



"ROLE OF SROTODUSHTI IN PATHOGENESIS: A COMPREHENSIVE REVIEW INTEGRATING CLASSICAL AYURVEDIC CONCEPTS WITH CONTEMPORARY BIOMEDICAL PERSPECTIVES"

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ABSTRACT:

Background: Srotas, the micro- and macroscopic channels described in Ayurvedic medicine, represent a sophisticated network governing the flow of biological substances, metabolic substrates, and consciousness-related impulses throughout the body. Their structural and functional integrity is indispensable for health (Swasthya), while any derangement — collectively termed Srotodushti — constitutes the foundational mechanism underlying virtually all disease processes in classical Ayurveda.

Objective: This review aims to critically examine the classical Ayurvedic concept of Srotodushti — its definition, classification, aetiology (Nidana), pathogenic types, and diagnostic significance — and to establish integrative correspondences with contemporary biomedical mechanisms of channel dysfunction, transport biology, and systems pathology.

Methods: A review of primary classical Ayurvedic texts (Charaka Samhita, Sushruta Samhita, Ashtanga Hridayam) was undertaken alongside a structured search of PubMed, Scopus, and Ayush research databases for contemporary peer-reviewed publications addressing channel biology, transport pathophysiology, and integrative frameworks.

Results: Thirteen primary Srotas (plus three exclusively female channels) are identified in classical texts, each with defined root organs (Moolasthanas), specific substrates, and four classical dushti types: Atipravrutti (hyperfunctional flow), Sanga (obstruction), Vimarga Gamana (aberrant trajectory), and Siragranthi (nodular formation). Each maps convincingly onto biomedical constructs including hypersecretion syndromes, vascular and lymphatic obstruction, ectopic pathology and metastasis, and neoplastic transformation. The mediating role of Ama (biotoxin of incomplete metabolism) as a universal sroto-obstructing agent is highlighted, with parallels to endotoxaemia, unfolded protein responses, and damage-associated molecular patterns (DAMPs).

Conclusion: Srotodushti provides a clinically applicable, mechanistically coherent, and translationally relevant framework for understanding the origin and progression of disease. Integration of this concept with modern pathophysiology can enhance both diagnostic precision and therapeutic strategy in integrative clinical practice and research.

Keywords: Srotodushti, Srotas, Ayurvedic pathogenesis, Nidana Panchaka, Ama, channel dysfunction, integrative medicine, Samprapti, disease mechanism

INTRODUCTION

Ayurveda, the ancient Indian system of life-science, conceptualizes health as a dynamic equilibrium of biological, psychological, and environmental forces. At its physiological core lies an intricate network of channels — termed Srotas (सर्तसि) — through which the body's vital substances circulate, transform, and communicate.^{1,2} The integrity of these channels is not merely anatomical; it is a precondition for metabolic efficiency, immune surveillance, neural signaling, and eliminatory adequacy.

The Charaka Samhita (Vimana Sthana 5/3) defines Srotas as: "Sravanat Srotansi" — that which flows, secretes, or transmits.¹ This definition encompasses not only gross anatomical conduits such as blood vessels, bile ducts, and renal tubules, but also subtle functional channels governing neural transmission, hormonal flux, and cellular communication. The concept therefore bridges the macroscopic and microscopic — spanning organ-system physiology and sub-cellular transport biology.

Srotodushti — the vitiation or dysfunction of these channels — is described in classical texts as the proximate mechanism through which dosha imbalances translate into clinical pathology. Without channel dysfunction, accumulated doshas cannot produce disease; Srotodushti thus represents the essential bridge between aetiological insult and manifest vyadhi (illness).³ Despite this centrality, a comprehensive and translationally integrated analysis of this concept remains underrepresented in contemporary academic literature.

This review synthesises classical textual sources, commentaries, and modern biomedical literature to construct a rigorous, integrative understanding of Srotodushti — its ontology, classification, pathogenic mechanisms, clinical correlations, and therapeutic implications — with the aim of providing a useful framework for researchers and practitioners working at the interface of Ayurveda and contemporary medicine.

SROTAS: CONCEPTUAL FRAMEWORK AND CLASSIFICATION**Etymology and Definition**

The Sanskrit root "sru" (to flow) gives rise to the term Srotas, connoting any pathway facilitating biological movement. Charaka Samhita (Vimana Sthana 5/3) defines them through their functional property of continuous flow (sravana), while Sushruta Samhita (Sharira Sthana 9/12) emphasises their structural substrate, equating them with Siras (vessels), Dhamanis (arteries), and channels within organ parenchyma.^{1,2} Ashtanga Hridayam (Sharira Sthana 3/15) integrates both aspects, defining Srotas as anatomically distinct pathways carrying specific physiological substrates⁴.

