

Anatomical Study of Gulpha Pradesha with Special Reference to Antarkandara Sira for Identification and Determination of Location of Sira for Sira Vyadha in Grudhrasi

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ABSTRACT:

Background of study: Grudhrasi is one of the painful conditions explained in Ayurveda in the context of vatavyadhi, where in the pain from sphik(buttock) radiates upto the paada(foot). Siravyadha is indicated in Grudhrasi and the region of siravyadha is mentioned as AntarkandaraGulpha. There is need to understand the term with respect to determining the exact location, identification of the structural entity for siravyadha in Grudhrasi. **Aims and Objectives:** For anatomical understanding of Gulphapradesha with special reference to Antarkandara Sira and to determine the location and selection of particular Sira for Siravyadha in grudhrasi. **Materials and Methods:** Study was conducted in three steps: 1. Conceptual study was done by reviewing relevant text books of Ayurveda and contemporary science, published research works etc. 2. Cadaveric observational study was carried out over 3 cadavers by dissecting in the Gulphapradesha. 3. Perspective clinical observation of 30 subjects with Grudhrasi advised for Siravyadha were taken for the study. **Results:** Antarkandara sira is considered as Neuro Tendinal component. As kandara and snayu have functional resemblance, they perform the function of holding and binding the various structures of human body like bones, muscles and adipose tissue and the sira that present is Great Saphenous vein medially and Short saphenous vein laterally. As antarkandara is taken as neurotendinal, here the veins of the ankle lie in between the neurotendinous component.

Keywords: Sira, Kandara, Grudhrasi, Siravyadha

I. INTRODUCTION

Ayurveda, the science of life, is a system of medicine in the sense that it systematizes and

applies the knowledge about health and disease, that is of balanced and unbalanced states of living beings, and how unbalanced states can be corrected and restored balance.¹

Shodhanachikitsa is of the most important treatment modality in Ayurveda. Sira Vyadha is one among the Pancha Shodhana and it is considered best among various treatment modalities explained for Sira Vyadhasadhyavyadhi.

Grudhrasi is one of the painful conditions explained in Ayurveda in the context of vatavyadhi, where in the pain from Sphik(buttock) radiates upto the Paada(foot) through the posterior aspect of Kati(hip), Prusta(back), Uru(thigh), Janu(knee) and Jangha(leg)².

In dealing with the treatment of Grudhrasi, Sira Vyadha, Basti and Agnikarma have been mentioned³. Raktamokshana by Sira Vyadha method is mentioned as Ardha Chikitsa⁴. Sira Vyadha is indicated in Grudhrasi and the region of Sira Vyadha is mentioned as Antarkandara Gulpha⁵.

Gulpha is a region present in the junction between Jangha and Paada made up of Gulpha Sandhi⁶ and the associated structural entities. Further there is need to understand the term Antharkandara Gulpha and probable structural entity and its relation with Sira Vyadha.

When Kandara is afflicted by vitiated vata, movements of the lower limbs get restricted, and is known as Grudhrasi⁷. Kandara is mentioned as Mahasnayu⁸.

When all the measures mentioned in vatavyadhi are unable to relieve Grudhrasi, making sure that shonitaavarana is the cause, Sira Vyadha has to be done⁹. It has indicated that Sira Vyadha has to be done in between Kandara and Gulpha.

As per the modern science the ankle region is made up of long flexors posteriorly and

long extensor group of muscles anteriorly and peroneal muscles laterally passing into the foot region and helping movements like plantar flexion and dorsiflexion, eversion and inversion. In turn the tendon of these muscles is held by condensation of deep fascia in the form of flexor, extensor and peroneal retinacula¹⁰.

The vascular structures passing from leg to foot crosses the ankle joint in various locations like the great saphenous vein, short saphenous vein superficially and the anterior tibial vein, posterior tibial vein, peroneal vein, as deep structures¹¹. Hence the study is intended to determine the exact location and identification of the structural entity that has to be selected for Sira Vyadha.

AIM AND OBJECTIVE

Anatomical understanding of gulphapradeshawith special reference to antarkanadarasira and Cadaveric study to determine the location and selection of particular sira for siravyadha in grudhrasi.

