A REVIEW OF THE CONCEPT OF ANGIOLOGY IN AYURVEDA

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ABSTRACT

The Sushruta Samhita (classical text) is one of the three great treatises (Brihattrayi) of Ayurveda representing mainly the school of surgery. Sushruta Samhita (classical text) is the best one in Sharira (Anatomy). The term sira (blood vessel) is as old as Vedas. In Ayurveda, the term sira (blood vessel) has been used for blood vessels. Angiology is the division of modern anatomy and it deals with different types of blood vessels of the body. The ancient texts of Ayurveda have mentioned sira (blood vessel), dhamani (artery) and srotas (capillary) are interchangeable words and these terms are equal to blood vessels in modern anatomy. According to Ayurveda, the term sira (blood vessel) reflects different modern anatomical terms like blood vessel, vein, and nerve. Therefore, it requires great research work to get a clear concept. The main aim of this work is to understand the concepts of sira (blood vessel) in Ayurveda and its correlation with modern angiology.

Key Words: Sira, Dhamani, Artery, Vein, Sushruta, Blood vessel

INTRODUCTION

Sushruta was the first scholar scientist who described the method of the dissection of a human cadaver and emphasized the importance of dissection in the study of anatomy. That’s why he is regarded as the father of anatomy and the Sushurut Samhita as the best one in sharira. In Ayurveda the structure sira (blood vessel) is of vital importance, we can see an elaborate description of the siras (blood vessel) in various classical texts. Sushruta has explained the anatomy of sira (blood vessel) in sharira sthana (part of Sushurut Samhita) 7th chapter “Sira varna vibhakta nama shariram”.

According to Ayurveda, the term sira (blood vessel) reflects different modern anatomical terms like blood vessel, vein, and nerve. So, the main aim of this work is to understand the concepts of sira (blood vessel) in Ayurveda and its correlation with modern angiology.

MATERIALS AND METHODS

The literary material related to sira (blood vessel) has been collected from different sthanas (parts) of Ayurvedic text books and modern anatomy books like Chaurasia general anatomy, Gray’s anatomy etc. critically reviewed and correlated with modern terms.

Review of literature

It is said that the word sira (blood vessel) derived from the Vedic term hira. The term hira is described as blood carrying channel towards the hrudaya (heart). Ayurvedic acharyas have used anatomical term sira (blood vessel), which is one of the controversial term (structure). It is used to represents tubular structure, to carry material such as rasa (plasma) & rakta (blood) and it is one of the synonyms of srotas (channels).

A. Origination of sira

Sushruta has stated that sira (blood vessel) originates in the embryonic life from nabhi (umbilicus) and they spread upward, downward and in oblique fashion from nabhi (umbilicus). Pranas (life) of living beings stay in nabhi (umbilicus). Nabhi (umbilicus) is surrounded by siras (blood vessel) in the same way as the nave of the wheel is surrounded by spokes.
Table 1: Showing origination of Sira by different Acharyas

<table>
<thead>
<tr>
<th>No.</th>
<th>Origination of Sira</th>
<th>Names of Acharyas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nabhi (umbilicus)</td>
<td>Sushruta, Bhava Prakash, Sharangadhara, Padma Purana</td>
</tr>
<tr>
<td>2</td>
<td>Hrudaya (Heart)</td>
<td>Charaka, Vagbhatta, Bhela, Kashyapa</td>
</tr>
</tbody>
</table>

B. Development of sira

Sushruta described that vayu by taking sneha (oiliness) of the meda (fat) converts them into sira (blood vessel) and snayu (ligament). When the paka is mild, it is sira (blood vessel). It is Pitruja bhava (paternal origin). The hard structures like hair, nail, teeth, bones, blood vessels, ligaments, etc. are derived from father.

C. Structure of Sira

Siras are like the fine fibers in the leaf of a tree, thick at their roots and becoming finer towards the end, the branches of the sira (blood vessel) resemble the tendrils, the first branch gives out a branch and this again gives out another branch and so on. The blood streams in all the sira (blood vessel) which are “like water channels going out to the diverse ranges of a garden or agricultural field”.

Table 2: According to Vagbhatta and Bhela structure of sira

<table>
<thead>
<tr>
<th>Vagbhatta</th>
<th>Bhela</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siras are dividing themselves into the size of two angula, one angula, half angula, half yava and so on, just like venation of the life.</td>
<td>Ten blood vessels are attached to the heart. These after going 4 inches become 20, then 60, then 3, 00,000 networks of sira. These are spread all over the body like branches of tree. In each and every pit of the hair (romakupa), there is an exit aperture of the sira.</td>
</tr>
<tr>
<td>Siras are big at the root (sthoole mula) and fine at periphery (sukhma agra). They are spread like the veins of a leaf.</td>
<td></td>
</tr>
</tbody>
</table>

D. General functions of Sira

Sira (blood vessel) has special properties to perform akunchana (contraction) and prasararana (dilatation) karma. The continuous uninterrupted nourishment of the body takes place due to the pumping of the heart and contraction and dilatation of the main blood vessels related to the heart. This nourishment takes place under the principle of “kedari kulya nyaya” (theory of transmission). The raktadhatu (blood) thus circulates the entire body and nourishes through the process of upasneha karma (diffusion). As a garden or a grain field is made wet by the water carrying big and small channels, similarly the sira (blood vessel) by their contractility and dilatory property, supply nutrition to the body.

