Understanding the Concept of Sevani in Ayurveda: A Cadaveric Study

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ABSTRACT

Sevani is one of the vital structures emphasized by all most all the Acharyas where surgical procedures should be avoided. These are situated five in the Shiras, one each in Jivha and Medra. The relevance of Sevani is mentioned in different operative procedures. So an attempt is made to understand the term Sevani, also to know the relevant structures underlying it, to explore the extent, nature and particular anatomical structure as Sevani with the help of cadaveric dissection was taken.

Keywords: sevani, shira, jivha, medra, nature, cadaver, dissection.

INTRODUCTION

Nature has bestowed many favors which are scientific miracles working for a smooth running of the human body. Veda is an ancient scientific document from which every science and technology have originated. Ayurveda the science of life, is also an outcome of such an imperishable intention of man’s conscience to explicit the nature added with the sequential comprehension of knowledge gained through self experimentation. Thus science can be considered as a gradual evolution which includes addition in the basis of Ayurveda, whose eternal basic principle remains the same. Ayurveda as a medical science basically demands understanding of the structural and functional constitution of the human body and its application in the practice of medicine and surgery. Detailed subject on basic Ayurvedic anatomical concepts in view of modern anatomy are need to be made available. Sevani is one of the important structures emphasized by Sushrutacharya which are situated five in the Shiras, one each in Jivha and Medra.¹ Sevani is a structure which holds two parts together for its structural and functional integrity in the body. These Sevani should be avoided during the surgical procedures as there is difficulty in the reunion of the structure.² In this study an attempt has been made to define the term Sevani, its nature and extent through the conceptual study and observations drawn from the cadaveric dissection.

MATERIAL AND METHODS

Three adult cadavers available in the department of Shareera Rachana, SDMCA, Hassan were dissected in the region of Shiras, Jivha and Medra. Numbers were assigned to the cadavers and observations were recorded. Structures were identified in the dissected region and a complete anatomical study was done. This was correlated with the data collected from classics and contemporary science and critically analyzed.

OBSERVATION

The dissection of the three cadavers in the region of head, tongue and penis was carried out as per Cunningham’s manual of practical anatomy. Dissection procedure was carried out layer by layer, observed and studied.
DISSECTION OF HEAD REGION

Skin: The skin was thick and provided with numerous hairs. Then a median incision was taken into the skin of the scalp from the root of the nose to the external occipital protuberance. Then a coronal incision was taken from the middle of the first cut to the root of each auricle. This incision is continued behind the auricle to the mastoid process and in front of it to the root of the zygomatic arch.

Dense Subcutaneous Tissue

It was composed fibrous and fatty tissue connecting firmly the overlying skin and underlying galea aponeurotica and epicranius muscle. Large blood vessels and nerves of the scalp were seen. The walls of the vessels were adherent to the fibrous network.

Epicranius Muscle and Its Aponeurosis

The bellies of occipitalis and frontalis were joined to form the epicranius muscle. The temporo parietalis muscle was also traced. A sagital incision was taken through the epicranius aponeurosis from the root of the nose to the external occipital protuberance. Each half was pulled laterally and detached from temporal lines.

Occipito-Frontalis

A pair of occipital bellies behind and a pair of frontal bellies in front were united by intervening galea aponeurotica. Each occipital belly took origin from lateral two thirds of the superior nuchal line of occipital bone and from the adjacent mastoid bone. The frontal bellies had no bony origin and they arised from the skin and subcutaneous tissue of the eyebrow and the root of the nose. In front of coronal suture the frontalis joins with galea aponeurotica.

Temporo-Parietalis

A variable sheet of muscle took origin from the galea and inserted into the root of the auricle.

Galea Aponeurotica

The occipitalis and frontalis muscles were joined together by a sheet of fibrous tissue. This sheet extended behind between the two occipital bellies and is attached to the external occipital protuberance and highest nuchal lines. In front, it persists between the two frontal bellies and blends with the subcutaneous tissue at the root of the nose. On each side, extends as a thin membrane superficial to the temporal fascia and is attached to the zygomatic arch.