II. METHODOLOGY:

Conceptual study: All conceptual data related to Grudhrasi, Siravyadha, Gulpha and Kandara were compiled from the Ayurveda as well as modern texts.

Cadaveric Observational study:Dissection was conducted as per Cunningham's Manual of Practical Anatomy in identifying antarakandara Sira by Dissecting and identifying of structures in ankle region and its relation with antarkandara Sira used for Siravyadha in grudhrasi.

Perspective observational survey study:Study was carried in the department of Panchakarma and Kayachikitsa, Sri DharmastalaManjunateshwara College of Ayurveda and Hospital, Hassan. 30 diagnosed cases of Grudhrasi which were advised for Siravyadha was taken for observation. Siravyadha procedure was observed and photos were taken to note the Sira that was punctured. Marking the standard anatomical point told by acharya charaka who has mentioned the Siravyadha point in Grudhrasi as Antarakandara Sira in Gulphapradesha.

III. OBSERVATION:

Cadaveric Observation:

1st Approach: Dissection of lower limb extending from iliac crest to the foot in identifying neuronal structure and its course.

The predominant neuronl structure seen was sciatic nerve which was 2 cm broad at its

origin and the broadest nerve in the body.It is the continuation of the upper band of the sacral plexus of the pelvis and consists of 2 parts, tibial part and common peroneal part.

The tibial part is formed by the ventral divisions of anterior primary rami of L4-L5; S1-S3. The common peroneal part is formed by the dorsal divisions of anterior primary rami of L4-L5; S1-S2.

It leaves the pelvis via the greater sciatic foramen below the piriformis and descends between the greater trochanter and ischial tuberosity, along the back of the thigh, dividing into the tibial and common peroneal (fibular) nerves, proximal to the knee.

The tibial nerve:The larger sciatic division (from the ventral branches of the fourth and fifth lumbar and first to third sacral ventral rami), descends along the back of the thigh and popliteal fossa to the distal border of popliteus, passing anterior to the arch of soleus with the popliteal artery and continuing into the leg.

In the leg the tibial nerve, ending under the flexor retinaculum by dividing into medial and lateral plantar nerves.

Its branches are articular, muscular, sural, medial calcanean and medial and lateral plantar. Just before the tibial nerve bifurcates it supplies the ankle joint.

Sural nerve joined by a sural communicating branch of the common peroneal. It connects on the dorsum of the foot with the superficial peroneal nerve, and in the leg with the posterior femoral cutaneous nerve.

Medial calcanean branches, Vascular branches, Medial plantar nervedivides near the metatarsal bases into three common plantar digital nerves.Three common plantar digital nerves each dividing into two proper digital branches.

Lateral plantar nervedividing into superficial and deep branches. The superficial branch splits into two common plantar digital nerves: the lateral and the medial connects with the third common plantar digital branch of the medial plantar nerve, dividing into two.

Common Peroneal Nerve about half the size of the tibial, is derived from the dorsal branches of the fourth and fifth lumbar and first and second sacral ventral rami.

Two cutaneous branches often from a common trunk, are the lateral sural and sural communicating nerves.

Deep peroneal nerve begins at the common peroneal bifurcation, dividing there into lateral and medial terminal branches.

Superficial peroneal nerve begins at the common peroneal bifurcation. The medial branch, dividing into two dorsal digital nerves. It communicates with the saphenous nerve and deep peroneal nerves. The smaller lateral branch, dividing into dorsal digital branches connecting with the sural nerve.

2nd Approach: Dissection of leg and foot region in identifying vascular structure, particularly superficial veins of foot and limb.

Superficial veins are the great and small saphenous.

Great Saphenous vein ascends about 2.5-3 cm anterior to the tibial malleolus, crosses the distal third of the medial surface of the tibia obliquely to its medial border, then ascends a little behind the border to the knee; proximally it is posteromedial to the medial tibial and femoral condyles, then ascends the medial aspect of the thigh; after traversing the saphenous opening) it finally opens into the femoral vein.

The small saphenous vein begins posterior to the lateral malleolus, as a continuation of the lateral marginal vein. Continuing its ascent its termination in the popliteal vein, 3-7.5 cm above the knee joint passes between the heads of the gastrocnemius, then proceeds to in the popliteal fossa.

3rd Approach: Dissection and identification of tendineae in ankle.

