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INTEGRATING AYURVEDIC EPISTEMOLOGY FRAMEWORK IN TO ANATOMY EDUCATION IN KERALA: A GUNA BASED PEDAGOGICAL MODEL WITH OSPE BASED OUTCOME ASSESSMENT

Dr Madan Kumar M K*[1], Dr Akashdeep Mesharam, [2] Dr Hemant Toshikane, [3]

[1] Faculty of Ayurveda, Parul University, Waghodia, Vadodara, Gujarat 391760, India, ORCID ID- 0009-0003-7894-1855.
[2] Department of Rachana Shareera, Parul Institute of Ayurveda, Faculty of Ayurveda, Parul University, Waghodia, Vadodara, Gujarat 391760, India
[3] Dean, Parul Institute of Ayurveda, Faculty of Ayurveda, Parul University, Waghodia, Vadodara, Gujarat 391760, India
*Corresponding author: Dr Madan Kumar M K, mkmkumar101@gmail.com

ABSTRACT
The teaching of gross anatomy to students of Āyurveda in India is largely done within a biomedical paradigm with minor reference to the classical description in the foundational Saṃhitās. A three part integrative pedagogical approach for gross anatomy based on the Śārīrasthāna of the Suśruta Samhitā is presented and tested by the author. The first part is a laboratory recreation of Suśruta's hydro-dissection technique, which involved immersing the parts in water for an appropriate duration and gently brushing them so as to make the anatomy visible to the eye (pratyakṣa). The second part is a more analytical approach to visceral organs and tissues with a guṇa-centred framework, reasoned upon by anumāna (inference), upamāna (analogy) and āgama (authoritative testimony) and is presented by a case analysis of medodhātu (adipose tissue). The third part is evaluating the learning outcomes through an OSPE comprising stations aligned to each pramana domain, with results indicating significantly higher student proficiency in correlating direct observation, inference, and classical textual knowledge of structural guna. The author's argument is that a synthesis of experiential and observation-based techniques and a guṇa-oriented conceptual framework is a possible model for teaching anatomy which does not subordinate the classic Āyurvedic perspective to biomedical description.

KEYWORDS: Sthula Sharira; Suśruta Samhitā; hydro-dissection; guṇa; Āyurveda education; gross anatomy; medodhātu

1. INTRODUCTION

A discipline can be best understood by examining the parts of the discipline as a whole and not as individual facts. This is especially true in the context of anatomy in the field of medicine, and in the context of medical education in India, gross anatomy (sthūla śarīra) is taught primarily from a biomedical perspective. Although biomedical anatomical knowledge is a necessary precondition for clinical training, its uncritical appropriation as the leading paradigm of anatomical education is likely to lead to the historical fossilization of the classical descriptions of the Saṃhitās and to the neglect of them as being a coherent system with its own method of observation and its own logic of explanation. Ranging from the Usman Committee report uptil the NCISM reforms, talks about the integration of modern biomedical sciences with Ayurveda. The Usman Committee (1921–23) initiated the modern institutional project of documenting and legitimising Ayurveda, prefiguring the century-long oscillation between integration into biomedical epistemics and the reconstruction and validation of traditional sciences within their own conceptual vocabulary *(pramana, guna, dravya, etc.)*(1).

In this regard the Suśruta Samhitā is in a class of its own among the classical Āyurvedic texts: in addition to providing a description of the structure of the body, the text provides an explicit method for gaining knowledge of the body, namely direct observation, and a larger epistemological framework, namely the four pramāṇas of pratyakṣa, anumāna, upamāna, and āgama, for the organisation and reasoning about this knowledge(2). The author suggests that both, observing and epistemological context, may be recovered and used in the pedagogy of the present-day anatomical education in Āyurveda. The historical precedence and methodological sophistication of Suśruta's conception of anatomy has been explored from various disciplinary perspectives, but not with much attention to its contemporary pedagogic application. In a review of the history of the study of anatomy in classical India, noted that one of the two main sources of anatomical knowledge in the subcontinent was the Suśruta Samhitā, which, together with the Charaka Samhitā, contained information that was surgically and anatomically significant and that demonstrated a degree of structural knowledge remarkable for the sixth century BCE(3–5). They also point out that Suśruta, who is thought to have taught at the ancient university on the banks of the Ganges at Benares, was an explicit advocate of human dissection, and that his text shows a good deal of anatomical reasoning in function and structure at the time. Further research has been done on the specific dissection protocol outlined in Śārīrasthana 5.49 in more historical and more procedural detail and emphasized the importance of Suśruta's use of dissection as a prerequisite for the surgical skills of physicians and mentioned that the body was carefully dissected after seven nights of decomposition, which enabled Suśruta and his students to observe anatomical structures in detail and to make significant contributions to the knowledge of human physiology and pathology(Fig A)(6). In a separate article on

the contribution of Suśruta to anatomy, the author concluded that the Śārīrasthāna is a unique and separate section on human anatomy and that not much attention has been paid to it compared to Suśruta's more famous surgical work, and that the dissection method is a new and innovative method for observation that could be repeated and shared with others, which was unprecedented for that time as the human body was considered sacred and it was common practice to burn the dead(7).