Loose Subcutaneous Tissue

Beneath the epicranius muscle and its aponeurosis, loose areolar tissue was seen. In this space emissary veins were traced.

Pericranium

It is the outer perioosteum of skull and loosely covers the bones except at the sutural margins where it is continuous with the endocranium through the sutural membrane. The periosteum was striped from the external surface of the vault of the skull down to a level below the upper attachment of the temporalis muscle detaching it from the skull. Looking at the skull from above four bones was seen. The bone forming the anterior part of the vault was the frontal bone. The greater part of the roof and side walls of the cranial cavity were formed by the right and left parietal bones. Sagittal suture was found in the midline were the two parietal bones joined. The two parietal bones joined the frontal bone at the coronal suture which crossed the cranial vault from side to side and runs downwards and forwards. The posterior part of the vault was formed by the occipital bone which was better seen when the skull is viewed from behind. A suture named lambdoid, which was in inverted ‘Y’ was found joining the occipital bone to the parietal bones. Lateral to the occipital bone, a part of the temporal bone was better seen, when the skull was viewed from the lateral side. A cut was taken at the sutures of the skull through the periosteum as it is continuous with endocranium. This turned the scalp, periosteum and upper parts of the temporalis muscles down over the auricles. A saw cut was made parallel to the sagittal suture on both the sides avoiding cutting deeper than the marrow cavity. Caution was taken in the temporal region as the skull was very thin. A blunt chisel was introduced into
the saw cut and the inner tables were split by a series of sharp strokes with a mallet. Even when this is divided, the calavaria did not lift free because it was attached to the endocranium and the outer covering of the brain; both were firmly adhered to the interior of the skull.

**Sutural Ligaments**

The loosely attached pericranium was found continuous with the endocranium through the sutures of the skull, forming the sutural ligaments. When the part of the skull cap was detached, the outer surface of the endocranium was exposed. It was found to be rough because of the fine fibrous and vascular processes which passed between it and the bones. Torn blood vessels were most numerous close to the midline. Superior sagittal sinus was seen deep to the endocranium. The endocranium was more firmly attached to the base of the cranial cavity than to the vault. Branches of the middle meningeal artery, with the corresponding veins on the external surfaces, were found grooving the inner table of the skull. The largest venous sinuses were traced along the lines of attachment of the dural folds to the endocranium. Then a median sagittal incision was made through the endocranium to open the superior sagittal sinus.

**FIGURES OF DISSECTION OF SCALP**

![Figure 1: layer of scalp](image1)

1 Skin, 2 subcutaneous, 3 galea aponeurotica, 4 loose aerolar tissue, 5 pericraium

![Figure 2: Cranial Sutures](image2)

1 coronal sutures, 2 sagittal sutures, 3 lambdoid suture, 4 squamous suture

![Figure 3: Emissary veins](image3)

![Figure 4: Confluence of Sinuses](image4)
TONGUE DISSECTION

During the dissection in the neck region the following structures were found from superficial to deep. The skin was incised from the chin to the sternum in the midline. The flaps of the skin were reflected inferolaterally where the platysma muscle was traced. The anterior jugular vein was traced near to the midline which was piercing the deep fascia about two cm above the sternum. Then a transverse incision was made through the first layer of the deep fascia just above the sternum, extending upto the anterior border of the sternocleidomastoid muscle. Soon after reflecting this fascia suprasternal space was found. The fat and the fascia in that area were cleared. The parotid glands were pushed forwards and the accessory nerve was traced. After removal of deep fascia four thin straps of infrahyoid muscles were traced. These muscles were crossed by a pair of anterior jugular veins which passed down the neck one on either side of the midline. The whole muscle was then separated and reflected upwards towards the lower border of mandible. Anterior triangle and its subdivision of the neck were observed. The median line of the neck was divided by hyoid bone into suprathyroid and infrathyroid region. The two mylohyoid muscles and median raphe and submandibular gland were observed. In the infra hyoid region, sternohyoid and omohyoid muscles were observed laterally.

