

PATHO-PHYSIOLOGY OF BAHUPITTA KAMALA DUE TO RAKTAVAHA SROTODUSTI W.S.R. TO HAEMOLYTIC JAUNDICE

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ABSTRACT

Raktavaha Srotas are the channelled system which deals with circulation of blood in required form to every system and there to deals with nourishment of whole body. It originates from *Yakrit*, *Pleeha* and *Raktavahini Dhmani*. Intake of food and drink which is sharp and acidic in nature causes burning of natural smooth composition of *Rasa Dhatu* which results in formation of abnormal *Rakta Dhatu* and hence causes vitiation of *Raktavaha Srotas*. When the person who is already suffering from *Pandu Roga* consumes food of hot and spicy nature, *Pitta Dosh* aggravates with all its qualities and further vitiates *Rakta* and *Mamsa Dhatu* to produce *Bahupitta Kamala*. As per modern medicine, Haemolytic jaundice, results from excessive red cells destruction as occurs in intra and extravascular haemolysis or due to ineffective erythropoiesis. Disease like Malaria, Sickle cell anaemia and drugs like Cephalosporins, NSAIDS etc. causes abnormal breakdown of red cells. There is increased release of haemoglobin from excessive breakdown of red cells that leads to overproduction of bilirubin. There is increase in unconjugated bilirubin in the serum and dark brown colour of stool due to excessive faecal excretion of bile pigments and increased urinary excretion of urobilinogen. On the basis of similarities in the symptoms haemolytic jaundice can be correlated with *Bahupitta Kamla* in *Ayurveda*. The aspect of *Raktavaha Srotodusti* in context of pathophysiology of *Bahupitta Kamala* will be discussed in full paper.

Keywords: *Rakta dhatu*, *Raktavaha Srotas*, *Bahupitta Kamala*, Haemolytic Jaundice

INTRODUCTION

Srotas are the specific varieties of the channels of circulation in the human body which are the same in number as the structural entities in it. All the (structural) entities in the human body cease either to maintain the continuity of their manifestation or to undergo diminution in the absence of the respective channels of circulation. The channels of circulation carry the *Dhatu*s (tissue elements or their constituents) under-

going transformation to their destination.^[1] The channelled system which deals with circulation of blood in required form to every system and there to deals with nourishment of whole body. Organs Related to blood circulation are included under *Raktavaha Srotas*.^[2] The *Rakta Dhatu* (blood) which is also referred as fourth *Dosha* by *Sushruta*, is one of the important functional element of body of which formation, trans-

formation and conduction is carried out by *Raktavaha Srotas*.^[3] Food and regimens that promote the morbidity of (aggravated) *Doshas* and go contrary to the well-being of *Dhatus* (tissue element) vitiate the channels. *Doshas* only when increase in quantity can vitiate others. When reduced in quantity, they are unable to vitiate other, they only manifest such symptoms as are caused by the reduction in their quantity.^[4,5] In *Ayurvedic* text, *Kamala* is described under *Raktapradoshaja Vikar*^[6], and *Bahupitta Kamala* is type of *Kamala* which can be correlated with Haemolytic Jaundice on the basis of similarity in the symptoms.

Rakta Dhatu

When *Rasa* is mixed with “*Ranjaka Pitta*” it forms *Rakta Dhatu* or Blood.^[7] It is mainly responsible for *Jivankarma* i.e. carrying gases O₂, CO₂, for the purpose of all *Jivanadi Vyaparas* or *Saptdhatu Karmas*. It increases life span and keeps the person active. It provides nourishment to every part of the body and included in *Dashpranayatan* and gives nourishment to successive *Dhatu* i.e. *Mansaposhana*. According to modern, the formed elements of the blood include three principal components: red blood cells (RBCs), white blood cells (WBCs), and platelets. Red blood cells, also known as erythrocytes, which are the most abundant cells of the blood.^[8] Red blood cells (RBCs) contain the oxygen-carrying protein haemoglobin, which synthesized before loss of the nucleus during RBC production and constitute about 33% of the cell's weight and gives whole blood its red colour.^[9] Blood transports oxygen from the lungs to the cells of the body and carbon dioxide from the body cells to the lungs for exhalation.^[10] After the lifespan of 120 days, the RBC is destroyed in the reticuloendothelial system, particularly in spleen and the haemoglobin is released into plasma. Soon, the haemoglobin is degraded in the reticuloendothelial cells and split into globin and heme. Globin is utilized for the resynthesis of hemoglobin. Heme is degraded into iron and porphyrin. Iron is stored in the body as ferritin and hemosiderin, which are reutilized for the synthesis of new hemoglobin. Porphyrin is converted into a green

pigment i.e. called biliverdin. Most of biliverdin is converted into a yellow pigment called bilirubin. Bilirubin and biliverdin are together called the bile pigments.^[11]