Fig A: An illustration created from the description of a Chinese –buddhist pilgrim, Hsuang-Tsang in 7th century who observed the practice of herbal preservation and hydrodissection in India . Kenneth G Zysk, renowed philologist reveals the detailed anatomical observation in indian medicine to the Buddhist tradition of contemplating the decomposing corpse.

Less explored in this literature is how to practically reconstruct the hydro-dissection technique itself under laboratory conditions and its application as a contemporary pedagogical tool instead of the mere topic of a historical or textual nature. The present study directly fills this gap by means of the laboratory simulation in the present Part 1. A framework based on guṇa developed in Part 2 of this article, is based on a separate but related literature dealing with the qualitative pharmacodynamics of rūkṣa and snigdha guṇa and their clinical application to disorders of medodhātu. Previous discussion has had a drying therapy (rūkṣaṇa karma) as an important treatment in the management of lifestyle disorders related to medodhātu accumulation, and also it is indicated in kleda-dominant and āma-related diseases. This is in line with the classic pharma-cological literature on anti-obesity (medohara) and lipid reducing (lekhaniya) dravyas, which has demonstrated that the herbs that have tikta (bitter) and kaṭu (pungent) rasa, along with laghu (light) and rūkṣa (dry) guṇa are characteristically prescribed for the management of medoduṣṭi and associated disorders such as sthaulya (obesity), a pattern which correlates well with the guṇa-based reasoning presented in the medodhātu case study below. Lastly, the epistemological base of pratyakṣa, anumāna, upamāna and āgama underlying both parts of this article has itself been the focus of renewed scholarly interest in an attempt to use it as a framework for integrative and evidence-informed research in Āyurveda. Studies on anumāna pramāṇa have analyzed the process of inference in Āyurvedic medicine not as a purely informal process of conjecture but as a rule governed process which relies on the concept of invariable concomitance (vyāpti) and which is as rigorous in its internal logical structure as were the formal patterns of deductive reasoning. The body of work also lends to the methodological validity of combining textual authority, observational reconstruction and inferential reasoning as has been done in the present study. Active learning is a cornerstone of simulation-based education, involving students in immersive experiences that allow for the application of knowledge, teamwork, and instant feedback. This approach helps deepen their understanding of Ayurvedic principles and practices.(8) Moreover, it aligns with evidence-based practice by integrating modern technologies and methods with traditional teachings, thus preparing graduates to meet contemporary healthcare demands effectively(9).

Despite its importance, Rachana Shareera is often perceived as a challenging subject due to its dual epistemological framework, which requires students to correlate classical descriptions with modern anatomical knowledge(10). The complexity of this integration necessitates effective and innovative teaching methodologies that can facilitate deeper understanding and clinical application.

Traditional pedagogical approaches, while rich in experiential and philosophical depth, may not fully address the learning needs of contemporary students. Conversely, modern educational tools enhance visualization and accessibility but may lack contextual grounding in Ayurvedic principles. This dichotomy underscores the need for a comprehensive evaluation of existing teaching methodologies and the development of an integrative pedagogical framework(11)

In contemporary Ayurvedic institutions, lecture-based teaching continues to be the predominant method for delivering theoretical content in Rachana Shareera. While lectures offer the advantage of structured and efficient dissemination of information to large groups of students, they are often associated with passive learning and limited student engagement. As a result, the retention of complex anatomical concepts may be suboptimal.

To address these limitations, audiovisual teaching methods have been increasingly incorporated into the curriculum. The use of presentations, animations, and instructional videos enhances visual understanding and facilitates the comprehension of intricate anatomical relationships. Comparative studies, such as those conducted by Narayanrao, have demonstrated that students exposed to audiovisual teaching exhibit improved retention and conceptual clarity compared to those taught through lectures alone.

Museum-based learning, involving the use of preserved specimens, models, and charts, serves as an important adjunct to theoretical teaching. This approach provides students with tangible representations of anatomical structures, thereby reinforcing their understanding and aiding in long-term retention.

The development of competency-based curricula tailored specifically for Rachana Shareera is another important future direction. Such curricula should clearly define learning objectives, competencies, and assessment criteria, ensuring that students acquire not only theoretical knowledge but also practical skills and clinical insights. Incorporating formative assessments, objective structured practical examinations (OSPE), and reflective learning practices can further enhance the effectiveness of competency-based education(12,13).

.The present study is also part of a larger and ongoing policy debates relating to the education of Āyurvedic medicine in India. A recent qualitative synthesis of curriculum changes of this nature, conducted by the National Commission for Indian System of Medicine, highlighted the recent regulatory changes to create a competency-based curriculum specifically designed to mix modern medical science and research methodologies with the traditional texts of Āyurvedic medicine, with ongoing challenges of faculty readiness, infrastructure, and the actual implementation of such changes at the institutional level. In this context, concrete pedagogical tools that can be used in the classroom and that operationalise an integrative approach, such as the two mentioned here, have a real need in the level of the curriculum policy and not just a conceptual or historical interest.

