

A REVIEW ARTICLE ON LITERATURE OF SUSHRUTA'S RAKTAVAHI DHAMANYA CORRELATION WITH PORTAL VEIN

Dr. Manisha K. Dawre*¹ and Dr. Laxmi B. Barela²

¹Professor, Department of Rachana Sharir, Govt. Ayurvedic College, Osmanabad, 413501,
Maharashtra, India.

²PG Scholar, Department of Rachana Sharir, Govt. Ayurvedic College, Osmanabad, 413501,
Maharashtra, India.

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*Corresponding Author

Dr. Manisha K. Dawre

Professor, Department of
Rachana Sharir, Govt.

Ayurvedic College,

Osmanabad, 413501,

Maharashtra, India.

ABSTRACT

Sushrut Samhita describes eleven types of *Srotas* while in *Charak Samhita* thirteen types of *srotas* are described. The word *srotas* derived from *Sanskrit* root “*Shu Gatau*” which means to exude, to flow and to filtrate. The structure of *srotas* which originates from vacant spaces (hollow organs) spread throughout the body and purveys materials are to be understood as *srotas* (channels) and it is different from *Sira* (vein) and *Dhamani* (artery).^[1] These possess the same colure as their *Dhatu* (tissue in which they are present), are circular, big (wide), or small (minute), long and resemble the net-like lines of a leaf.^[2] These orifices (openings/mouths) of the *srotas* are minute small, spread long and far, like those in the lotus stalk; through them formation of *Rasa*

Dhatu occurs (fluid tissue carrying nutrition, nourishes all the part of the body).^[2] Each *Srotas* is said to associate with two organs which are termed as *Srotomool*. The normal functioning of *Srotas* depend on the *Moolashtana*. The *Raktavaha Srotas Srotomool* is the *Yakrit* (liver), *Pleeha* (spleen), *Raktavahi Dhamanya*, when these are injured blue discolouration of the body, fever, burning sensation, anaemia, heamorrhage and redness of the eyes occurs these symptoms manifest by *Acharya Shushrut*.^[3]

KEYWORDS: *Srotas*, *Raktavaha Srotas*, *Raktavahi Dhamanya*, Portal vein.

INTRODUCTION

Acharya Sushrut has defined *Srotas* as the hollow channels except large *Siras* and *Dhamanis* which originating from root space, spreads all over the body, circulates and exudes the specific entities. According to *Ashtanghridaya Sharirsthana Acharya Vagbhat* explained there were 2 types of *Srotas* that is *Abhyantar Srotas* and *Bahya Srotas*. *Acharya Charaka* mentions there are 13 types of *Srotas* and *Acharya Shushrut* explained about 11 pairs of *Yogavahi Srotas*. Each *Srotas* is said to be associate with two organs which are termed as *Strotomool*. According to *Acharya Charaka* and *Acharya Vagbhata* *Yakrit* and *Pleeha* are *Moolasthan* of *Raktavaha Srotas* but *Acharya Shushrut* mentions *Yakrit*, *Pleeha* and *Raktavahi Dhamanya* are *Moolasthan* of *Raktavaha Srotas*.^[4]

According to *Acharya Shushrut* – 700 sira and 24 dhamani and *Raktavahi Dhamanya* is *Moolsthan* of *Raktavaha Srotas*.^[5]

Portal vein

Portal vein is a large vein which collects blood from.

1. The abdominal part of the alimentary tract.
2. The gallbladder
3. The pancreas
4. The spleen and conveys it to the liver.

In the liver, the portal vein breaks up into sinusoids which are drained by the hepatic veins to the inferior vena cava. It called the portal vein because its main tributary, the superior mesenteric vein, begins in one set of capillaries (in the gut) and the portal vein ends in another set of capillaries in the liver. The portal vein is about 8 cm long. It is formed by the union of the superior mesenteric and splenic veins behind the neck of the pancreas at the level of second lumbar vertebra. Inferior mesenteric vein drains in to splenic vein. It runs upwards and a little to the right, first behind the neck of the pancreas, next behind the first part of the duodenum, and lastly in the right free margin of the lesser omentum.^[6]

The blood flow in portal vein is slow. Blood of superior mesenteric vein drains in to right lobe. Blood of splenic and inferior mesenteric vein drains into left lobe. This is called “streamline flow/turbulent flow”. The portal vein can thus be divided into infraduodenal, retroduodenal and supraduodenal parts.^[6]

