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# Pleeha as Mulsthan of Raktvaha Srotas in Ayurveda and its Affiliates in Modern Perspective: A Review

Author: Anil Tomar<sup>1</sup>

Co Authors: M B Gaur<sup>2</sup>

<sup>1,2</sup>Department of Kriya Sharir, Ch. Brahm Prakash Ayurved Charak Sansthan, Khera Dabar, Najafgarh, New Delhi, India

## ABSTRACT

According to Ayurveda human body is structured with different types of srotas. The term Srotas means channels or networks which are basic and essential parts of body. All srotas are closely connected with their particular origin (mulasthan). Mulasthan of srotas are the sites of utpati (formation), vahan (transportation) and sangrah (storage) of a particular constituent to which the srotas belongs. Rakta (blood) is one of the important functional connective tissue of body of which formation, transformation and transportation is carried out by raktvaha srotas and the mula of the raktvaha srotas are Yakrut and Pleeha. For blood circulation modern science especially mentioned the cardiovascular system, liver as a most important metabolic gland and spleen as lymphoid organ and part of reticuloendothelial system. Blood related concepts like – formation of RBCs (hemopoiesis), destruction of RBCs and reservoir of RBCs is rooted in liver and spleen (pleeha). In this article, the relationship between Pleeha (Spleen) and Rakta (Blood) is studied. Also, an effort has been made to discover the reasons for mentioning the Pleeha (Spleen) as mulasthan of raktvaha srotas.

**Key Words:** Srotas, Mulasthan, Pleeha, Raktvaha srotas, Raktadhatu

## INTRODUCTION

Ayurveda is a holistic science of life, mentioned various type of fundamental theories. Like *dosha*, *dhatu* and *mala* these 3 are the basic structural & physiological unit of the body. *Dosha* in mutual association always keep trying to make equilibrium in body. Energy required for daily metabolic activity is provided by the external factors i.e., *prana* (O<sub>2</sub>), *ahara* (food) and *udaka* (liquid). In the process of *dhatu utpati* (formation) explain in fig no.1

*Saptadhatus* (*rasa*, *rakta* etc.) formation is depending upon *samyawastha* (normality) of

*dosha*, *samyak jatharagni*, *bhootagni* and *dhatvagni* and normal structure of *srotas*.

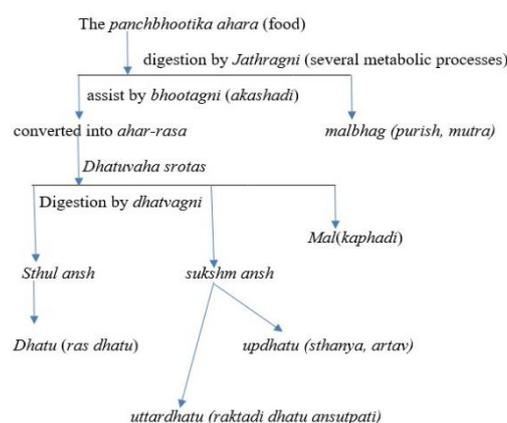


fig.- 1. Process of dhatu utpati.

**Figure 1** Process of dhatu utpati

The word *srotas* is derived from “*Sau-Gatau*” Sanskrit terminology which means *srotas*



## REVIEW ARTICLE

(Sro+tasi) which means to permeate, ooze, to convey. According to Acharya Charak “*sravanat srotansi*” which means *srotas* are the streams or channels of circulation which carries the *dhatu*<sup>1</sup>. Acharya Charak stated that *Srotas* have color similar to those of the *dhatu*s they carry and are tubular, large or small, long and tendril like in shape<sup>2</sup>. *Srotas* are immovable according to their different actions depending on the biological material that they are carrying their openings are numerous. *Srotansi* are defined as inner transport system of the body and fine channels of circulation & pathways, carrying out *dhatu* (all nutrients which responsible for *dhatu* formation) undergoing transformation<sup>3</sup>. There are as many kinds of *srotas* as there are entities of the body. In the absence of *srotas*, all such entities do not appear or fester<sup>4</sup>. Acharya Sushrut and Vagbhat compared *srotas* to the very fine pathways and pores in the lotus stem, from which *rasadi poshya*