This article is divided into three sections. The first is a laboratory reconstruction of Suśruta's hydro-dissection technique described by the author to test its usefulness for exposing anatomical structures, some of which are not readily visible when dissected by the cut-open method. The second proposes a framework of analysis of the body structures based on guṇa, which the author has developed on the basis of anumāna, upamāna and āgama, and demonstrates through the case study of medodhātu. The third component of this study assessed learning outcomes through an Objective Structured Practical Examination (OSPE), with individual stations deliberately designed to correspond to each of the three pramanas—pratyaksha (direct perception), anumana (inference), and aptopadesha (verbal testimony, represented here by classical textual knowledge)—as delineated in the Sushruta Samhita's epistemological framework. This tripartite station design allowed the assessment to move beyond conventional rote recall and instead probe whether students could independently exercise, and subsequently integrate, each mode of knowing when reasoning about structural guna of dissected tissue. Students were evaluated not merely on their ability to identify anatomical structures by sight (pratyaksha), but on their capacity to infer functional or compositional properties from observed characteristics (anumana), and to situate these observations within the descriptive vocabulary and conceptual categories articulated in classical texts (aptopadesha).

2. MATERIALS AND METHODS

2.1 Hydro-Dissection: Source Text and Rationale

Suśruta Samhitā Sharīrasthāna 5.49 explains about the study of human body with pratyakṣa by sitting in the running water and gently brushing the tissues. The whole body, after the removal of the entrails, should be left to decompose: "After the removal of the waste, the body should be wrapped in muñja grass, bark, kuśa grass, or hemp and placed in a cage or net in a running stream, in a place of concealment" (14). After 7 nights, when the body is completely decomposed, the body is taken out and spread out and external and internal major and minor structures are identified by sight after very slowly rubbing down the layers of skin and underlying tissues with bundles of Vetiver grass, coarse animal hair, bamboo or Balvaja grass. The author has termed the technique as “hydro-dissection”. It is of particular interest as it seems to be able to show anatomical structures which are not easily appreciated during conventional dissection, such as the seven layers of skin described by Suśruta. The passage has attracted a large number of text critics, but the author does not know of any previous attempt to experiment with reconstructing the procedure, which led to the present work.

2.2 Hydro-Dissection: Experimental Protocol

In the Department of Rachana Sharira (Anatomy), Government Ayurveda Medical College, Thiruvananthapuram, the hydro-dissection procedure was modified and applied on human hand. There were two modifications of the classical protocol that were imposed by practical and ethical considerations: A palm cut at the wrist joint from a cadaver embalmed using Thiel’s method was procured for the study. The hand was first dipped in distilled water for 7 days at a temperature of 2 degree celcius to decrease the concentration of the embalming fluid remaining. Then it was moved to a stainless steel tank of grade 308 (75cm × 45cm × 60cm; 202.5 litre capacity) filled with 200litres of distilled water and passed through a sponge-filtered pump

that was set to create a flow rate around 500 L/hour. The water was changed after 48 hours and the study was continued for 15 days. After seven days of immersing, the palm was taken and moved to the dissection tray. The hand was removed from the tank each day and scrubbed adequately for 1-2 hours (depending upon subjective observation of the appearance of new structures) with blunt metal and organic brushes. Each scrubbing was followed by a rinse of the hand and return to the water at a temperature of 4 degree celcius, which seemed to increase the apparent difference in structures, the water column, in effect, serving as a magnifying medium. The machine has been designed by the author based on the requirements for a setting to recreate the dissection method, including the preparatory steps(Fig B).The structures

identified were demonstrated and explained to students on daily basis. Digital documentation of the structures identified were done which is portrayed in fig D

Fig B: The designed hydrodissection and hydropreservation machine in different views, front, top and side view.

2.3 Guṇa-Based Analytical Framework

The author, taking the basic structure knowledge from the hydro-dissection, has developed a framework for the qualitative Āyurvedic analysis of the visceral organs and tissues based on the guṇas and reasoned through anumāna, upamāna and āgama. This framework is the author's observation of the correlation between the guṇa profile of different tissues and the characteristic localisation of the doṣas within the body that has direct implications on treatment planning(Table 1).

Structural qualities were assessed against the classical schema of gunas (attributes), which include paired opposites such as *Guru–Laghu* (heavy–light), *Sheeta–Ushna* (cold–hot), *Snigdha–Ruksha* (unctuous–dry), *Manda–Tikshna* (slow/dull–sharp), *Sthira–Chala* (stable–mobile), *Mridu–Kathina* (soft–hard), *Vishada–Picchila* (clear–slimy), *Slakshna–Khara* (smooth–rough), *Sandra–Drava* (dense–liquid), and *Sukshma–Sthula* (subtle–gross), among others enumerated in classical sources. Each structure was assigned its predominant guna characteristics based on its palpatory, visual, and textural properties as observed during hydrodissection.

In parallel, each structure was correlated with its governing dosha — *Vata*, *Pitta*, or *Kapha* — based on classical descriptions of dosha-tissue affinity and functional attribution. Finally, each structure was mapped to its corresponding core dhatu (tissue) as per the classical *Saptadhatu* framework — *Rasa*, *Rakta*, *Mamsa*, *Meda*, *Asthi*, *Majja*, and *Shukra* — allowing the guna and dosha attributions to be anchored within a specific tissue-level substrate. This tripartite correlation (guna–dosha–dhatu) provided a structured, textually grounded basis for interpreting the qualitative character of each dissected structure alongside its modern biomedical identity.

