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CONCEPTUAL AND PATHOLOGICAL ASPECTS OF SROTAS (CHANNELS): A CORRELATION WITH MODERN MEDICAL SCIENCE

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ABSTRACT

The concept of Srotas (body channels) forms the cornerstone of Ayurvedic understanding of human anatomy, physiology, and disease processes. These channels facilitate the movement of vital substances throughout the body, playing a crucial role in sustaining balance and overall health. This review highlights classical Ayurvedic descriptions of Srotas and examines their relevance in light of modern anatomical and physiological knowledge. Notable similarities are observed between Srotas and systems such as the circulatory, lymphatic, and other transport mechanisms. In this article we will discuss about conceptual and pathological aspect of srotas with perspective of modern and Ayurveda.

KEYWORDS: Ayurveda, Srotas, Channel, Anatomy, Shareera Rachna.

INTRODUCTION

SROTAS means minute channels of body which performs various functions eg: circulation of micronutrients, detoxification and nutritional supply. This word derived from the Sanskrit word "Sru," meaning "to flow,"[1] As we previously said, srotas are described as channels or pathways responsible for the transportation of various substances, including nutrients (Ahara Rasa), metabolic by-products (Malas), and life forces (Prana). These pathways are not limited to anatomical structures but also include physiological and subtle energetic flows.

Different Acharya ‘s such as Charaka, Sushruta, and vagbhatta, provide detailed descriptions of the origin, location, structure, and function of different Srotas. They are categorized into macro channels (visible structures like blood vessels) and microchannels (subtle pathways, including cellular and metabolic processes). In addition to their physiological roles, Srotas are integral to understanding the manifestation and progression of diseases, as disruptions in their flow—termed Srotodushti—are considered precursors to pathological conditions.

AIMS AND OBJECTIVE

1. Expound the conceptual understanding of Srotas as described in Ayurveda.
2. Correlate these channels with analogous structures and functions in modern medical science.

1. Primary Sources

Charak Samhita Sushrut samhita Ashtang hridya

Commentaries of chakrapani Datta and Dalhan

2. Secondary Sources

Review articles

Book of ayurvedic anatomy and physiology

3. Modern Medical References: Gray’s Anatomy

Conceptual Understanding of Srotas: The term Srotas is derived from the Sanskrit root “Sru,” meaning "to flow." In classical Ayurvedic texts, Srotas are described as channels or pathways that facilitate the movement of substance[2] i,e nutrients, biological materials, waste products, and life forces (prana). Specific srotas perform specific functions depending upon their location and distribution to the various body parts. The anatomical and physiological perspective of srotas play vital role towards the normal health and vitiated srotas can lead many health issues and diseases. These channels are not limited to physical structures but include micro-level and functional pathways, such as molecular transport and metabolic processes. For example:

- Charaka Samhita defines Srotas as pathways that enable the flow of various elements required for life, including Rasa (nutritive fluid), Rakta (blood), and Prana (life force)[3]
- Sushruta Samhita emphasizes the structural and functional aspects of Srotas, describing them as hollow or porous structures capable of transporting[4]

Classification of Srotas[5]

1. **Macro Srotas (sthoola srotas**): These are anatomical structures that can be observed or palpated, such as blood vessels, ducts, and respiratory pathways.

2. **Micro Srotas (sookshm srotas):** These include cellular pathways, molecular transport systems, and energetic pathways that regulate physiological and biochemical processes.

3) Specific types of srotas

Table No. 1: Classical texts (according to Acharya charaka) identify 13 srotas based on their role in transporting substance.

SROTAS[1]	TRANSPORTED SUBSTANCE[7,8]	MODERN CORRELATION[6]
Prana vaha srotas	Prana (life force or oxygen)	Respiratory system
Anna vaha srotas	Food and nutrients	Digestive system
Udaka vaha srotas	Electrolyte, buffer ions	Interstitial fluid pathway
Rasa vaha srotas	Nutritive fluids, hormones, immunity	Lymphatic system and circulatory system
Rakt vaha srotas	Blood	Circulatory system
Mamsa vaha srotas	Muscles nourishment	Muscular blood supply
Meda vaha srotas	Fat and lipids	Adipose tissue network, lipid trasport system
Asthi vaha srotas	Bone nourishment	Bone vascularization , mineral regulation, skeleton system
Majja vaha srotas	Marrow/nervous tissue	Bone marrow, synovial and nervous system
Shukra. Vaha srotas	Reproductive fluids	Reproductive system
Mootra vaha srotas	Urine	Renal system
Purisha vaha srotas	Feces	Gastrointestinal tract (especially colon and rectum)
Sweda vaha srotas	Sweat	Sweat gland and integumentary system

Origin and Location of Srotas

- Prana Vaha Srotas originates in the heart (Hridaya) and the great vessels, aligning with the cardiovascular and pulmonary systems.
- Anna Vaha Srotas originates in the stomach (Amashaya) and esophagus, paralleling the gastrointestinal tract.
- Rakta Vaha Srotas originates in the liver (Yakrit) and spleen (Pleeha), reflecting the hematopoietic functions of these organs.

