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# A LITERATURE STUDY TO UNDERSTAND PHYSIOLOGY OF PRE VENEPUNCTURE-POSITION OF LEGS W.S.R TO SUSHRUT SAMHITA

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## ABSTRACT

Position of a patient in surgical procedures, clinical examinations is an important assisting factor. Position of patient in minor and major surgical procedures is mentioned in ayurveda as well as modern surgery. One of such position is mentioned in *Sushrut samhita sharirsthan* chapter 8 and *shloka* number 8. This reference is about *siraa utthaan* before *siravedh* / venepuncture / bloodletting procedure. Before this procedure a position is given to patient by doctor. This study is about review of physiological changes in venous blood flow due to position of legs, use of *bandhan* [like tourniquet], location of *bandhan* from venepuncture site and effect of these techniques on veins and venous blood volume. Vein should be prominent and full of blood [*sira utthaan]* i.e., expected before bloodletting treatments/procedures.

**Keywords:** *sira vedh*, veins in legs, venous blood volume in legs, *sira utthaan*, bloodletting in legs

## INTRODUCTION

As title indicates, it is a literature review to understand physiology in position of legs before venepuncture for bloodletting from veins in the legs of patient. Question is, "why this particular position is mentioned by *sushrut*, what will be the effect of this technique on veins of legs, will the veins become prominent by this

technique [*sira utthaan*], how it will assist to bloodletting procedure. So, the aim is to understand physiology in pre- venepuncture position of legs w. s. r. to *sushrut samhita*.

**Anatomy /study of structure of *sira* /veins in legs**

***Ayurvedic* concept:** By definition *sira* means "a structure which pushes and conducts fluid in the body" (*saranaat sira*). *Sira* goes from organ to organ, from one body part to another. *Sira* can constrict and relax. Embryological development of *sira* is from *pitruja* element in fetus, as somewhat hard structure. In *mansadhara kalaa, sira* gets branched and rebranched. It looks like roots of lotus spreaded in the mud *(lok-purush samya siddhant*). It grows deep by branching and rebranching inside mud. *Sira* is supported by *mansadhara kalaa*. Total number of *sira* is 700, as per *sushrut*. Legs have 200 *sira*, out of 700. Each leg carrying 100 *sira*. Out of 100 *sira*, 8 are *vedhya*. *Vedhya sira* are those which are indicated for bloodletting procedures.

***Ayurvedic* physiology of *sira*-** Sira gets nourishment from *raktdhaatu*. *Sira* is formed as a byproduct of *raktadhaatu* metabolism. "*Saran*" is a main function of *sira*, in which secretion and exudation is not expected from its walls. This structure is made to hold the fluid in such a way that it will not exude or ooze out. Its fluid should not spread in other tissues. This structure pushes fluid in it. *Raktamokshana* is half of a treatment in *Ayurvedic* surgery. Vitiated fluid from body is removed by short surgical procedures, which is called as *Raktamokshana*. One of its procedures is "*siravedh*". By puncturing *vedhya sira*, vitiated fluid is removed.

**Anatomy of vein-modern concept-** Veins of lower limbs have valves included in their structure. They push blood above, towards heart, against gravity or they pull blood towards heart from limbs. Negative pressure in chest and right heart helps in this process.

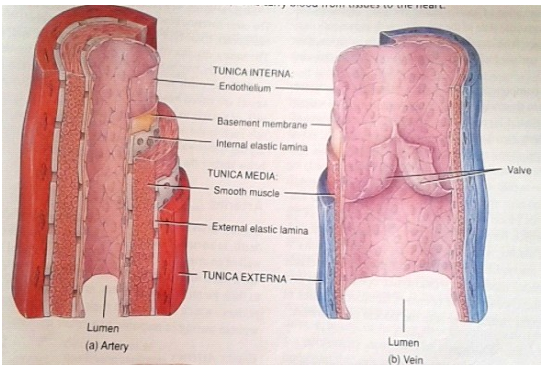


**Image 01:** Internal Structure of artery and vein respectively (see valve in vein)

According to modern anatomy, there are three types of veins in legs.

1. Superficial veins
2. Deep veins
3. Perforators

Superficial veins are located in subcutaneous tissue of leg; they are dorsal venous arch of foot, small saphenous vein and long/great saphenous vein. Deep veins are located below deep fascia. They are femoral, popliteal, profunda femoris, peroneal, anterior and posterior tibial veins. Perforators are special veins in lower limb. They perforate deep fascia, to communicate with deep veins from superficial veins. They have unidirectional valve, which allow blood flow from superficial to deep venous system. Major perforators located in the lower limb below knee are cockett's and Boyd's.

