



Anatomico physiological aspects of siravedha W.S.R to neuromuscular disorders

Panda Ipsita¹✉, Dev Sangeeta², Singh Shalini³ and Shukla Shweta G.⁴

Received: 01.10.2019

Revised: 14.10.2019

Accepted: 20.11.2019

Abstract

Siravedha/bloodletting is a worldwide favoured medical practice having its origin from the prehistoric era. Among many of its accomplished functions, *Sushruta* (the father of surgery) has also prescribed it in some *Vatavyadhi* (i.e., diseases predominantly causing pain/*Shula* due to *Vata* predominance). *Vagbhat* advised *Raktamokshana*/bloodletting as a treatment modality that relieves pain & redness immediately (*Sadya Raga Ruja Samana*). Throwing some light on the anatomical & physiological considerations lying behind the effectiveness of therapeutic bloodletting in neuromuscular conditions (*Vatavyadhi*) is of immense value for sustainment of para-surgical procedures in modern day medical practices.

Keywords: *Vatavyadhi, Raktamokshana, Siravedha, Phlebotomy, Neuromuscular disorders.*

Introduction

Siravedha or Bloodletting, the taking of blood from a patient with therapeutic intent, was a practice carried out over millennia (AFI, 2003). It is an important part of treatment protocols prescribed under *Unani*, *Ayurveda*, and traditional Chinese & Hildegard medicine. According to G. Greenstone-2010, Egyptian history tracing back to 3000 years ago cites practicing of venesection/therapeutic phlebotomy, then continued with the Greeks & Romans, the Arabs & Asians, then spread through Europe during the Middle Ages & the Renaissance. It reached its peak in Europe in the 19th century but subsequently declined & today in Western medicine is used only for a few selected conditions (hemochromatosis, polycythemia vera, porphyria cutanea tarda, etc). * *Acharya Sushrut*. The Father of Surgery have given immense value to the anatomical & functional aspects of *Sira* and described it under two chapters in *Sharir Sthana* of *Sushrut Samhita* as “*Sira Shariram*” & “*Sira*

Vedhyavidhi Shariram”. His compendium is regarded as one of the oldest treatise dealing with surgery. As such he have emphasized on specific areas where venesection should/shouldn't be done. The treatise's insight, accuracy & details of the regions allotted for venesection in different neurological disorders should be analysed by both literary & clinical studies. Although speculations are raised on the efficacy of *Siravedha* in combating different types of diseases; but till date many clinical studies claim reduction in pain/numbness, etc with cases like sciatica, migraine, low backache, rheumatic conditions, etc. Thus, the sole purpose of this study is to propose the anatomical entities involved in *Siravedha* for different neuromuscular disorders & physiological changes that could be attributed to its actions in pain management, etc in these cases.

Review of literature

In *Ayurveda*, *Siravedha* is prescribed for many types of diseases including neuromuscular disorders like *Avabahuka* (Frozen shoulder/Brachialgia), *Visvachi* (Brachial neuralgia or neuritis), *Bahusosha* (Muscular wasting of arm/forearm), *Gridhrasi* (Sciatica), *Khanja* (Limping), & *Pangu* (Paraplegia). *Siravedha* as such implies puncturing of *Sira* for bloodletting. It is a type of *Raktamokshana* (bloodletting), which is described under the *Sodhana*/purification processes of body in *Ayurveda*. *Sushruta* considers *Raktamokshana* as

Author's Address

^{1&2}Department of Sharir Rachana, Uttarakhand Ayurved University, Rishikul Campus, Haridwar-249401, Uttarakhand, India

³Department of Shalaky Tantra, Uttarakhand Ayurved University, Gurukul Campus, Haridwar-249401, Uttarakhand, India

⁴Department of Kayachikitsa, Uttarakhand Ayurved University, Rishikul Campus, Haridwar-249401, Uttarakhand, India,

E-mail: pandaipsita82@gmail.com



a regimental therapy in the months of autumn for purification of body humour (*Dosha*) & is also advocated as *Ardhachikitsa* or half of the treatment for surgical cases. *Ayurvedic Acharya's* have used the word *Sira* for different vessels of body in different contexts. As such, it becomes a necessity to come to a common conclusion for which vessels to be punctured while performing *Siravedha*.

Sira: the word originates from the *Vedic* word *Hira*, which means blood carrying channel towards heart (Kumar, 2013).

