WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 3, 223-240. Review Article ISSN 2277–7105

CONCEPTRUAL STUDY OF SROTAS WITH SPECIAL REFERENCE TO RAKTAVAHA SROTAS

Dr. Anu Bala*[1], Dr. Upender Nath Sharma[2], Dr. Ram Mohan Singh Kushwah[3], Dr. Pooja Thakur[4], Dr. Pooja Makhnotra[5] and Dr. Namrita Bhadouria[6]

[1,6]MD Scholar, P.G. Dept. of Rachana Sharir RGGPG Ayurvedic College Paprola.
[2]H.O.D P. G. Dept. of Rachana Sharir RGGPG Ayurvedic College Paprola.
[3]Professor P. G. Dept. of Rachana Sharir RGGPG Ayurvedic College Paprola.
[4,5]Lecturer, P.G. Dept. of Rachana Sharir RGGPG Ayurvedic College Paprola.

Article Received on
09 Dec. 2024,
Revised on 30 Dec. 2024,
Accepted on 20 Jan. 2025
DOI: 10.20959/wjpr20253-35384

***Corresponding Author**
Dr. Anu Bala
MD Scholar, P.G. Dept. of Rachana Sharir RGGPG Ayurvedic College Paprola.

ABSTRACT

In Ayurveda, the body's vital components—*Dosha*, *Dhatu*, and *Mala*—are transported through the *Srotas*, which function as the body's internal channels. These channels are responsible for circulating the *Dosha*, *Dhatu*, and *Mala*, ensuring proper physiological processes. Each *Srotas* is connected to a specific anatomical structure known as the *Moola* (Root), and the functioning of the *Srotas* depends on the health of this root structure. *Srotas* are described as pathways that carry nutrients and waste throughout the body. The primary organs associated with these channels are *Sira* and *Dhamani*, two types of channels mentioned by *Acharya Charaka*. Some *Srotas* are subtle (*Sukshma*), while others are more substantial (*Sthula*), often taking on the color of the *Dhatu* they transport. For example, the *Raktavaha Srotas*, which carry Rakta (blood), are linked to the *Yakrit* (liver) and *Pleeha* (spleen) as their *Moola Sthana*, and these organs are involved in the haemopoietic system. *Acharya Charaka* suggests therapies like *Virechana* (purgation), *Langhan* (fasting), and *Raktasravana* (bloodletting) for treating blood-related disorders, such as *Raktapitta*. *Acharya Sushruta* further explains that damage to the *Moola Sthana* of the *Raktavaha Srotas* can cause symptoms such as *Shayavangata* (dark discoloration), *Jwara* (fever), *Daha* (burning), *Panduta* (pallor), *Shonitagaman* (excessive bleeding), and *Raktanetrata* (bloodshot eyes). Understanding the anatomy and function of *Srotas* is crucial for both *Ayurvedic* and modern medicine in maintaining health and diagnosing ailments.

KEYWORDS: Srotas, Raktavaha Srotas, Rakta, Yakrit, Pleeha.

INTRODUCTION

Ayurveda is a profound science of living that encompasses the whole life. Ancient philosophies serve as basis of *Ayurveda*. Science of *Ayurveda* is the outcome of human curiosity. The facts mentioned by our *Acharyas* in ancient times require in depth study and research. *Ayurveda* strongly emphasize on prevention of disease and maintenance of health. The term "*Ayurveda*" is originated from *Sanskrit* words "*Ayu*" and "*Veda*" which signifies life and science. Therefore, *Ayurveda* is known as "The Science of Life". It is often referred to as "Mother of all Healing". It is derived from the historic *Vedic* civilization. *Ayurveda* the ancient Indian system of medicine includes not only the treatment protocol in the *Samhitas* but also contains the structural anatomy of the body in *Sharira Sthana*. *Sharira Sthana* of *Samhita* describe even the subtle part of human body.

- शरीरं चिन्त्यते सर्वं दैवमानुषसंपदा ।

सर्वभावैर्यतस्तस्माच्छारीरं स्थानमुच्यते ।।

(च.शा. 8/69)

This section is known as "*Sharira Sthana*" because it deals with the description of the knowledge which is helpful in understanding of all the godly and human aspects of the phenomena in the individual's body.[1]

- शरीरविचयः शरीरोपकारार्थमिष्यते ।

ज्ञात्वा हि शरीरतत्त्वं शरीरोपकारकरेषु भावेषु ज्ञानमुत्पद्यते ।

तस्माच्छरीरविचयं प्रशंसन्ति कुशलाः।।

(च.शा. 6/3)

Detailed knowledge of the human body is conductive to the well-being of the individual. Understanding of the factors that constitute the body provides knowledge regarding the factors which are responsible for its well-being. That is why expert extol the detailed knowledge of the body.[2]

- अपि चैके स्रोतसामेव समुदयं पुरूषमिच्छन्ति ।

(च.वि. 5/04)

According to *Acharya Charaka* human body is nothing but conglomeration of channels only. *Srotas* is a crucial concept in *Ayurveda*. *Acharya Charaka* has acknowledged in the *Vimana Sthana* that *Purusha* is made up of infinite number of *Srotas*.[3]

The specific varieties of the channels of circulation in the human body are same in number as the structural entities in it. All the structural entities in human body cease either to maintain the continuity of their manifestations or to undergo diminution in the absence of the respective channels of circulation. These channels carry the tissue elements which are undergoing transformation from their previous states like *Rasa* to their subsequent states like *Rakta* etc.

The channels of circulation do not transport *Sthira* (stable) *Dhatu* but only the mobile *Dhatu* that is meant to be transformed into another *Dhatu* located in a different area. Each *Dhatu* has two fractions one which is stable (*Poshya*) and which gets nutrition from the preceding *Dhatu* and other which is unstable provide nutrition to the succeeding *Dhatu* (*Poshak*). This second fraction of preceding *Dhatu* cannot move to the succeeding *Dhatu* for providing the nutrition in the absence of a channels of circulation. So, the *Dhatu* are nourished through their respective channels and only one channel cannot provide nourishment to another *Dhatu* as one canal cannot irrigate trees situated in different places.