Classification of Srotas

Classical Ayurvedic texts enumerate thirteen primary Srotas applicable to all humans, with three additional channels specific to the female physiology (Artavavaha, Stanyavaha, Garbhavaha). Each channel possesses a defined anatomical root (Moolasthan), characteristic openings (Mukha), and a specific substrate it transports. Table 1 summarises

the primary classification with modern biomedical correlations.

Table 1: Classification of Srotas with Moolasthana and Biomedical Correlations

Srotas (Channel)	Moolasthana (Root)	Carries (Vahya)	Biomedical Correlation
Pranavaha Srotas	Hridaya, Mahasrotas	Prana (vital breath)	Respiratory tract
Udakavaha Srotas	Kloma, Talu	Udaka (water/fluids)	Aquaporin channels, renal tubules
Annavaha Srotas	Amashay, Vama Parshwa	Anna (food)	Gastrointestinal tract
Rasavaha Srotas	Hridaya, Dasha Dhamani	Rasa Dhatu (plasma/chyle)	Lymphatic/circulatory system
Raktavaha Srotas	Yakrit, Pliha	Rakta Dhatu (blood)	Hepatic-splenic hematopoietic axis
Mamsavaha Srotas	Snayus, Tvak	Mamsa Dhatu (muscle tissue)	Myofascial planes
Medovaha Srotas	Kidneys, Vapa (omentum)	Meda Dhatu (adipose)	Lipid transport / adipose tissue
Asthivaha Srotas	Jagana (hip), Sakthi (limbs)	Asthi Dhatu (bone)	Skeletal system / periosteum
Majjavaha Srotas	Asthi, Sandhis	Majja Dhatu (marrow/neural)	Neuro-marrow axis / CSF
Shukravaha Srotas	Vrushana, Shishna	Shukra Dhatu (reproductive tissue)	Reproductive tract
Mutravaha Srotas	Vasti, Medhra, Vankshana	Mutra (urine)	Renal-urinary system
Purishavaha Srotas	Pakvashaya, Sthula Guda	Purisha (faeces)	Large intestine / rectum
Swedavaha Srotas	Meda Dhatu, Loma (hair follicles)	Sweda (sweat)	Eccrine/apocrine glands

SROTODUSHTI: DEFINITION, TYPOLOGY, AND MECHANISMS

Classical Definition

Srotodushti refers to the vitiation, obstruction, derangement, or dysfunction of the Srotas system. Charaka Samhita (Vimana Sthana 5/24) provides the foundational categorisation of Srotodushti into four principal types, each reflecting a distinct pathogenic mechanism¹. This classification is particularly significant because it is pathophysiologically comprehensive — together, these four types can account for the full range of pathological phenomena observed in clinical practice.

Four Types of Srotodushti

Table 2: Four Classical Types of Srotodushti — Definition, Mechanism, and Clinical Manifestation

Type of Dushti	Ayurvedic Definition	Pathological Mechanism	Clinical Manifestation
Atipravrutti	Excessive flow through channels	Increased secretion/flux, loss of regulatory feedback, hypersecretion syndromes	Diarrhoea, haemorrhage, hyperhidrosis, polyuria, hypersalivation
Sanga	Obstruction or stasis within channels	Accumulation of ama/dosha, impaired clearance, inflammatory blockade	Constipation, oedema, urinary retention, lymphadenopathy, tumour formation
Vimarga Gamana	Flow in an abnormal direction or path	Ectopic migration, retrograde flow, aberrant cellular trafficking, metastasis-like spread	Reflux disorders, ectopic pregnancy, metastatic spread, autoimmune tissue invasion
Siragranthi	Formation of nodular mass or cyst in	Organised fibro-cellular aggregation, angiogenesis,	Cysts, fibroids, calculi, varices, benign and malignant

	channels	neoplastic proliferation	tumours (Arbuda)
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Atipravrutti (Excess Flow)

Atipravrutti denotes pathological hyperfunctioning of a channel — an excessive, unregulated flow of the channel's specific substrate beyond physiological bounds. Biomedically, this corresponds to hypersecretion states, loss of negative feedback regulation, and impaired receptor-mediated downregulation. Examples include: haemorrhagic diatheses (Raktavaha Srotas); watery diarrhoea (Purishavaha Srotas); excessive lacrimation, salivation, and sweating (Swedavaha Srotas). Neuroendocrine parallels include hyperthyroidism, SIADH, and hypercortisolaemia.^{5,6}