*dhatu* circulates throughout the body and provides nutrition for body. *Srotas* term concluded with both *anu srotas* and *sthula srotas* in it. Presently cell is considered as *anu srotas* as it is microscopic living units and tissue is considered as *sthula srotas* as it is a group of structurally and functionally similar cells which function together to form an organ system. Acharya Sushrut has mentioned 11 *yogvahi* (pairs) of *srotas*<sup>5</sup>. Same as Charak but Acharya Sushrut has left out *Asthivaha*, *Majjavaha*, *Swedvaha srotas* and included *Artavvaha srotas* in females on the other hand Acharya charak has mentioned 13 *srotas*; 7 for 7 *dhatu*, 3 for mala and 2 for intake of nutrient substance like food, air, and one for regulation of water<sup>6</sup>. According to different *acharya*, different types of *srotas* and their *mula* explain in table no.1.

### *Srotas* and their *mula*

**Table 1** Mula of various type of *srotas*

| <i>Srotas</i>     | Charaka               | Sushruta                        | Vagbhat                  |
|-------------------|-----------------------|---------------------------------|--------------------------|
| <i>Pranavaha</i>  | Hriday, Mahasrotas    | Hriday, Rasvahi dhamni          | Hriday, Mahasrotas       |
| <i>Annavaaha</i>  | Amashaya, Vamparshwa  | Amashaya, Annavahi dhamni       | Amashaya, Vamparshwa     |
| <i>Udakavaha</i>  | Talu, Kloma           | Talu, Kloma                     | Talu, Kloma              |
| <i>Rasavaha</i>   | Hriday, Dasdhamni     | Hriday, Rasvahi dhamni          | Hriday, Dasdhamni        |
| <i>Raktvaha</i>   | Yakrut, Pleeha        | Yakrut, Pleeha, Raktvahi dhamni | Yakrut, Pleeha           |
| <i>Mamsavaha</i>  | Snayu, Twak           | Snayu, Twak, Raktvahi dhamni    | Snayu, Twak              |
| <i>Medovaha</i>   | Vrikka, Vapavahan     | Vrikka, Kati                    | Vrikka, mamsa            |
| <i>Asthivaha</i>  | Meda, Jaghan          | -                               | Meda, Jaghan             |
| <i>Majjavaha</i>  | Asthi, Sandhi         | -                               | Asthi and parva          |
| <i>Shukravaha</i> | Vrishan, Medhra       | Vrishan, Stan                   | Stan, Mushka and Majja   |
| <i>Artavvaha</i>  | -                     | Garbhashay, artavaha dhamni     | -                        |
| <i>Purishvaha</i> | Pakvashay, Sthoolguda | Pakvashay, guda                 | Pakvashay and sthulantra |
| <i>Mutravaha</i>  | Basti, Vankshan       | Basti, Medhra                   | Basti, Vankshan          |
| <i>Swedovaha</i>  | Meda, Lomakoopa       | -                               | Meda, Lomakoopa          |



## REVIEW ARTICLE

### Synonyms of *srotas*: -

- *Srotamsi*: - Openings, passages, channels.
- *Sira*: - Veins
- *Dhamani*: - Arteries
- *Rasayani*: - Nutrient vessels & lymphatic's
- *Nadi*: - Vessels, cords, canal, tube, nerve
- *Pantha*: - Channels
- *Marga*: - Tracts, Passage
- *Sharirachhidra*: - Body orifices
- *Samritasavritta*: - External and internal passages of the body
- *Sthan*: - Organ
- *Ashaya*: - Spaces
- *Niketa*: - Resorts<sup>7</sup>.

The concept of *srotas* by *acharyas* has been mentioned differently in views, *Acharya Charak* considered flow of *bhav* within the body provide nourishment and transportation within the body. Equilibrium has been maintained by every *dhatu* by performing special type of functions like “*jeevan karma*” (to provide nutrients) by *ras* (*plasma*), “*preeran karma*” (tissue oxygenation) by *rakta* (*blood*). *Acharya Sushrut* explains *srotas* in much more scientific means as: *srotas* is an anatomical structure whose roots have cavity in it. “*Mulat khadyantare dehe prasutam abhivahiyat*” Suggest that *srotas* originates from organ or group of organs that has *akash mahabhoot* dominance and these same organs are considered as *mulsthan* (prime organ)<sup>8</sup>.