Origin of Rakta Vaha Srotas

- ❖ According to *Acharya Charaka*, *Raktavaha Srotas* originates from *Yakrit* (liver) and *Pleeha* (spleen).^[12]
- ❖ *Acharya Susruta* has mentioned that *Raktavaha Srotas* are two in number and they originate from *Yakrit* (liver), *Pleeha* (spleen) and *Raktavahini Dhamani* (blood vessels).^[13]

Causes of Rakta Dhatu Vitiation

The factor causing vitiation to *Rakta Dhatu* and *Pitta Dosh* are the main causes for *Raktavaha Srotas Dusti*. It is due to intake of adulterated liquor, excessive intake of salty, alkaline, sour, spicy, pungent, potently hot type of foods, lentils, horse gram (type of pod-*Nishpava*), sesame seeds or oil, *Pindalu* (*Dioscoria Altata*), radish, green leafy vegetables, sour curds, whey, spirituous liquor-wine (*Sura*) or sour barley gruel (*Sauviraka*) etc. Intake of incompatible food contents or intake of stale, rotten or adulterated food and day time sleep after eating fatty, unctuous food cause *Rakta Dhatu* vitiation. Avoiding of blood-letting procedure (*Rakta Mokshana*) when indicated, accepting hot sun or working near the heat for longer times, suppression of natural urge to vomit, avoiding of bloodletting (*Rakta Mokshana*) procedure during *Autumn-Sharada Ritu*, excessive physical exertion, physical trauma, hyper hostile nature and indigestion and repeated excessive eating. *Rakta Dhatu* vitiate as natural environment effect of *Autumn-Sharada Ritu*. Excessive intake of meat as well as of animal residing at dry or wet lands e.g. Fish, beef, pork etc also vitiate *Rakta Dhatu*.^[14]

Causes for vitiation of Raktavaha srotas

Raktavaha Srotas get vitiated due to the intake of food and drinks which is sharp and acidic in nature. It causes burning of natural smooth composition of *Rasa Dhatu* which results in formation of abnormal *Rakta Dhatu* and hence causes vitiation of *Raktavaha Srotas*. Intake of excessive fatty food contents lower down the

power of *Agni* and thus formation of healthy *Rakta Dhatu* does not occur hence causes vitiation of *Raktavaha Srotas*. Food contents which are hot by quality and character because burning out of *Rasa Dhatu* which hinders process of *Rakta Dhatu* formation which cause vitiation of *Raktavaha Srotas*. Intake of excessively liquid type of food contents cause imbalance in ratio of solid and liquid of blood and also of the body and causes vitiation of *Raktavaha Srotas*. Accepting excessive heat in form of direct sunlight or by any other mode cause burning of *Rasa Dhatu* and hence abnormal *Rakta Dhatu* is produced. It causes vitiation of *Raktavaha Srotas*.^[15,16] *Rakta Dhatu* cannot vitiate on its own. Involvement of some aggravated *Dosha* is essential for vitiation of *Rakta Dhatu*. Hence specific time period of vitiation of *Rakta Dhatu* may be calculated according to involve *Dosha*.^[17]

Symptoms produced when *Raktavaha Srotas* injured at their roots as explained by *Acharya Susruta*

When these are injured, blue colouration of the body, fever, burning sensation, anaemia, haemorrhage and redness of the eyes manifest.^[18]

SROTODUSTI

Srotodusti is disturbance at the level of *Srotas* either structurally or functionally leads to the occurrence of the disease. There are four varieties of *Srotodusti* mentioned in ancient text i.e. *Atipravritti*, *Sanga*, *Siragranthi* and *Vimargagamana*.^[19]

1. **Atipravritti**- Increased activity of the function of one or more *srotas*.
2. **Sanga**-It is opposite of the *atipravritti*, creates *srotorodha* in one or more *srotas*.
3. **Siragranthi**- It means thickening, new growth or tumors.
4. **Vimarga Gamana**- Entering into other path after leaving its own path.