Etymology:

'Sira', word derived from "सृ+क+टाप् meaning 'Rakta Vahini Nadi' (T. Sharma)

"सरणात्सिराः" by Charka (J T Acharya, 2018)

"सरणाद्रसादीनांगमनात्सिरा इत्युच्यन्ते" by Kaviraj Gangadhar (T. Sharma)

"न हि वातं सिराः क्वचित् पितं केवलं तथा। श्लेष्माणं वा बहन्त्येता अतः सर्ववहाः स्मृताः।" by Sushruta (Murthy, 2004).

From the aforesaid descriptions given by different *Acharyas* about *Sira*, it seems to be a tubular structure where movement occurs and it is capable of transmission of *Rakta, Dosha & Dhatu*.

There is also different views regarding the origin of *Sira*, *Sushruta* have accepted *Sira* to start from *Nabhi* or *Umbilicus* and *Vagbhat* opines it to origin from *Hriday/Heart*.

"तासां नाभिमूलं, तत च प्रसरन्त्यूर्ध्वमधस्तिथेक्च।" by Sushruta (Murthy, 2004).

"दशमूलसिराद्दुत्थास्ता।" by Astanga Hriday (Paradakara, 2018).

Commentators of *Ayurveda* address this disparity as follows: *Sushruta* have considered fetal blood circulation (where umbilical vein & arteries play the role) into account & *Vagbhat* have considered adult blood circulation. The place of origin also proves the fact that these structures have something to do with blood circulation rather than neural transmission. This fact is further accentuated by the views of *Bhel Samhita*: "हृदोरसोनिःसरतिततएवचसर्वतः। सिराभिःहृदयज्वैतितस्मादहत्प्रभवाः सिराः।"

Acharya Charka has given clear distinction between the *Swarup* of *Dhamani* & *Sira*: (Acharya, 2018): "धमनाद्मन्यः" --- which have pulsation.

"सरणात्सिराः"--- where *Sarana Karma* takes place; means going, moving or flowing.

These two definitions clearly depicts that *Dhamanis* can be correlated to arteries which shows pulsation

& *Sira* with veins where moving of blood occurs with presence of valve without pulsation.

Siravedha: "तत्रशास्त्रे विस्त्रावणद्विविधं प्रच्छानं, सिराब्धनं च।" (Murthy, 2004).

Raktamokshana (bloodletting) process is described to be of 2 types by *Sushruta Prachhana & Siravedha*. This shows that scrapping of superficial blood capillaries is different from venesection procedure adopted in major blood vessels. Two methods are advocated because of the fact that major blood vessels of some regions (like scalp) cannot be incised: "When making incisions into the scalp, care should be taken to avoid the main arteries. The blood vessels, when wounded, do not contract & retract freely; & therefore, the haemorrhage from scalp wounds is often very considerable"-Grey's Anatomy. *Sushruta* further opines that only blood vessels (superficial) that could be easily seen after *Yantran Vidhi* should be incised to avoid complications.

Specific Yantran Vidhi for specific areas of Siravedha: (Murthy, 2004).

For Legs: "पादं समे स्थाने सुस्थितं स्थापयित्वा अन्यं पादमीषत्संकुचितमुच्चैः कृत्वा व्यण्यसिर पादं जानुसन्धेरधः शटकेनावेष्टय हस्ताभ्यां प्रपीडय गुल्फं व्यध्यप्रदेशस्योपरी चतुरंगुले प्लोतादीनामन्यतमेन बद्ध्वा वा पादसिरां विध्येत्।"

For puncturing of veins of the legs, one leg should be placed firmly on an even place, & the other leg is to be slightly flexed & raised above; then the leg in which the vein is to be punctured, is wrapped with a binder below the knee. Hands knead the ankle & a band cloth is tied about 4 *Angula* (8cm) above the site of puncture. Then the vein is punctured.

For Hands: "गुढाङ्गुष्ठाकृतमुष्ठी।"

Veins of the arms should be punctured by tightly clenching the fists with thumbs inside it.

For Gridhrasi & Visvachi: "संकुचितजानुकूर्परस्य।"

In *Gridhrasi* & *Visvachi*, puncturing should be done with the knee or the elbow joints (respectively) being flexed.

For Prustha (back) & Skandha (shoulder):

"ऊत्रामितपृष्ठस्यावाकशिरस्कस्योपविष्टस्य विस्फूजितपृष्ठस्य विध्येत।" Veins of the back & shoulders should be punctured by making the patient sit, raising his back & lowering his head; thus expanding the back surface area.