Sanga (Obstruction)

Sanga — arguably the most clinically prevalent form of Srotodushti — denotes obstruction or stasis within the channel. It is precipitated by the accumulation of Ama (the biotoxin of incomplete digestion and metabolism), vitiated Kapha, or incompletely processed Dhatu. Biomedically, Sanga finds expression in vascular stenosis and thrombosis (Raktavaha Srotas); lymphatic obstruction and oedema (Rasavaha Srotas); urinary calculi (Mutravaha Srotas); and biliary obstruction. It is now understood that chronic low-grade inflammation, endothelial dysfunction, and microbiome-derived endotoxaemia — processes analogous to Ama formation — underlie many of these obstructive phenomena.^{7,8}

Vimarga Gamana (Aberrant Flow Direction)

Vimarga Gamana describes the movement of channel contents in an abnormal direction or through an aberrant pathway. This is among the most conceptually sophisticated of the four dushti types, with broad biomedical resonance. Classical examples include the retrograde movement of gastric acids (Annavaha Srotas — paralleling gastro-oesophageal reflux), the abnormal distribution of fluid into serosal cavities (ascites, pleural effusion), ectopic implantation syndromes, and autoimmune tissue invasion mediated by aberrantly trafficked immunological effectors. In oncology, Vimarga Gamana offers a compelling conceptual parallel to lymphogenous and haematogenous metastasis.⁹

Siragranthi (Nodular Formation)

Siragranthi refers to the formation of pathological aggregations — nodules, cysts, or masses — within the channel walls or lumen. These arise from the organised fibroproliferative response to chronic inflammation, unresolved Sanga, or the accumulation of stagnant Dhatu and Dosha elements. Biomedically, Siragranthi corresponds to granuloma formation, fibrosis, calculi, atheromatous plaques, varices, and benign and malignant tumours (Arbuda). The classical description of Arbuda (tumour) arising from Siragranthi in Raktavaha and Mamsavaha Srotas is of particular relevance to contemporary oncology research.¹⁰

NIDANA (AETIOLOGY) OF SROTODUSHTI

Charaka Samhita (Vimana Sthana 5/21) identifies three cardinal aetiological categories of Srotodushti:

(1) excessive intake (Atiyoga) of substances that directly vitiate the respective channel;
 (2) suppression of natural urges (Vegavarodha); and
 (3) traumatic insult to the channel's Moolasthana (root organ).¹ These primary categories expand into a broader multifactorial aetiological schema in clinical practice.

Table 3: Nidana (Causative Factors) of Srotodushti with Biomedical Parallels

Nidana Category	Ayurvedic Causative Factors	Modern Biomedical Parallels
Aharaja (Dietary)	Viruddha Ahara (incompatible food), Adhyashana (overeating), Vishamashana (irregular meals)	Dysbiosis, inflammatory diet, food-borne endotoxaemia, impaired gut-barrier function
Viharaja (Lifestyle)	Vegavarodha (suppression of natural urges), Divaswapna, Ratrijagarana (nocturnal wakefulness)	Autonomic dysregulation, circadian disruption, impaired detoxification cycles
Manasika (Psychological)	Shoka, Chinta, Krodha, Bhaya (grief, anxiety, anger, fear)	HPA-axis over-activation, chronic inflammation via cortisol-mediated pathways, neuropeptide dysregulation
Agantuja (Exogenous)	Abhighata (trauma), Krimi (microbial invasion), Visha (toxins)	Physical injury, infection-mediated barrier damage, xenobiotic-induced channel dysfunction
Dosha-Specific	Prakupita Vata (channel constriction), Prakupita Pitta (inflammatory)	Vasospasm / neurogenic dysfunction; oxidative inflammatory

	erosion), Prakupita Kapha (obstructive mucus accumulation)	injury; mucous hypersecretion / viscosity syndromes
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ROLE OF AMA IN MEDIATING SROTODUSHTI

Ama occupies a central position in Srotodushti pathogenesis. Produced by impaired Agni (digestive and metabolic fire), Ama is a viscous, sticky, incompletely processed biotoxin that possesses the unique capacity to adhere to channel walls (Srotorodha) and impair their function.^{1,3} Its characteristics — malodourous, heavy, slimy, clogging — map conceptually onto the properties of advanced glycation end-products (AGEs), LPS-mediated endotoxaemia, unfolded/misfolded protein aggregates, and DAMPs in contemporary molecular pathology.⁷