The data used in this framework for Tridoṣic were collected from the Sūtrasthāna and the correlation of doṣa and dhātu with body parts were taken from the Śārīrasthāna of Suśruta Samhitā.

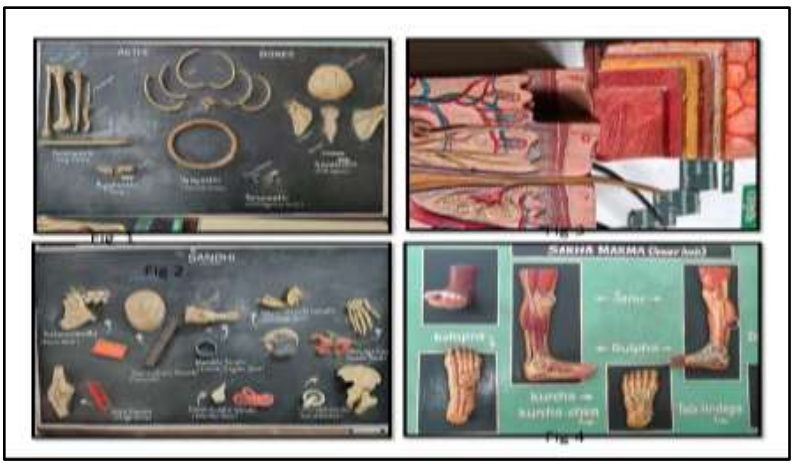
Sanskrit Anatomical Terms	English Translation	Predominent doṣa (*inferred)	Core Dhātu	Inferred primary guna(s)	Citatios (where applicable)
akṣi	eye	pitta	majja	uṣṇa	
karṣa	ear	vāta	asthi	rūkṣa	SS Śa 5.27
nāsā	nose	pṛthivi	aṣthi	snigdha	SS Śa 5.20
jihva	tongue	kapha	rakta + mimsa	snigdha	SS Śa 4.28
tvak	skin	vita	rasa	rūksa	SS Śa 4.5
mastuluṅga	brain	vata	medas	snigdha	SS Sa 23.13/ Sa 14.42
phuphusam	lungs	vita	rakta	snigdha	SS Śa 4.25
hṛdayam	heart	kapha	rakta	snigdha	SS Śa 4.41
vapivahanam	Mesentery	*kapha	medas	snigdha	CS VI 5.8
āmāśaya	stomach	pitta	mīmsa	snigdha	SS Śa 5.8
yakṛt	liver	pitta	rakta	uṣṇa, snigdha	SS Śa 4.25
pittāśaya	gallbladder	pitta	mamsa	uṣṇa	SS Śa 5.8
asthi	bones	vāta	medas + vāya	sthira, khara	SS Sa 14.10
sandhi	joints	vāta + kapha	majja	chala, mṛdu	SS Śa 5.27
pesi	muscles	pitta + kapha	māmsa	mṛdu, uṣṇa	SS Śa 5.39
medodharā kalā	subcutaseous tissue	kapha	medas	snigdha, uṣṇa	SS Śa 4.12
anvasthi/ taruṣāsthi	cartilage	pitta	medas	mrdu	SS Śa 4.12/5.20
stana	breast	kapha	rasa	snigdha	SS Śa 4.24
āntram	intestines	vata, pitta, kapha	rakta	rūkṣa	SS Śa 4.26
basti	urinary bladder	vata, pitta, kapha	rakta	rūkṣa	SS Śa 4.26
guda	anus	vata, pitta, kapha	rakta	rūkṣa	SS Śa 4.26
vṛkka	kidney	*vāta	rakta + medas	rūkṣa	SS Śa 4.31

Table 1: Correlation of classical anatomical structures with their modern biomedical equivalents, associated dosha–dhatu attribution, and guna-based characterization, with corresponding classical textual references.

2.4 Objective Structured Practical Examination

The Objective Structured Practical Examination (OSPE) is a widely recognized method for assessing practical skills in medical education. It provides objectivity, transparency, and uniformity in evaluation compared to traditional practical examinations, which are often influenced by examiner bias and variability. In Ayurveda, *Rachana Shareera* (Anatomy) is a foundational subject, and accurate assessment of learning is essential for developing clinical competency. A prospective, cross-sectional study was conducted in March, 2026 at the Department of *Rachana Shareera*, Government Ayurveda College, Trivandrum, Kerala. A total of 89 undergraduate Ayurveda students participated after providing informed consent. Eligibility criteria included students of first year BAMS with attendance above 75 %.

Two assessment methods were employed: the conventional practical examination (spotters, specimen identification, and viva voce) and the OSPE. The OSPE tool was designed and validated for content and face validity by a panel of subject experts. The stations included identification of bones, muscles, and viscera; surface marking; interpretation of classical references from *Sushruta Samhita* and *Charaka Samhita*; and applied clinical anatomy(Fig C). Each station was timed and assessed using a structured checklist.



