

Anatomical considerations on sira in Ayurveda with special reference to Sushruta Samhita

Review Article

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Abstract

The *Sushruta samhita* is one of the three great treatises (Brihatrayi) of *Ayurveda* representing mainly the school of surgery. *Sushruta samhita* as the best one in *Sharira* (śāire Sushrutaḥ śreṣṭhaḥ). *Sushruta* has clarified the details such as distinction among *sira*, *dhamani* and *srotas*. The term *sira*, in one place reflects a meaning of blood vessels while at other place, it means nerve. In such condition it is very difficult to know doubtlessly about it like Modern Anatomy. Therefore, it requires great research work to get a clear concept. Aims and objectives- 1) To search and find out the references in relation to *sira* in *Sushruta samhita*. 2) To understand the concept of *sira* in *Sushruta samhita* and correlate with Modern Anatomy. Methods: - Ancient *Ayurvedic* classics were consulted and compiled references out of them for said subject to elaborate as well as to understand the process of *sira* in *Sushruta samhita*. Important observations: - Scattered references are available in *Sushruta samhita* and Modern Anatomy texts regarding *sira*. Results: - In *Sushruta samhita* *sira* is elaborated nicely it can be concluded and correlate with blood vessels, lymphatics and nerves in Modern Anatomy.

Key words: *Sira, Dhamani, Artery, Vein, Sushruta, Srotas*

Introduction

The *Sushruta samhita* is one of the three great treatises (*Brhatrayi*) of *Ayurveda* representing mainly the school of surgery. *Sushruta samhita* as the best one in *Sharira* (śāire Sushrutaḥ śreṣṭhaḥ). Anatomy being the basis of surgery probably it was necessary for *Sushruta* to deal anatomical details before preparing for surgery. It is also possible that the knowledge of Anatomy got more advanced during the period of *Sushruta*. Before *Sushruta* in *Vedic* times, the knowledge of

Anatomy was derived from the dissection of animals during sacrifices. In *Brahmanas* and *Kalpasutras*, we find names of a number of organs which are similar in human body. *Sushruta* was the first scholar scientist who described the method of the dissection of human cadaver and emphasised on the importance of dissection in study of Anatomy (1). Though it was also crude it may be taken as a historical land mark in the development of Anatomy in India and a clear step of advancement in the knowledge of Anatomy. That's why he is regarded as the father of Anatomy and the *Sushrut samhita* as the best one in *Sharira*. Dr. B. G. Ghanekar says *Sharira* of his is the best and not lost, but it is only difficult to interpret. *Sushruta* has explained Anatomy of *sira* in *Sharira sthana* 7th chapter "Siravarna Vibhakta Nama Shariram". *Sushruta's* concepts of

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“Sira Shariram” and “Sira vedhyavidhi Shariram” are specifically unique. But the term *sira*, in one place reflects a meaning of blood vessels while at other place, it means nerve. In such condition it is very difficult to know doubtlessly about it like Modern Anatomy.

Aims and objectives-

- 1) To search and find out the references in relation to *sira* in *Sushruta samhita*.
- 2) To understand the concept of *sira* in *Sushruta samhita* and correlate with Modern Anatomy.

Materials and Methods:

The Literary material related to *sira* has been collected from Different *sthans* (parts) of *Sushruta samhita* and Modern Anatomy books like Chaurasia General Anatomy, Gray’s Anatomy etc. critically reviewed and correlated with modern terms.

Discussion:

It is said that the word *sira* derived from the Vedic term *hira*. The term *hira* is described as blood carrying channel towards the heart (2). *Ayurvedic* acharyas has used an anatomical term *sira*, which is one of the controversial term (structure). It is used to represents tubular structure, to carry material such as *Rasa & Rakta* and it is one of the synonyms of *srotas* (3). *Sushruta* has clarified the details such as distinction among *sira*, *dhamani* and *srotas*. In 9th chapter of *Sharira sthana* “*Dhamani Shariram Vyakaranam*” *Sushruta* speaks more clearly, he says that “some says that there is no difference among *sira*, *dhamini* and *srotas*, as *dhamini* and *srotas* are only *sira vikara*. This is not correct. *Dhamini* and *srotas* are the entities other than *sira*.” (4)

Sushruta has given the 4 reasons for differentiation of these three structures. These are (5)

- 1) *Vyanjanayatvat* (different features) – By difference in features *siras* are of

various colours like crimson red, white, blue and red. Whereas there is no such differentiation in *dhaminis* and *Srotas*.