MATERIAL AND METHODS

All sorts of references regarding *Srotas* and *Raktavaha Srotas* are compiled from various available *Ayurvedic* classics text like *Sushruta Samhita*, *Charak Samhita*, *Ashtang Hridya*, *Ashtang Sangraha Ayurvedic commentaries* and modern books like B.D Chourasia, Gray's Anatomy, Review articles, journals, etc.

DISCUSSION

The ideas of *Srotas* have been widely disseminated throughout *Ayurveda*. *Srotas* that make up the body play a vital function in keeping the various bodily constituents in balance. Both maintenance of health and the state of sickness are under their purview.

Srotas are *Akash Mahabhoota* dominant structure. When seen from a physiological perspective *Srotas* are the pathways that allow various components to change, transmute, circulate and move.

- स्रवणादिति रसादेरेव पोष्यस्य स्रवणात ।

(चक्रपाणि टीका सू. 30/12)

Acharya Chakrapanidatta used his commentary to explain the *Sravana Karma.* The mechanism by which the *Poshya Dhatu* receives *Poshaka Rasa*. It was observed by him that

the body uses *Sravana Karma* to carry the nutritional precursor of tissues. *Rasadi Dhatu* secrete through *Srotas* to nourish its descendant *Dhatu.*[4]

- स्रवणात् स्रोतांसि ।

(च.सू. 30 /12)

Acharya Charaka explain *Sravana Karma* as specific property of the *Srotas*. *Sravana* means to ooze, to exude, to filter and to permeate. *Acharya Chakrapanidatta* explained *Sravana Karma* as process of transportation.[5]

- अयनानि च तानि मुखानि चेत्ययनमुखानि ।

(चक्रपाणि टीका सू. 28/5)

The entry point of *Srotas* is known as *Ayan Mukha*.

- अत्र आयान्त्यनेनेत्ययनानि मार्गाणि ।

(चक्रपाणि टीका सू. 28/5)

The word *Ayan* denotes path of *Srotas* through which *Dhatu* and *Mala* travels. Opening via which *Dhatu* and *Mala* enters are known as *Mukha*.

Ayanmukha are the pores or microchannels which are present in cell membrane.

- स्रोतसामेव समुदयं पुरूषमिच्छन्ति ।

(च.वि. 5/04)

Acharya Charaka has acknowledged in the *Vimana Sthana* that *Purusha* is made up of infinite number of *Srotas.* The specific varieties of the channels of circulation in the human body are same in number as the structural entities in it.

The average adult human body consists of more than 100 trillion cells. Cells are the basic, living, structural, and functional units of the body.

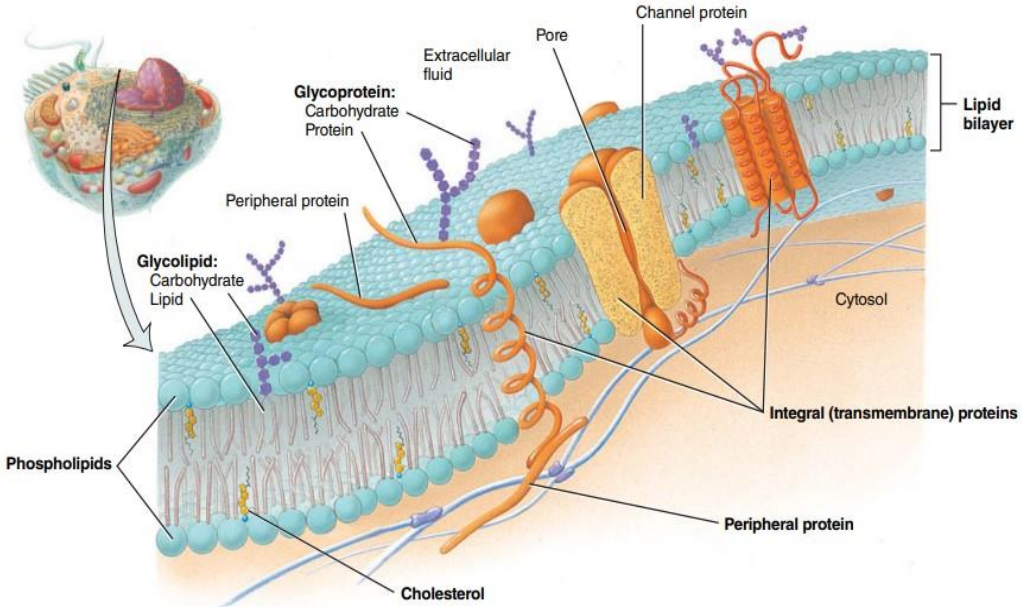
The plasma membrane forms the cell's flexible outer surface separating the cell's internal environment (everything inside the cell) from the external environment (everything outside the cell). It is selective barrier that regulates the flow of materials into and out of a cell. This selectivity helps establish and maintain the appropriate environment for normal cellular activities. Transport of materials across the plasma membrane is essential to the life of a cell. Certain substances must move into the cell to support metabolic reactions. Other substances that have been produced by the cell for export or as cellular waste products must move out of

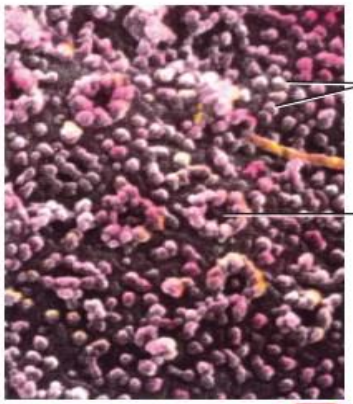
the cell. Substances generally move across cellular membranes via transport processes that can be classified as passive or active, depending on whether they require cellular energy. Nuclear pores control the movement of substances between the nucleus and cytoplasm, nucleoli produce ribosomes and chromosomes consist of genes that control cellular structure and direct cellular functions.