***Dehe prasutam***: - is extending capability all over body via completely different channels (*srotas*).

***Abhivahi***: - it is the broad term that include of *utpatti* (*production*), *parinaman* (*transformation*) and *utsarjan* (*excretion*) in it. The formation of other *dhatu*s involves the movement of nutrients from *ahar* to that *dhatu* and the formation of the *dhatu* by acting upon that nutrients, but the formation of blood particles in the formation of *rakta dhatu* is one process and the *ranjan* of blood particle through *ranjak pitta* is other process. According to *Acharya Charak* and *Sushrut ranjak pitta* resides in *yakrut* and *pleeha* however *Acharya Vagbhat* stated for *ranjak pitta* resides in *amashya* and *Acharya Sadhangdhar* stated that *ranjak pitta* lives in *yakrut* and *ranjan* of *ras* occurs in *hridaya*.

***Sharirdhatuavkashanam***: - Suggest that it is the site where all the body structure be located in, *sharir dhatu*s resides in and function of the *srotas* can't be performed by any other structure so as we know *yakrut* and *pleeha* is considered as the *mulsthan* of *raktvaha srotas*<sup>9</sup>.

***Garbhasya yakrutpleehano sonitajoo***: - According to *acharya Sushrut*, *yakrut* and *pleeha* are originated from blood during embryonic development. *Pleeha* called as *raktasaya*<sup>10</sup>. The basic fact, that the *Pleeha* develops in the dorsal mesentery and its blood communicates through splenic vein with the portal vein<sup>11</sup>. There are two different blood storage areas in the Spleen;

- a) The Venous Sinuses
- b) The pulp → Red pulp and White pulp



## REVIEW ARTICLE

Sinuses can swell and store whole blood like any other portion of the venous system. The capillaries are so permeable in the splenic pulp that the whole blood, including red blood cells, oozes into a trabecular mesh through the capillary walls, forming red pulp although the red cells are trapped by the trabeculae, while the plasma flows through the venous sinuses and then into the general circulation. As a result, the spleen's red pulp is a specialized reservoir containing vast amounts of concentrated red blood cells. As the sympathetic nervous system is activated and allows the spleen and its vessels to contract, they can then be thrown into the general circulation. The red pulp is a blood filter that removes foreign body and dented and effete erythrocytes. Red pulp is also a storage area for iron, erythrocytes, and platelets. It is a site of hemopoiesis, particularly in fetal and neonatal animals<sup>12</sup>. In other areas of splenic pulp are islands of white blood cell, which mutually are called the white pulp. There lymphoid cell is manufactured similar to those manufactured in the lymph nodes.

## DISCUSSION

*Rakta* is the one of the most important *dhatu* mentioned in *Ayurveda*. *Rakta* (blood) is the main nutrient of body and *dharan* (hold) the body, formation, transformation and distribution of *rakta dhatu* is dependent on *raktvaha srotas* and *mulasthanas* of *raktvaha srotas* are *Yakrut* and *Pleeha*. From here *raktadhatu* is distributed and circulated through *raktavaha srotasa*. According to *ayurveda* formation of *raktadhatu* is a different metabolic process on *ahar-ras* with the help of

*raktagni* and *ranjak pitta*<sup>13</sup>. Any organ or structure can be considered as its *Mulasthanas* on following basis-