After seeing the infrahyoid structures, for the clear approach to the tongue, mandible was separated from the maxilomandibular joint. Then the mandible was cut vertically at symphysis menti and lower lip. The left mylohyoid muscle and part of the right were reflected and the geniohyoid muscle extending from the mental spine of the mandible to the body of the hyoid bone was observed. The hypoglossal nerve, deep part of the submandibular gland, and lingual nerve and mucous membrane of floor of the mouth with twigs of the sublingual artery were observed. The stylohyoid muscle is reflected superiorly; the hyoglossus muscle ascending from the greater horn and body of the hyoid bone to the side of the tongue. The styloglossus muscle was traced posteroinferiorly and interdigitating with bundles of the hyoglossus muscle. The genioglossus muscle was seen anteriorly, fanning out into the tongue. The hypoglossal nerve, crossed twice by the digastrics muscle, crossing twice the lingual artery, and supplying all the muscles of the tongue both extrinsic and intrinsic except palatoglossus muscle was traced. After reflecting the geniohyoid muscle, the genioglossus muscle was identified in the floor of the mouth. Superiorly the frenulum was incised and the muscle fibers of the genioglossus which are attached to the base of the tongue were identified. It arises from the mental spine of the mandible and gets inserted in to the hyoid bone and the floor of
the tongue. Innervated by the hypoglossal nerve, the genioglossus depresses and protrudes the tongue. The branch of lingual artery supplying to the base of the tongue and sublingual gland was traced.

FIGURES OF DISSECTION OF TONGUE

Figure 7: Frenulum of tongue

Figure 8: Genioglossus muscle

Figure 9: Ventral aspect of tongue
1 frenulum of tongue, 2 lingual veins

Figure 10: Vascular supply of tongue
1 Genioglossus muscle, 2 tongue, 3 lingual artery 4lingual nerve

Figure 11: Midsagittal section of head  (1) tongue attachment of Genioglossus muscle
DISSECTION OF PENIS

Two parts of the penis were seen a root, attached portion and a body, free portion. The root was situated in the superficial perineal pouch. It was composed of three masses of erectile tissue i.e. the two crura and one bulb. The two dorsally placed corpora cavernosa were fused together in the body of the penis. But these two were diverged in the perineum to form the crura of the penis which were attached to the sides of the pubic arch. The corpus spongiosum was traced on the ventral surface which transmitted the urethra and was enlarged proximally to form the bulb of the penis. The bulb of the penis continued forward as the corpus spongiosum. Its terminal part was expanded to form a conical enlargement called the glans penis. Throughout its whole it is traversed by the urethra. The base of the glans penis has a projecting margin, the corona glandis, which overhangs an obliquely grooved constriction known as the neck of the penis.

Skin

The skin was thin, dark in color, loosely envelops the subjacent structures and devoid of hairs. At the neck of the penis the skin was reflected forwards over the glans as a fold, the prepuce. A median raphe was seen on the ventral surface of penis which was formed by the line of fusion of the two genital folds which formed the floor of the spongy urethra. A cut was taken from the symphysis pubis to the end of the prepuce. Then the skin was reflected along the dorsum of the penis.

Superficial Fascia

It was composed of loose areolar tissue without fat. The extension of the membranous layer of the superficial fascia of the abdominal wall on to the penis was found which is called as fundiform ligament. The superficial dorsal vein of penis was traced in the superficial fascia which divided proximally into right and left branches, which passed to the external pudendal veins of the corresponding thigh.

Deep Fascia

The deep fascia formed a close constricted sheath around the corpora. The suspensory ligament of the penis was traced in the dorsum and sides of the penis. The deep dorsal vein along with the dorsal arteries and nerves were found on each side of it.