So, we can correlate *Srotas* with the pores present in cell membrane.

TYPES OF *SROTAS*

According to *Acharya Charaka*, the specific variety of the channels of circulation in the human body are the same in number as the structural entities in it. Some Scholars stated that *Srotas* are innumerable in number while others take them as numerable.





(b) SEM of ribosomes & pores on nuclear membrane

There are also two types of *Srotas Sukshma* and *Mahan*. *Nabhi* and *Romkoopa* include in *Sukshma Srotas* whereas *Mahan Srotas* are Nine in number. The *Purusha* has nine external orifices two for each eye, nose, ear and one for mouth, rectum and urethra. Females have three more *Srotas* two for breast and one for vagina. The other thirteen internal *Srotas* are vital to life. They are the *Pranavaha*, *Udakavaha*, *Annavaha*, *Rasavasha*, *Raktavaha*, *Mamsavaha*, *Medovaha*, *Mutravaha*, *Purishvaha*, *Shukrvaha*, and *Artavaha Srotas.* They are also called as *Yogavahi Srotas*.

One significant point to note here is that *Asthi*, *Majja* and *Swedavaha Srotas* are not mentioned by *Acharya Sushruta*. *Dalhana* explained the reason because they are beyond the scope of *Shalya Tantra*.

According to *Acharya Charaka* the *Srotas* are innumerable but thirteen main *Srotas* which are described by him are *Sthula Srotas*. So, the other *Srotas* must be *Sukshma* in nature.

The *Moola Sthana* of *Srotas* would be considered as the foundation point or source of these channels. This could be interpreted as anatomical or physiological locations from where these channels originate or have their primary connection. *Acharya Sushruta* has furnished eleven Pairs of *Srotas* especially in the context of injury and has mentioned symptoms of piercing at its root.

Showing the *Moola Sthana* of *Srotas* by *Acharya Charaka* and *Acharya Sushruta*

Sr.No.	Name of *Srotas*	*Acharya Charaka*	*Acharya Sushruta*
1.	*Pranavaha Srotas*	*Hridya, Mahasrotas*	*Hridya, Rasavahini Dhamani*
2.	*Udakavaha Srotas*	*Talu, Kloma*	*Talu, Kloma*
3.	*Annavaha Srotas*	*Amashaya, Vamaparshva*	*Amashaya, Annavahini Dhamani*
4.	*Rasavaha Srotas*	*Hridya,Dash Dhamani*	*Hridya, Rasavahini Dhamani*
5.	*Raktavaha Srotas*	*Yakrit, Pleeha*	*Yakrit, Pleeha And Raktvahini Dhamani*
6.	*Mamsavaha Srotas*	*Snayu, Tvaka*	*Snayu, Tvaka Raktavahini Dhamani*
7.	*Medovaha Srotas*	*Vrikka, Vapavahana*	*Kati, Vrikka*
8.	*Asthivaha Srotas*	*Meda, Jaghana Pradesh*	-
9.	*Majjavaha Srotas*	*Asthi, Sandhi*	-
10.	*Shukravaha Srotas*	*Vrishana, Shefa*	*Stana, Vrishana*
11.	*Mutravaha Srotas*	*Vasti, Vankshan*	*Vasti, Medhra*
12.	*Purishvaha Srotas*	*Pakvashaya, Sthula Guda*	*Pakvashaya, Guda*
13.	*Swedavaha Srotas*	*Meda, Loma Koopa*	-
14.	*Artavavaha Srotas*	-	*Garbhashaya, Artavavahini Dhamani*

Instead of these *Srotas*, *Acharya Charaka* has described *Artavavaha Srotas* in the context of *Garbha Prakarana*.

Acharya Sushruta did not considered *Asthi*, *Majja* and *Swedavaha Srotas.*

Moola Sthana

The *Moola Sthana* is so considered without which the origin, maintenance and destruction of the specific carrier of the body nutrient cannot be possible. It is the place which controls the entire functional dealings and processes of that specific carrier. As the tree is seriously affected by injury to its root, similarly the channels of circulation in the human body are seriously affected when their *Moola Sthana* is injured.

Acharya Chakrapanidatta said that "*Mulamiti Prabhava Sthanam*" which means the site of origin.

DISCUSSION ON *AYURVEDIC* REVIEW OF *Raktavaha Srotas* w.s.r. to Haemopoietic system.

Srotas are circulating channels that carry the *Dhatu* and its constituent elements. *Acharya Charaka* defined that *Srotas* act as channels through which *Mala* and *Prasad Dhatu* travels. The structure of *Srotas* is *Svadhatu Samvarna* (it will have the same colour of the *Dhatu*), *Vritta* (Circular in form), *Sthula* (Large in size), *Anu* (Small in size), *Dirghakrita* (Large in length), *Pratan Sadrishyani* (Reticular structure). According to *Acharya Sushruta*, *Dhamani* and *Sira* differ greatly from *Srotas* in terms of *Lakshana* (Symptomatology), *Moolasaniyamat* (System of origin), *Karma* (Function) and literary content. According to *Acharya Dalhana*, the passage through which *Prana, Anna, Jala, Rasadi Sravana* takes place is known as *Srotas*.

The first thing that should come in the mind when structure of *Srotas* is explained that they must have a specific structure which should be different from the other structures of the body. *Svadhatu Samvrana* means that the colour of *Srotas* is similar to the colour of the *Dhatu* they carry. It is true that the capillaries which are present in different parts of the body may appear similar in colour in which they are present. *Pratan Sadrishyani* means that *Srotas* are branched like and netlike structures. The same arrangement can be seen in the capillaries. *Raktavaha Srotas* can be compared with microcirculation through capillary Network.