The pathway Nidana → Agni Dushti → Ama formation → Srotavarodha → Dosha accumulation → Vyadhi represents the classical Samprapti (pathogenesis) applicable to metabolic disorders, autoimmune conditions, and malignancies alike. Modern systems biology increasingly recognises analogous cascades: dietary dysregulation → gut microbiome disruption → intestinal permeability → systemic low-grade inflammation → organ-specific pathology.¹¹

SROTODUSHTI IN SAMPRAPTI: INTEGRATION WITH THE SIX-STAGE PATHOGENIC MODEL

Classical Ayurveda delineates disease progression

through six sequential stages known as Kriya Kala or Shadkriyakala:

- (1) Sanchaya (accumulation),
- (2) Prakopa (aggravation),
- (3) Prasara (spread),
- (4) Sthana Samshraya (localisation),
- (5) Vyakti (manifestation),
- (6) Bheda (differentiation/complication).^{1,3}

Srotodushti becomes operational from the third stage (Prasara) onwards, when aggravated doshas overflow their primary sites and begin to infiltrate the channel network. At Sthana Samshraya, doshas settle within specific Srotas — the nature of the resulting Srotodushti (Sanga, Atipravrutti, etc.) and the identity of the affected Srotas together determine the nature of the clinical disease. This model is consistent with modern understanding of the sequential progression from systemic inflammation to organ-specific pathology mediated by aberrant cellular trafficking, tissue remodelling, and clonal selection.^{12,13}

SROTODUSHTI IN MAJOR DISEASE CATEGORIES: BIOMEDICAL CORRELATIONS

The clinical applicability of the Srotodushti framework is best appreciated through its correlation with specific disease entities. Table 4 presents representative vyadhis alongside their primary srotas involvement, dushti type, and biomedical equivalents.

Table 4: Disease-Specific Srotodushti Correlations with Biomedical Equivalents

Disease (Vyadhi)	Primary Srotas Involved	Type of Srotodushti	Biomedical Equivalent
Prameha (Madhumeha)	Medovaha, Mutravaha	Sanga, Atipravrutti	Type 2 Diabetes Mellitus, Metabolic Syndrome
Shotha (Oedema)	Rasavaha, Udakavaha	Sanga	Lymphoedema, Congestive heart failure
Arbuda (Tumour)	Raktavaha, Mamsavaha, Rasavaha	Siragranthi, Vimarga Gamana	Benign / malignant neoplasms, angiogenesis
Rajajakshma (Pulmonary wasting)	Pranavaha, Rasavaha	Sanga, Kshaya	Pulmonary Tuberculosis, Interstitial Lung Disease
Udara Roga (Ascites)	Annavaha, Purishavaha, Raktavaha	Sanga, Vimarga Gamana	Portal hypertension, hepatic cirrhosis
Amavata (Rheumatoid Arthritis)	Rasavaha, Asthivaha, Majjavaha	Sanga (Ama-mediated)	Rheumatoid Arthritis, Autoimmune arthropathies
Mutrakrichra / Ashmari	Mutravaha Srotas	Siragranthi, Sanga	Urolithiasis, UTI, Chronic Kidney Disease
Unmada (Mental derangement)	Manovaha, Majjavaha	Vimarga Gamana, Sanga	Schizophrenia, Major Depressive Disorder, Neurotoxic syndromes

DIAGNOSTIC SIGNIFICANCE:

SROTODUSHTI LAKSHANA

Classical texts provide specific clinical signs (Lakshana) for each affected Srotas. Charaka Samhita (Vimana Sthana 5/7–20) enumerates characteristic symptoms for each of the thirteen Srotas, enabling channel-specific diagnosis. For

instance, vitiation of Pranavaha Srotas is characterised by dyspnoea, abnormal respiratory patterns, and altered consciousness; Rasavaha Srotodushti manifests as anorexia, nausea, heaviness, pallor, and oedema; Medovaha Srotodushti produces excessive adiposity, impaired perspiration, and fatigue.¹

Contemporary diagnostic parallels exist in the form of organ-specific biomarkers (e.g., serum creatinine for Mutravaha Srotas; LFTs for Raktavaha Srotas; lipid profiles for Medovaha Srotas), imaging-based channel assessment, and functional tests of channel integrity (e.g., pulmonary function testing for Pranavaha Srotas). The development of integrative diagnostic protocols correlating Ayurvedic Srotodushti signs with validated biomarkers represents a high-priority research agenda.¹⁴