- **Utpatti sthan (formation)**- 3<sup>rd</sup> to 5<sup>th</sup> month of IUL and in middle trimester of gestation reasonable number are also produced in the spleen.
- **Sangraha sthan (storage area)**- The red pulp in spleen (*pleeha*) is special reservoir of RBC's and also storage area for iron, erythrocytes.
- **Vahana sthan (conduction)**- Microcirculation of the spleen. Destructed blood cells are transported from *pleeha* to *yakrut* by splenic vein drain into portal vein.
- **Naidanic drishtikon (diagnostic point of view)**- according to *acharya charak* in *vididhasitpitiya* adhaya mentioned *pleeharog* as a *raktapradosaj vikar*<sup>14</sup>. *Mula* controls all the physiological activities of *srotas*, any anatomical or physiological deformity in the *mula* affects the function of *srotas*.
- **Chikitsatmak drishtikon (clinical point of view)**- By giving treatment on *srotomula* concern *srotas* diseases is cured as in *Raktvaha Srotas* the drugs acting on *Pleeha* are used e.g., *Rohitaka* (*Tecomella Undulata*).  
*Yakrut* and *pleeha* are originated from blood during embryonic development and during second trimester erythropoiesis occurs in *Yakrut* (Liver) & *Pleeha* (Spleen). Hence on the basis of *Guna-samanya*, *Ashraya-Ashrayi* (quality wise interdependence between abode & resident) the relation between *Yakrut-Pleeha* and *Rakta dhatu* gets proven successfully<sup>15</sup>. Hence, we should



## REVIEW ARTICLE

diligently protect blood. The blood formation process is not as simple as that of other dhatu.

comprises of three steps as follows explain in table 2: -

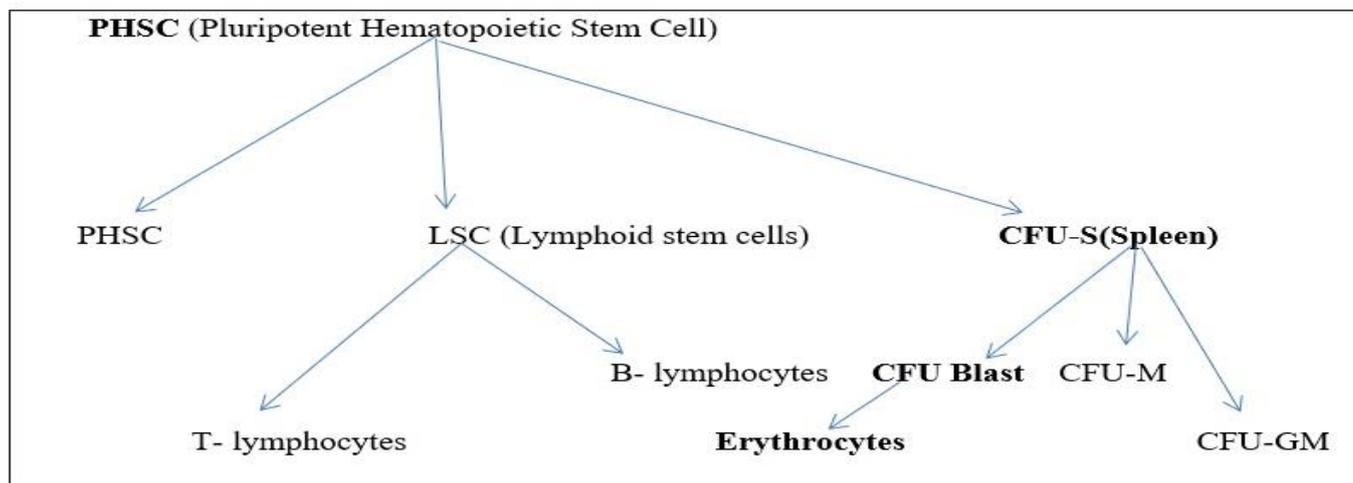
### Formation of RBC's (ERYTHROPOIESIS)

**Table 2** Stages and sites of formation of RBC's.

|                                |   |
|--------------------------------|---|
| 1)Intravascular Erythropoiesis | <ul style="list-style-type: none"> <li>3<sup>rd</sup> week of intra uterine life. Primitive nucleated RBC's are produced in yolk sac.</li> </ul>  |
| 2)Extravascular Erythropoiesis | <ul style="list-style-type: none"> <li>3<sup>rd</sup> to 5<sup>th</sup> month of IUL the erythropoiesis occurs in liver and spleen.</li> <li>In middle trimester of gestation, the liver is the main organ for production of RBC'S, but reasonable number are also produced in the spleen and lymph nodes.</li> </ul> |
| 3)Bone marrow Erythropoiesis   | <ul style="list-style-type: none"> <li>From 5 month and from now onwards erythropoiesis occurs exclusively in Red Bone Marrow.</li> </ul>   |