Capillaries

These are networks of microscopic vessels which connect arterioles with the venules. These come in intimate contact with the tissues for a free exchange of nutrients and metabolites across their walls between the blood and the tissue fluid. The metabolites are partly drained by the capillaries and partly by lymphatics.

Capillaries are replaced by sinusoids in certain organs like liver and spleen. Capillaries, sinusoids, and postcapillary venules are the exchanging vessel.

Arteries are divided into 3 types

1. Large arteries of elastic type.
2. Medium and small arteries of muscular type.
3. Smallest arteries of muscular type are called arterioles.

Smallest arteries of muscular type are called arterioles. They measure 50-100 micron in diameter. Arterioles divide into terminal arterioles with a diameter of 15-20 micron and having one or two layers of smooth muscle in their walls. The side branches from terminal arterioles are called metarterioles which measure 10-15 micron at their origin and about 5 microns at their termination. The terminal narrow end of metarteriole is surrounded by a precapillary sphincter which regulates blood flow into the capillary bed.

Capillaries (capillus = hair) are networks of microscopic endothelial tubes interposed between the metarterioles and venules. The capillary bed and postcapillary venules form an enormous area for the exchange of nutrients, gases, metabolites and water between the blood and interstitial fluid.

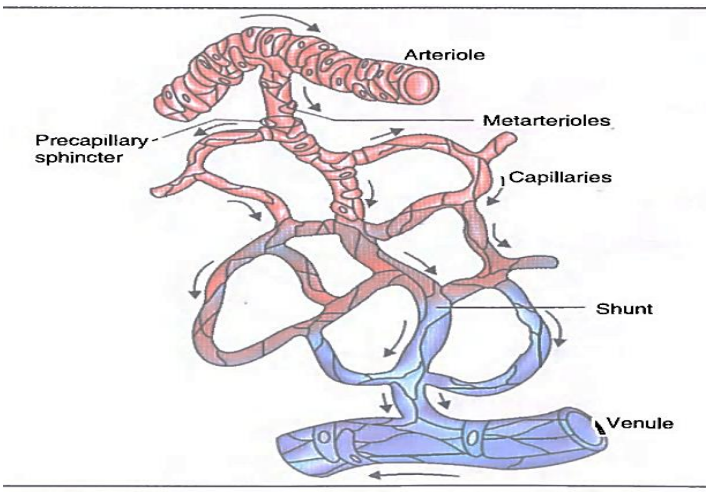
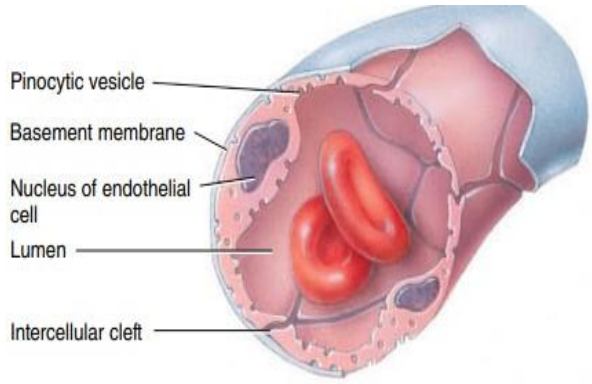


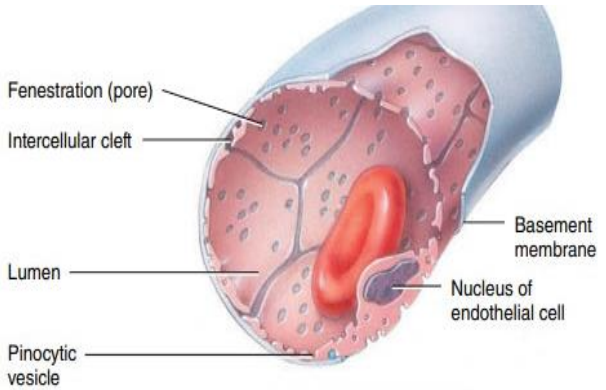
Fig. 5.4: Capillary bed between arteriole and venule

Capillaries are found near almost every cell in the body but their number varies with the metabolic activity of the tissue they serve. Body tissues with high metabolic requirements such as muscles, the brain, the liver, the kidneys and the nervous system use more O2 and nutrients and thus have extensive capillary networks. Tissues with lower metabolic requirements, such as tendons and ligaments contain fewer capillaries.

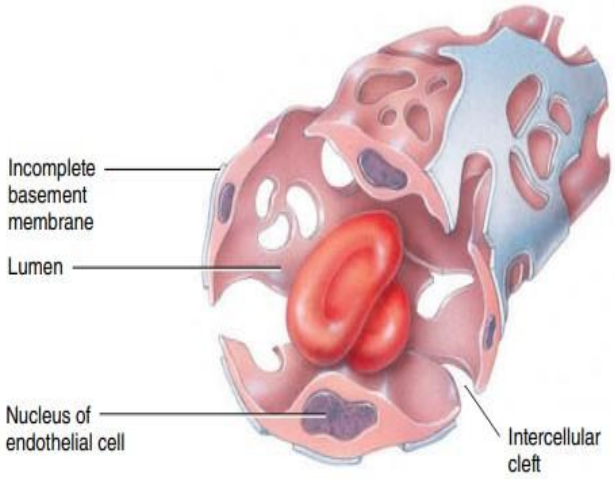
The structure of capillaries is well suited to their function as exchange vessels because they lack both tunica media and tunica externa. Because capillary walls are composed of only a single layer of endothelial cells and a basement membrane a substance in the blood must pass through just one cell layer to reach the interstitial fluid and tissue cells. Exchange of materials occurs only through the walls of capillaries. The body contains three different types of capillaries i.e. continuous capillaries, fenestrated capillaries and sinusoids. Most capillaries are continuous capillaries, in which the plasma membranes of endothelial cells form a continuous tube that is interrupted only by intercellular clefts, gaps between neighboring endothelial cells. Continuous capillaries are found in the central nervous system, lungs, muscle tissue and the skin. The body contains three different types of capillaries i.e. continuous capillaries, fenestrated capillaries and sinusoids.



