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IJAPC

e ISSN 2350 0204

VOLUME 12 ISSUE 1 2020

GREENTREE GROUP PUBLISHERS (GGP)



The Basic Concept of *Srotas* at Cellular Level - A Scientific Review

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ABSTRACT

Cell is the smallest possible unit of organization from where life begins. *Ayurveda* is an age old science with a deep knowledge of human body and its intricate interactions within and with the environment around. In dealing with maintaining healthy state and longevity and healing of diseased, we must look into and explore basic concepts of the science. One such novel concept is that of *SROTAS*-which needs to be viewed and understood as fundamental of *Ayurveda* at cellular level. This article aims at exploring the basic concept of *srotas* and trying to understand it in scientific terms both structurally and functional aspect. This will further help in implementing the knowledge to clinical use and establishing our theories in rational and systemic ways. When we thoroughly go through the concept of Cell and *Srotas*; lots of similarities and co-relations exists which prove that health sciences may have different ways of visualization of human body but the concepts and idea remains the same.

KEYWORDS

Srotas, Cell, Cell organelles



Greentree Group Publishers

Received 03/10/19 Accepted 28/12/19 Published 10/01/2020



INTRODUCTION

Ayurveda science is based upon the basic fundamentals of *Panchmahabhuta*, *Triguna*, *Dosha*, *Dhatu*, *Oja*, *Agni* and *Srotas*. *Srotas* are basically the channels spread throughout the body for transportation and providing medium for metabolism of *dosha*, *dhatu*, *mala*, *oja* etc. The word *Srotas* is derived from the Sanskrit root- *Sru-gatau* (*Sru+tasi=srotas*) meaning flowing, oozing, moving, continuing, filtering, leaking, secreting etc. *Srotas* in Ayurvedic classics is defined as “*Sravanata Srotamsi*” i.e. *Srotas* (channels) due to flowing¹. Literature signifies importance of understanding the concept of *Srotas* by saying that *Srotomayam hi Shareeram* i.e. the whole aggregation of *srotas* working in harmony with each other at all gross and subtle levels carry out all the life processes and constitute of *Sharir*.

Improper diet regime and lifestyle leads to pathogenesis in these *Srotas* and further paving way for manifestation of diseases. Whereas, following a healthy lifestyle leads to morbid free *Srotas* and consequently to a healthy state of body².

Likewise all living beings; from structures not perceptible to naked eyes to perceptible ones (from micro to macro) are cells (single cell or their systematic aggregations). A

single cell is capable of carrying out entire range of functions needed for survival.

Here we take an insight into *Srotas* as cellular unit of *Sharir*, trying to have a better understanding of it at anatomical and functional levels.

SROTAS

Unvitiated *vayu* makes gross and subtle channels in the body³. *Yavantah purushe murtimanto bhav visheshastawant evasmin strotsam prakarvishesha*- clearly stating that there are as many *srotas* in human body as are the components it constitutes of. Further it is stated that without the *srotas* no *bhavas* (components) can be generated nor can be decayed; signifying its fundamental requirement in the mere existence of living being⁴.

They are innumerable according to some experts and are grossely countable according to some⁵. They can also be classified as external and internal orifices. Nine external orifices or *Srotas* i.e. 2 in the nose, 2 in the eyes, 2 in the ears, 1 of the mouth, 1 of rectum and 1 of urethra. Females have 3 additional orifices, 2 in breast and 1 for menstrual blood⁶. *Acharya Charaka* named 13 internal *Srotas* and *acharya Sushruta* named 11 pairs of such major functioning organ systems of the body. These are seats of life activities essential for existence ; like



prana(respiration) *dhatu*s (7 basic tissues) *mala* (3 chief waste) *udaka* (fluid) *anna*(food)⁷. Organ systems are collection of organs functioning together; organs which are formed from similar tissues; tissues which are nothing but differentiated collection of cells doing similar actions. As long as these *Srotas* are normal, healthy status of body is maintained. Foods and behavior which are in accordance to *Dosha* and opposing the *Dhatu* properties lead to pathogenesis in the *Srotas*⁸. Morbidity in *Srotas* are due to four basic causes-

- I) Enhanced flow
- ii) Obstruction
- iii) Formation of Nodules
- iv) Flow of contents in wrong direction⁹.

Sira -vein,
Resaying- lymphatics,
Naadi-tubular conduits ,
Marg-pathway,
Samvrita-asamvrita –open or blind passages,
Aashaya-respositories,

Illuminating the fact that all the transportation throughout the body are happening due to *Srotas*¹¹. These synonyms also highlight the whole range of morphological and functional specificity according to the systems. Also the *Srotas* are highly specific in terms of signals, information or any macro or micro molecules they carry. They act together as a whole system of the body or group of

From *Srotas* we interpret all the macro(*Sthula*) and micro(*sukshma*) components of the body which are involved in exchange, transportation, metabolism and excretion processes. They include entire range of structural and functional units from gross to subtle designed to carry specific ionic exchange, molecules, messages, impulses, emotions and thoughts.

Srotas are present in the entire body (*sarvagatatvat*) transporting the *doshas* i.e. *Vata*, *Pitta* and *Kapha* all over the body. All the *Srotas* also serve the purpose of passage for mind, soul etc which are transcending sense organs, the entire sentient body serves as passage as well as location¹⁰.