AYURVEDIC LITERATURE REVIEW

Moolasthan of Srotas

मुलमिती प्रभावस्थानम्।

(च.वि.५/८ चक्रपाणि टिका)

Chakrapani has described *Moolasthan* as *Prabhavsthana*. Means the anatomical seat of respective *srotas*.^[7]

Raktavahi Dhamanya

रक्तवहे द्वे.तयोर्मुलं यकृत्प्लीहानौ रक्तवाहिन्यश्च धमन्याः।^[8]

सु.शा.९/१६

According to *Acharya Sushrut Raktavahi Dhamanya* is a *Moolasthan* of *Raktavaha Srotas*, this *Moolasthan* is only considered by *Acharya Sushrut* for *Raktavaha Srotas*. For that we have to first understand the concept of *Srotas*, *Sira* and *Dhamani*. Generally, these work as the channels of the body which assigned a job of carrying substances within the body. It is well admired fact that *Acharya Sushrut* succeed to trace very minute and minute channels present in the body. He was able to recognize every pore in the skin that had its own nerve, blood and lymphatic supply. It was calculated that there were about 700 *Siras* and 24 *Dhamanis* according to *Acharya Sushrut*, which could be easily enumerated but when the minute *Siras* were counted with their branches, there number was estimated to be the same as the number of hair follicles. Hence it can be said that the study of anatomical aspects of the body was at very peak in those days. As per modern assumption portal circulation system (*Yakrutgat Paribhramana*) is consider as separate system, so that *Raktavaha Srotas* consider as portal capillaries.^[8]

What is the *Dhamanya*?

स्त्रोतांसि सिरा धमन्यो शरीरधात्ववकाशानां लक्ष्यालक्ष्याणां नामानि।

च.वि.५/९

Dhamani is a tube-like structure, hollow space with pores. The correlation of *dhamani* is always done with hriday. The *Dhamani* circulate the *rasa* and *rakta*. *Dhamani* is pulsating structure (*spandan, dhaman*).^[9]

गुढाः समास्थिताः स्निग्धाः रोहिण्यः शुद्ध शोणितम्।

अ.ह.शा.३/३८

The tabular structure which carries the pure blood which is situated in dipper layer are well nourished and red colour.^[10]

रक्तवहे द्त्वे, तयोर्मुलं यकृत्प्लीहानौ रक्तवाहिन्यश्च धमन्याः ।

सु.शा.९/१६

Yakrut, Pleeha and Raktavahi dhamanya is the *moolsthana* of *Raktavaha srotas* said by *Acharya Sushrut*.^[11]

धमनिस्थे सफेन् रक्तमीरयन्ननिलः सशब्दं निर्गच्छत ।

सु.सु.२६/१२

The structure which circulates *rakta* with *vayu* by producing some sound called as *dhamani*.^[12] Means which dose the work of *Dhamana, Dhmaan, Spandan* (pulsating) is called *Dhamani*.^[13]

Normal anatomy of Portal vein

Medical definition of portal vein: A large vein that is formed by fusion of other veins, that terminates in a capillary network, and that delivers blood to some area of the body other than the heart.^[13]

Portal vein is a large vein which collects blood from

1. The abdominal part of the alimentary tract
2. The gallbladder
3. The pancreas
4. The spleen, and conveys it to the liver. In the liver, the portal vein breaks up into sinusoids which are drained by the hepatic veins to the inferior vena cava. It is called the portal vein because its main tributary, the superior mesenteric vein, begins in one set of capillaries (in the gut) and the portal vein ends in another set of capillaries in the liver. Portal vein supplies around 85% blood to liver.

Formation

The portal vein is about 8 cm long. It is formed by the union of the superior mesenteric and splenic veins behind the neck of the pancreas at the level of second lumbar vertebra. Inferior mesenteric vein drains into splenic vein.

Course

It runs upwards and a little to the right, first behind the neck of the pancreas, next behind the first part of the duodenum, and lastly in the right free margin of the lesser omentum.^[14]

The blood flow in portal vein is slow. Blood of superior mesenteric vein drains into right lobe. Blood of splenic and inferior mesenteric vein drains into left lobe. This is called “streamline flow/turbulent flow”.

The portal vein can thus be divided into infraduodenal, retroduodenal and supraduodenal parts.

Termination

The vein ends at the right end of the porta hepatis by dividing into right and left branches which enter the liver.