Vyadha Pramana (size of puncture) according to place:

In Mamsala Sthana: वमात्रं (0.24cm) (AFI, 2003)

Rest of the places: अर्धयवमात्रं (0.12cm) (AFI, 2003)

or व्रीहिमात्रं इल व्रीहिमुखयन्त्र

Over Asthi (bones): अर्धयवमात्रं by कुठारिकायन्त्र

In muscular areas, puncturing should be the size of *Yava* (barley grain), in other areas it shall be half *Yava* or one *Vrihi* (paddy/rice) using a *Vrihimukha Shastra* (trocar or puncturing needle). Veins over the bones should be punctured to the size of half *Yava* by using a *Kutharika* (small surgical axe). From the above descriptions, it can be concluded that the depth of puncturing shouldn't exceed 0.24cm or 2.4mm (thus, venesection should only be performed on superficial veins which becomes prominent with application of pressure. For proper bloodletting of a place, *Sushruta* opines that it should be done for 1 *Muhurta* (AFI, 2003) & maximum blood flow to be allowed is limited upto of 1 *Prastha* (AFI, 2003).

Veins to be punctured in different neurological disorders: The specific veins described for puncturing in different parts of body have special affinity to decongest the organ or part & stimulate it to reorganize due to its closed proximity to the affected areas.

Avabahuka (Frozen Shoulder or Brachialgia): Frozen Shoulder or Adhesive capsulitis causes pain & stiffness in shoulder. Pain is usually located over the outer shoulder area & sometimes upper arm.

Process: done by *Brihimukha Yantra*- 2*Angul* above *Kshipra Marma* (*Padasyaangusthaangulyo Madhye*) or *Amsyo Antare*: The first place described above lies 2 *Angul* above the midpoint of the angle formed between thumb & index finger towards the dorsum of palm. The major superficial vein present in this area is cephalic vein. The second place to be punctured is advised as a place in between the two scapulas, thus the vein to be punctured may be probably a cutaneous vein (as dorsal scapular vein is deep seated in this area).

Visvachi (Brachial Neuralgia or Brachial Neuritis): In case of Brachial neuralgia the lower motor neurons of the brachial plexus (C5 to T1) &/or individual nerves or nerve branches are involved. It is characterised by unilateral shoulder pain, followed by paralysis of shoulder &

parascapular muscles. It is thought to be an immune-system mediated inflammatory reaction against nerve fibres of the brachial plexus.

Process: venesection is to be done at 4 *Angul* above and below elbow joint. The major vein that is superficial in this region & becomes prominent with application of pressure is median cubital vein.

Two sites for puncturing were advised may be due to the fact that: median cubital vein which is a superficial vein overlying bicipital aponeurosis in the roof of cubital fossa shows variable forms in pattern of joining the cephalic vein to basilic vein (H-type or M-type). Hence, its exact location can't be assessed.

Bahusosha (Muscular wasting of shoulder/forearm): Muscle wasting in hand is multifactorial, viz., stroke, spinal cord injury, injury of shoulder or hand, rheumatoid arthritis, poliomyelitis, etc. Mostly muscles supplied by brachial plexus are affected in these cases.

Process: venesection to be done in between two scapulas ("अंसयोः अन्तरे"). The main vessel to be punctured in these cases may be cutaneous blood vessels as dorsal scapular vein that accompanies dorsal scapular artery is deep seated in this area.

Gridhrasi (Sciatica): Sciatica, a condition of leg pain, alongwith tingling, numbness or weakness of leg that originates in the lower back & travels through the buttock & down the large sciatic nerve in the back of each leg. Nerve roots compressed in this case mostly are L4 – L5 & S1- S3.

Process: venesection to be done 4*Angul* above & below *Janu Sandhi* (knee joint). The major vein present here are branches to great saphenous vein (superficially) & femoral vein (deep) above knee and tributaries to great saphenous vein (superficial) & anterior tibial vein (deep) below knee. Thus, most probably great saphenous vein is to be punctured in cases of sciatica.

Khanja (Limping) and Pangu (Paraplegia): Limp is a type of asymmetric abnormality of the gait mainly due to pain, weakness, neuromuscular imbalance, or a skeletal deformity. Paraplegia is the impairment in motor or sensory function of the lower extremities. It is usually caused due to spinal cord injury, congenital conditions, CVA, etc. The area of spinal cord mainly affected in paraplegia is thoracic, lumbar or sacral regions.

