EXPLORATION OF KALA SHARIRA W. S. R. TO EFFECTS OF SARPAVISHA ON RAKTADHARA KALA

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ABSTRACT

Kala is a unique part explained by Acharya Sushruta in Garbhavyakaran Sharira Adhyaya of Sushruta Samhita. Kala are defined as membranous structures which separate Dhatus and Ashayas. There are seven kala explained by Acharya Sushruta as, Mamsadhara, Raktadhara, Medodhara, Shleshmadhara, Purishdhara, Pittadhara and Shukradhara Kala. In Kalpasthana of Sushruta Samhita, Acharya has explained about the Visha. In Sarpadashtra Visha Vigyaniya Adhyaya he has put forth the concept of Visha Vegantar which means transmission of visha from one dhatu to another dhatu through kala and according to different kala different Visha Lakshana i.e. symptoms are explained. Amongst saptakala second kala is Raktadhara Kala which is deeply embedded in Mamsa dhatus i.e. muscle tissues. The specific site of this kala is Siras Yakruta and Pleeha. When Sarpavisha enters the Raktadhara Kala, some kind of anatomical and physiological changes occurs at the level of structures associated with it. Hence the attempt was made to explore Kala Sharira and compile effects of Sarpavisha on Raktadhara Kala.

Keywords: Raktadhara Kala, Sarpavisha, Kala, Liver, Visha lakshana

INTRODUCTION

Kala is a unique part explained by Acharya Sushruta in Garbhavyakaran Sharira Adhyaya of Sushruta Samhita. Kala is defined as ‘Dhatvashayantar Maryada’ i.e. membranous structure which separates or limits Dhatus and Ashayas.¹ There are seven kala explained by Acharya Sushruta as, Mamsadhara, Raktadhara, Medodhara, Shleshmadhara, Purishdhara, Pittadhara and Shukradhara Kala. As kala limits dhatus and ashayas they allow them to function properly.

Amongst Saptakala 2nd kala is Raktadhara kala. Raktadhara kala is deeply embedded in Mamsa Dhatu i.e. muscle tissues. The specific site of this kala is Siras, Yakrut and Pleeha.² Through Raktadhara kala blood circulation is carried out.

In kalpasthan, Acharya has explained about Visha i.e. Poison their symptoms, treatment and prognosis according to the manifested symptoms. In Sarpadashtra Vishavigyaniya Adhyaya he has described about various types of snakes, their habitat, poisonous symptoms and other systemic effects on human body. He has also explained about the concept of visha vegantar i.e. transmission of poison from one dhatu to another through kala and according to differ-
ent kala different Visha lakshanas i.e. toxic symptoms are explained.[3]

Acharya Sushruta has mentioned Rakta as Jiva[4] i.e. life, as damshtra visha enters directly to the Rakta and vitiates Raktdhara kala and some Anatomical and Physiological changes occurs at the level of structures associated with it.

**Aim**
To explore Kala Sharira and effect of Sarpavisha on Raktdhara Kala.

**Objectives**
- To explore Raktdhara kala.
- To explain various effects of Sarpavisha on Raktdhara Kala.
- To study Anatomical and Physiological changes occurring at the structures associated with Raktdhara Kala.

**Material and Methods**
Sushruta Samhita and other samhitas from Bruhat-trayee and Laghutrayee along with their commentaries by different Authors were referred for the study.

While studying about Kala through Sushrut Sharir Sthan the commentaries of different authors and some texts were critically studied to interpret and conclude about Kala. The matter available on internet and published journals were also studied. References from modern sciences were also utilized to correlate the concepts.

**Sthana Nishchiti**
According to Acharya Sushruta, Raktdhara kala is deeply embedded in Mamsa Dhatu i.e. muscle tissues. The specific site of this kala is Siras, Yakrut and Pleeha.[5]

Yakruta and Pleeha are completely made up of Rakta.[6] Also these two are stated as the origin of Raktavaha Srotas[7] i.e. Circulatory system.

**Correlation-**
- Yakruta – Liver
- Pleeha – Spleen
- Siras – Blood Vessels

**Observations**
When different type of snake venoms are injected to the animals like Rats and Monkeys various kind of Histopathological changes are seen as –

