



An Anatomical Exploration of Paadagata Kandara Through Cadaveric Study

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<https://doi.org/10.48165/irjay.2026.9.05.03>

ARTICLE INFO

Article history:

Published: 2026

Keywords:

Kandara
Paadagata Kandara
Paribhasha Shareera
sciatic nerve

ABSTRACT

Paribhasha Shareera, a component of Rachana Shareera in Ayurveda, provides definitions and explanations of anatomical terminology essential for understanding the human body. Kandara is described as a cord-like fibrous structure and has been interpreted as a tendinous, ligamentous, or neuro fibrous structure in contemporary anatomy. Classical Ayurvedic texts describe sixteen Kandara distributed among Hasta, Paada, Greeva, and Prista. In Paada, Kandara is described in relation to Uru Mandala and Nakha Agraprarooha. The present study aimed to examine the classical description of Paadagata Kandara and identify the contemporary anatomical structure that most closely corresponds to it through cadaveric dissection and textual analysis. Four candidate structures—femoral nerve, tendo-calcaneus, great saphenous vein, and sciatic nerve—were considered using predefined anatomical criteria: proximal origin, continuity toward the distal extremity, terminal distribution, and functional relevance to movement. The sciatic nerve showed the closest overall anatomical correspondence among the structures considered. However, this interpretation represents a conceptual anatomical correlation and should not be considered an exact equivalence. Further studies using larger cadaveric series, histological methods, and comparative textual analysis are required.

INTRODUCTION

Paribhasha enlightens the meaning of a subject clearly with minimum words whenever the matter is not mentioned, is unclear, is said very little, or is doubtful and confusing; it helps in understanding the subject matter clearly and properly¹. The word Kandara is Strilinga and is derived from (kadi + aran + tapach), indicating Mahasnayu and Mahanaadi². Kandara means a sinew or a principal vessel of the body, including a large artery or vein³. Mahasnayu are termed Kandara; Cakrapani names it Sthula Snayu⁴, while the commentator on Sharangadhara Samhita refers to it as Mahanadi⁵. Kandara is considered an Upadhatu of Rakta Dhatu⁶. In relation to Shareera

Rachana, it is described as a structure resembling Vritta Snayu and associated with Akunchana and Prasarana. Sixteen Kandara are described, distributed as four each in Hasta, Paada, Greeva, and Prista⁷. Those situated in Hasta and Paada have Nakha as their Agraprarooha; Medhra and Hridaya are described in relation to Greeva, and Bimba in relation to Shroni and Prista⁷.

Dalhana commentary on Sushruta Samhita, explains the proximal or upper ends (Upa-Pranta) of Kandara.

- Amsapinda represents the upper termination of Kandara extending in the upper limb⁷.
- Urumandala represents the proximal end of Kandara

extending in the lower limb ⁷.

- Murdha represents the upper end of Kandara connecting the Greeva and Hridaya ⁷.
- Vakshapinda represents the upper termination of Kandara associated with the Shroni and Prishtha regions ⁷.

PAADAGATA KANDARA

षोडश कण्डराः- तासां चतस्रः पादयोः, तावत्यो हस्तग्रीवापृष्ठेषु; तत्र हस्तपादगतानां कण्डराणां नखा अग्रप्ररोहाः, ग्रीवाहृदयनिबन्धिनीनामधोभागगतानां मेढ्रं, श्रोणिपृष्ठनिबन्धिनीनामधोभागगतानां बिम्बं, मूर्धोरुवक्षोऽसपिण्डादीनां च || (Su.Sha.5/11)

Acharya Sushruta states that the Kandara of Paada ends in the Nakhagravaroha (nail beds). Dalhana explains that the Kandara of Paada takes its origin from Uru Mandala; therefore, structures extending from Uru Mandala toward Nakha Agravaroha may be considered in interpreting Paadagata Kandara ⁷.

INTERPRETATION OF URUMANDALA AND NAKHA AGRAPRAROHA

The interpretation of 'Uru Mandala' as the pelvic girdle/lumbosacral region is a contextual interpretation used in the present study. However, 'Uru' may also be interpreted as the thigh region. Therefore, the proposed pelvic-girdle interpretation should be regarded as an interpretive hypothesis rather than an established anatomical equivalence. In Vatavyadhi, aggravated Vata affecting the Kandara of Paada is described in relation to Khanja and Pangu, in which impairment of lower-limb movement is observed ⁸ The functions of Kandara include Akunchana (flexion) and Prasarana (extension).