(a) Continuous capillary formed by endothelial cells



(b) Fenestrated capillary



(c) Sinusoid

In *Charaka Samhita* it is clearly mentioned that *Rakta* is formed by the *Ushma* of the *Pitta* which renders the *Rasa* into a coloured state. *Acharya Charaka* and *Acharya Sushruta* described that *Rakta* is formed in *Yakrit* and *Pleeha* with the help of *Ranjak Pitta*. He also explained that *Rasa* when circulates through *Yakrit* and *Pleeha* become coloured there and thus *Rakta* is formed. These two organs are primarily involved in *Rakta* Formation.

Ranjak Pitta

Acharya Sushruta explained five types of *Pitta* along with their functions. Among these five *Pitta*, *Ranjak Pitta* whose location is described in *Yakrit* and *Pleeha* is responsible for the formation *Rakta* from *Rasa*.

Location of *Yakrit* and *Pleeha* same as the Liver and Spleen

The *Yakrit* is one of the *Koshthanga* which maintains the metabolic function of the human body. It is situated on the right and inferior to the *Hridya*. *Yakrit* is developed from *Matrijadi Bhava* (maternal derivative) and originate from the essence part of *Rakta*.

- तस्याधो वामत प्लीहा फुप्फुस यकृत् दक्षिणतो क्लोम च ।

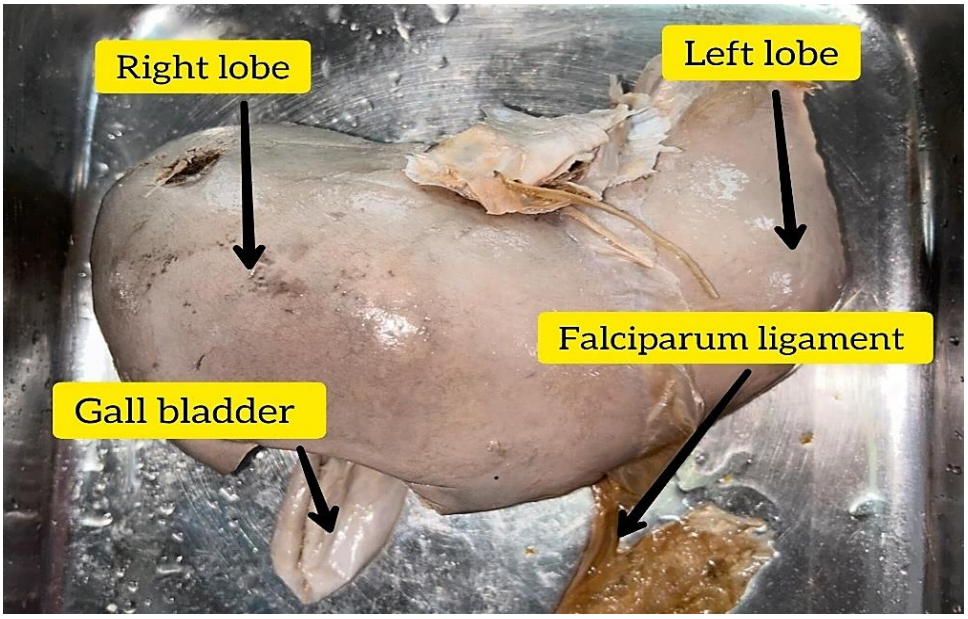
(सु.शा. 4/30)

- तद्वामे फुप्फुसप्लीहौ दक्षिणागें यकृन्मतम् ।।

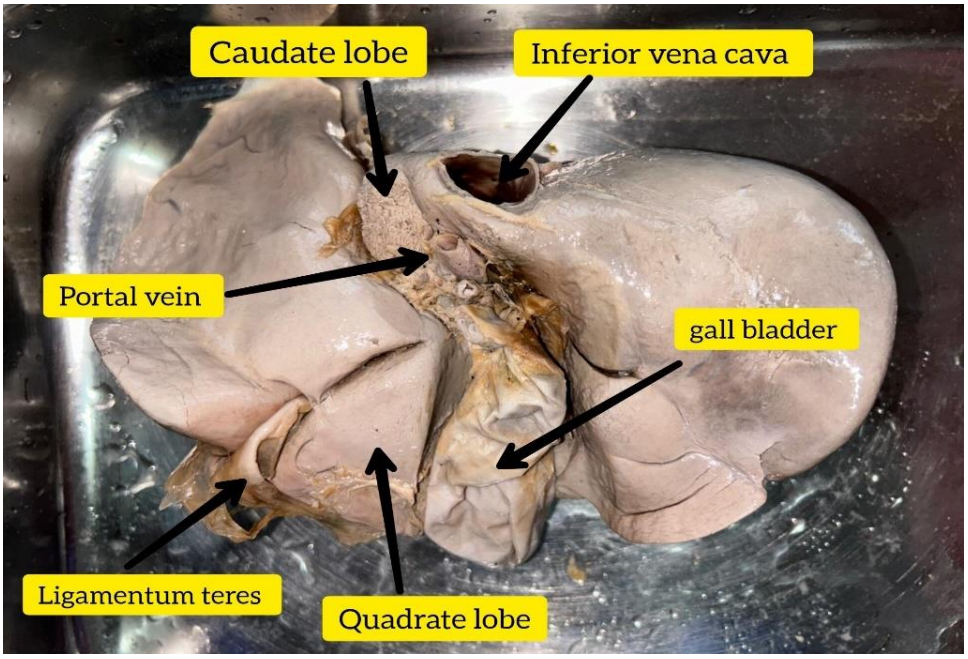
(शा.स. 5 /40)