Process: Venesection to be done 4 *Angul* above *Gulpha* (ankle joint) in the *Jangha* (crus). The



superficial vein to be punctured in these cases is tributary to great saphenous vein.

Physiological changes due to bloodletting:

Bloodletting works according to the principle of Tanqiya-e-Mavad, i.e. evacuation of morbid matters from the affected area. It also improves circulation to the area & provides better nutrition to the area, where it is applied. A study by Ma et al., 2006, showed that Acupuncture (a type of Chinese bloodletting process) in mice with focal cerebral ischemia could reduce the release of Tumor Necrosis factor- α /TNF- α . It also showed an increase of HSP70 (heat shock protein in brain) messenger ribonucleic acid (mRNA) expression in the cortex & hippocampus. This indicates that acupuncture can boost HSP70mRNA expression in the brain through regulation of calcium channels by HSP70 to achieve nerve protection. It also promotes human metabolism & increases heart rate, systolic blood pressure, & blood supply to brain. Through the nerve-body fluid regulation, it improves microcirculation & vascular function, which helps to remove harmful free radicals from the blood. It also causes increase in partial O₂ pressure & a decrease in H⁺ concentration in regions of ischemia. It further eases hypoxia & acidosis due to ischemia (He et al., 2002), adjusts homeostasis of K⁺ & Na⁺ in ECF, & reduces the development of cytotoxic edema (Ma et al., 1997). Pricking to draw blood can reduce nitric oxide (NO) concentration, improve nitric oxide synthase (NOS) activity, & reduce damage caused by free radicals on tissue. It also decrease the malondialdehyde (MDA) concentration, increase super oxide dismutase (SOD) activity, clear free radicals, & reduce lipid peroxidation. Acupuncture is one of the induced physiological stresses that can stimulate HPA axis, by triggering hypothalamus to secrete CRH (corticotropin-releasing hormone) that then stimulate anterior pituitary pelvic to release ACTH (adrenocorticotroic hormone). ACTH in turn stimulates adrenals to release glucocorticoids. Glucocorticoids enhance immune functions & inhibit the production of pro-inflammatory cytokines.

Results and Discussion

Neuropathic pain is a complex, chronic pain state that usually accompanied by tissue injury. It is the result of disease or injury to peripheral or central

nervous system & the lesion may occur at any point. These types of pain are than characterized by humans as spontaneous pain, allodynia (increased response of neurons), & causalgia (severe burning pain). Spontaneous pain includes sensations of 'pins & needles', shooting, burning, stabbing & paroxysmal pain often associated with dysesthesias (abnormal unpleasant sensation) & paresthesias (abnormal dermal sensations). A normal pain circuitries involve activation of nociceptors (noxious substances like K⁺, H⁺, S-HT, bradykinin induces pain stimuli in free nerve endings)→ Na⁺ influx & K⁺ ion outflow causing depolarization of first order neurones→ which ends in trigeminal nucleus of brainstem or dorsal horn of spinal cord→ voltage gated Ca⁺ channels activates & release glutamate→ glutamate binds to NMDA (N-methyl-D-aspartate) receptors on the second order neurones causing depolarization→ these go upto third order neurones in thalamus, which in turn connects to limbic system & cerebral cortex. The clinical expression of spinal segmentation sensitization includes hyperalgesia, pain at mild touch, referred pain, & dysfunction of motor & autonomic nerve function. Sustained CNS sensitization caused by pain enhances the excitation of neurons & enlarges the receptor pool of neurons, thus inducing intractable referred pain (Coderre, 1993). The inhibitory pathway prevents pain signal transmission in the dorsal horn. Anti-nociceptive neurons originate in brain stem & travels down the spinal cord synapsing with short interneurons in the dorsal horn by releasing serotonin & norepinephrine (mood elevators or antidepressants). The interneurons modulate the synapse between the first-order neuron & second-order neuron by releasing gamma amino butyric acid (GABA), an inhibitory neurotransmitter.

Based on the previous stated facts neuropathic pain can be relieved by blocking neurotransmission at 3 levels: the local periphery, the spinal segment, & the CNS:

At periphery level: bloodletting therapy expels the blood with a high concentration of pain producing substances, improving local circulation, & helping to repair damaged tissue.

At spinal segment: when noxious stimulation & stimulations initiated by puncturing signalare are sent to the same or nearby spinal segments,



Anatomico physiological aspects of siravedha

puncturing or pricking significantly reduces pain, thus reversing spinal segmental sensitization.