METHODS

CONCEPTUAL STUDY: Ayurvedic classical textbooks and commentaries, relevant contemporary anatomy texts, and published literature related to Kandara and Paadagata Kandara were reviewed. The primary Ayurvedic sources identifiable in the manuscript include Sushruta Samhita, Charaka Samhita, and Sharangadhara Samhita.

- COMPLETE SEARCH PERIOD-2.5years
- DATABASES/SOURCES SEARCHED-pubmed, researchgate, google scholar, shodhaganga etc
- SEARCH TERMS- Kandara, Paada, Paadagata Kandara
- INCLUSION/EXCLUSION CRITERIA-

Inclusion criteria: Adult human cadavers of both sexes available during the study period, with adequately preserved and identifiable structures of the gluteal region, posterior thigh, and lower limb relevant to Paadagata Kandara, were included.

Exclusion criteria: Cadavers with trauma, deformity, amputation, previous surgery, severe pathological changes, extensive decomposition, inadequate preservation, or damage affecting identification and measurement of the structures under study were excluded.

- CADAVERIC DISSECTION: Human cadaveric dissection was performed according to the Cunningham Manual of Dissection.
- NUMBER OF CADAVERS-4
- LOWER LIMBS DISSECTED-8
- SEX-male/female
- AGE RANGE-above 50years
- PRESERVATION METHOD-cadavers are preserved in formalin
- INSTITUTION-Shri Dharmasthala Manjunatheshwar College of Ayurveda and Hospital Hassan
- DISSECTION INSTRUMENTS-Scalpel, toothed forceps, untoothed forceps, artery forceps
- METHODS USED TO IDENTIFY/CONFIRM STRUCTURES-identified nerve, artery and vein
- METHOD OF RECORDING OBSERVATIONS-photographs were taken layer by layer

Ethics approval

- NAME OF INSTITUTIONAL ETHICS/IEC COMMITTEE- Shri Dharmasthala Manjunatheshwar College of Ayurveda and Hospital Hassan
- APPROVAL/REFERENCE NUMBER-SDM/IEC/60/2024
- DATE-4/5/2024
- Report the number of cadavers/limbs examined-4

METHODOLOGY

A descriptive cadaveric study was conducted on four adult human cadavers (8 lower limbs) in the Department of Rachana Shareera, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan. The region extending from Uru Mandala (hip region) to Paada (foot) was identified and marked for dissection. Dissection was performed systematically, layer by layer, following the relevant anatomical descriptions of Paadagata Kandara and Cunningham's Manual of Practical Anatomy.

The skin and superficial fascia were reflected first to identify superficial veins, cutaneous nerves and lymphatic structures. The deep fascia was then exposed and removed to study the underlying muscular compartments and their associated neurovascular structures.

In the anterior thigh, the quadriceps group and femoral

neurovascular structures were identified. The medial thigh was dissected to expose the adductor muscles and obturator neurovascular structures. In the gluteal region, the gluteal muscles were reflected sequentially to identify the piriformis, superior and inferior gluteal neurovascular structures, and the sciatic nerve.

The posterior thigh and popliteal fossa were subsequently dissected to identify the hamstring muscles, sciatic nerve and its branches, popliteal vessels, and tibial and common peroneal nerves. The leg was dissected through the anterior, lateral and posterior compartments to trace the muscles, tendons, arteries and nerves.

Dissection was continued onto the dorsum and sole of the foot. The plantar aponeurosis was exposed, followed by identification of the plantar nerves, vessels, muscles and their respective layers. The course and relationships of the medial and lateral plantar nerves and associated structures were documented.

The lumbosacral region was also dissected layer by layer to identify the thoracolumbar fascia, deep muscles, sacroiliac and iliolumbar ligaments, lumbosacral and sacroiliac joints, and the lumbar and sacral nerves, including the lumbosacral plexus and sciatic nerve.

