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REVIEW ARTICLE

Towards Standardization of *Marma* Point Identification: Integrating Classical Ayurvedic Descriptions with Surface Anatomy and Modern Imaging Techniques

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Abstract

Marma Sharira (the Ayurvedic science of vital points) describes 107 anatomically defined sites whose injury carries prognostic consequences, and the concept remains central to Ayurvedic anatomy, surgery, and therapeutics. The localization of individual *Marma* points in contemporary education and research, however, is complicated by variations in classical interpretation, reliance on subject-specific finger-breadth measurement (*Anguli Pramana*), and anthropometric diversity in modern populations. This narrative review critically examines the possibilities, challenges, and methodological requirements for standardizing the anatomical identification of *Marma* points by integrating classical descriptions with surface anatomy and modern imaging. Classical classifications from the Sushruta Samhita and related compendia are summarized, and the interpretive and biometric obstacles to reproducible localization are analysed against published studies of anthropometry, palpatory reliability, and ultrasound-assisted landmark identification. The potential contributions and limitations of ultrasonography, magnetic resonance imaging, computed tomography, and three-dimensional digital reconstruction are discussed, with an explicit distinction between visualizing anatomical structures and validating a traditional *Marma* point. A staged, nine-step framework is proposed for developing, documenting, and externally validating standardized localization protocols, combining textual verification, surface-landmark definition, anthropometric protocols, imaging-based assessment, multidisciplinary expert review, and reliability testing. The framework is presented as a methodological proposal, not an experimentally validated model. Substantial anatomical and psychometric work, including cadaveric investigation, ultrasound-assisted mapping, interobserver reliability studies, and multicentre validation, will be required before a universally accepted standard of *Marma* localization can be established.

Keywords: Anatomical landmarks; Anatomical standardization; *Anguli Pramana; Marma points; Marma Sharira;* Surface Anatomy; Ultrasonography

Introduction

The concept of *Marma* occupies a distinctive position within Ayurvedic anatomy. The Sushruta Samhita defines *Marma* points as sites where muscle (*Mamsa*), vessels (*Sira*), ligamentous structures (*Snayu*), bone (*Asthi*), and joints (*Sandhi*) meet in particular combinations, and enumerates 107 such sites distributed across the body.[1] Injury to these sites was held to produce consequences ranging from severe pain and deformity to delayed or immediate death. *Vagbhata's Ashtanga Hridaya* retains the same enumeration while revising the structural composition of several categories,[2] and the *Charaka Samhita,* approaching the subject from the standpoint of disease management, accords particular importance to three principal seats of vitality, *Shiras* (head), *Hridaya* (heart), and *Basti* (bladder).[3] Comparative scholarship has highlighted both affinities and differences with the acupoints of traditional Chinese medicine, underscoring that *Marma* represents an independent anatomical tradition rather than a regional variant of acupuncture.[4]

Renewed research interest in *Marma*-based therapeutics, including a registered randomized trial protocol evaluating *Marma* therapy in lumbar disc radiculopathy,[5] makes the accurate and reproducible localization of these points a matter of practical importance rather than purely historical interest. In education, consistent localization underpins the teaching of *Rachana Sharira* (Ayurvedic anatomy); in research, it is a precondition for comparing interventions across studies.

At present, localization relies largely on textual description, instructor tradition, and subject-specific

finger-breadth measurement. Interpretations of classical locational phrases vary between teachers and published commentaries, anatomical landmarks are not always specified, and individual differences in body proportions complicate the transfer of proportional descriptions. The reproducibility of *Marma* localization has consequently not been established. This review examines the possibilities, challenges, and methodological requirements for standardizing *Marma* point identification through the integration of classical descriptions with contemporary surface anatomy and imaging techniques, and proposes a staged framework for future validation studies.

Classical Understanding of Marma Sharira

The classical account of *Marma* Sharira is transmitted primarily through the *Pratyeka Marma Nirdesa* chapter of the *Sushruta Samhita Sharira Sthana*.[1] Sushruta classifies the 107 points in four complementary ways: by predominant structure, by regional distribution, by dimensions expressed in the subject's own finger-breadths, and by the prognosis of injury.