1. **Changes at Liver :**

<table>
<thead>
<tr>
<th>Cobra</th>
<th>Viper</th>
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<tbody>
<tr>
<td>• 203 gene expressions are altered.[8]</td>
<td>• Hepatic necrosis.</td>
</tr>
<tr>
<td>• Deleterious alteration of hepatic tissues.[9]</td>
<td>• Mitochondrial damage.[16]</td>
</tr>
<tr>
<td>• Liver injury.[10]</td>
<td>• Fibrin deposition.</td>
</tr>
<tr>
<td>• Cytoplasmic granulation of hepatocytes[11]</td>
<td>• Ischemia.[17]</td>
</tr>
<tr>
<td>• Swelling of the Hepatocytes</td>
<td>• Hepatic damage.[18]</td>
</tr>
<tr>
<td>• Disturbed cell permeability.[12]</td>
<td>• Vascular damage.</td>
</tr>
<tr>
<td>• Decreased in Na+/K+ ATPase Activities.</td>
<td>• Presence of lympho-histocyte element in the liver.</td>
</tr>
<tr>
<td>• Cell Death.[13]</td>
<td>• Hemosiderin increases.[19]</td>
</tr>
<tr>
<td>• Rupture of Hepatic cell membranes.[14]</td>
<td>• Congestion of blood vessel.</td>
</tr>
<tr>
<td>• Inflammatory cellular infiltration (ICI) around hepatic veins.</td>
<td>• Hydropic degeneration (Swelling) of hepatocytes[20]</td>
</tr>
<tr>
<td>• Prominent van kupffer cells[15]</td>
<td>(Van Kupffer cells reside within the lumen of the liver sinusoids and are constantly exposed to gut-derived bacteria, microbial debris and bacterial endotoxins, hence known to activate macrophages.)</td>
</tr>
</tbody>
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**Common changes found in both the Species**
- Degeneration of collagen IV.
- Destruction of basement membrane.
• Breakdown of capillary vessels.
• Leakage of blood components.
• Inflammation or impairment of Hepatocyte function.\[21],[22]

2. **Changes in Blood Vessels**\[23],[24] :
   - Congestion of blood vessels.
   - Loss of collagen fibers.
   - Damaged blood vessels.
   - Disappearance of the collagen fibers at basement membrane of endothelial cell of blood vessels.
   - Leakage of blood components from blood vessels.
   - Rupture of walls of vessels.
   - Formation of thrombus completely/ partially blocking lumen of vessel.
   - Necrotic changes in vessel wall.

3. **Changes in Blood**\[24] :
   - Presence of Polymorphonuclear Leucocytes.
   - Extra vasculated Erythrocytes were swollen and spherical.

**Post mortem changes**\[24]:
- **Liver** :
  - Liver is not found usual.
  - Several small petechial haemorrhages are seen along anterior border of liver.
- **Spleen** :
  - Spleen found usually small.
  - Firm and slate grey in colour.
  - The cut surface was red and dry, a very little blood could be scrapped from the surface.

**DISCUSSION**

*Kala* is a unique concept explained by *Acharya Sushruta* in *Sushrut Samhita Sharira Sthan*. We also find references of *kala* in *Ashtanga Sangrah, Ashtanga Hridaya* and *Sharangdhar Samhita*. All Acharyas has explained seven *kala*. In 4\textsuperscript{th} chapter of *Sushrut Samhita Kalpasthan*, Acharya has explained about *visha vega* and *visha vegantar* which means transmission of *visha* through *kala*. According to seven *kala*, seven *vega* are explained. Each *vega* shows specific *lakshanas* i.e. symptoms.

When snake bites, the venom directly enters the blood stream and starts circulating in whole body along with blood. Also according to *Acharya Charak*, *visha* firstly affects *rakta dhatu* which further affects *siras, yakrut and pleeha*. As *yakrut* and *pleeha* are origin of *rakta vaha srotas* they get affected quickly. According to *Acharya Sushruta*, *yakrut* and *pleeha* are completely made up of *Rakta dhatu*. Hence they get viti- ated easily. Changes occur in liver, spleen and blood vessels which lead to death of the person.

To prevent the further damage to the tissues and organs and death of the patients, *Acharya Sushrut* has stated the treatment according to the *visha vegas* so that the *visha* doesn’t spread further in the body and become fatal to the life. Amongst all the treatment modalities told by *Acharya Sushrut* and *Acharya Charak*, both have told to firstly treat *Rakta Dhatu* by means of *Arishtabandhan, Utkartan, Nishpidan, Chushan, Raktapkarshan*. Different kind of *agad* are also been told for treatment purpose in order to save patients life\[26],[27],[28]

**CONCLUSION**

- Snake venom enters the blood stream and starts damaging blood vessels, altering blood components, affects the structure and function of spleen (phagocytosis), it also damages liver and hamper its normal function.
- It eventually leads to the blockage of blood vessels, ischemia, alteration of cell permeability, rupture of vessels and leakage of blood components. This will lead to hampering the function of organs which would finally lead to death of the person.
- Getting into the consideration of importance of *Rakta* and *Raktadhara kala*, Acharyas has specifically emphasized on the treatment modalities related to the *raktadhatu* which prevents further spread of the *visha* and vitiation of *Raktadhara Kala* which ultimately leads to saving of patient’s life.
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