In the pathogenesis of *Bahupitta kamala*, mainly *Atipravritti* and *Vimargamana Srotodusti* occur.

ETIO-PATHOGENESIS

Bahupitta Kamala- The word *Kamala* means it is disease of liver in which all likes and dislikes disappear.^[20] Consuming alkaline, sour, salty, too hot, in-

compatible and unsuitable food, exercise use of beans, black gram, sesame oil, day sleep, exercise and sexual intercourse during the food is being digested, suppression of natural urges particularly in person afflicted with sexual desire, anxiety, fear, anger and grief, *Pitta* in heart gets aggravated and spread in the whole body due to aggravation of *Vata*. This *Pitta* located between skin, *Mamsa* affects *Kapha*, *Vata*, *Rakta*, skin and *Mamsa* and produce *Pandu*. Such patient suffering from *Pandu* or Anaemia, if consume excess amount of *Pitta* aggravating diet, may develop this disease. In this disease aggravation of *Pachaka* and *Ranjaka Pitta* affecting hemopoetic system and liver. Aggravated *Pitta* (with hot and penetrating qualities) further vitiate *Rakta* and *Mamsa Dhatu* to burn and thus destroy blood and muscle tissue (in the liver) and produce this disease.^[21]

Haemolytic Jaundice- This results from excessive red cells destruction as occurs in intra and extravascular haemolysis or due to ineffective erythropoiesis. There is increased release of haemoglobin from the excessive breakdown of red cells that leads to overproduction of bilirubin. In haemolytic jaundice, the excretory function of the liver is not impaired, but red blood cells are haemolysed so rapidly that the hepatic cells simply cannot excrete bilirubin as quickly as it is formed. As a result, the plasma concentration of free bilirubin rises to above normal levels. Also the rate of formation of *urobilinogen* in the intestine is greatly increased, and much of this is absorbed into the blood and later excreted in the urine.^[22]

DESCRIPTION OF SROTODUSTHI IN BAHUPITTA KAMALA

1. **Atipravitti (Hyper activity)**:- In *Bahupitta Kamala*, due to affliction of *Pandu Roga* and repeated acceptance of causes provoking *Pitta* aggravation, *Pitta Dosha* aggravates with all its quality. Same thing happened in Haemolytic Jaundice, due to excessive red cells destruction as occurs in intra and extra vascular haemolysis or due to ineffective erythropoiesis. There is increased release of haemoglobin from excessive

breakdown of red cells that leads to overproduction of bilirubin.

2. **Vimarga Gamana (Abnormal activity) :-** In *Bahupitta Kamala*, due to aggravated *pitta Dosha*, it further vitiates *Rakta* and *Mamsa Dhatu* and symptoms like dark yellow coloured skin, eyes, nails and urine appears. Also in Haemolytic Jaundice, due to very high concentration, bilirubin can slowly diffuse into the peripheral tissue where it is toxic. Excessive haemolysis, the liver may not be able to remove all excess urobilinogen, and so more is removed by the kidney. Laboratory data in haemolytic jaundice, in addition to predominant unconjugated hyperbilirubinemia, reveal normal serum level of transaminase, alkaline phosphatase and proteins. Bile pigment being unconjugated type is absent from urine (acholuric jaundice). However, there is dark brown colour of stool due to excessive faecal excretion of bile pigment and increased urinary excretion of urobilinogen.^[23]

Similarity of Sign and Symptoms of *Bahupitta Kamala* and Haemolytic Jaundice^[23,24]

हारिद्रनेत्रः स भृशं हरिद्रत्वङ्गनखाननः । रक्तपीतशकृन्मूत्रो भेकवर्णो हतेन्द्रियः । दाहविपाक दौर्बल्यसदनारुचिकर्षितः । (च. चि. 16/35-36)

- ❖ Lemon-yellow tinge of bulbar conjunctiva
- ❖ Acholuric urine or dark coloured urine (due to increased excretion of urobilinogen in urine)
- ❖ Darkened coloured stool (due to increased stercobilinogen in feces)
- ❖ Pale looking, due to anemia
- ❖ Fever
- ❖ Burning sensation of the Body
- ❖ Restlessness