Functional Aspects of Srotas(G)

1. Transport of nutrients and waste

1. Srotas play a vital role in carrying essential nutrients to various body tissues and eliminating metabolic waste products. For example:

Anna Vaha Srotas facilitates the transfer of absorbed nutrients and digested food into the circulatory system.

Mootra Vaha Srotas and Purisha Vaha Srotas are involved in regulating the processes of urine and fecal excretion, respectively.

2. **Maintenance of Homeostasis:** The proper functioning of Srotas ensures physiological balance and prevents disease. For example, Rakta Vaha Srotas (Channels of Blood) Primary Srotas responsible for hemostasis. They carry and regulate blood (Rakta Dhatu) throughout the body.

3. **Interconnectivity of Systems:** Srotas exemplify the interconnectedness of body systems. Impairment in one Srotas can affect others, a principle similar to the systemic impact of diseases like hypertension and rheumatoid arthritis.

Pathophysiology of Srotas

The concept of Srotodushti (channel impairment) is crucial in Ayurveda for understanding disease progression. Srotodushti can manifest as:

Pathophysiological Aspects of Srotas

1. Types of Srotodushti (Channel Pathologies)

(Table No. 2)

Types[1]	**Description**[3,4]	**Modern correlation**[7,8]
Sanga (obstruction)	Blockage in the channel due to endogenous or exogenous factors Leading to stagnation of flow	Atherosclerosis, thromboembolism, urinary stones, obstructive jaundice
Atipravriti (Hyperactivity)	Excessive flow through the channel caused by over functioning of the respective system or organ	Diarrhea, hyperglycemia, hyperhidrosis menorrhagia, polyuria hyperthyroidism
Sirogranthi (Nodular growth)	Abnormal growths due to inflammation, swelling obstructiong or narrowing the lumen of the channel.	Tumors, aneurysms, fibroids, lymphadenopathy, thyroid nodules
Vimarga gamana (Diversion)	Abnormal flow or leakage of substances from the channel causing pathological effects elsewhere the body	Fistulas, vascular shunting, ectopic pregnancies, peritonitis due to perforations

1. **Sanga (Blockage)**
   - Obstruction in the channels disrupts the flow and cause deep vein thrombosis, urinary obstruction, atherosclerosis
   - Example: Blockage in anna vaha srotas cause amalpita

2. **Atipravritti (Excessive Flow)**
   - Overactivity or hyperfunction of channels, similar to conditions like polyuria, hemorrhage.

3. **Siragranthi (Nodular Swelling)**
   - Nodular or obstructive growths, for example: fibroadenoma or lymphadenopathy.

4. **Vimarga Gamana (Diversion of Flow)**
   - Abnormal flow of substances, as seen in fistulas or vascular leaks.

Structural Correlation with Modern Medical Systems

1. **Prana Vaha Srotas and the Respiratory System**

The anatomical structures of the respiratory tract, including the trachea, bronchi, and alveoli, align with the description of Prana Vaha Srotas in facilitating gas exchange and oxygen distribution.[10]

2. **Rasa and Rakta Vaha Srotas and Circulatory Systems**

Rasa Vaha Srotas corresponds to the lymphatic system, responsible for nutrient transport and immune regulation.

Rakta Vaha Srotas aligns with the cardiovascular system, ensuring oxygen and nutrient delivery.[11,12]

3. **Anna Vaha Srotas and the Digestive System**

The anatomical correlation includes the esophagus, stomach, intestines, and accessory digestive organs such as the pancreas and liver.[14]

4. **Sukra vaha srotas and the reproductive system**

Testes, penis, seminiferous tubules, epididymis, vas deferens, ejaculatory ducts, urethra, ovaries, fallopian tubes, uterus, vagina.

5. Subtle Channels

Micro-level pathways, such as capillaries and molecular transport systems, are comparable to the Ayurvedic description of minute Srotas.[13]

Mechanisms of Srotodushti

Pathologies in Srotas can arise due to a variety of intrinsic and extrinsic factors, many of which align with modern pathophysiological mechanisms.

A) Accumulation and Blockage (Sanga)

- **Ayurvedic View**

Obstruction occurs when excess Ama (undigested toxins) or external factors like Dosha aggravation accumulate within a Srotas.

Example: Blockage in Anna Vaha Srotas due to mandagni which leads to ajeerna and cause intestinal obstruction and chronic constipation.