DISSECTION OF UROGENITAL TRIANGLE IN FEMALE

A longitudinal incision along the medial border of the labia majora laterally to the ischiopubic ramus and the skin of the perineum was removed. The subcutaneous tissue of the perineum was composed of a superficial fatty and a deeper membranous layer. The fat of the labia majora was cleared. The excess fat was removed and the membranous plane laterally to the ischiopubic ramus was reflected.

After clearing the muscular fascia, the ischiocavernosus and bulbospongiosus muscles were identified. Great care was taken because the muscles were very thin and delicate. The perineal body was cleared and the bulbospongiosus muscle from the perineal body on one side was reflected carefully lifting it from the surface of the vestibular bulb and noting the manner in which the muscle ends at the base of the shaft of the clitoris. The greater vestibular glands at the posterior margin of the vestibular bulbs, deep to the bulbospongiosus muscles were identified. The ischiocavernosus muscle on the same side was reflected and the crus of the clitoris were exposed. The corpus cavernosum clitoridis was traced forward until it unites with the corpus cavernosum of the opposite side to form the shaft of the clitoris.

DISSECTION OF UROGENITAL TRIANGLE IN MALE

The skin from the penis, scrotum and perineum laterally to the ischiopubic ramus was removed. There was no fat in the subcutaneous tissue of the penis and scrotum. In the scrotum this layer, the tunica dartos scroti, contains smooth muscle. The half scrotum was pulled along with its contained testis, towards the ventral abdominal wall, revealing the complete
perineum and the ventral surface of the penis. The subcutaneous tissue of the perineum consists of a fatty and a membranous layer. Both were carefully reflected to one side from the shaft of the penis. The ischiocavernosus and bulbospongious muscles were dissected and the deep fascia of these muscles completely investing the shaft of the penis (deep penile fascia) was observed. The muscular fascia was cleared to reveal the ischiocavernosus and bulbospongious muscles covering the crura and bulb of the penis. One ischiocavernosus muscle was reflected and the crus of the corpus cavernosum penis was exposed. The bulbospongious muscle was reflected from the midline and the manner in which the muscle covered the bulb of the corpus spongiosum and encircled the root of the penis was observed. The corpus spongiosum, its bulb, and at the tip of the penis, the glans were identified and traced. The corpora cavernosa penis was traced and observed how the right and left unite to form the shaft of the penis. The crus of the penis from the ischiopubic ramus were cut on one side and the bulb on this side was made free from its attachment to the perineal membrane. The deep artery of the penis and the artery to the bulb were identified.

