

A REVIEW OF LITERATURE OF RAKTA DHATU WITH SPECIAL REFERENCE TO
BLOOD

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INTRODUCTION

In Ayurveda, Dosha, Dhatu and Mala are the basic blocks upon which the body stands. Out of these, Dhatu mainly perform the function of holding- together the bodily elements. There are seven Dhatu in person; these are Rasa, Rakta, Mamsa, Meda, Asthi, Majja and Shukra. Rakta Dhatu is a very important component of our body and its Moola Sthana are Yakrita and Pleeha. Sushruta mentioned that Rakta Dhatu is base of living body; it maintains life, so one should take proper care of Rakta Dhatu by proper diet that gives nourishment to Rakta and by following proper regimen to benefit Rakta.

The components of blood include plasma, platelets, and red and white blood cells that circulate through the body. Blood supplies essential substances, such as sugars and oxygen, to cells and organs, and removes waste from cells.

CONCEPTUAL STUDY

Review of Ayurvedic Literature about Rakta Dhatu

i) Nirukti

रज रंजने, तेन रंजनः रागवर्णयुक्तः रागकृत् च धातुः रक्तम् इति अर्थो भवति । रक्तेन संयुक्तं शुक्लवस्त्रं रक्तवर्णः रागकृत् च अयं धातुः इति स्पष्टम् एव ।

अमरकोष

Caecum A body component which is red (*rag varna*) in colour and in liquid form is called *Rakta Dhatu*.

Dhatu 'Ranja' means to colour. *Ras dhatu* get coloured by *Ranjak -pitta* and called as *Rakta*.

ii) Paryaya

रुधिरसूक् लोहितास्त्ररक्तक्षतज शोणितम् ।

अमरकोष

रुधिर - रूणद्धि, रूध्यतेवा ।

Because it beholds the *prana* which is essential for life.

असूक् - अस् क्षेपणे ।

Means which is circulated through the body.

क्षतज - क्षतात् जातं क्षतजं ।

Because it starts oozing from wound.

लोहित -रूह रोहति ।

रक्त - रञ्ज रंजने ।

शोणित - शोण शोणते शोणतिवा ।

Rakta, Shonit and *Lohita* these three synonyms indicate its red colour nature.

iii) Utpatti (Formation of Rakta Dhatu)

Utpatti All *acharyas* including *Charak, Sushrut, Vagbhata, Sharangdhara* have different opinions about formation of *Rakta Dhatu*.

तेजो रसानां सर्वेषां मनुष्याणां यदुच्यते ।

पित्तोष्मणा स रागेण रसरक्तत्वमृच्छति ॥

च. चि. १५/ २८

That which is called the bright component of body fluid of all persons acquires the redness from colouring quality of the *pitta* and *rasa* gets converted in *Rakta*.

स खलु आप्यो रसः यकृत प्लिहानौ प्राप्य रागमुपैति ।

सु.सू. १४/ १४

The *Rasa* through a *saumya* fluid obtain its characteristic red colour (*Ragam*) in it while passes through *Yakrit* and

Pliha.

यत्तु यकृतप्लिहानौ पित्तं तस्मिन् रञ्जकोऽग्नि इति सं
स रसस्य रागकृत उक्तः ।

सु.सू. २१ / १०

The *Pittagni* which has situated in liver and spleen is called as *Ranjakagni*. It converts *Rasa dhatu* into *Rakta dhatu* and so called *Ragakrit* (i.e. colouring pigment).

iv) *Raktasya Svarupam*

तपनीयेन्द्रियगोपाभं पद्मालक्तकसन्निभम् ।

गुञ्जाफलसवर्णच विशुद्ध विद्धिशोणितम् ॥

च. सू. २४ / २२

The pure blood is of the colour of heated gold or that of the insect called *Indragopa* (*Trondidium*) or like the red lotus or like the *Alaktaka* juice or like *Jeguurity* berry.

v) *Raktasya Pramanam*

अष्टौ अंजलयः शोणितस्य ।

च. शा. ७ / १४

In *Prakrutavastha* total amount of *Rakta Dhatu* has been described about 8 *anjali*, according to *Charaka*.