The *Pleeha* is a *Koshtanga* situated below and left to the *Hridya*. The *Pleeha* is developed from *Matrijadi Bhava* (maternal derivative) and originate from essence part of *Rakta*. *Dhamani* is the structure which nourishes the body and maintains the function of the body

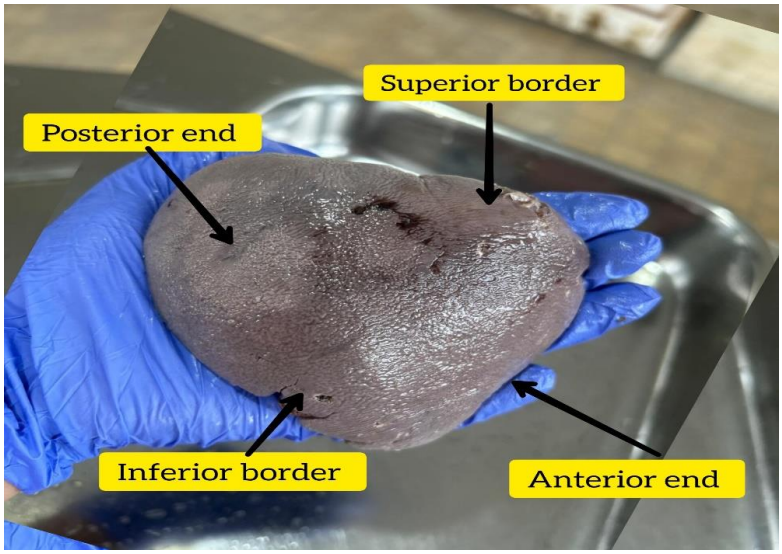
properly. In other version it is the structure in which pulsation can be felt. *Dhamani* originated from *Nabhi*. It spreads like spikes of the wheel. The *Raktavahini Dhamani* are the structures which carries *Rakta* to different parts of the body and *Ranjak Pitta* may be considered as the factor which is responsible for the formation of red blood cells as mentioned in modern aspect. The factors which are responsible for the colour of *Rasa Dhatu* are proteins, pigments and vitamins. These all are manufactured in liver and spleen.



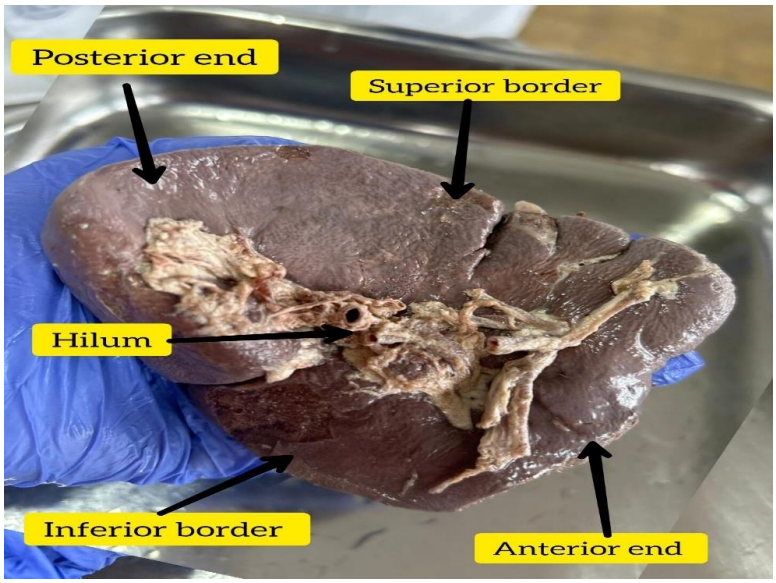
Anterior Surface of Liver



Visceral Surface of Liver



Diaphragmatic Surface



Visceral Surface

Function of Liver and Spleen in relation with Haemopoietic System

1. The Liver is known as *Yakrit* in *Ayurveda.* It is considered as the seat of *Ranjak Pitta* responsible for various metabolic processes including transformation of nutrients, detoxification of harmful substances and production of bile. It also plays a major role in blood purification by filtering out toxins and metabolic waste products from bloodstream. Within the context of *Raktavaha Srotas* the liver is closely connected to blood circulation through the hepatic portal system. This system collects nutrient rich blood from the digestive organs and transport it to liver for processing before enters the general circulation.

2. Liver produces various blood clotting factors.
3. Large nests of proliferating cells which produce red and white blood cells lie between hepatic cells and walls of the vessels. This activity gradually subsides during the last 2 months of intrauterine life and only small haematopoietic island remains at birth.
4. The definitive haematopoietic stem cells are derived from mesoderm surrounding the aorta in a site near the developing mesonephric kidneys called the aorta gonad mesonephros region (AGM). These cells colonize in the liver which becomes the major haematopoietic organ of the embryo and foetus from 2^{nd} to 7^{th} month of development. Cells from liver colonise in the bone marrow.
5. Reticuloendothelial cells that line the liver sinusoids remove bacteria and other particulate matter that might enter the blood from the gastrointestinal tract. Thus, liver prevents direct transport of potentially harmful agents into the remainder of the body.
6. During pathological conditions haematopoietic stem and progenitor cells leave their microenvironment in the bone marrow and establish in different anatomical locations where they continue to produce mature blood cells known as Extramedullary Haematopoiesis (EMH). In these pathological conditions the liver and spleen resume their foetal role of haematopoiesis.
7. The spleen is a lymphoid organ that belongs to the Reticulum endothelium system. During foetal life spleen produce erythrocytes and after birth it produces lymphocytes. It is also a highly vascular organ which contains almost 1/3rd of the total body platelets and high number of neutrophils.
8. The Spleen or *Pleeha* in *Ayurveda* is another vital organ closely associated with circulatory system and blood purification. It acts as a blood filter removing damaged red blood cells. Spleen also stores amount of blood that can be released into circulation during the times of need such as during haemorrhage.