**FIGURES OF DISSECTION OF PENIS**

Figure 12 Ventral aspect of penis
1 raphe of penis, 2 Scrotal raphe

Figure 13 Bulbospongiosus muscle

Figure 14

Figure 15

Figure 14, 15 Bulbospongiosus muscle in females.
DISCUSSION

Discussion on Shirogata Sevani

During the cadaveric dissection it was observed that the loosely attached pericranium was found continuous with the endocranium through the sutures of the skull, forming the sutural ligaments. Beneath this endosteal layer was attached to the sutural lines. Endosteal layer contributes in the formation of the important sinus system. Sutures are limited to skull and occur wherever margins or broader surfaces of bones are separated by the connective tissue. The sutural ligaments are a surviving unossified part of mesenchymatous sheets in which the dermal bones develop. Sutural ligaments display regions of differentiation concerned in growth and binding of apposed bone surfaces. On its sutural aspect each bone is covered by a layer of osteogenic cells (the cambial layer). It is overlaid by a capsular lamella of fibrous tissue. It is collectively corresponding to and continuous with the periosteum at the margins of the sutural surfaces both inside and outside the skull. A central stratum of loose fibrous connective tissue is found between these two layers of sutural periosteum. This central stratum contains thin walled blood vessels, the veins which communicate with diploic vessels, intracranial venous sinuses and external veins of the scalp. The fibrous periosteum adherent to the bones crosses the interval between them as the two uniting layers (external and internal) enclosing the sutural ligament and to its strength. During active growth the orientation of collagen fibers within sutural membranes is adaptable to several factors particularly to the direction of growth of minute bone spicules. When united by sutural ligament and periosteum such sutures are almost completely immobile. By the above description it is understood that sutural ligament is a fibrous structure which holds the bones of the head together and thus contributes in the formation of vital sinus system of brain. This structure can be correlated to Sevani of Shiras. This has extended along the five sutures of the head. Clinical point of view these sutural ligaments have their own significance. Infections in the scalp region are very painful because of the abundant fibrous tissue in the subcutaneous layer. This infection spreads by the emissary veins, which are valveless, to the skull bones, causing osteomyelitis. Infected blood in the diploic veins may travel by the emissary veins further into the venous sinuses and produce venous sinus thrombosis. Subperiosteal blood or pus is limited to one bone because of the attachment of the periosteum to the sutural ligaments.

Discussion on Jihvagta Sevani

On the basis of review and practical observations following facts are revealed: The superior fibers of the genioglossus muscle ascend forward to enter the whole length of the ventral surface of the tongue from the root to the apex, intermingling with the intrinsic lingual muscles. The median lingual septum, a median fibrous partition extending through the length of the tongue, giving attachment to transverse lingual muscles. Posterior it extends laterally to form the hyoglossal membrane connecting the lingual root to the hyoid bone and the inferior fibers of the genioglossi are attached to it. It is observed that to fix the tongue to the floor of mouth, frenulum and genioglossus fibers lying in the median part just beneath the frenulum and lingual septum have got a very important role. Genioglossi muscles are symmetrically arranged on either side which can be revealed through the development of the tongue out of two lingual swellings in first brachial arch. By this explanation one can include the larger midline fold of mucosa that passes from the gingival covering the lingual aspect of the anterior alveolar ridge to the posteriorinferior surface of the tongue and superficial of genioglossus muscles present in the midline and proximal part of median lingual septum under the composition of Sevani. On this basis one
can ascertain the extent of Jihvagata Sevani from the posterior end of median lingual septum along with the muscular fibers of genioglossus up to, behind the tip of the tongue. The description of Adhijihva disease gives a clue to reveal the location of Sevani (Prabandhana). In the description of Alasa disease, in which there is Paaka of the muscles of tongue. Therefore it is instructed to surgeons not to take incision in the midline part of the floor of tongue. This instruction highlights the importance of Sevani in the Jihvatala Bhaga. Applied point of view the region besides the frenulum particularly in the floor is very important as on either side there are sublingual glands. The lingual nerve and artery have got a close relationship between fibers of genioglossus and sublingual glands. So during operations on either side of midline of tongue one should be careful. Injury to hypoglossal nerve resulting in paralysis and eventual atrophy of one side of the tongue. Tongue deviates to paralysed side; during protrusion because of the action of unaffected genioglossus and intermingling of fibers through the median septum.

**Discussion on Medragata Sevani**

On the basis of practical observation it can be understood that penile urethra underlying in the midline just beneath the skin attachment of raphe up to the membranous part of urethra. Practically the corpora spongiosum comprising penile urethra can be felt in the perineal area. On the basis of embryological development penile urethra is formed as a result of fusion of definitive urethral folds and it develops only up to glans penis. The distal most part of urethra is of ectodermal origin and is formed by canalization of solid mass of ectodermal cells. The genital swellings fuse with each other in the midline to form the scrotal sac into which the testis descends later. Over the bulb of penis there is covering of bulbospongious muscle arranged in symmetrical manner. The fibers of which are arranged from central raphe and it has got a very important action in emptying of residual urine or semen and also to compress the penile part of urethra. The fibers of bulbospongious contribute to the formation of perineal body, which is a fibro muscular node located in the midline at junction between the anal canal and urogenital canal Perineal raphe is a median ridge in the skin and fasciae overlying the perineal body that runs forward from the anus. In males it is continuous with the raphe of scrotum.