Synonyms of *srotas* are:-

Dhamani-artery,
Rasavaahini-capillaries,
Pantha-tracts, passage ,
Sharirchidra-body orifices ,
Sthan-site, location,
Niket-resorts

tissues and transporting channels for various mediums. Acharyas gave the anatomical description about the *srotas* as circular, big, small or not perceptible to eyes, long and resembling lines of a leaf. Their color and form would be similar to the *Dhatu* they transport¹². The orifices or openings of the *Srotas* are minute, spread long and far like those in the lotus stem.



Through these openings *rasa* (fluid tissue carrying nutrition) nourishes the body¹³.

Cells varies greatly in their size and structure .They are specialized as neurons (in nervous system), as nephrons (in excretory system) or functioning as connective, muscle, epithelial or nervous tissue according to their functions and location in the body.

Entire metabolism (anabolism-catabolism) occurs at the *Srotas* level (*sukshma-sthula*) and then the products whether essence or excreta are transported through these pathways. Like cells provide energy by oxidation of glucose/AA/ fatty acids which after binding with specialized receptors are carried to specific body tissues.

As doshas do movement through them, their *kshaya* (depletion) and *vriddhi* (aggravation) takes place in these *Srotas*.

CELL

Cells exhibit its functions systematically through cell organelles. Cell membrane forms outermost boundary of the cell organelles thus protecting them. It does all the transportation through channels, carrier proteins, receptors, ionic pumps etc. The Cell membrane also exhibit property of selective permeability thus allowing exchange of selective ions and other contents according to location and

need of the system they are part of Endoplasmic Reticulum helps process molecules made by the cell and transports them to their specific destinations inside or outside the cell. Ribosomes are attached to Granular Endoplasmic Reticulum are composed of a mixture of RNA and proteins, and they function to synthesize new protein molecules in the cell.

Golgi apparatus are wrapping and packaging department of the cell. It produces secretion granules i.e. membrane enclosed complexes, which store hormones and enzymes in protein secreting cells. Lysosomes are vesicular organelles that provides an intracellular digestive system that allows the cell to digest damaged cellular structures, food particles that have been ingested by the cells and unwanted matter such as bacteria. Mitochondria considered as power house or power generating units of cells; provide energy for the cell activities. Without them cells would be unable to extract enough energy from the nutrients, and essentially all cellular function would cease, which is the control center of the cell; sends messages to the cell to grow and mature, to replicate, or to die. It contains large quantities of DNA, which comprise the genes¹⁴. Genes determine the characteristics of the cell's proteins, including the structural proteins as well as the intracellular enzymes that control



cytoplasmic and nuclear activities¹⁵. Srotas is a processing unit in which function of bio-transformation of previous *dhatu* into the next *dhatu* takes place and then their transportation through these network of channels providing nourishment to the tissues.

SROTAS	CELL
1. Innumerable <i>srotas</i> compose of <i>Sharir</i>	1. Human Body constitutes of Trillion of cells.
2. Shape and size of <i>srotas</i> varies greatly from anu to sthula, circular, big, small, long etc	2. Shape and size of cells vary according to site and function like nephrons, neurons, RBC, WBC etc
3. Exchange of all the bio-products occur through them.	3. Cell Membrane do all the exchange across the ICF and ECF through certain carriers and channels.
4. Transportation of all the molecules, impulses, emotions, thoughts happen via <i>srotas</i> .	4. Transportation of ions, impulse, signals etc are all traversed through cell.
5. <i>Dhatu</i> s are processed, formed and transported further in <i>srotas</i>	5. Mitochondria in the cell release ATP which meet the energy requirements of the body.
6. <i>Sthula srotas</i> have been classified by acharyas which perform all vital functions.	6. Cells differentiate and aggregate to form tissue, organs and further organ systems which functions for survival of living beings.

DISCUSSION

Entire range of life processes in healthy and disease depends on the integrity of *srotas* system of the body. *Srotas* are not merely transport system of the body which provides platform for activities of bio-factors but also are specific in their

functions. Transformation and metabolism of *poshya dhatu* occurs in *srotas*. *Srotas* serve as medium through which both *Prasad* (nutrient) and *mala* (waste product) are transported. All *Dosha*, *Dhatu* and *Mala* are reliant on the functioning of *srotas* for their genesis, relevant movement and destruction. The transport of biological fluids, physiological regulatory factors, nourishment of the tissues and bio-availability of medicaments depends on the coherence of the *Srotas* system. Similarly all the ongoing life activities in human body however complex they seem are actually the processes happening at cellular level. These functioning on mere observation may appear very massive and gross but these are actually the collective results of all the proceedings and going-froing occurring at the cellular level.

CONCLUSION

From the above mentioned discussion and review regarding *Srotas* and its functioning at cellular level; we may conclude that the transport of the biological fluids (*Dosha*, *dhatu*, *mala*), nourishment of tissues and even the exchange of impulse, emotions, message and thoughts depend on the coherence and integrity of *Srotas*. Understanding of *Srotas* is very much essential to interpret physiological,



pathological and pharmacological implications in human body just like all of these are elucidated at cellular level.



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