**Physiology of veins in legs- modern concept**

Veins in legs are assisted by skeletal muscle pump, perforators and valves[3]. They move blood from lower side to upper side of body, towards heart. Gravity is acting on these veins, which pulls blood in opposite direction i.e. downward direction. Muscles in legs act as pump and push blood towards heart with the help of valves in veins, see image 01 and images 02. Valves prevent backflow of blood in downward direction i.e. towards feet. Chances of backflow of blood are more in standing position. In limbs, these veins are surrounded by muscles. Contraction of these muscles pushes blood towards heart. image 03.

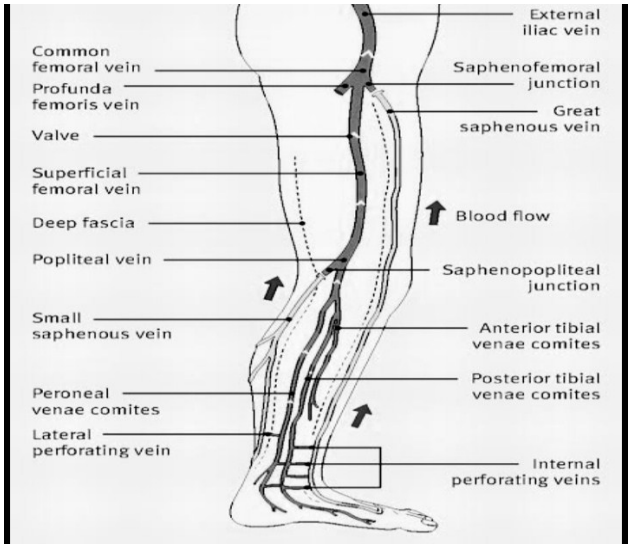


**Image 02:** veins of leg

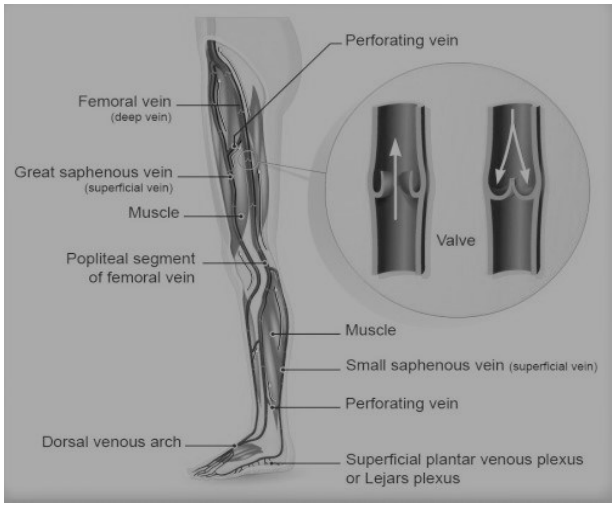


**Image 03:** valves of veins in leg

When calf muscle contraction occurs, blood in veins, specifically in deep veins is pumped rapidly in upward direction, as venous return[4]. Deep venous system in lower limb is high pressure system. When muscle pump works, blood is pushed up ward and pressure is lowered in deep veins. As soon as pressure is lowered, blood rapidly moves from superficial veins to deep veins through perforating veins. Valve of perforating vein is unidirectional. It does not allow blood flow back to superficial vein from deep vein.

**Pre - venepuncture position of legs w.s.r. to *sushrut samhita sharirsthaan***

*Sushruta* had mentioned following position of patient's leg for venepuncture in bloodletting procedure[1]. Before bloodletting from a vein, it should be prominent, full of blood and fixed in its location [*sira utthaan*, not moving or slipping]. Patient stands on a plain platform. Leg, from which bloodletting is planned, is straight. Another leg is bent. Piece of cloth is used as tourniquet, by binding it below knee and squeezing movement from ankle is done in upward direction [towards knee]. This tourniquet can be binded four angul [finger] distance above the venepuncture site rather than below knee. These two locations of tourniquet are mentioned in this reference, below knee and four angul [finger] distance above from venepuncture site. Position of tourniquet depends on venepuncture site in leg. After this position, vein becomes prominent and venepuncture should be done. In this reference *sushruta* had mentioned 'leg below the knee', not above the knee, so the *vedhya* [indicated for venepuncture] veins below the knee are considered for venepuncture in this reference.