DISCUSSION

Srotas can be interpreted as micro-vascular carrier which specialized for exchange of the materials between interstitial fluid and intra capillary substance move through highly specific pores which are called *Ayana*. *Raktavaha Srotas* can be considered as the channel system which involved in blood circulation. *Raktavahasrotas* from its *Utpattisthan*, we can compare with Haemopoetic system. From the *Sangrahas-*

han come to know liver and spleen act as reservoir of blood. And from the *Vahansthan* we can also compare with the circulatory system of the body and its *Moolasthan* we can compare with the portal system and from its *Moolasthan* it is easy to diagnosis the disease. Thus we can concluded that *Raktavahasrotas* is nothing but whole circulatory system and the disease of the *Raktavahasrotas* and the disease which is mainly liver and spleen disease.^[25] *Srotodusti* means to vitiate or contaminate the *Srotas*(channelled system). To know the pathogenesis of *Bahupitta Kamala*, It's very essential to know the type of *Srotodusti* involved to adopt appropriate treatment modalities. *Pitta Dosha* aggravates with all its qualities which indicate *Atipravitti Srotodusti* and further vitiation of *Rakta* and *Mamsa Dhatu* indicate *Vimarggaman Srotodusti* to form *Bahupitta Kamala*. There is increased release of haemoglobin from excessive breakdown of red cells that leads to overproduction of bilirubin.^[26] Approximately 250 to 350 mg of bilirubin is produced daily in healthy adults, about 85% of which is derived from turnover of senescent red blood cells. Unconjugated bilirubin at normal values is about 5 mg/kg/day or, for a 75-kg individual, about 400 mg/day. The half-life of unconjugated bilirubin is short; 60% of labelled bilirubin appears within hepatocytes within 5 minutes of injection. Clearance rate increases with an increasing concentration of unconjugated bilirubin up to at least 4 mg/dL. In hemolytic jaundice, unconjugated bilirubin rises as a result of abnormally high levels of haemoglobin released from erythrocytes. If the rate of bilirubin formation exceeds the rate of liver clearance (i.e., a state of overproduction of bilirubin), there will be a rise in the bilirubin level in serum. Virtually all of this bilirubin will be unconjugated bilirubin. Thus one manner of confirming a diagnosis of hemolytic jaundice is the finding, in adults, of elevated indirect bilirubin levels in serum. Usually, these levels are not dramatically elevated and are generally in the 1.5 to 3.0 mg/dL range.^[27] Haemolytic disorders that cause excessive haem production may be either inherited or acquired. Inherited disorders that include spherocytosis, sickle cell anaemia, thalassemia, and deficiency of red cell enzymes such as py-

ruvate kinase and glucose-6-phosphate dehydrogenase. In these conditions, the serum bilirubin rarely exceeds 86µmol/L (5mg/dl). Higher level may occur when there is coexistent renal or hepatocellular dysfunction or in acute hemolysis such as a sickle cell crisis. Acquired haemolytic disorders include microangiopathic haemolytic anaemia (e.g. haemolytic-uremic syndrome), paroxysmal nocturnal hemoglobinuria, spur cell anaemia and immune haemolysis. Ineffective erythropoiesis occurs due to deficiency of cobalamin, folate, and iron. [28] Importance of *Srotas* in manifestation of the disease - If *Srotas* are in healthy state the formation of *Dosa*, *Dhatu*, and *Mala* are good, but when these *Srotas* get vitiated then *Dosha*, *Dhatu* and *Mala* also become vitiate and body becomes diseased.

CONCLUSION

Srotas are important to maintain the normal physiological functions of the body. To study the physiological and clinical significance of *Srotas* as it is involved in pathogenesis of disease. *Raktavaha Srotas* is an important *Srotas* for the maintenance of homeostasis of the body. *Srotodusti* (pathological involvement of *Srotas*) are important to gain knowledge about manifestation of disease due to improper diet and life style and also helpful in prognosis. In *Ayurvedic* literature, *Kamala* is described in *Raktapradoshaja Vikar* and *Bahupitta Kamala* is its one type in which *Raktavaha Srotodusti* occurs. Fundamentals given in *Ayurvedic* literatures are very strong and deep rooted and very practical and should never be overlooked. After study of both, literature and fundamentals in *Ayurveda* and modern, it is concluded that the approach of pathophysiology and symptoms of *Raktavaha Srotodusti* in *Bahupitta Kamala* closely resembles with Haemolytic jaundice.

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