available from: <https://www.theinternationalmedicine.com/article-read/1349/>
60. Padmane SB, Jagtap M. A Review of Controversies of Kloma. *J Emerg Technol Innov Res.*, 2024; 11(8): 468-473.