The identified structures were documented with respect to their course, anatomical relationships, attachments and relevant morphometric measurements. The number and proportion of specimens demonstrating each finding were recorded, and photographic documentation was performed during dissection.

DISCUSSION

Kandara and Snayu

The concepts of Kandara and Snayu occupy a significant place in Ayurvedic anatomical literature, especially within Sharira Rachana. Although these structures are sometimes discussed together because of functional similarities, classical references indicate a conceptual distinction based on Dhatu origin (Upadhatu). Snayu is described as an Upadhatu of Meda Dhatu, whereas Kandara is considered an Upadhatu of Rakta Dhatu⁵. Despite overlapping functional roles in support and movement, Kandara should therefore not be simplistically equated with Snayu; the two concepts should be examined separately and comparatively.

Pratanavati and Vritta Snayu

It is categorically established through classical Ayurvedic literature that the Shakha (extremities) region houses both varieties of Snayu—Pratanavati and Vritta—simultaneously, though they serve distinctly different anatomical and physiological purposes.

Acharya Sushruta states that out of the 900 Snayu in the human body, 600 are located in the extremities. Within these 600 Snayu, both Pratanavati and vritta snayu find their specific locations and functions, creating an integrated connective tissue framework that enables both stability and mobility⁹.

Table 1. Difference Between Pratanavati and Vritta Snayu

Sl.no	Feature	Pratanavati snayu	Vritta snayu
1.	Structural Morphology	its spreading, creeper-like morphology	cylindrical or rounded in form
2.	Location	Shakha and Sarva sandhi	Hasta, Paada, Greeva, Prishtha
3.	Functional Dichotomy	structural binding and joint stabilization, not active movement production.	active facilitation of Prasara (extension) and Akunchana (flexion)
4.	Modern Correlation	ligaments, intermuscular septa, aponeurosis, and tendinous insertions	large nerves and tendons

Criteria for anatomical correlation: a candidate structure was considered plausible when it (1) has a proximal origin compatible with Uru Mandala, (2) demonstrates continuity toward the distal lower limb, (3) has a terminal distribution reasonably comparable with Nakha Agraprarooha, and/or (4) has a functional relationship with Akunchana and Prasara. These criteria were applied consistently to the four candidate structures.

Femoral Nerve as a Paadagata Kandara

The femoral nerve arises from the lumbar plexus and passes beneath the inguinal ligament lateral to the femoral artery to enter the femoral triangle. It gives muscular, cutaneous, and articular branches. However, it does not continue as a single structure from the lumbosacral region to the distal foot or terminate toward the Nakha Agraprarooha. On the criteria used in this study, the femoral nerve provides only a partial proximal and functional resemblance and is not the preferred correlate.

Tendo-Calcaneus as a Paadagata Kandara

The tendo-calcaneus (tendo-Achillis) is formed by the fusion of the gastrocnemius and soleus tendons and inserts on the posterior surface of the calcaneus. It has a clear functional relationship with plantarflexion and therefore partially satisfies the movement criterion. However, it does not originate from the Uru Mandala/lumbosacral region and does not extend to the distal digits. It is therefore considered a partial functional correlate rather than the

best anatomical correlate of Paadagata Kandara.

Great Saphenous Vein as Paadagata Kandara

The great saphenous vein is a tubular venous structure beginning from the dorsal venous arch of the foot and ascending along the medial aspect of the lower limb to the saphenous opening in the thigh. It participates in venous return but has no direct mechanical role in flexion or extension. It therefore fails the principal structural and functional criteria for Paadagata Kandara and is not considered a suitable correlate.

Sciatic Nerve as Paadagata Kandara

The sciatic nerve arises from the sacral plexus (L4–S3), descends through the posterior thigh, and divides into the tibial and common fibular nerves. The tibial nerve continues into the foot and gives rise to the medial and lateral plantar nerves. This continuous proximal-to-distal pathway provides the closest anatomical match to the proposed course from Uru Mandala toward Nakha Agrapraroaha. The sciatic nerve also has major motor and sensory functions in the lower limb, supporting the functional component of the comparison. Among the candidate structures considered, it therefore demonstrates the closest overall correspondence. The correlation remains interpretive rather than an assertion of direct anatomical equivalence. The cadaveric photographs document the nerve at the gluteal region (Fig. 1), popliteal fossa (Fig. 2), posterior thigh (Fig. 3), posterior leg (Fig. 4), and foot (Fig. 5), while Fig. 6 summarizes its origin, course, branches, and termination.