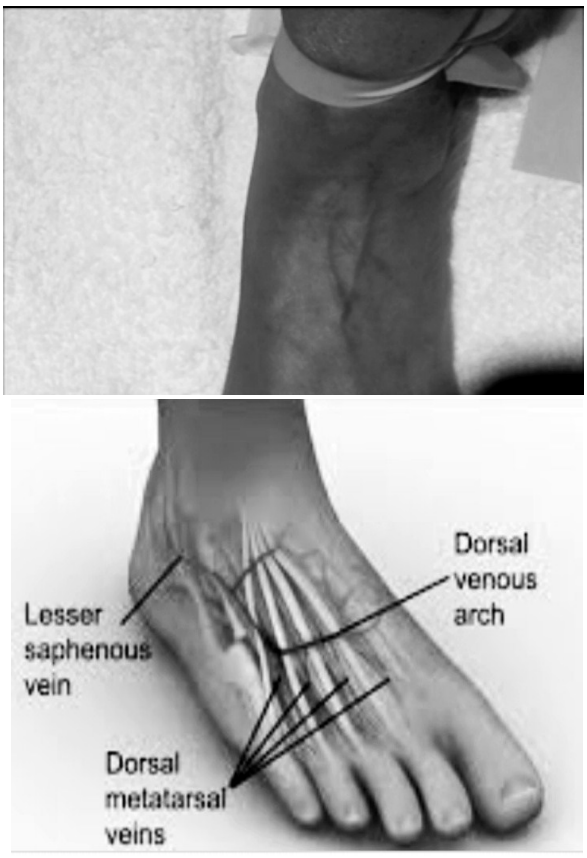


**Image 04:** Position of tourniquet, prominent vein in dorsum of foot

**Effect of pre venepuncture position of legs in bloodletting procedure [or treatment of *raktamokshana*]-**

- Gravity acts most, on the veins in legs, when patient stands on plain platform. It pulls blood in downward direction, away from heart. It is assisting for bloodletting procedure as volume of blood is accumulating in vein. Venous pressure will increase with volume, in standing position[2].
- Use of tourniquet will stop movement of blood in upward direction as its location is below knee. Venous blood normally moves in upward direction towards heart. When blood flow is obstructed below knee, blood will accumulate in vein located below knee. Or when tourniquet is binded four angul [finger] distance above the venepuncture site, same effect will be seen. Blood will not move in upward direction as tourniquet is above the site. Tourniquet is used to stop normal blood flow in upward direction i.e. venous return. [image 04]
- Squeezing movement from ankle in upward direction will assist to accumulate blood in superficial veins of leg located below knee. Venous blood volume and pressure will rise. At one stage superficial veins will be full of blood, as tourniquet is used. Superficial Vein will be prominent, full of blood and fixed in its location.

It is expected pre- venepuncture position. e.g. image 05, venepuncture in foot

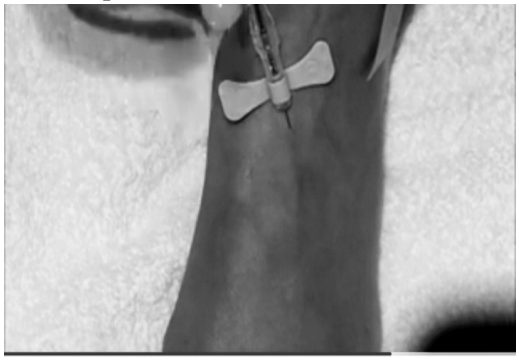

Image 05, venepuncture in foot, direction of needle puncture

## DISCUSSION

In bloodletting procedures, vein should be indicated for bloodletting [*vedhya*], prominent and engorged. It will assist the procedure. There should be more venous pressure. Venous pressure is directly proportional to volume of blood. If venous return to right heart is decreased, then blood will be more in peripheral veins. There will be more venous pressure in peripheral veins. At physiological level, venous pressure in the organs below the heart level is more as compare to above. Tourniquet and gravity are used by *sushruta* to make veins more prominent in leg below knee. When calf muscle [gastronemius and soleus] contracts blood rapidly moves towards heart from deep veins of legs. Superficial veins rapidly empty into deep veins due to negative pressure developed in them. Emptying of superficial veins is not expected in *siraa utthaan* and bloodletting treatments. So, contraction of muscle is avoided in position of patient mentioned by *Sushruta*. The patient's leg in which *siraa utthaan* is planned is placed on plain ground without bending or moving. Calf muscle is kept relaxed, as their contraction moves venous blood from vein to vene cavae as well as from superficial to deep veins of legs. Tourniquet, gravity and position of leg will result in accumulation of blood in peripheral veins, engorgement of veins. Squeezing movement can be done above ankle, if *vedhya* vein [indicated for venepuncture] is in between ankle and knee. Below ankle, squeezing cannot be done but tourniquet is sufficient to make veins prominent in dorsum of leg as shown in images 04 and 05. Blood flow is moving towards heart, in upward direction so veins will fill with blood continuously.

It is an expected preposition of bloodletting procedure in leg below the knee for *siraa utthaan*.

## CONCLUSION

Position mentioned in *shloka of Sushrut shaarir sthan 8/8*, is an expected position for *siraa utthaan* and bloodletting from leg veins, below knee. Physiologically, blood will accumulate in superficial veins of legs increasing venous blood volume and venous pressure. It will assist bloodletting, by making vein prominent i.e. *sira utthaan.*

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