At CNS level: The puncturing or pricking signal can be sent into the cerebrum through the ventrolateral funiculus. In the frontal abdominal side of the medulla oblongata, periaqueductal gray matter of midbrain & the thalamus, noxious stimulation & puncturing/pricking signal gathers in the same cells & nuclear groups. When they take effect at the same time, noxious stimulation will be depressed by puncturing/pricking signal, thus reversing CNS sensitization (Parapia, 2008).

HSP70 are normal intracellular proteins produced in greater amounts when cells are subjected to stress or injury (Morang, 2005). These proteins are assumed to protect cells from thermal or oxidative stress by inducing protein folding. Therefore, as bloodletting increases the level of HSP70 protein in body it ensures neural protection by initiating cell protection machineries. Moreover TNF- α is not only a proinflammatory mediator but also a pain mediator. It is involved in the generation & maintenance of inflammation-related pain & is released by numerous nociceptors (Schaible, 2010). Bloodletting results in decrease in production of TNF- α thus further accentuating neural protection alongwith hindering pain signal transmission. From the above depicted experimental evidences it may be deduced that *Siravedha* or bloodletting can prove as an effective modality in cases of neuropathic pain (*Vatavyadhi*) management & associated sensory or motor features. These anatomical & physiological considerations alongwith other unknown factors may be responsible for clinical evident management of *Vatavyadhi* through *Siravedha* as proposed by our classics.

References

AFI, 2003. second edition, Appendix-V, The controller of publication, Part 1: 483.

Paradakara H. S. S. (Ed.), 2018. Astanga Hriday of Vagbhat, Chaukhambha Sanskrit Sansthana, Varanasi, Sharir Sthana, Adhyaya 3/Shloka 18: 389.

<https://www.bcmj.org/premise/history-bloodletting> Retrieved on 28/09/2019

<https://ispub.com/IJPS/4/2/8232> Retrieved on 28/09/2019

https://www.researchgate.net/publication/265964377_THE_EFFECT_OF_BLOODLETTING_ON_MIGRAINE_HEADACHE Retrieved on 29/09/19

<https://www.intechopen.com/books/acupuncture-clinical-practice-particular-techniques-and-special-issues/acupuncture-for-disorders-of-consciousness-a-case-series-and-review> Retrieved on 29/09/19

<https://www.practicalpainmanagement.com/pain/neuropathic/pain-athophysiology-neuropathic-pain> Retrieved on 30/09/19

Coderre, T.J. 1993. Contribution of central neuroplasticity to pathological pain: review of clinical & experimental evidence, *Pain*, 52: 259-285.

<https://www.practicalpainmanagement.com/pain/neuropathic/pain-athophysiology-neuropathic-pain> Retrieved on 30/09/19

<https://www.sciencedirect.com/science/article/pii/S0254627216300048> Retrieved on 30/09/2019

Acharya, J.T. (Ed.), 2018. Charka Samhita by Agnivesha, Chaukhambha Sanskrit Sansthana, Varanasi, Sutrasthana, Adhyaya 30-Sloka 12: 185.

Murthy K.K.S. (Translator), 2004. (2nd Edition), Sushruta Samhita, Chaukhambha Orientalia, Varanasi-1, Sharir Sthana, Adhyaya 7/Shloka 16: 125.

Murthy K.K.S. (Translator), 2004. (2nd Edition), Sushruta Samhita, Chaukhambha Orientalia, Varanasi-1, Sharir Sthana, Adhyaya 7/Shloka 3: 122

Murthy K.K.S. (Translator), 2004. (2nd Edition), Sushruta Samhita, Chaukhambha Orientalia, Varanasi-1, Sutrasthana, Adhyaya 14/Shloka 25: 92.

Murthy K.K.S. (Translator), 2004. (2nd Edition), Sushruta Samhita, Chaukhambha Orientalia, Varanasi-1, Sharir Sthana, Adhyaya 7/Shloka 8: 131-132.

Kumar, B.M.N. 2013. Anatomical considerations on Sira in Ayurveda with special reference to Sushruta Samhita, *Int. Journal of Ayurvedic Medicine*, 4(4): 320-327.

Morange, M. 2005. What history tells us II. The discovery of chaperone function. *J Biosci*, 30: 461-464.

Parapia, L.A. 2008. History of bloodletting by phlebotomy, *Br J Haematol*, 143: 490-5.

Schaible, 2010. The role of TNF- α as pain mediator; <https://www.ncbi.nlm.gov/m/pubmed/20309696/>