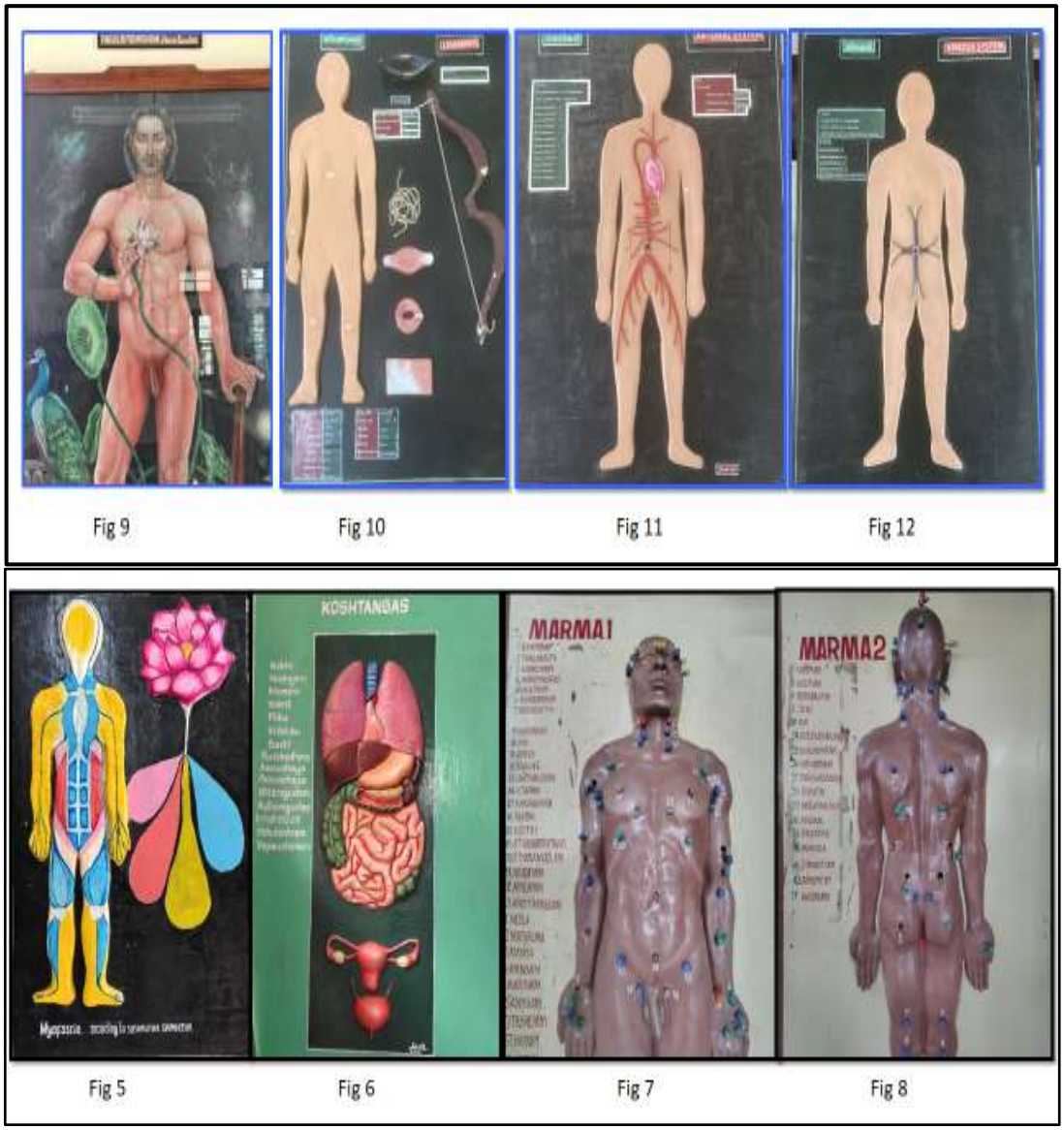


Fig C: 3d models charts and illustrations prepared by the author simulating the ayurvedic classical interpretations. Fig 1: osteology according to Sushrutha, Fig 2: arthrology according to Sushrutha, Fig 3: seven skin layers according to Sushrutha, Fig 4: Marma in the lower limb, Fig 5: Mamsa(Myofascial and fascial planes in Ayurveda), Fig 6: visceral organs and relations as per Sushrutha, Fig 7 marma (vital land marks) surface marking –front, Fig 8: marma (vital land marks) surface marking- back,Fig 9:Anthropometry(Anguala pramana),Fig 10: tendons and ligaments :-sushruthas simili and prespective, Fig 11: heart and arterialm circulation according to sushrutha,Fig 12: veins and circulation according to sushrutha

3. RESULTS

3.1 Hydro-Dissection Findings

It was found that the scrubbing process yielded information in two ways; one was to elucidate structural detail and the other was to reveal tactile qualities or guṇas, as described in classical texts. Structures could be identified visually and tactilely; the venous plexus of the hand was found to be very rūkṣa (dry) in nature and therefore very fragile, and needed to be handled very carefully in order to avoid any disruption, while nerve tissue was relatively snigdha (unctuous) and less liable to disruption.

This observation suggests that hydro-dissection might enable a larger range of guṇas to be perceived than is possible with conventional dissections of cut-open tissue, as the qualitative, tactile dimension of tissue is maintained and even enhanced by the technique.