9. THE SPLEEN AS A RESERVOIR FOR STORING RED BLOOD CELLS

In the splenic pulp the capillaries are so permeable that whole blood including the red blood cells oozes through the capillary walls into a trabecular mesh forming the red pulp. The red cells are trapped by the trabeculae while the remaining plasma enter into the venous sinuses and then into the general circulation. As a consequence, the red pulp of the spleen is a special reservoir that contains large quantity of concentrated red blood cells. These concentrated red blood cells can then be expelled into the general circulation whenever the sympathetic nervous system becomes excited and causes the spleen and its vessels to contract. As much as

50 milliliters of concentrated red blood cells can be released into the circulation raising the haematocrit 1 to 2 percent. In other areas of spleen there are islands of white blood cells which collectively known as white pulp. Here lymphoid cells are manufactured that are similar to those manufactured in the lymph nodes. They are the part of the body's immune system.

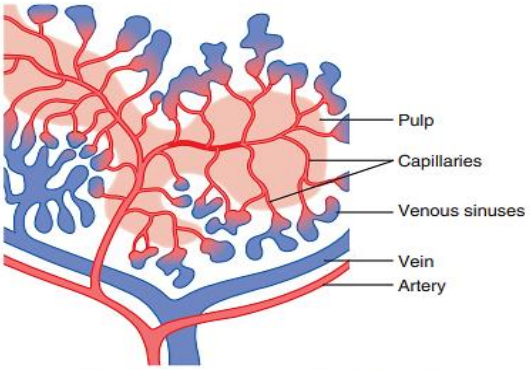


Figure 15-13. Functional structures of the spleen.

SINUSOIDS

Sinusoids replace capillaries in certain organs like liver, spleen, bone marrow, suprarenal glands, parathyroid glands, carotid body etc.

Sinusoids are large, irregular, vascular spaces which are closely surrounded by the parenchyma of the organ. These differ from capillaries in the following respects-

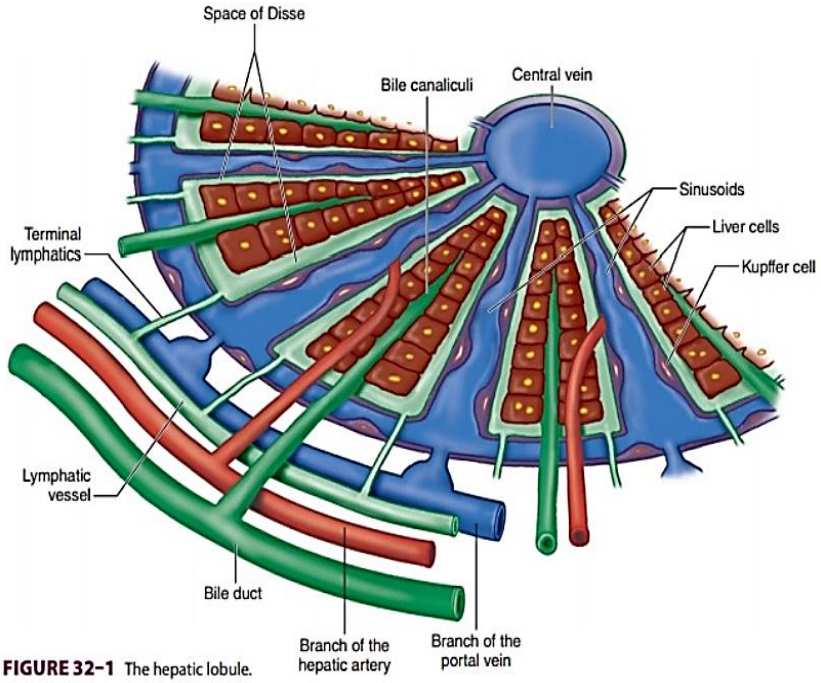
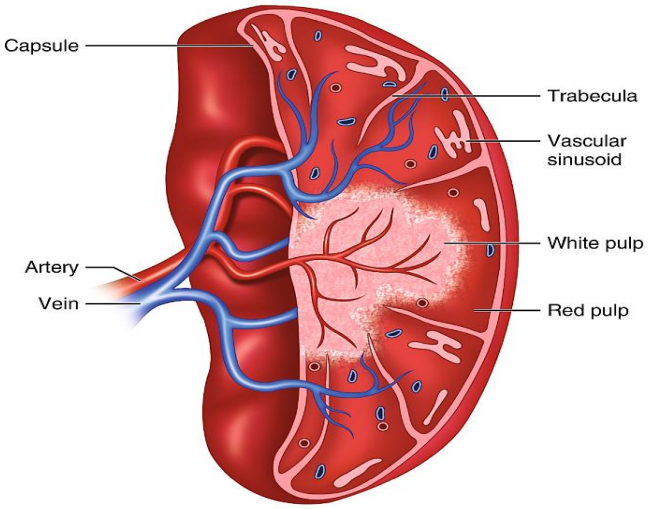


FIGURE 32–1 The hepatic lobule.

1. Their lumen is wider (upto 30 micron) and irregular.
2. Their walls are thinner and may be incomplete. They are lined by endothelium in which the phagocytic cells (macrophages) are often distributed. The adventitial support is absent.
3. These may connect arteriole with venule (spleen, bone marrow) or venule with venule (liver).

These Sinusoids present in Liver and Spleen can be compared with *Raktavaha Srotas.*



10. *Raktavaha Dhamani* can be compared with portal vein. Splanchnic system is such that all the blood that courses through the gut, spleen and pancreas flows immediately into the liver through the portal vein. From liver through hepatic veins blood drain into Inferior vena cava.

CONCLUSION

The following findings are drawn from the present research work "Conceptual Study of *Srotas* with special reference to *Raktavaha Srotas*" based on the literature review and factual analysis.