Relations**1. Infraduodenal part**

Anteriorly: Neck of pancreas

Posteriorly: Inferior vena cava

2. Retroduodenal part

Anteriorly

1. First part of duodenum
2. Bile duct
3. Gastroduodenal artery.

Posteriorly

Inferior vena cava.

3. Supraduodenal part

Anteriorly

1. Hepatic artery
2. Bile duct (with in the free margin of the lesser omentum).

Posteriorly

Inferior vena cava, separated by epiploic foramen.

4. Intrahepatic course

After entering the liver, each branch divides and redivides along with the hepatic artery to end ultimately in the hepatic sinusoids, where the portal venous blood mixes with the hepatic arterial blood.

Branches

1. The right branch is shorter and wider than the left branch. After receiving the cystic vein, it enters the right lobe of the liver.
2. The left branch is longer and narrower than the right branch. It traverses the porta hepatis from its right end to the left end, and furnishes branches to the caudate and quadrate lobes. Just before entering the left lobe of the liver, it receives during foetal life:
 - a. Paraumbilical veins along the ligamentum teres.
 - b. Ductus venosus along ligamentum venosum.

Tributaries

Portal vein receives the following veins.

1. Left gastric
2. Right gastric
3. Superior pancreaticoduodenal
4. Cystic vein in its right branch
5. Paraumbilical veins in its right branch

The left gastric vein accompanies the corresponding artery. At the cardiac end of the stomach, it receives a few oesophageal veins. The right gastric vein accompanies the corresponding artery. It receives the prepyloric vein.

The paraumbilical veins are small veins that run in the falciform ligament, along the ligamentum teres, and establish anastomoses between the veins of the anterior abdominal wall present around the umbilical and the portal vein.

Normal size of portal vein

In an individual without portal hypertension (PH), the diameter of the portal vein is **13 mm** or **16 mm** during deep inspiration. Under standard conditions, measurements greater than **13 mm** indicate PH with a specificity of 100% but low sensitivity of 45-50%.

Normal portal vein pressure

Portal venous pressure is the blood pressure in the hepatic portal vein, and is normally between 5-10 mmHg. Raised portal venous pressure is termed portal hypertension, and has numerous sequelae such as ascites and hepatic encephalopathy.

Clinical anatomy of portal vein

1. Portal pressure: Normal pressure in the portal vein is about 5-10 mmHg. It is usually measured by splenic puncture and recording the intrasplenic pressure.

2. Portal hypertension: (Pressure above 40 mmHg): It can be caused by the following.

- a. Cirrhosis of liver, in which the vascular bed of liver is markedly obliterated.
- b. Banti's disease (Abnormal enlargement of spleen).
- c. Thrombosis of portal vein.

The effects of portal hypertension are as follows.

- a. Congestive splenomegaly
- b. Ascites
- c. Collateral circulation through the portosystemic communication. It forms:
 - i. Caput medusae around the umbilicus, which is of diagnostic value to the clinician.
 - ii. Oesophageal varices at the lower end of oesophagus which may rupture and cause dangerous or even fatal Hematemesis
 - iii. Hemorrhoids in the anal canal may be responsible for repeated bleeding felt per rectum.

In cases of cirrhosis of liver, sometimes a shunt operation is done, where one of the main portal channels (Splenic, superior mesenteric or portal vein is directly anastomosed with either inferior vena cava or the left renal vein.

3. Hence the blood flow in portal vein is slow, and streamlined, the toxic infective substances absorbed from small intestine pass via the superior mesenteric vein into the right lobe of liver leading to toxic changes or amoebic abscess in right lobe. The blood lacking in amino acids, etc. which is absorbed via the inferior mesenteric vein affect the left lobe, leading to its fibrosis or cirrhosis.

4. The lower end oesophagus is one of the sites of portocaval anastomoses. Some oesophageal vein drain in to gastric vein and then in to portal vein. Other oesophageal veins

drain into hemiazygos vena cava. In liver cirrhosis, portal vein pressure is raised, leading to oesophageal varices, which may rupture leading to haematemesis.

DEVELOPMENT

Portal vein develops from the following sources.

1. Infraduodenal part from a part of the left vitelline vein distal to the dorsal anastomosis.
2. Retroduodenal part from the dorsal anastomosis between the two vitelline veins.
3. Supraduodenal part from the cranial part of the right vitelline vein.

Portal vein is a not a true vein

The portal vein is not a true vein, because it conducts blood to capillary beds in the liver and not directly to the heart. It is a major component of the hepatic portal system, one of only two portal venous system in the body – with the hypophyseal portal system being the other.