**In case of females,** once the urogenital membrane ruptures it does not fuse and the genital folds persist as the labia minora. The clefts between the labia minora, the vestibule, receive the openings of the urethra and vagina. The genital swellings form the labia majora and the phallus persists as the clitoris. The perineal body lies directly posterior and is attached to posterior commissure of labia majora and introitus of vagina. Perineal body is the major structure incised during a median episiotomy. Episiotomy is a surgical incision of perineum and inferoposterior vaginal wall taken in order to enlarge the vaginal orifice. It helps to decrease excessive traumatic tearing of the perineum. The rationale of the median incision is that the scar produced as the wound heals will not be greatly different from the fibrous tissue surrounding it because the incision extends only partially into this fibrous tissue. The muscle which are attached to this helps to maintain pelvic organs in position. Damage to it during childbirth can weaken the perineum and may lead to prolapse of pelvic organs. A study was conducted to check the relationship of episiotomy to perineal trauma and morbidity, sexual dysfunction, and pelvic floor relaxation. It was found that perineal and pelvic floor morbidity was greatest among women receiving median episiotomy versus those remaining intact or sustaining spontaneous perineal tears. Median episiotomy was causally related to third- and fourth-degree tears. By considering the above this, nature of Sevani refers to be of fibro muscular.
Discussion on the basis of clinical aspects

By the above discussion it is understood that Medragata Sevani is a very important structure which has intimate relation with the structures of genitourinary system and support of pelvic floor. Keeping this in mind eminent scholars of Ayurveda have cautioned physicians to avoid surgical incisions in and around area of Sevani. This was observed in the context of trans-perineal extraction of Ashmari. Perineal area is a very crucial region within which eight vital structures named as Asta Marma, structurally and functionally interconnected with each other are situated. Among these Asta Marma Sevani has proved its significant place. Further in the context of Mutravrudhi also it is advised to puncture the scrotum by avoiding PhalaSevani. In the context of types of incisions the guidelines have been given to the surgeons to perform Ardhachandrakara (semilunar) incision over Guda and Medra. Even here also raphe is to be vomited. The prognosis of Bhagandara depends on its location and relation with the Sevani because the sphincters are attached to the perineal body. In high level fistula there is possibility of cutting this connection. So Sushruta might have cautioned the surgeons. In hypospadias there are different degrees in which external meatus of urethra is situated at some points on undersurface of penis/perineum. To understand pathology physicians should know the structure and development of Sevani (raphe).

CONCLUSION

Sevani is a structure which holds two parts together for its structural and functional integrity. The structure responsible to hold cranial bones together is sutural ligaments which are to be considered as Shirogata Sevani. The sutural ligament is fibrous in nature extending along the five sutures of the vault. Jh vagata Sevani is to be taken as a lingual median septum, superior fibers of genioglossus muscle and frenulum extending up to the tip of tongue. Therefore Jh vagata Sevani is made up of mucno-fibro muscular structure. There is one Sevani present in ventral aspect of Medra. Study has revealed three parts of Sevani are made according to region as Medragata Sevani, Phalagata Sevani and Bhagagata Sevani. Medragata Sevani has to be correlated with scrotal fold and median raphe of bulbospongious muscle Bhagagata Sevani to be considered as continuation of same line of scrotum to anterior part of anus including part of perineal body. In case of females Sevani is to be correlated with fusion of posterior commissure and part of perineal body. So the nature of Sevani is fibromuscular in nature.

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How to cite this article: Gupta RK, Dhaded R. Understanding the concept of sevani in ayurveda, a cadaveric study. International Journal of Research and Review. 2020; 7(11): 242-251.

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