Dalhana commented this arama (garden) or kedari (a small piece of land) is irrigated by jalharani of kulya (small channels), in the same fashion body is nourished by sira (blood vessel). Through this process, the entire body gets nourished constantly.

E. Number and types of sira

The total numbers of the sira (blood vessel) are 700. The Mula sira (root vessels) are 40. These classified into 4 types based on carrying vata, pitta, kapha and rakta.

1. Vatavaha sira are 10, when they reach the organs of the body where vata predominant, divide into 175 branches.
2. Pittavaha sira are 10, when they reach the organs of the body where pitta predominant, divide into 175 branches.
3. Kaphavaha sira are 10, when they reach the organs of the body where kapha predominant, divide into 175 branches.
4. Raktavaha sira are 10, when they reach the yakrut (liver) and piliha (spleen), divide into 175 branches.

By this Sushruta meant that vatavaha sira are those which are found in vata predominating areas, similarly pitta and kaphavaha sira are found in pitta and kapha predominating areas respectively.

F. Colour, characters and functions of four types of sira

1. Vatavaha sira – Aruna varna (crimson red) and filled with vayu. These sira (blood vessel) perform physical functions without hindering the specific of buddhi (intellect) and sense organs. Acharya Dalhana has explained the term kriyam in this he includes both voluntary action and involuntary action. The word buddhi karma (intellect function) is related to the five sense organs and manas (mind). The intellect plays its role in deciding the normal state. When there is a hindrance in the normal functioning of sense organs; it is supposed that there is something wrong with the buddhi (intellect) or it has gone under moha (confusion).

2. Pittavaha sira – Neela varna (blue) and have a warm touch. These sira (blood vessel) create lusture in the body and develop a good appetite. Maintain normal health and normal functions of the body.

3. Kaphavaha sira – Gaura varna (white) and cold to touch and steady. These sira (blood vessel) give lubrication to the various body parts and produce firmness in the joints. It also improves strength and maintains normal functions of the body.

4. Raktavaha sira (blood vessel) – Red and they are neither too hot nor too cold. These sira (blood vessel) nourish the dhatus (tissues), improves the complexion, cause a definite
perception of *sparsha* (touch) and maintain normal functions of the body.

**Table 3: showing colour, character and function of four types of siras by Sushruta**

<table>
<thead>
<tr>
<th>Type of sira</th>
<th>Colour</th>
<th>Character</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vatavaha siras</td>
<td>Aruna varna (crimson red)</td>
<td>Filled with vayu</td>
<td>Perform physical functions without hindering the specific functions of buddhi (intellect) and sense organs.</td>
</tr>
<tr>
<td>Pittavaha siras</td>
<td>Neela varna (blue)</td>
<td>Warm to touch</td>
<td>It creates luster in the body and develops a good appetite.</td>
</tr>
<tr>
<td>Kaphavaha siras</td>
<td>Gowra varna (white)</td>
<td>Cold to touch and steady</td>
<td>Gives lubrication to the various body parts and produces firmness in the joints. It also improves strength.</td>
</tr>
<tr>
<td>Raktavaha siras</td>
<td>Rohini varna (red)</td>
<td>Neither they are too hot nor too cold</td>
<td>Nourishes the dhatus (tissues) improves the complexion definite perception of <em>sparsha</em> (touch).</td>
</tr>
</tbody>
</table>

**Table 4: showing colour, character and function of four types of siras by Vagbhatta**

<table>
<thead>
<tr>
<th>Type of sira</th>
<th>Colour</th>
<th>Character and Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vatavaha siras</td>
<td>Swaya-Aruna varna (bluish red)</td>
<td>Pulsate, small, get full and empty every minute. It carries blood associated with Vata.</td>
</tr>
<tr>
<td>Pittavaha siras</td>
<td>Nila-Pitavarna (bluish yellow)</td>
<td>Warm to touch and bleed quickly. It carries blood associated with Pitta.</td>
</tr>
<tr>
<td>Kaphavaha siras</td>
<td>Sveta varna (white)</td>
<td>Smooth, hard, cold to touch and causes itching steady. It carries blood associated with Kapha.</td>
</tr>
<tr>
<td>Siddha Raktavaha sira</td>
<td>Mild red in colour</td>
<td>Those which are even, deep-seated, smooth. It carries purified blood.</td>
</tr>
</tbody>
</table>

**G. Sarvavaha sira (blood vessel)**

According to *Sushruta* no *sira* (blood vessel) in the body carries either the *vayu* or the *pitta* or the *kapha* alone. Therefore *siras* (blood vessel) should be considered as *sarvavaha sira* (blood vessel). The particular *sira* (blood vessel) is to circulate a particular *dosha* (body humor) in its specific area. But all the three *doshas* (body humor) circulate in the whole of the body. Therefore *doshas* (body humor) are not apt for circulation only in their specific areas but they circulate in the whole of the body. This proves that the *siras* (blood vessel) are *sarvavaha*.