- 2) *Mulasanniyamat* (originating point) – By originating point original *siras* are 40, whereas *dhamanis* and *srotas* are 24 and 22 respectively.
- 3) *Karmavisesyat* (specific functions) – By specific functions *sira* by their contractility and dilatory property, supply nutrition to the body. *Dhamanis* carry sensation of sound, vision, taste, smell etc., while *Srotas* carry air, water, food, *rasa* etc.
- 4) *Agamcca* (scriptural authority) –By scriptural authority, treatises of *Ayurveda* have mentioned *sira*, *dhamani* and *srotas* separately at many places. Hence *dhamani* and *srotas* are different from *sira*.

These structures look similar because (6)

1. *Paraspara sannikarshata* (mutual proximity) –*Sira*, *dhamani* and *srotas* are lies very close in the body. Veins and arteries along with their branches are found side by side closely, in all the parts of the body.
2. *Sadhrusyagama* (similar authority)- Due to the transport of the *rasa*, there is no distinct difference between *sira*, *dhamani* and *srotas*. In *Ayurveda*, these three terms are used for each other inter changeable. Veins and arteries are identical because all these are hollow tubes.
3. *Sadhrusya karma* (similar function) – Common function of these three structures are transport of *doshas* and *dhatus*. Along with functional similarity, there is also some anatomical similarity. All these three structures are elements of *akash* (ether).
4. *Sukshamat* (minuteness) –Due to its minute nature the differentiation is difficult. This means that the lack of knowledge of *vaidyas* and common

men in general about those minute structures makes them a like.

Anatomical Considerations on Sira in Sushruta Samhita

In *Sushruta samhita sira* has been used in two purposes-in general *sira* has been used to denote the vessels otherwise in specific sense *sira* means veins. He includes artery, vein, capillary and lymphatics in *sira*. Apart from this in *Sushruta samhita*, in some references like *sira marma*, *sira* has been used to denote the nerve.

Origination of Sira

According to *Sushruta sira* originate in the embryonic life from *nabhi* (umbilicus) and they spread upward, downward and in oblique fashion from *nabhi* (umbilicus) (7). This statement of *Sushruta* is accepted only during embryonic life. In foetus it can be seen also, that number of veins are attached to umbilicus. In the fetal life the *siras* are concerned with the nutrition of the foetus through the umbilical cord, but after birth these *sira* no more exist. *Sushruta* has labeled them “*Nabhiprabhava*” because either they start or end in *nabhi*(umbilicus) in uterine life. Thus *Sushruta*'s description regarding the origin of *sira* seems to be correct (8).

Structure of Sira

According to *Sushruta* Structure of *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* resemble the tendrils, the first branch gives out a branch and this again gives out another branch and so on. The blood flows in all the *sira* which are “like water channels going out to the different areas of a garden or agricultural field (9).

Modern Anatomy of *sira* also considered same regarding structure. Large arteries leave the heart and branch into smaller ones that reach out to various parts

of the body. These divide still further into smaller vessels called arterioles that penetrate the body tissues. Within the tissues, the arterioles branch into a network of microscopic capillaries. Substances move in and out of the capillary walls as the blood exchanges materials with the cells. Before leaving the tissues, capillaries unite into venules, which are small veins. The venules merge to form larger and larger veins that eventually 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. The walls of both arteries and veins are composed of three coats, but they differ in thickness. The inner and middle coats of arteries are thicker than those of veins. This makes arteries more elastic and capable of expanding when blood surges through them from the beating heart. The walls of veins are more flexible than artery walls. This allows skeletal muscles to contract against them, squeezing the blood along as it returns to the heart. One-way valves in the walls of veins keep blood flowing in one direction. The walls of capillaries are only one cell thick. Of all the blood vessels, only capillaries have walls thin enough to allow the exchange of materials between cells and the blood. (10)

General Function of Sira

As a garden or a grain field is made wet by the water carrying big and small channels, similarly the *sira* by their contractility and dilatory property, supply nutrition to the body (11). The blood vessels of the body (arteries, capillaries, and veins) make up a closed system of tubes that carry blood from the heart to tissues all over the body and then back to the heart. Arteries carry blood away from the heart, while veins carry blood toward the heart. (12) Here dilation and contraction is the function of arteries. Sympathetic and parasympathetic nerves

are responsible for vasodilatation and vasoconstriction. Because of pulsation the blood circulates all over the body. In nutrition process of the body all the three blood vessels takes part. Lymphatics also take part in nutrition and they circulate lymph.