Figure 1. Sciatic Nerve at Gluteal Region



Figure 2. Sciatic Nerve branching at Popliteal fossa



Figure 3. Sciatic Nerve at Posterior Region

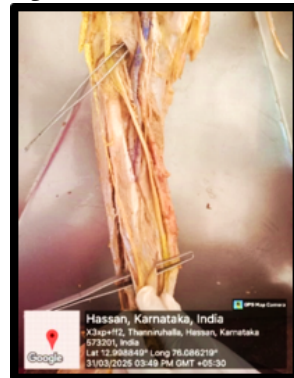


Figure 4. Branches of Sciatic Nerve at Of thigh Posterior Part of Leg

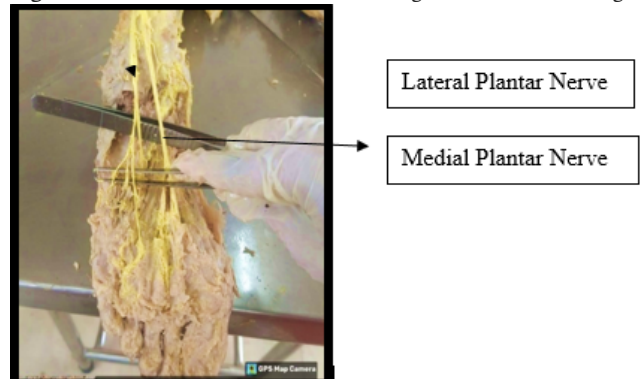


Figure 5. Sciatic Nerve Branches at Foot Region

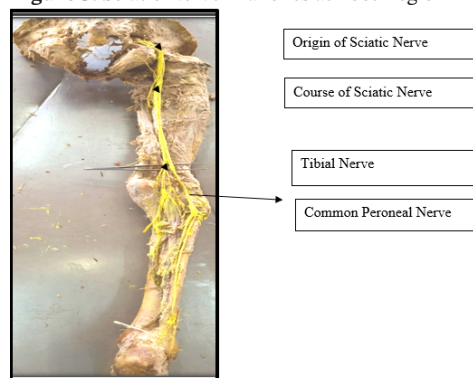


Figure 6. Origin, Course, Branches and Termination of Sciatic Nerve

CONCLUSION

The present cadaveric and textual analysis supports the sciatic nerve as the closest contemporary anatomical correlate of Paadagata Kandara among the structures considered, based on proximal origin, continuity toward the distal lower limb, terminal distribution, and functional

relevance. This correlation may help frame the Ayurvedic descriptions of Khanja and Pangu in relation to lower-limb neuroanatomy, while recognising that classical terminology cannot be assumed to represent a one-to-one anatomical equivalent. Future research should include larger multi-cadaver studies, histological confirmation, and systematic comparison of relevant Ayurvedic commentaries with contemporary anatomical findings.

Table 2. Comparison Between Paadagata Kandara and Sciatic Nerve

Sl.no	Features	Paadagata kandara	Sciatic nerve
1	Synonyms	M a h a s n a y u , M a h a n a a d i	Longest and thickest nerve in body
2	Origin	Urumandala/Shroni mandala	Lumbosacral area.
3	Insertion	Nakha Agraprarooha	Medial and lateral plantar nerves are terminal branches of the tibial nerve; the sciatic nerve does not insert into the nails.
4	Function	A k u n c h a n a , P r a s a r a n a	Flexion and extension
5	Number	2 in each Paada	Not applicable as a single insertion; the sciatic nerve terminates by division into the tibial and common fibular nerves.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING

No external funding was received for this study.

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How to Cite this Article: Benakanahalli B., G S.. (2026). An Anatomical Exploration of Paadagata Kandara Through Cadaveric Study. *Int. Res. J. Ayurveda Yoga*, **9**(5), 12-16. <https://doi.org/10.48165/irjay.2026.9.05.03>