Repeated scrubbing and immersion made structures such as kalā (fascia), snāyu (tendons and ligaments) and sirā (veins) clearly visible as illustrated in the accompanying figures. The author hopes that a future study on fresh unfixed tissue may be able to resolve the seven layers of skin described by Suśruta, which could not be done in the present study due to the limitation imposed by the formalin fixed tissue.

Fig D: The documented images from the commencement of dissection till the last day of structural identification. Fig 1 and 2 shows the view from within the tank , showing the positioning of the specimen and flow of water within the tank. Fig 3 and 4 shows the specimen after 7 days of immersing in 2 degree celcius of water. Fig 5 and 6 shows the brush used and the brushing being done. Fig 7 and 8 shows the dermal layer after the epidermis is scraped off. Fig 9 and 10 shows the layer beneath dermis and the removing of superficial fascia. Fig 11 and 12 shows deep palmar fascia and exposing of palmar aponeurosis. Fig 13,14,15 and 16 shows the reflection of each structures identified beneath.

3.2 Guṇa-Based Analysis: Case Study of Medodhātu

The guṇa-based framework is presented by analysing one of the medodhātu called adipose tissue(Table 2). The main guṇa of medas is taken here as snigdha with mṛdu and uṣṇa qualities. Medas are distributed throughout the body as per the region where vāta doṣa is predominant: vātasthāna is richly endowed with medas which counterbalance the qualities associated with predominance of vāta in that area(Fig E). The subcutaneous medas (vasā) could also be seen as a counterweight to tvak (skin), which is seat to sparśa (touch) and is linked with the element vāyu. This tendency to vitiation is locally mitigated locally by the snigdha, uṣṇa and guru qualities that are locally provided by medas, which is caused by the rūkṣa, śīta and laghu qualities of sparśa, causing vitiation of vāta doṣa.

Sl no	dhatu	dosa	guna	
1	Rasa-plasma	Kabha	Snigdha,manda	Sita (cold)
2	Rakta-blood	Pitta	Saram,drava	Usna(hot)
3	Mamsa-muscle	Kabha	Mrdu,guru	Sita (cold)
4	Meda-fat	Kabha	Guru,snigda	Usna(hot)
5	Asthi-bone	Vata	Kathina,sthira	Sita (cold)
6	Majja-marrow	Kabha, pitta	Snigdha, guru	Usna(hot)
7	Sukra-semen	kabha	Snigdha, guru	Sita (cold)

Table 2: Relationship between Ayurvedic biomedical parlances-dhatu(tissues), dosha(biohumors) and guna(qualities and potency) .

There are direct clinical implications to this framework. In the body weight gain due to accumulation of medas, the increase in kapha doṣa is also in direct proportion to the increase and there is also increase in kleda (moistness/stickiness) which leads to the progression of the disease of obesity. Rūkṣa is the opposite quality of kleda so therapeutic measures to increase rūkṣa in the body would help to halt this progression. Hence, at the fundamental level, the author suggests that obesity can thus be treated by rūkṣaṇa karma (drying interventions) by using uṣṇa and rūkṣa dravyas (medicines). The kaṣāya (astringent), tikta (bitter) and kaṭu (pungent) rasas are certain to be rūkṣaṇa in their effect and physical exercise, which is a kind of rūkṣaṇa karma, is indicated in the diseases related to obesity.