Classification of Sira

Siras are classified into 4 types. These are *vataavaha siras*, *pittavaha siras*, *kaphavaha siras* and *raktavaha siras*. In these four types of *siras* every type of *sira* has specific character, colour and function.

Table 1: showing character, colour and function of four types of *siras* (13).

Type of <i>sira</i>	Colour	Character	Function	Modern correlation(14)
<i>Vataavaha siras</i>	<i>Aruna varna</i> (crimson red)	Filled with <i>vayu</i>	Perform physical functions without hindering the specific functions of <i>buddhi</i> (intellect) and sense organs.	Arteries Nerves
<i>Pittavaha siras</i>	<i>Neela varna</i> (blue)	Warm touch	Creates lusture in the body and develops good appetite.	Veins
<i>Kaphavaha siras</i>	<i>Gowra varna</i> (white)	Cold to touch and steady	Gives lubrication to the various body parts and produces firmness in the joints. It also improves strength.	Lymphatic
<i>Raktavaha siras</i>	<i>Rohini varna</i> (red)	Neither they are too hot nor too cold	Nourishes the <i>dhatu</i> s improves the complexion definite perception of <i>sparsha</i> .	Capillaries

IMPORTANT SIRAS IN THE BODY

Sushruta has explained some important *siras* in the body under the heading of *Avedhaya sira* and *Sira marma*.

Avedhya Sira

Some *siras* are not suitable for venepuncture .These *siras* are called *Avedhya sira*. A surgeon should not perform venesection on this *siras* would definitely cause disability or death. Among seven hundred *sira* only 98 *sira* are considered as *Avedhya sira*. Remaining can be choosing for venepuncture in certain diseases (15).

Table 2: showing *siras* which should not be punctured

Regions/ locations	Numbers	Sanskrit names	According to <i>Dr.B.G.Ghanekar (Sushruta sharirasthana commentary)</i> modern correlation of <i>Avedhya sira</i> (16)
<i>Sakthies /bahu</i> (upper and lower limbs)	8+8	(i) <i>jaaladhara</i> (ii) <i>urvi</i> (iii) <i>lohitaksha</i>	Great sephanous veins, femoral vessels, cephalic veins, brachial vessels, axillary vessels

<i>Shroni</i> (inguinal and gluteal region)	8	(i) <i>Vitapa</i> (inguinal or groin) (ii) <i>Katikataruna</i>	spermatic vessels Gluteal vessels
<i>Parshva</i> (flanks)	4	-	There is no such big artery and vein in the lateral side of the body.
<i>Prishtha vansha</i>	2	<i>Brihati</i>	Subscapular artery
<i>Udara</i> (above the penis and the side of <i>romaraji</i>)	4	-	Inferior epigastric vessels
<i>Vaksha</i> (thorax/ chest)	14	(i) <i>Hridaya</i> (ii) <i>Stanamoola</i> (iii) <i>Stanarohita</i> (iv) <i>Apalapa</i>	Intercostal vessels Internal mammary vessels Lateral thoracic vessels
<i>Greeva</i> (neck)	16	(i) <i>Ashta-matrika</i> (ii) <i>Krikatika</i> (iii) <i>Vidhur</i>	External, internal carotid arteries and jugular veins. Occipital vessels Posterior auricular vessels
<i>Hanusandhigata</i> (temporo-mandibular joint)	4	-	Internal maxillary vessels
<i>Jihva</i> (tongue)	4	(i) <i>Rasavaha</i> (ii) <i>Vakvaha</i>	Profunda lingulae vessels
<i>Nasa</i> (nose)	5	(i) <i>Aupnasika</i>	Angular vessels
<i>Talu</i> (palate)	2	<i>Talu sira</i>	Palatine vessels
<i>Netra</i> (eyes)	2	<i>Apanga sira</i>	Zygomatico -temporal vessels
<i>Karna</i> (ears)	2	<i>Shabdavahi sira</i>	Anterior tympanic vessels
<i>Lalata- nasa- netra gata</i> (vessels located in forehead but runs towards the nose and eyes orbit)	5	(i) <i>Keshantanugata sira</i> (hairline) (ii) <i>Aavarta</i> (iii) <i>Sthapani</i>	The nasal branch of frontal vein and branches of superficial temporal arteries. Frontal branch of superficial temporal vein.
<i>Shankha</i> (temporal)	2	<i>Sankhasandhigata sira</i>	Superficial temporal vessels in the temporal region.
<i>Murdha</i> (head)	8	(i) <i>Utkshepa</i> (ii) <i>Seemanta</i> (iii) <i>Adhipati</i>	Parietal branch of superficial temporal vessels. Branches of occipital and superficial temporal vessels.