- **Modern Correlation**
- Cholesterol deposits in blood vessels causing atherosclerosis.
- Kidney stones obstructing Mootra Vaha Srotas.
- Biliary obstruction in Anna Vaha Srotas.

b) Hyperfunction (Atipravritti)

- **Ayurvedic View**

Overactivity in a Srotas can result from excess flow of substances (Ati Pravahana), leading to imbalances.

Example: Hyperacidity (Amlapitta) due to increased flow of gastric juices in Anna Vaha Srotas

- **Modern Correlation**
- Increased gut motility causing diarrhea, Irritable bowel syndrome
- Overactive sweat glands leading to hyperhidrosis.

c) Structural Damage or Growth (Siragranthi)

- Ayurvedic View Swelling, nodes, or deformities in Srotas impede normal function Example: varicose vein and hematoma affecting Rakta Vaha Srotas.

- **Modern Correlation**

Benign or malignant tumors.

Fibrotic changes in the liver, lymph node and swelling in lungs, breast.

d) Leakage or Diversion of Flow (Vimarga Gamana)

- **Ayurvedic View**

Abnormal flow, such as leakage of vital substances into inappropriate areas, disrupts the body's homeostasis.

Example: Leaking blood from capillaries causing bruises.

- Modern Correlation:

Vascular shunting causes oxygen deprivation in tissues. Gastrointestinal perforation leading to peritonitis.

Leakage of enzymes in pancreatitis.

4) Clinical Manifestations of Srotodushti

(Table No. 3)[7,8]

Affected Srotas	Clinical features	Modern equivalent
Prana vaha srotas	Breathlessness cough, cyanosis and chest pain, shortness of breath	Asthma, bronchitis, pneumonia, COPD, Emphysema
Anna vaha srotas	Anorexia, indigestion, acid reflux, vomiting	GERD, peptic ulcers, irritable bowel syndrome
Rasa vaha srotas	Fatigue, swelling, restlessness immunodeficient,	Anemia, lymphedema, chronic fatigue syndrome
Rakt vaha srotas	Bleeding disorders, inflammation, skin rashes	Hemophilia, vasculitis, leukemia
Mootra vasa srotas	Dysuria, urinary retention or excessive urination	Kidney stones, urinary tract infection, chronic kidney disease
Shukra vaha srotas	Infertility, decreased libido, hormonal imbalance	PCOS , erection dysfunction, hormonal deficiencies

DISCUSSION

The Ayurvedic concept of Srotas (body channels) is fundamental for understanding both the normal functioning and disease processes of the human body. These channels, as explained in classical Ayurvedic texts, are responsible for transporting essential substances like nutrients, oxygen, waste products, and life energy (Prana). They closely correspond to systems recognized in modern science, including the circulatory, digestive, lymphatic, and excretory

systems. Ayurveda further classifies Srotas into macro-channels and micro-channels, which can be compared to large organ systems and smaller anatomical structures such as capillaries and interstitial spaces in modern physiology. When these channels become disturbed—a condition known as Srotodushti—various types of diseases can occur, many of which are still recognized today. For instance:

Sanga (obstruction) is similar to diseases like atherosclerosis or chronic bronchitis, where normal flow is blocked.

Atipravritti (excessive flow or activity) is comparable to hypersecretion or hypermotility disorders in the digestive or endocrine systems.

Siragranthi (nodular growth) can be related to tumors, cysts, or fibrotic changes in tissues.

These comparisons show that Ayurveda had a deep and advanced understanding of human pathophysiology, which is now increasingly supported by modern diagnostic techniques such as imaging studies (like ultrasound, CT, MRI) and molecular-level research.

CONCLUSION

The concept of Srotas in Ayurveda refers to the body's internal channels that transport and distribute vital substances such as nutrients, air, fluids, and waste. These channels are essential for maintaining the body's health and balance. They can be compared to modern systems like thecirculatory, digestive, respiratory, and lymphatic systems. srotas are responsible for delivering nutrients to body tissues, circulating gases like oxygen, maintaining fluid balance, supporting healing, and regulating metabolic and digestive activities. They also help in the movement of doshas (biological energies), formation and nourishment of Dhatus (body tissues), and elimination of Malas (waste products). When these channels function properly, the body remains healthy.

However, any disturbance in their function—known as Srotodushti—can lead to various health problems. These may include breathing difficulties, excessive thirst, poor appetite, indigestion, constipation, skin disorders (like Visarpa and Kustha), abnormal tissue growths (Arbuda, Adhimamsa), and urinary issues. To prevent or manage such disorders, Ayurveda recommends various approaches.[15]

- Following Sadvritta (good lifestyle and moral conduct).
- Regular detoxification (like Panchakarma)[16]

- Using Ayurvedic herbs and formulations.
- Practicing yoga, exercise, and meditation.

Together, these methods help maintain the proper functioning of Srotas, support overall health, and prevent the onset of diseases.

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