1) *Srotas* are the empty pathways that originate at the root position and ascend throughout the entire body serving as a conveyance mechanism to fulfil the organism's nutritional needs. *Srotas* helps in the transport and distribution of vital substances, ensuring that nutrients reach the tissues and waste products are removed. Similarly, the pores present in cell membrane act as gateways allowing selective permeability and facilitating essential

cellular processes such as nutrient uptake, waste removal and maintaining ionic balance. So, we can correlate *Srotas* with the pores present in cell membrane.

2) *Raktavaha Srotas* can be compared with microcirculation through capillary Network. This capillary network in liver and spleen replaced by sinusoids.
3) As mentioned in our *Samhitas* the location of *Yakrit* and *Pleeha* are the same as those of the liver and spleen.

   Liver is situated in right hypochondriac region. In our *Samhitas* location of *Yakrit* is below and right to *Hridya*. Spleen is situated in left hypochondriac region which is same as mentioned by our *Acharyas* that *Pleeha* is located below and left to *Hridya*. In foetal life both organs are developed from *Rakta*. So, we can consider Liver and Spleen as *Moola Sthana* of *Raktavaha Srotas.*
4) Liver and Spleen act as reservoir of blood. Additionally damaged red blood cells are removed from circulation and destroyed by phagocytic macrophages found in the liver and spleen. The life cycle, degradation and recycling of red blood cells are primarily mediated by the liver and spleen.
5) Liver becomes the major haematopoietic organ of the embryo and foetus from 2^{nd} to 7^{th} month of development.
6) Large nests of proliferating cells, which produce red and white blood cells lie between hepatic cells and wall of the vessels.
7) A complex of cell types including hepatoblasts creates the haematopoietic microenvironment in the foetal liver. Recently hepatoblasts have been shown to play an important role in regulation of erythropoiesis.

   Hepatic Stage - From third month of intrauterine life Liver is the main organ that produces red blood cells. Spleen and lymphoid organs are also involved in erythropoiesis.

   Myeloid Stage - During the last three months of intrauterine life, the red blood cells are produced from red bone marrow and liver.
8) Haemocytoblasts which are produced by certain fixed mesenchymal cells in the spleen give rise to erythroblasts during the fifth month of pregnancy.
9) Spleen perform immunological functions like destruction of damaged and aged erythrocytes, filters blood, produce B and T lymphocytes and acts as reservoir of the blood.
10) Significant amount of concentrated red blood cells are found in the red pulp of the spleen. Once the sympathetic nervous system is activated and the spleen and its arteries constrict, these concentrated red blood cells can be released into the general circulation. Higher

haematocrit levels of 1 to 2 percent can be achieved by releasing up to 50 milliliters of concentrated red blood cells into the bloodstream.

11) Large amount of blood may be kept in the liver's blood arteries due to its expandable nature. Its typical blood volume which includes the blood in the hepatic sinuses and veins is around 450 millilitres or roughly 10% of the body's total blood volume.
12) Until the age of five almost every bone marrow generates red blood cells. Around the age of 20, the marrow of the long bones with the exception of the proximal sections of the humeri and tibiae becomes very fatty and stops producing red blood cells. After this age the majority of red blood cells are still made in the marrow of membranous bones such the ilia, sternum, ribs, and vertebrae. As we age the marrow become less productive even in these bones.
13) Haematopoiesis that takes place in organs other than the bone marrow is referred to as extramedullary haematopoiesis. Even the liver and spleen regain their foetal function of haematopoiesis in extramedullary haematopoiesis.
14) All blood that passes through the pancreas, spleen and gut is directed into the liver via portal vein by the splanchnic circulation. Blood from liver drain into inferior vena cava through the hepatic veins. So, we can consider portal vein as *Raktavaha Dhamani*.

Considering the above listed facts, we can conclude that *Srotas* are the pores present in cell membrane. The *Raktavaha Srotas* can be compared with Sinusoids and capillaries. It has been mentioned that *Moola* of *Raktavaha Srotas* are *Yakrit* and *Pleeha*. Liver and spleen both play major role in formation, circulation and storage of blood. Based on their anatomical structure and physiological functions we can correlate *Moola Sthana* of *Raktavaha Srotas* i.e. *Yakrit* and *Pleeha* with Liver and Spleen.

REFERENCES

1. Charaka Samhita, Text with English Translation and critical exposition based on Chakrapani Datta ‘s Ayurveda Dipika, Author Dr. R.K. Sharma and Vaidya Bhagwan Dash, Published by - Chowkhamba Sanskrit Series Office Varanasi (India), Edition reprint, 2016, 2: Sharira Sthana 8/69, 516.
2. Charaka Samhita, Text with English Translation and critical exposition based on Chakrapani Datta ‘s Ayurveda Dipika, Author Dr. R.K. Sharma and Vaidya Bhagwan Dash, Published by - Chowkhamba Sanskrit Series Office Varanasi (India), 2, Edition reprint, 2016; Sharira Sthana 6/03, 426.

3. Charaka Samhita, Hindi Commentary - Vidyotini, Author Pandit Kashinaath Pandey, Dr. Gorakhnath Chaturvedi, Published by - Chaukhambha Bharati Academy, Edition reprint, 2021; Vimana Sthana 5/04, 631.
4. Charak Samhita, Hindi Commentary – Ayurveda Dipika by Charkapanidutta, Author – Vaidya Hrishchandra Singh Kushwaha, Published by- Choukhamba Orientalia Varanasi, Edition Reprint, 2022; Sutra Sthanaa 30/12, 492.
5. Charaka Samhita, Hindi Commentary - Vidyotini, Author Pandit Kashinaath Pandey, Dr. Gorakhnath Chaturvedi, Published by - Chaukhambha Bharati Academy, Edition reprint, 2021; Sutra Sthana 30/12, 513.