Sira Marma

The word *Marma* has been used in the classical as well as non-classical books. It

is as old word as *Vedas*. It seems that *Acharyas* have described the regional anatomy in relation to surface anatomy of

Marma. The word *Marma* means vital spot in the body. According to *Dalhana*, the commentator of *Sushruta samhita*, *Marma* is that spot where if any injury or trauma is made, causes death (17). According to *Sushruta* *Marma* is the vital spot in the body where confluence of *mans* (muscles), *sira* (blood vessels), *snayu* (ligaments), *asthi* (bones) and *sandhi* (joints) present. In these places *prana* resides specially by nature, therefore any trauma on any one of these *Marmas* invariably causes death (18). Total numbers of *Marmas* are 107. According to structure he was classified *Marmas* into 5 types. In this one variety is *Sira Marma*, these are 41. These are-

- *Niladhamani-4*
- *Matrika-8*
- *Srngataka-4*
- *Apanga-2*
- *Sthapani-1*
- *Phana-2*
- *Stanamula-2*
- *Apalapa-2*
- *Apastambha-2*
- *Hridaya-1*
- *Nabhi-1*
- *Parsvasandhi-2*
- *Brhati-2*
- *Lohitaksha-4*
- *Urvi-4*

The main symptoms of *Marma* injuries are bleeding and unconscious. In this context *Sushruta* said that – “there are four types of *siras* in the body. They generally lie in the site of *Marmas* and supply nutrition to *snayu* (ligaments), *asthi* (bones), *mans* (muscles), and thus maintain the body. When *Marmas* are injured the *vayu* is increased and encircles the *siras*, it causes severe pain. Because of

this, pain consciousness is gradually lost” (19). Here *sira* is the structure that gives nutrition to the body and maintains the body. Same point is noted in Modern science every structure in the body receives blood supply for nutrition and nerve supply for motor and sensory functions. Every structure is supplied by neurovascular bundle; it contains artery, vein and nerve. In *sira marma* concept all these structures are considered under the term of *sira*.

Conclusion

The term *Sira* stands for channels through which substances or physical forces flow. In general, this term stands for blood vessels, even though *Sushruta* has also used it in the sense of nerves (*vataavaha siras*). In modern Anatomy the *Vataavaha Siras* can be put under the arteries and nerves. The *Pittavaha Siras* can be accepted as veins and *Kaphavaha Siras* can be considered as lymphatic channels and *Raktavaha Siras* are correlated with capillaries of the body.

Modern correlation of four types of *siras* -

- In *Vataavaha siras* seeing the colour *aruna varna* (crimson red) and character filled with *vayu* (pulsation) denotes that in Modern Anatomy these two are characters of artery. If see the function maintaining the intellect and sense organs suggests that in Modern science these functions are generally performed by nervous system.
- In *Pittavaha siras* seeing the colour *neela varna* (blue), it suggests that in Modern science veins are blue in colour because these carry deoxygenated blood.
- In *Kaphavaha siras* seeing the colour *gowra varna* (white), it suggests that in

Modern science lymphatics are white in colour because these carrying clear fluid lymph.

- In *Rakthavaha siras* seeing the colour *rohini* (red) and function nourishes the *dhatu*, it suggests that in Modern science capillaries are red in colour and exchange the nutrients in tissue level.

In *Ayurvedic* classics the nervous system has not been described but the functions of the nervous system have been described through the blood vessels. The *vayu* which circulates in the blood vessels has been held responsible for performing the functions of nervous system. So it seems that *Sushruta* includes the nervous network in the vascular system. So the word *Sira* is correlated with the blood vessels and lymphatics is not farfetched and fanciful.

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