The portal vein is usually formed by the confluence of the superior mesenteric and splenic veins and also receives blood from the inferior mesenteric, left and right gastric veins and cystic veins.^[14]

DISCUSSION

According to Ayurveda *Dhamani* is a tubular hollow spacious structure which arising from heart (*Hridaya*) which carries *rasa* and *rakta* and it is pulsating (*spandansheel*) in nature. According to some experts, organ heart (*Hridaya*) is nothing but brain (*Mastishka*), so if *dhamani* comes from heart they called it as *Naadi* that is nerve as per modern science but if we studied *Ayurveda Granthas* thoroughly we can conclude that *Dhamani* is not nerve.^[15]

Dhamani means not only specific arteries as we know *dhamani* word come from ‘*dhmanat dhamanih*’ means which does the work of *dhamana*, *dhman*, *spandan* (pulsating), tubular hollow spacious *Pitruj panchbhautik Avayav* and it having *Akash Mahabhut Adhikya*. So, while discussing *Moolsthana* of *Raktavaha Srotas* here we can concluding *Raktavahi Dhamanya* as the portal vein.^[15]

ध्मानात् धमन्यः।

च.सु.३०/११

As we know the “*Dhamani*” it is tube like structure who carries blood, *vayu* for *Dhaman*, *spandan* i.e it is pulsating structure.^[16]

रक्तवहे द्वे.तयोर्मुलं यकृत्प्लीहानौ रक्तवाहिन्यश्च धमन्याः।
 तत्र विध्दस्य श्यावांगता ज्वरो दाहः पाण्डुता शोणितागमनं रक्तनेत्रता च।
 सु.शा.९/१२

Moolasthan of Raktavaha srotas is Yakrut, Pleeha, and Raktavahi dhamanya. In that place if injury occurs it will cause shavangata, jwara, daaha, panduta, shonit aagmana, rakta netrata. So, these symptoms can also see in rupture of portal vein. so, it may we compare that Raktavahi dhamanya with Portal vein.

कुष्ठ वीसर्प पिडका रक्तपित्तमसृग्दरः
 गुदमेद्दास्यपाकश्च् प्लीहा गुल्मोअथ्वविद्रधी ॥
 नीलिका कामला व्यंग पिप्लवस्तिलकालकाः।
 दद्रुश्चमदलं शिवत्रं पामा कोठास्त्रमण्डलम्॥
 रक्तप्रदोषाज्जायन्ते.....॥

च.सु.२८/९,१०

Raktapradoshaj vikara are according to the Acharya Charaka is kushta, visarpa, pidaka, raktapitta,ashrugdara, ashrugdara, guda, medhra, paka, pleeha, gulma, vidhraddhi, nilika, kamala, vyanga, piplavstilkalakaha, dadru, charmadala,svitra, pama, kothastra, mandalam. The symptoms mention by Acharya charaka such as pleehadosha (Banti's disease-abnormal enlargement of spleen), pleehavridddhi (Spleno-megaly), gulma (Haemorrhoids) also similler to modern science. So from above we can conclude that Raktavahi dhamanya is the portal vein.^[17]

As per modern science portal vein is not a true vein, because it conducts blood to capillary beds in the liver and not directly to the heart. It is a major component of the hepatic portal system, one of only two portal venous system in the body – with the hypophyseal portal system being the other the portal vein is usually formed by the confluence of the superior mesenteric and splenic veins and also receives blood from the inferior mesenteric, left and right gastric veins, and cystic veins. so, the *Raktavahi dhamanya* is the portal vein, on the basis of portal vein is not a true vein.

CONCLUSION

Portal vein is not a true vein, because it conducts blood to capillary beds in the liver and not directly to the heart. It is a major component of the hepatic portal system.

Raktavaha srotas from its origin we can compare with the hemopoietic system. From the reference of *Sushrut Samhita sharirasthan* we come to know that *pleeha* (spleen), *Yakrut* (liver), and *Raktavahi dhamanya* that is portal vein is the *Raktavaha srotas* as *moolsthana*. Also we can conclude according to *Acharya Sushruts* explanation about *Viddha Lakshana* of *Raktavaha srotas* as *moolasthanas* are that is same as in rupture of portal vein and *vedha* occurs same, so on the basis of above discussion we should correlate of *Raktavahi dhamanya* with portal vein.

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