Further Formation of multiple different blood cell from PHSC (Pluripotent Hematopoietic Stem

Cell) in Bone Marrow as follows explain in fig. no. 2:



**fig-2- Formation of multiple different blood cell from PHSC (Pluripotent Hematopoietic Stem Cell) in Bone Marrow.**

The Blood cells began their lives in the bone marrow from single type of cell called the Pluripotent Hematopoietic Stem Cell, from which all the cells of circulating blood are eventually derived. The proerythroblast is the first cell which can be classified as belonging to the sequence of Red Blood Cells. Large numbers of these cells are produced from CFU-E stem cells (Colony Forming Unit Erythrocytes) under sufficient stimulation. Once the proerythroblast is formed, it divides many times, ultimately forming several

mature red blood cells. The basophil erythroblasts are named first-generation cells. Endoplasmic reticulum is also reabsorbed at the same time. The cell is termed a reticulocyte at this point since it still contains a small amount of basophilic material consisting of the Golgi apparatus remnants and mitochondria. The reticulocyte's remaining basophilic content usually disappears within 1 to 2 days, and then the cell is a mature erythrocyte<sup>16</sup>. According to *Acharya Chakrpani mula* is the *Prabhavsthana*. The word *Prabhavsthana* means



## REVIEW ARTICLE

the governing site or organ. In classics the term *prabhavsthana* is used in the context of *srotas* only for two *srotas* that is *Raktvaha srotas* and *Mutravaha srotas*. *Mula* controls all the physiological activities of *srotas*, any anatomical or physiological deformity in the *mula* affects the function of *srotas*. *Srotomula* is very important organ from the diagnostic point of view as most of the *srotas* after vitiation produces some kind of symptoms on their *Mula*. *Mula* works as the junctions where two *srotas* unites to each other to make the continuity of the body e.g., *Grahni* (*Annavaha srotas* and *Purishavaha srotas*). *Mula* works as the base for the *srotas* by providing nutrition to it and storing the essential material of that *srotas* e.g., *Yakrut* and *Pleeha- Raktvaha srotas*

### **Destruction of Hemoglobin: -**

When RBC destruct and release their Hb, in different parts of the body, hemoglobin is phagocytized almost immediately by macrophages, but especially by Kupffer cells of the liver and macrophages of the spleen and bone marrow. The macrophages release iron from the hemoglobin over the next few hours to days and move it back into the blood, to be transferred to the bone marrow by transferrin for the formation of new red blood cells or to the liver and other tissue for storage in the form of ferritin. The porphyrin part of the hemoglobin molecule is converted by the macrophages, through a Sequence of phases in the bile pigment bilirubin that is released into the blood and after that

removed from the body by secretion through the liver into the bile<sup>17</sup>.

**RBC** — RUPTURE IN SPLEEN —————> Hb comes in stroma and caught by Reticuloendothelial cells by the process of phagocytosis (Eating up of cell)

## CONCLUSION

*Srotansi* indicate all macro and micro level description pertaining to exchange, excretion and transportation. *Raktvaha srotomula pleeha* are associated with formation, circulation, transportation and decomposition of blood or lymph. *Srotomula* also helps to understand the diagnosis of disease as most of the time *srotas* is vitiated first then *srotomula* is vitiated afterwards. By giving treatment on *srotomula* concern *srotas* diseases is cured as in *Raktvaha Srotas*. The most important function of *pleeha* is destruction of blood cells i.e., RBC's. This destructed blood cells element are transported from *pleeha* to *yakrut* with *pleeha sira* (Splenic vein) through the portal vein for erythropoiesis. The red pulp in spleen (*pleeha*) is special reservoir of RBC's and also storage area for iron, erythrocytes, and platelets hence *pleeha* can be considered as one of the *mulasthan* of *raktvaha srotas*.



## REVIEW ARTICLE

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