Ankle joint is surrounded anteriorly by tendons of tibialis anterior, extensor hallucis longus, tibial vessels, tibial nerves, tendons of extensor digitorum longus and posterior tibialis in order. These structures are held in position by superior and inferior retinacula.

Posteriorly, ankle is surrounded by tendons of tibialis posterior, flexor digitorum longus, posterior tibial vessels, tibial nerves and tendon of flexor hallucis longus pass in order behind and below the medial malleolus. Flexor retinacula hold them in position. Posteriorly tendo-Achilles and plantaris. These tendons are all covered by synovial sheath with no muscular covering⁸².

Postero-laterally peroneus longus and brevis held in position by superior and inferior peroneal retinacula.

Clinical observational survey study:

The prospective clinical study over 30 individuals, who were diagnosed cases of Grudhrasi which were advised for Siravyadha was taken for observation.

Probable structure used clinically for Siravyadha intervention:

Great Saphenous Vein was punctured in 15 patients.

Short Saphenous vein was punctured in 8 patients.

Dorsal Venous arch was punctured in 7 patients.

IV. RESULTS:

The structural entity observed in dissection are correlated with the data collected from classics, contemporary science, published journals and prospective clinical observational study and analysed with most possible structural. This was assessed with special reference to location, dimension, structural composition, and structure responsible for antarkandarasira for siravyadha.

The structures observed that would satisfy the antarkandarasira are the great saphenous vein and the short saphenous vein.

V. DISCUSSION:

The peculiarities of antarkandarasira in gulphapradesha with respect to location, dimension, structural composition, with the help of conceptual review, cadaveric observation and prospective clinical observational study are discussed.

Discussion on Sira used for Siravyadha:

According to Acharya Charaka the Sira has been mentioned for Sira Vyadha is Antarkandara Sira in GulphaPradesha.

Based on the cadaveric dissection the site of siravyadha:

On the cadaveric dissection, the site that was considered was on GulphaPradesha; and the Antarkandarasira as per classics is present as vascular structure present in between neuronal and tendinous component. By clinical observations of 30 siravyadha procedures done in the region of ankle was related with Great Saphenous Vein and Short Saphenous Vein which was explored in the same spot by dissection of cadaver.

After dissection at the region of ankle joint the structures seen were Great Saphenous vein lying medially; in between the tendons of Tibialis anterior and Tibialis posterior and tendon of Flexor digitorum longus post behind the medial malleolus. It was also observed that the neuronal entity found flocking together with Great Saphenous vein are the Saphenous Nerve and the Dorsal digital nerve. The vein was observed in between these nerves.

Further it was observed that among 30 cases of siravyadha, in 8 cases, the procedure was done along lateral longitudinal arch and posterior to the lateral malleolus. By doing dissection the structure which was observed was Short Saphenous vein. It was present in between the Peroneus longus and Peroneus brevis tendons anteriorly and Achilles tendon posteriorly. The neuronal component observed are the Sural Nerve along with its cutaneous branches in association with the Short Saphenous Vein.

Hence, the antarkandara is considered here as neuro tendinal component and the sira that was seen were Great Saphenous vein medially and Short saphenous vein laterally used for siravyadha in Grudhrasi.

Discussion on Kandara as Neuro-tendineous component:

Kandara as neuronal component:

VruttaKandara are said to be a type of Snayu, and in the context of Grudhrasi, is considered as large nerve, the sciatic nerve that supplies into whole lower limb and any damage in its course from root upto small branches supplying the foot can be considered as one among the Kandara, which is Vrutta in structure. There are also supporting evidences in clinical manifestations of Grudhrasi (sciatica), along with condition like Visvachi, Khalli, Khanja and Pangu where there is a clear nervous pathology in the disease manifestation and related with nervous entity.

Kandara as tendinal component.

Bhava misra mentions – MahtiSnayavhaproktaKandrastuushodasa - which means that they are large tendon. Kandara are distributed as mentioned below Agraparoha (terminal points) of the Kandara of limbs are located in the nakha (nails) Agraparoha of kandas of Greeva, Hridaya, those extending downwards are located in the medhra (pubic region). Agra-praroha of the Kandara of shroni (pelvis), pristha (back), those extending downwards are located in the region of bimba (shroni-pelvis). Here the meaning of AGRAPRAROHA is antimbhaga (terminal ends) & through these only Kandara are able to fix themselves properly. Here Agraparoha does not mean that Kandara are developing them instead we can consider it as distribution site.