The structural classification assigns eleven points to *Mamsa Marma* (predominantly muscular sites), forty-one to *Sira Marma*, twenty-seven to *Snayu Marma*, eight to *Asthi Marma*, and twenty to *Sandhi Marma*.[1,8] Classification mentioned in table 1.

Table 1. Classical Classification of Marma Points by Structural Predominance

Structural category	Interpretive gloss	No. Su. S[1]	No. A. Hridaya[2]
Mamsa Marma	Regions with predominant muscular bulk (interpretive gloss)	11	10
Sira Marma	Regions associated with vessel-dominated structures	41	37
Snayu Marma	Regions associated with cord-like and fibrous structures; boundaries relative to tendon, ligament, and nerve are debated	27	23
Asthi Marma	Bone-related regions	8	8
Sandhi Marma	Articular regions	20	20
Dhamani Marma	Sites with predominance of tubular or channel-like structures	-	09

Regionally, forty-four points lie in the four limbs, twelve in the thorax and abdomen, fourteen over the back, and thirty-seven in the head and neck above the clavicles.[1] The prognostic classification distinguishes Sadyah *Pranahara* points, fatal immediately on injury (nineteen), *Kalantara Pranahara*, fatal after a delay (thirty), *Visalyaghna*, fatal on removal of a lodged foreign body (three), *Vaikalyakara*, producing deformity (forty-four), and *Rujakara*, producing pain (eight).[1] Classical dimensions range from half an *Anguli* for most points, through one, two, and three Anguli for sites such as *Manibandha, Gulpha, Janu,* and *Kurpara,* up to the span of the subject's own palm for centrally located points including *Hridaya* and *Nabhi* (umbilicus).[1,8]

These categories are traditional anatomical constructs, and their mapping onto modern histological structures is not self-evident. Classical *Sira* and *Snayu* each cover a range of tubular, cord-like, and fibrous structures whose boundaries do not coincide neatly with the modern categories of vessel, nerve, tendon, and ligament. The *Ashtanga Hridaya* reassigns the counts to ten *Mamsa*, thirty-seven *Sira*, twenty-three *Snayu*, eight *Asthi*, twenty *Sandhi*, and nine *Dhamani Marma* (sites with predominance of tubular channels), while retaining the total of 107.[2,8]

Modern attempts to correlate this framework with contemporary anatomy have so far been modest in scale. An early monograph devoted to *Marma* from a combined classical and anatomical perspective compiled illustrated correlations for numerous points but lacked primary anatomical data.[6] More recently, a cadaveric and virtual dissection study of *Sthanarohita Marma*, an anterior thoracic point, located the classical marking, described as two *Anguli* superomedial to the nipple, within the second and third intercostal spaces, identifying pectoral musculature superficially and the internal thoracic vessels in depth; the authors interpreted their findings as a regional correspondence rather than a one-to-one identity with any single modern structure.[7] That cautious formulation is methodologically instructive for the whole field.

Challenges in Anatomical Identification and Standardization

Several distinct sources of variation hinder consistent identification of *Marma* points, and each has parallels in the broader literature on palpatory anatomy.

The first is interpretive variation. Locational descriptions in the classical texts are compact and anatomically implicit, and the divergence between compilations in the

structural counts noted above demonstrates that classical description admits more than one defensible reading.[1,2] Modern translations and commentaries add further layers of interpretation.[8]

The second is uncertainty in *Anguli Pramana*. The unit is defined proportionately, as the breadth of the subject's own finger, yet the classical texts do not specify the precise anatomical point at which the finger is to be measured, and training traditions rely on consensus conventions. An empirical study of 192 Indian adults found mean *Anguli* values of approximately 2.1 cm in men and 1.9 cm in women.[9] Whether the proportional logic of the classical texts should be preserved or converted into absolute distances is a methodological decision that has not been formally examined for *Marma* localization. The third is the general difficulty of palpatory landmark identification. A systematic review of manual palpation for myofascial trigger points found that most reliability studies were methodologically weak and that only a minority of palpatory findings showed acceptable reproducibility.[10] Even among physicians trained in musculoskeletal medicine, palpation of the acromioclavicular joint line was verified by ultrasound in only 16.7% of attempts, and of the lateral knee joint line in 58.3%.[11] These figures concern established, formally taught landmarks; the expectation that unstandardized *Marma* descriptions would fare better finds no support in evidence.