**DISCUSSION**

In *Ayurveda* the term *sira* (blood vessel) used in two purposes—in general *sira* has been used to denote the vessels otherwise in specific sense *sira* means veins. He described the angiology under the term of *sira* (blood vessel) and he includes artery, vein, capillary and lymphatics in four types of *siras* (blood vessel). The following points suggest that similarities in between the *Ayurvedic* term of *sira* and the blood vessels in modern science—

⇒ *Sira* (blood vessel) originates in the embryonic life from *nabhi* (umbilicus) and they spread upward, downward and in oblique fashion from *nabhi* (umbilicus). This statement of *Sushruta* is accepted only during embryonic life. In foetus it can be seen also, that number of blood vessels are attached to the umbilicus. In fetal life, the *siras* (blood vessel) are concerned with the nutrition of the foetus through the umbilical cord, but after birth, these *siras* (blood vessel) no more exist. *Sushruta* has labelled them “*Nabhiprabhava*” because either they start or end in *nabhi* (umbilicus) in uterine life. Thus *Sushruta*’s description regarding the origin of *sira* (blood vessel) seems to be correct. Here the term *sira* (blood vessel) is used for umbilical vessels.

⇒ *Sushruta*’s description regarding the structure, the *sira* is very similar to the structure of blood vessels in modern anatomy. After leaving the heart, large arteries are branch into smaller ones that reach out to different parts of the body. These smaller vessels despite everything further into minute vessels considered arterioles that enter the body tissues. Inside the tissues, the arterioles branch into a network of microscopic vessels called capillaries. Substances move all through the capillary walls as the blood exchange materials with the cells. Before leaving the tissues, capillaries join and form venules, which are little veins. The venules converge to shape larger veins that in the long run return blood to the heart. The walls of arteries, veins, and capillaries differ in structure. In all three, the vessel wall surrounds a hollow center through which the blood flows.
⇒ As a garden or a grain field is made wet by the water carrying big and small channels, similarly the sira (blood vessel) by their contractility and dilatory property, supply nutrition to the body\(^3\). The blood vessels of the body (supply arteries, capillaries, and veins) make up a closed framework of tubes that carry blood from the heart to tissues all over the body and after that back to the heart. Arteries carry blood away from the heart, whereas veins carry blood toward the heart. Here dilation and contraction are the functions of arteries. Because of pulsation, the blood circulates all over the body. In the nutrition process of the body, all the three blood vessels take part. Lymphatics also take part in nutrition and they circulate lymph\(^3\).

⇒ The four types of siras (blood vessel) are correlated with blood vessels by the following way\(^26\):

a. The colour and character of vatavaha sira like aruna varna (crimson red) and filled with vayu (pulsation) are very similar to the characters of an artery.

b. The colour neela varna (blue) of pittavaha siras are very similar to veins. These are blue because these carry deoxygenated blood.

c. The gowra varna (white) of kaphavaha siras are very similar to lymphatics. These are white because these carrying clear fluid lymph.

d. The colour and function of raktavaha sira like rohini (red) and nourishes the dhatus (tissues) are very similar to capillaries. These are red and exchange the nutrients in tissue level.

Table 5: Showing similarities between four types of siras and blood vessels

<table>
<thead>
<tr>
<th>Type of sira</th>
<th>Modern correlation</th>
<th>Similarities between sira and blood vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vatavaha sira</td>
<td>Arteries</td>
<td>Aruna varna (crimson red), filled with vayu</td>
</tr>
<tr>
<td>Pittavaha sira</td>
<td>Veins</td>
<td>Neela varna (blue)</td>
</tr>
<tr>
<td>Kaphavaha sira</td>
<td>Lymphatic</td>
<td>Gowra varna (white)</td>
</tr>
<tr>
<td>Raktavaha sira</td>
<td>Capillaries</td>
<td>Rohini varna (red), nourishes the dhatus (tissues)</td>
</tr>
</tbody>
</table>

CONCLUSION

According to Ayurveda sira (blood vessel) is a tubular structure, which carries the materials such as rasa (plasma) & rakta (blood). In common, this term sira (blood vessel) implies for blood vessels. In modern anatomy the vatavaha siras can be compared with the arteries, the pittavaha siras can be accepted as veins, kaphavaha siras can be considered as lymphatic channels and raktavaha siras are correlated with capillaries of the body. So it seems that Sushruta includes the vascular system (angiology) under the term of sira. So the word Sira is correlated with the blood vessels and lymphatics is not farfetched and fanciful.

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