vi) *Raktasya Sthanam*

कृत्स्न शरीर (आपादतल मस्तक)

व्यानेन रसधातुर्हि विक्षेपोचितकर्मणा । युगपत् सर्वतोऽजस्रं
देहे विक्षिप्यते सदा ॥

च. चि. १५ / ३६

शोणितस्य स्थानम् यकृतप्लिहानौ तच्च प्रागभिहि तम् ।

तत्रस्यमेव शेषाणां शोणितस्थानानां अनुग्रहं करोति ॥

सु.सू. २१ / १६

The sites of *Rakta* are *Yakrit* (Liver) and *Pliha* (spleen) from where it helps its other receptacles to serve their proper functions.

vii) *Raktadhara Kala*

द्वितीया रक्तधरा नाम मांसस्याभ्यंतरतः तस्यां शोणितं
विशेषतस्य सिरासु

यकृतप्लिहानच्च भवति ।

सु.शा. ४ / १०

The second *kala* is called *Raktadhara* (vasculature of blood vessels etc.) located within *Mamsa Dhatu*. This *kala* is present especially in vessels, liver and spleen.

Acharya Sushruta states

वृक्षाद् यथाभिप्रहतात् क्षीरिणः क्षीरमावहेत् ।

मांसादेवं क्षतात् क्षिप्रं शोणितं संप्रिस्रच्यते ॥

सु.शा. ४ / ११

Just as milky juice comes out from a latex tree when it is pierced, similarly blood oozes out from a fleshy part containing *Raktadhara Kala* when it is cut through. The main site of *Raktadhara kala* are *sira*, *yakrit* and *plihā*.

viii) *Raktashaya*

आशयास्तु- वाताशयः, पित्ताशयः, श्लेष्माशयो, रक्ताशयः,
आमाशयः, पक्वाशयो,

मूत्राशयः, स्त्रीणां गर्भाशयोऽष्टम इति ॥

सु. शा. ५ / ७

There is seven *ashaya* in our body i.e. *vatashaya*, *pittashaya*, *shleshmashaya*, *raktashaya*, *amashaya*, *pakvashaya*, *mutrashaya*; and one extra *ashaya* mentioned related to female body i.e. *garbhashaya* (uterus). Among these *Raktashaya* is 4th *ashaya* according to *Sushruta*. It includes Liver and Spleen both are blood depot in the body. The reservoir function of the spleen plays a considerable role. Spleen can modify both the volume and quality of blood in mechanical way.

ix) *Raktasya Karyam (Functions of blood)*

तद्विशुद्ध हि रूधिरं बलवर्णसुखायुषा ।

युनक्ति प्राणिनं प्राणः शोणितं हि अनुवर्तते ॥

च.सू. २४ / ४

Pure blood provides strength, lusture and healthy long life to the human because flow of blood signifies life.

रक्तं वर्णप्रसादं मांसपुष्टी जीवयति च ॥

सु.सू. १५ / ७

Pure *Rakta* improves the glow, providing good complexion, nourishing *Mamsa dhatu*.

x) *Rakta Prasakti*

देहस्य रूधिरं मूलं रूधिरेणैव धार्यते ।

तस्मात् यत्नेन संरक्ष्य रक्तं जीव इति स्थितिः ॥ सु.सू. १४ / ४४

In this *Sushrutacharya* says that *Rudhira* i.e. *Rakta* is the basic element of the body on which whole health is maintained. *Rakta* is important factor of life, so protection of *Rakta* means protecting good health. *Rakta* is important because it carries *prana* or *jiva* to each and every cell and organ.

DISCUSSION ON BLOOD

• BLOOD

Blood is a connective tissue in fluid form. It is considered as the fluid of life because it carries oxygen

from lungs to all parts of the body and carbon dioxide from all parts of the body to the lungs. It is known as fluid of growth because it carries nutritive substances from the digestive system and hormones from endocrine gland to all the tissues. The blood is also called the fluid of health because it protects the body against the diseases and gets rid of the waste products and unwanted substances by transporting them to the excretory organs like kidneys.