The 4th source is biological variability. Age, sex, body composition, and habitus alter both the position of landmarks and the palpability of the structures beneath them. Finally, and consequentially, no validated localization protocol exists for any *Marma* point, so the individual contributions of these sources of variation remain unresolved. A recent commentary on acupoint localization also cautions that representing such sites as fixed coordinates may be a poor model, since repeated localization by trained practitioners yields clusters rather than identical positions.[12] Whether a probabilistic representation suits *Marma* is an empirical question, but the point stands that classical dimensions do not guarantee point-like precision.

Integration of Classical Descriptions with Surface Anatomy Classical locational phrases can frequently be restated in terms of established surface anatomy without asserting more than a regional correspondence. Palpable bony landmarks, muscle borders, tendons, joint spaces, and cutaneous creases provide anchors that are independent of the subject's finger-breadth and can be defined in standard anatomical positions. *Manibandha Marma*, for example, is classically described as spanning two *Anguli* at the wrist[1], a description naturally anchored to the distal forearm creases and the radiocarpal region; *Kurpara Marma* corresponds regionally to the elbow near the lateral epicondyle; Janu *Marma* to the knee joint region; and *Kshipra Marma* to the first dorsal interosseous space of the hand. For each such anchoring, the classical description should be cited first and the landmark correlation stated as an interpretation, in the manner adopted by the *Sthanarohita* cadaveric study[7] rather than as an equivalence. The rationale for systematic landmark-based definition is well illustrated outside Ayurveda. A cadaveric study of first rib palpation quantified the relationship between candidate landmarks, the transverse process spans of the first cervical and first thoracic vertebrae, and reported close agreement between the two spans (intraclass correlation coefficient 0.88), supporting one landmark-based palpation technique and refining another.[13]

Standardization additionally requires agreement on examination positioning, since joint posture changes the position of adjacent landmarks, and on measurement technique. Reviews of acupoint location in traditional Chinese medicine teaching likewise conclude that proportional measurement requires landmark-based correction.[14] Anthropometric documentation, at minimum stature, limb lengths, and the subject's own *Anguli*, would allow future analyses to test which representation better predicts agreement among examiners.[9]

Two caveats follow. Regional anchoring does not establish that a classical *Marma* corresponds to a single modern structure, and some classical sites, particularly those described in relation to vital function rather than to palpable structures, may resist anatomical anchoring altogether. The scope of standardization should therefore be defined point by point, with transparent documentation of the strength of the classical description and the confidence of the anatomical correlation.

Role of Modern Imaging Techniques in Marma Point Identification

Imaging can contribute to standardization by documenting the structures present within a defined region, by verifying surface landmarks against deeper anatomy, and by building digital teaching resources. It cannot, by itself, establish the identity, existence, or functional significance of a traditional *Marma*; imaging establishes anatomy only. Table 2 summarizes these contributions and limitations.

Table 2. Potential Contributions and Limitations of Contemporary Imaging Techniques in Marma Localization.