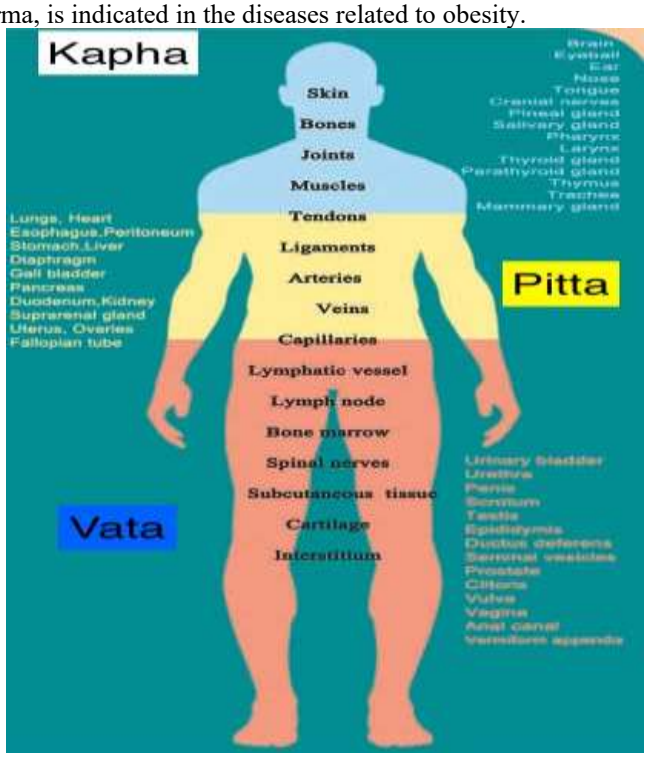


Fig E: Enumeration of body structures based on doshas and its location

3.3 Results from the comparative scoring test- Conventional exam vs OSPE

Eighty-nine undergraduate students were included in the analysis. The mean score for the conventional practical examination was 35.43 (SD 21.83), while the mean OSPE score was 51.79 (SD 25.11). The mean paired difference (OSPE − Conventional) was 16.36 (SD 17.34). A paired-samples t-test showed a statistically significant increase in scores with OSPE compared to conventional assessment ($t(88) = 8.899$, $p < 0.001$). The Wilcoxon signed-rank test (non-parametric) confirmed this finding ($W = 153.0$, $p < 0.001$). Cohen's d for paired samples was 0.943, indicating a large effect size. Subgroup analyses were performed by splitting the cohort at the median Conventional score (≤ 40 vs > 40). In the lower-performing subgroup (Conventional ≤ 40; n = 54), the mean improvement with OSPE was **+19.81** points; the increase was statistically significant (t = **8.177**, $p < 0.001$). In the higher-performing subgroup (Conventional > 40; n = 35), the mean improvement was **+11.03** points and was also statistically significant (t = **4.247**, $p = 0.0002$). Normality testing of paired differences (Shapiro–Wilk) indicated a mild departure from normality overall ($W = 0.969$, $p = 0.033$); subgroup testing showed non-normality in the low-score subgroup ($p = 0.0056$) but not in the high-score subgroup ($p = 0.8949$). For transparency, both parametric and non-parametric results are presented.

Agreement analysis using a Bland–Altman approach showed a mean difference of **16.36** and 95% limits of agreement from **−17.63** to **50.35** (mean ± 1.96 × SD of differences). Four observations (4/89; **4.5%**) lay outside these limits, which is within the commonly accepted 5% threshold for outliers, indicating acceptable agreement patterns without systematic bias