• PROPERTIES OF BLOOD

Normal red blood cells, are biconcave discs having a mean diameter of about 7.8 micrometers and a thickness of 2.5 micrometers at the thickest point and 1 micrometer or less in the center. The average volume of the red blood cell is 90 to 95 cubic micrometers.

The shapes of red blood cells can change remarkably as the cells squeeze through capillaries. Actually, the red blood cell is a "bag" that can be deformed into almost any shape. Furthermore, because the normal cell has a great excess of cell membrane for the quantity of material inside, deformation does not stretch the membrane greatly and, consequently, does not rupture the cell, as would be the case with many other cells.

1. Colour: Blood is red in colour. Arterial blood is scarlet red because it contains more oxygen and venous blood is purple red because of more carbon dioxide.

2. Volume: The average volume of blood in a normal adult is 5 L. In new born baby the volume is 450 ml. It increases during growth and reaches 5 L at the time of puberty. In females it is slightly less and is about 4.5 L. It is about 8% of the body weight in a normal young healthy adult weighing about 70 kg.

3. Reaction and pH: Blood is slightly alkaline and its pH in normal conditions is 7.4.

4. Viscosity: Blood is five times more viscous than water. It is mainly due to red blood cells and plasma proteins.

Blood contains the blood cells which are called formed elements and the liquid portion known as plasma.

Plasma - Plasma is a straw colored clear liquid part of blood. It contains 91 -92 % of water and 8-9 % of solids. Serum is the clear straw colored fluid that is left after blood has clotted.

• Blood Cells

Three types of cells are present in the blood:

1. Red blood cells
2. White blood cells
3. Platelet

• Red blood cells

RBCs are the non-nucleated formed elements in the blood. The red colour of Red blood cell is due to the presence of the colouring pigment called haemoglobin. RBCs play a vital role in transport of respiratory gases. RBCs are larger in number compared to the other two cells namely white blood cells and platelets. Average lifespan of RBC is about 120 days. After the lifetime the senile RBCs are destroyed in reticulo-endothelial system.

• PRODUCTION OF RED BLOOD CELLS

In the early weeks of embryonic life, primitive, nucleated red blood cells are produced in the yolk sac. During the middle trimester of gestation, the liver is the main organ for production of red blood cells, but reasonable numbers are also produced in the spleen and lymph nodes. Then, during the last month or so of gestation and after birth, red blood cells are produced exclusively in the bone marrow.

• FATE OF RED BLOOD CELLS

When red blood cells are delivered from the bone marrow into the circulatory system, they normally circulate an average of 120 days before being destroyed. Even though mature red cells do not have a nucleus, mitochondria, or endoplasmic reticulum, they do have cytoplasmic enzymes that are capable of metabolizing glucose and forming small amounts of adenosine triphosphate.

• HEMATOCRIT VALUE

If blood is collected in a haematocrit tube along with a suitable anticoagulant and centrifuged for 30 minutes at a speed of 3000 rpm, the red blood cells settle down at the bottom having a clear plasma at the top. The plasma forms 55 % and the red blood cells form 45 % of the total blood. The volume of red blood cells expressed in percentage is called the haematocrit value or packed cell volume.

• PACKED CELL VOLUME (PCV)

PCV is the proportion of blood occupied by RBCs expressed in percentage. It is the volume of RBCs packed at the bottom of hematocrit tube when the blood is centrifuged.

The normal PCV:

- In males = 40-45 %
- In female = 38-42 %

1) MEAN CORPUSCULAR VOLUME (MCV)

MCV is the average volume of a single RBC and it is expressed in cubic microns.

The normal MCV is 90 cubic microns. (78 -90 cubic microns)

2) MEAN CORPUSCULAR HEMOGLOBIN (MCH)

It is the quantity or amount of hemoglobin present in one RBC. It is expressed in micro microgram or picogram (pg).

The normal value of MCH is 30 pg (27 - 32 pg).

3) MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATION (MCHC)

This is the concentration of hemoglobin in one RBC. It is the amount of hemoglobin expressed in relation to the volume of one RBC. So, the unit of expression is percentage.

The normal value of MCHC is 30% (30 -38).

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