THERAPEUTIC IMPLICATIONS: SROTOVIRECANA AND CHANNEL RESTORATION

Therapeutics in Ayurveda are fundamentally oriented toward restoring Srotashodhana — the purification and normalisation of channel function. The five-fold Panchakarma procedures operate primarily at the level of Srotas, with each modality targeting specific channels: Vamana (emesis) for Annavaha, Rasavaha, Pranavaha Srotas; Virechana (purgation) for Purishavaha, Raktavaha, Annavaha Srotas; Basti (enema) for Purishavaha, Mutra, Asthivaha, Majjavaha Srotas; Nasya for Pranavaha, Manovaha Srotas; and Raktamokshana for Raktavaha Srotas.⁴

Pharmacological interventions (Aushadhi) are selected on the basis of their Sroto-khedana (channel-opening), Sroto-shodhana (channel-purifying), or Sroto-rodha (channel-blocking) properties. Herbal candidates with demonstrated bioactivity in channel-restoration contexts include: Guggulu (*Commiphora mukul*) for Medovaha Srotoshodhana (hypolipidaemic); Punarnava (*Boerhavia diffusa*) for Mutravaha Srotas (diuretic, anti-inflammatory); and Trikatu for Ama-mediated Srotorodha (digestive stimulant, bioavailability enhancer).^{15,16}

DISCUSSION

The concept of Srotodushti represents one of Ayurveda's most sophisticated contributions to medical theory — a mechanistic, multi-dimensional model of pathogenesis that is neither purely humoral nor purely structural, but integrates flow dynamics, substrate specificity, and spatial directionality into a unified framework. Its four-type classification (Atipravrutti, Sanga, Vimarga Gamana, Siragranthi) constitutes a comprehensive taxonomy of pathological change applicable across all physiological systems.

What renders this framework particularly compelling from an integrative medicine perspective is its capacity to bridge ontologically distinct medical traditions. The biomedical parallels identified in this review — hypersecretion syndromes, obstructive pathologies, ectopic migration and metastasis, neoplastic transformation — are not superficial analogies; they reflect deep structural

correspondences between Ayurvedic channel biology and contemporary transport physiology, cellular biology, and systems pathology.

The role of Ama as the universal channel-clogging toxin merits particular attention in the context of modern chronic disease epidemiology. The parallel between Ama formation (arising from impaired Agni) and gut microbiome-derived endotoxaemia, metabolic endotoxaemia (LPS translocation), and DAMP-mediated sterile inflammation suggests a shared mechanistic substrate for the Ayurvedic and biomedical models of chronic, systemic, low-grade inflammatory disease — the dominant disease burden of the 21st century.^{17,18}

Several important limitations of this integrative approach must be acknowledged. The structural and functional definitions of Srotas do not map with perfect precision onto single biomedical anatomical structures; rather, each Srotas represents a functional system-level construct. The four-type Srotodushti classification was developed through centuries of clinical observation rather than controlled experimental inquiry, and the mechanistic correspondences identified herein require rigorous empirical validation. Prospective clinical and translational research protocols, informed by both Ayurvedic diagnosis and validated biomarkers, are needed to establish these correspondences on a robust evidence base.

CONCLUSION

Srotodushti provides Ayurvedic medicine with a parsimonious, mechanistically coherent, and

clinically applicable model of pathogenesis. Its four classical types — Atipravrutti, Sanga, Vimarga Gamana, and Siragranthi — collectively encompass the full spectrum of pathological change observed across medical disciplines, from metabolic and inflammatory disease to oncology and neurology. The mediating role of Ama as a channel-obstructing biotoxin offers a compelling interface with contemporary molecular medicine.

From a translational standpoint, the Srotodushti framework offers three concrete opportunities: (i) a systems-level taxonomy for classifying the pathological mechanisms underlying complex chronic diseases; (ii) a principled basis for selecting and evaluating Ayurvedic therapeutic interventions targeting channel restoration; and (iii) a conceptual scaffold for developing integrative diagnostic protocols that bridge Ayurvedic clinical signs with validated biomarkers. Realising this potential requires sustained interdisciplinary collaboration between classical Ayurvedic scholars, systems biologists, and clinical researchers.

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Author 1: Conceptualisation, writing (original draft).

Author 2: Writing (review and editing), formal analysis.

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