Baahusira is the Upari-pranta of Kandara those extending upward in upper limb & are 4 in numbers. Similarly, Uru-mandala is the upari-pranta of Kandara those extending upward in lower

limb & are 4 in numbers. Mastaka is the upari-pranta of Kandara those binding greeva & heart are 4 in numbers. At last, vaksha is the upari-pranta of Kandara those binding shroni & pristha & they are also 4 in numbers.

In Astangasangraha, the Kandara situated at the back of the arm and connected with the Palm and fingers, getting invaded cause loss of movements of the arm, this is by name Viswachi. When vata localized in the waist, invades the big tendons of the legs, then the person suffers from Khanjata (lame by one leg) and Pangu when both the legs are affected (lameness by both legs). In Madhavanidana, viswachi is affecting of the Kandara of the fingers, the arms and the shoulders, causing loss of function of the arm. Vata affecting the Kandara of the waist makes a man lame: known Khanja if one leg is affected and Pangu if both legs are affected.

Kandara can be understood along with the big (mahatya, mahasnayu) and round shape (vrittasnayu) tendons. Susruta mentioned the word nakhaagrparroha for the tendons (kandara) which can be understood as insertion of the tendons. He mentioned about the insertion of tendons of hand and feet as the nakhaagrparroha which can be understood along with the flexor and extensor tendons of the digits which are extensions of the forearm muscles. In case of feet also the extended tendons of the leg muscles like extensor digitorum longus, extensor hallucis brevis and longus etc to the phalanges can be understood in this regard.

Discussion related to structural entity of Gulpha Pradesha:

The Gulpha is an important region of the lower limb present between leg and foot. The predominant structural entity present in this area is a joint, which is called Gulpha Sandhi. The description of the ankle joint is the joint between the Jangha and Paada. Jangha is the leg between knee and the ankle and Paada indicate the foot. Based upon anatomical classification, Gulpha is included under Sandhi Marma. Ten Peshi are present in Gulpha sandhi provide skeletal framework and help to impart movements of foot.

Ankle joint is a synovial joint of hinge variety. The Ankle/foot complex meets these diverse requirements through the integrated movements of its 28 bones that form 25 component joints. These joints include

*Proximal and distal tibiofibular joints

*Talo-calcaneal or Subtalar joint.

*The Talonavicular and calcaneocuboid joints.

- *The five tarsometatarsal joints.
- *The five metacarpophalangeal joints.
- *Nine interphalangeal joints.

The talocrural joint is of uniaxial type, the lower end of the tibia and its malleolus, the malleolus of the fibula, and the inferior transverse tibiofibular ligament together form a deep facet in which the body of the Talus is embraced, the line of the joint can be gauged from the anterior margin

of the lower end of the tibia which can be felt through the skin in the living when the overlying tendons are relaxed, although anatomically this joint appears simple hinge, and is usually styled "uniaxial" it must be emphasized that the axis of rotation is dynamic, taking up a series of different positions during dorsiflexion-plantar flexion changes.

Discussion on Injury to GrudhrasiNaadi:

Structures involved in Gridhrasi and effects of Samprapti

Structures involved in Grudhrasi	Normal function	Effects of Samprapti
Snayu	Bhara Sahana	Derangement of Gamana & Cheshta Karma of Sakthi Pradesha
Kandara	Utkshepa and Nikshepa	Mahasnayu Sausheerya, flexion and extension get restricted
Mamsa	Giving strength and stability	Loss of strength and stability
Majja	Asthi Poorana	Shithilata in Sandhi leads to Asthi Kshaya
Asthi	Maintains the structures of body, keep Peshi, Snayu intact	Sausheerya, Daurbalata and Shaithilyata of Sandhi

Symptoms involved in Grudhrasi:

Ruk
Toda
Stambha
Spandana
Aruchi
Tandra
Gaurava
SLR Test
Standing

Mode of action of Siravyadha in Grudhrasi

- Any chemical change capable of being accelerated by removing of blood consequently accelerates the chemical changes i.e metabolism and removes vitiated the vata pitta and kapha dosha and activates blood circulation that further enhances function of structures in the lower limb distributed by grudhrasinaadi
- As accelerated metabolism increases waste product output including metabolites, these metabolites act on walls of capillaries and arterioles to dilatation.
- The increase in metabolism is greatest in the superficial tissues.
- As a result of the increased metabolism there is increased demand for oxygen and foodstuffs, and an increased output of waste products, including metabolites.
- As a result of vasodilatation there is an increased flow of blood through the area so that the necessary oxygen and nutritive materials are supplied and waste products are removed.
- Removal of blood induces muscle relaxation and increases the efficiency of muscle action, as the increased blood supply ensures the optimum conditions for muscle contraction.
- Stimulation to large sensory fibers from peripheral tactile receptors depresses the transmission of pain signals either from the

same area of the body or even from many segments. This results in local lateral inhibition

- In ayurveda use of particular therapy in a particular disease condition depends on its qualitative attributes like rasa, guna etc. that helps in correction of vitiated dosha to reinstate the tri- dosha equilibrium.
- Siravyadha act on predominately in pitta, rakta and kaphajavyadhi or when pitta or kapha is in anubandha to vata dosha. Siravyadha is indicated in RaktaDushti and RaktavahaSrotoVikara.
- Other structural entities like Kandara, peshi are also affected. The kandara of parshni and anguli get vitiated by vatadosha and results in functional disability of the lower limb.
- Kandara is upadhatu of Raktadhatu- So involvement of Raktadushti is clear. The causative factors provoke pitta and Rakta dhatu leading to vitiation of Rakta and RaktavahaSrotas.
- The vitiation of Vata in general and vyanavata in particular leads to further manifestation of the disease.
- In condition of vataprakopa due to kapha and pitta avarana, Siravyadha can remove the avarana of kapha or pitta dosha giving way for anulomana indirectly curing vatika symptoms along with pitta or kapha dosha and patient gets immediate relief in pain.
- By Siravyadhamalabhuta pitta is removed and thereby vitiation of the Rakta by vatadi dosha are reduced. Thereby the symptoms of disease like Ruk, Toda, stambha, Spandana, will get relieved.

Discussion on relief observed after Siravyadha:

- Among 30 patients, majority of the patients (60%) shown response in the form of relief from symptoms like Ruk, Toda, Stambha, and Range of movements. Walkable distance and sitting time got increased after treatment. Others shown only symptomatic relief (30%) immediately, and a few (10%) shown no relief at all.
- After Siravedha, out of 30 patients, 21 patients were available for follow up among which 3 patients were not cured, 18 got marked improvement and 9 patients got moderate improvement according to immediate follow up.
- Thus the data suggest that Siravedha is effective in the management of pain in grudharsi.

VI. CONCLUSION:

The conceptual study and cadaveric observation have favoured in ascertaining the exact location and structural entity of antarkandarasira. Which resulted out to be The Great Saphenous Vein and The Short Saphenous Vein. The prospective clinical observational study favoured to validate the Siravyadha procedure that was carried at that particular site was more effective.

Identification of structure

- Antarkandarasira is considered as **Neuro Tendinal component**.
- As kandara and snayu have functional resemblance, they perform the function of holding and binding the various structures of human body like bones, muscles and adipose tissue.
- Detailed observation of these structures reveals them as generally fibrous structures which are strong enough to withstand a certain amount of tension.
- After dissection at the region of ankle joint the structures seen was **Great Saphenous vein** lies medially; in between the tendons of **Tibialis anterior** in the anterior of vein and **Tibialis posterior** and **Flexor digitorum longus** tendon behind the medial malleolus and Great Saphenous veins lie in between these tendons and in between **the Saphenous Nerve** and the **Dorsal digital nerve**.
- **Short Saphenous vein** lies laterally; in between **the Peroneus longus** and **Peroneus brevis** tendons anterior to the vein and **Achilles tendon** posteriorly and Short Saphenous vein lie in between these tendons and in between **the Sural Nerve**.
- Hence, the antarkandara involves neuro tendinal component and the sira that was seen there is **Great Saphenous vein** medially and **Short saphenous vein** laterally and **Dorsal venous arch** which are usually intervened during the siravyadhana procedure.

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