Modality	Potential contribution	Principal limitations
Ultra-sonography	Real-time visualization of superficial muscle, tendon, fascia, vessels, and nerves; verification of landmarks; measurement of depths; no ionizing radiation	Operator dependence; limited depth; performance reduced with increased adiposity; no published Marma-specific validation
Magnetic resonance imaging	Superior soft-tissue contrast for deeper structures; suited to cadaveric specimen correlation; multiplanar documentation	Cost and availability; scan time; no published MRI-based Marma localization study
Computed tomography	Precise skeletal detail relevant to Asthi and Sandhi sites; cadaveric correlation	Ionizing radiation difficult to justify in volunteers; limited soft-tissue contrast
Three-dimensional reconstruction and digital mapping	Anatomical documentation, teaching atlases, probabilistic representation of localization variability	Derived from source data; adds no anatomical information beyond the underlying imaging

Ultrasonography is the most practicable modality. It depicts superficial muscle, tendon, fascia, vessels, and nerves without ionizing radiation, and inter-rater reliability studies of ultrasound-based soft-tissue measurement report good to excellent agreement when examiners are trained.[15] In acupuncture research, ultrasound has been used to locate the second posterior sacral foramen by palpation, quantify the depth of the target structure, and verify needle placement, illustrating how sonographic verification can convert a palpatory convention into a documented protocol.[16] Performance nevertheless degrades with increased adiposity, and operator dependence remains a constraint.[17] For superficial *Marma*s, including sites such as *Kshipra* and *Manibandha*, ultrasound-assisted mapping during cadaveric dissection is a realistic next step.

Magnetic resonance imaging offers superior soft-tissue contrast and is well suited to correlating classical regions with deeper structures in cadaveric specimens, where scanning time and clinical justification are not limiting. At present no imaging study has validated the location of a *Marma* point in vivo, so the modality's role here is prospective. Computed tomography provides the most precise depiction of skeletal anatomy relevant to Asthi and Sandhi sites, but ionizing radiation is difficult to justify for research localization in healthy volunteers when non-radiating alternatives exist; its use is best restricted to cadaveric work or incidental clinical imaging.

Three-dimensional reconstruction and digital mapping are likely to matter most for documentation and education. Virtual dissection platforms have already been combined with layer-by-layer cadaveric dissection in the *Sthanarohita* study.[7] A conceptually important development in acupuncture research is the proposal to represent point localization as spatial probability distributions rather than fixed coordinates.[12] Applied to *Marma*, the same approach would permit the localizations of several examiners for a given point to be summarized as a region with a density centre, which is arguably closer to the classical description of a measured area than to a point.

Proposed Framework for Standardization of Marma Point Identification

Building on the preceding analysis, a staged framework for developing standardized localization protocols can be proposed. It is a methodological proposal grounded in the reviewed literature, not an experimentally validated model, and its stages are set in Table 3.

The framework begins with verification of the classical description: collating the locational, dimensional, structural, and prognostic statements for a chosen *Marma* across the principal compilations and their commentaries, and recording divergences rather than harmonizing them silently. The corresponding anatomical region is then defined, and reproducible surface landmarks are selected, with the examination position specified. Standardized anthropometric measurements, including the subject's own Anguli, are documented so that proportional and absolute

representations can be compared. Anatomical assessment follows, using ultrasonography in the first instance, with MRI or CT reserved for cadaveric correlation of deeper or skeletal sites.

Table 3. Proposed methodological stages for the anatomical standardization of Marma point identification

Stage	Activity	Intended output
1.	Verification of classical descriptions across principal compilations and commentaries	Collated textual record with documented divergences
2.	Definition of the corresponding anatomical region	Regional description acceptable to classical and contemporary anatomists
3.	Selection of reproducible surface anatomical landmarks and examination positions	Landmark set and standardized positioning protocol
4.	Development of anthropometric measurement protocols	Documented measurements, including the subject's own Anguli
5.	Anatomical assessment by suitable imaging (USG first; MRI or CT mainly cadaveric)	Imaging-correlated regional anatomy
6.	Interdisciplinary expert review (Ayurveda anatomists, contemporary anatomists, radiologists)	Consensus locational protocol
7.	Assessment of interobserver and intraobserver reliability in future studies	Quantified agreement (e.g., intraclass correlation coefficients, kappa statistics)
8.	Documentation of anatomical variability	Variability profile for each point or region
9.	Development and external validation of the localization protocol in independent samples	Externally validated, documented protocol