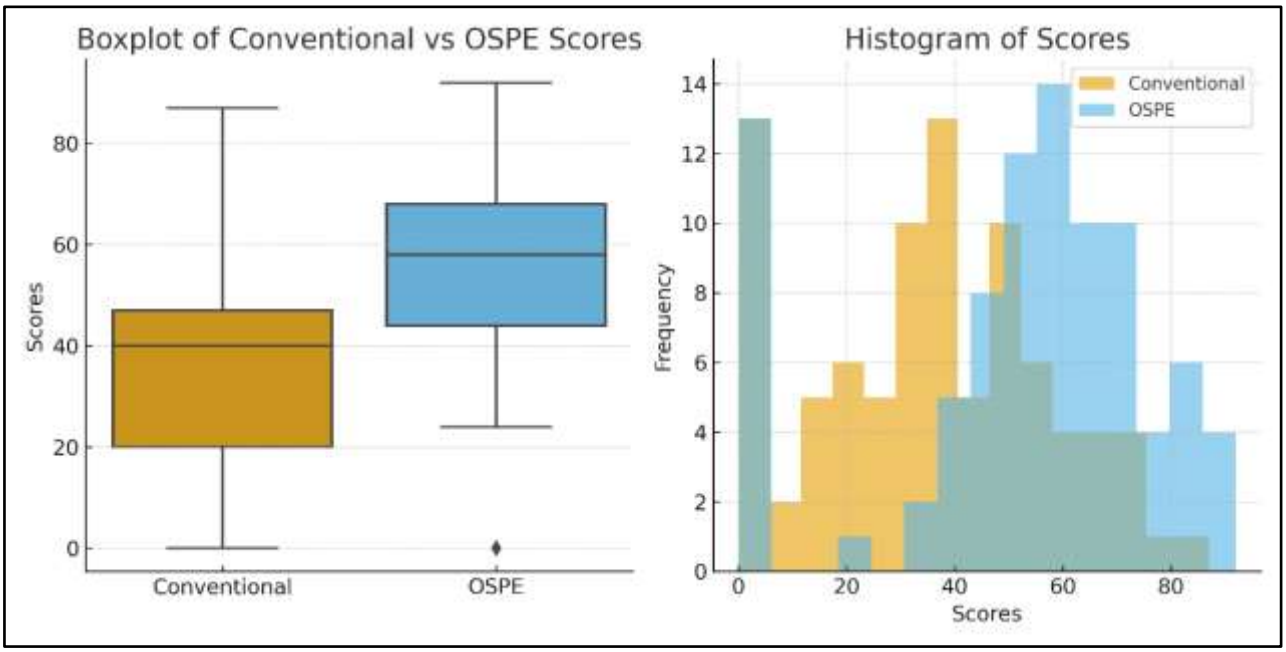


Fig F: box-plot and histogram of conventional vs OSPE scores

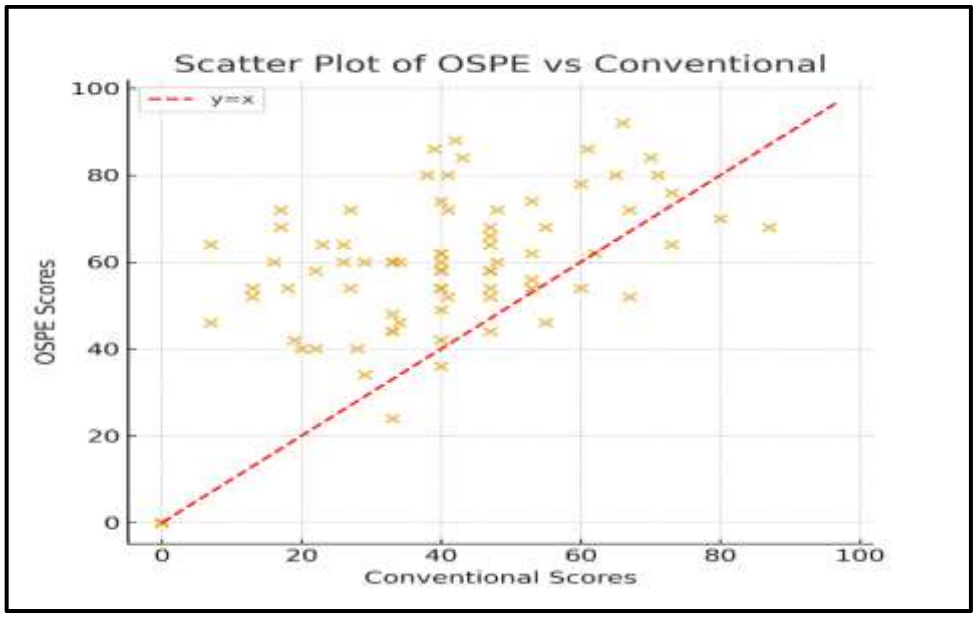


Fig G: scatter plot of OSPE vs Conventional with y = x reference line

The distributional characteristics are illustrated in Figure F and Figure G , which show that while many students cluster near the line of equality, a large proportion scored substantially higher on OSPE compared with the conventional method. The top ten students who demonstrated the greatest absolute increases (OSPE − Conventional) are presented in Table 2; the largest positive difference observed was **+57** points and the tenth largest was **+41** points.

4. DISCUSSION

According to the Suśruta Samhitā the gross body is made up of the five elements, namely pañcabhūtas. Although the treatise mentions and describes a large number of independent structures, similar to an anatomical atlas in biomedical sciences, throughout, emphasis is placed on the functional relevance of these pañcabhūtas in relation to the tridoṣic principles which form the basis of Āyurvedic diagnosis and treatment. The results of this study suggest that structure and function cannot be separated issues in the classical Āyurvedic approach: the hydro-dissection technique allows for a qualitative, functional property (guṇa) to be made apparent to the observer, and reveals the structural detail precisely in the same way: a dissection optimized for structural identification alone is unable to do this.

This merging of structure and quality has immediate pedagogical consequences. When a student learns about the rūkṣa nature of venous tissue or the snigdha nature of nerve tissue simply by handling them, it gives him/her knowledge of anatomy that is instantly continuous with clinical reasoning, because assessment of guṇa is fundamental to the diagnoses and treatment planning in Āyurveda. This is in contrast to a purely biomedical anatomy education, where students are taught about the structure and function of anatomical parts of the body separately, and clinical relevance is reserved for later training. In the hydro-dissection study reported here, there were two main limitations compared to the classical study.

First, it was preserved in formalin before the study and the ability of the distilled water submersion to restore the properties of the tissue to that of fresh unfixed tissue may not be fully achieved, which was responsible for not being able to see the finer structure of the seven layers of the skin mentioned by Suśruta. This is consistent with the rest of the anatomical literature on embalming methods that has demonstrated formalin fixation is excellent for long-term preservation but alters haptic and visual properties of the tissue compared to a fresh or alternatively preserved (e.g., Thiel-embalmed) specimen, and that a fresh or minimally fixed specimen retains a more lifelike colour, softness and pliability that may be more important for a technique like hydro-dissection, which relies on the differential tactile response of tissue to scrubbing. Second, the water circulation was accomplished with the use of a mechanical pump, instead of the natural available running stream, which might have made the tissues more or less accessible to the action of the classical method than it was intended to make them. Future replications should be done with fresh cadaveric tissue, and where practicable, ethically and logistically, a closer approximation of natural flowing water conditions should be employed in order to address these limitations. As such, the classification of guṇas to tissues, as presented in Part 2, is an interpretive synthesis and the author agrees that the future work would be valuable with further cross validation to clinical outcomes, as per classically defined anumāna, upamāna and āgama.

The findings of the study highlight OSPE as a reliable and effective method for assessing *Rachana Shareera* in Ayurveda. The results align with previous research in modern medicine, where OSPE was found to improve fairness, reliability, and student satisfaction(15,16). In our study, OSPE particularly benefited lower-performing students, suggesting that structured assessment formats may support weaker learners(17).

Other studies have shown similar benefits across various disciplines such as physiology pathology and biochemistry(18–20). These findings reinforce the value of OSPE as a universal tool adaptable across medical and Ayurveda education. While resource and time constraints remain challenges, the educational benefits of OSPE justify its integration into Ayurveda curricula.

5. CONCLUSION

It is the guṇas on which the clinical practice of Āyurveda is basically organised. The classical observational technique described here, along with a guṇa-based analytical framework, shows one possibility of teaching gross anatomy to the Āyurvedic student not just to memorize the anatomical structures, but to understand, reason about, and clinically apply the principles of Āyurvedic treatment from the very beginning of studying anatomy. The author proposes that education in anatomy in Āyurveda could become more integrative in nature and that if it is adapted to the institutional context of the modern medical school, such education might help to bring the teaching of anatomy out of its biomedical framework and into one that is more faithful to the classical education that it is derived from.

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