Review by an interdisciplinary panel of Ayurveda anatomists (*Rachana Sharira* specialists), contemporary anatomists, and radiologists precedes any field testing. Reliability is then assessed empirically: multiple trained examiners localize the point in standardized positions, and agreement is quantified using appropriate statistical methods, such as intraclass correlation coefficients for coordinate data and kappa statistics for categorical identification, with intraobserver repeatability examined in the same design. Only after acceptable agreement has been demonstrated does protocol development proceed to external validation in independent samples and centres. The order matters: reliability testing without prior textual and anatomical consensus would measure agreement on an unstable target, while anatomical correlation without reliability testing would produce descriptive atlases of uncertain reproducibility.

Research Gaps and Future Directions

The limitations of the current evidence base are genuine rather than rhetorical. Apart from the single cadaveric study of *Sthanarohita Marma*,[7] the anatomical literature contains no published investigation in which a *Marma* point has been examined with contemporary cadaveric, sonographic, or cross-sectional imaging methods under a documented protocol.

Cadaveric investigation, region by region, therefore remains the necessary reference method for establishing what structures lie within classically described areas; ultrasonography is the feasible first-line modality for superficial points and can be combined with dissection; MRI-based correlation is appropriate for deeper regions in specimens. Standardized anthropometric protocols would permit the proportional-versus-absolute question to be answered empirically, and formal interobserver reliability studies would establish whether any proposed protocol achieves acceptable agreement. Digital atlases and multicentre validation would extend single-centre findings, and dissemination through standardized teaching protocols would translate results into education.

Practical and ethical constraints are real. Cadaveric availability is limited and governed by donation frameworks; imaging of healthy volunteers for purely anatomical research requires careful justification, with radiation-based methods effectively restricted to cadaveric work; and the workload of examining 107 points argues for prioritization, beginning with superficial points whose classical descriptions already reference palpable structures. Interdisciplinary collaboration between Ayurveda institutions and anatomy or radiology departments is a precondition rather than an ideal.

Discussion

Three distinctions organize the material reviewed here. The first is between classical description and modern equivalence. The classical categories are internally coherent, prognostically motivated, and, as the divergent counts between compilations show, historically fluid.[1,2] They can be documented and interpreted without asserting that Sira means vessel or Snayu means nerve. The Sthanarohita study illustrates the appropriate register: regional correspondence, plausible correlates, no claim of identity.[7]

The second is between localization, structural correlation, and validation. A point can be localized

reproducibly without its structure being known; its structures can be documented without any functional significance being established; and even a demonstrated structural richness would not validate therapeutic claims, which require their own clinical evidence. The proposed framework addresses only the first two steps.

The third is between what is standardizable now and what remains uncertain. Region-level localization anchored to surface landmarks, examination positioning, and anthropometric documentation are within reach of existing methods; point-level precision, the functional content of classical categories, and the prognostic claims attached to individual points are not reducible to coordinates.

A final caveat concerns this review itself. It is a narrative review based on literature retrievable through PubMed, Google Scholar, and open web sources, restricted to references whose bibliographic details could be independently verified; it is not a systematic review, and the relatively short reference list reflects those verification requirements rather than a comprehensive search.

Conclusion

The classical science of *Marma Sharira* remains anatomically suggestive and educationally central, but its localization has not been standardized, and claims of precise modern correspondence are premature. What can responsibly be done now is modest and well defined: verify classical descriptions against reliable editions, anchor them to reproducible surface landmarks in standardized positions, document them anthropometrically, and examine them with appropriate imaging, chiefly ultrasonography, under protocols assessed for interobserver reliability. A staged framework of this kind treats classical texts as primary sources to be interpreted, not as validated anatomical data, and treats imaging as a tool for documenting structure, not for certifying traditional identity. If such work is undertaken collaboratively and reported transparently, a defensible, evidence-based standard of *Marma* localization may eventually emerge. Until then, the appropriate scientific posture is caution about what has been established and clarity about what remains to be tested.

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