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Review Article

Marma Sharir and Peripheral Neurovascular Bundles: An Anatomical Correlation

Dr.Neha Mayur Gosavi,
Associate Professor -Department of Rachana Sharir,
Swami Vivekanand Ayurved College, Pargaon,Ta.Shrigonda, Dist-Ahilyanagar, Maharashtra,India
vd.nehagosavi@gmail.com

Dr.Uday Bhikanrao Bhoir,
Professor-Department of Rachana Sharir,
Government Ayurvedic College,Dharashiv, Maharashtra,India
ubhoir68@gmail.com

Dr.Premanand B. Bhalerao,
MD,Ph.D(Rachana Sharir)
Associate Professor- Department of Rachana Sharir,
YMT Ayurveda Medical College,Kharghar, Navi Mumbai,Maharashtra, India
drpremanandb@gmail.com

Abstract

Marma Sharir describes 107 vulnerable anatomical regions whose injury may cause pain, disability, deformity, delayed deterioration, or death. The account is especially detailed in the *Sushruta Samhita*, where each *Marma* is understood through its location, dominant tissue, dimensions, and likely outcome after trauma. Modern anatomy approaches vulnerability through a different vocabulary, but it recognizes the clinical importance of compact regions in which nerves, arteries, veins, fascia, muscles, bones, and joints lie in close relation. This review examines the possible relationship between selected *Marma* and peripheral neurovascular bundles. Classical descriptions are read alongside regional and clinical anatomy, with attention to the upper and lower limbs, head, neck, and trunk. Several comparisons—notably *Shankha* with the pterion, *Manya* with the carotid region, *Lohitaksha* with the femoral triangle, and *Kurpara* with the cubital fossa—are anatomically persuasive. Others remain provisional because a *Marma* is usually a functional zone rather than a single structure. The comparison may support anatomy teaching, trauma awareness, surgical planning, regional anaesthesia, and rehabilitation, but it should not be treated as proof that classical and modern terms are interchangeable. More reliable conclusions will require standardized surface landmarks, cadaveric dissection, imaging, and prospective clinical observation.

Keywords

Marma Sharir; peripheral neurovascular bundle; clinical anatomy; *Sushruta Samhita*; trauma; surgical anatomy; integrative medicine

1. Introduction

A wound can be small at the skin and devastating beneath it. Surgeons, anatomists, and emergency physicians encounter this principle whenever a narrow anatomical corridor contains a major nerve, artery, vein, or organ. Long before contemporary anatomical nomenclature developed, Sushruta organized comparable observations under the concept of *Marma* and described their value in operative practice and prognosis [1]. A widely used translation of the classical account identifies 107 such regions and records the consequences expected when they are injured [2].

Marma are therefore better understood as vulnerable anatomical zones than as points marked only on the body surface. Their importance arises from the structures that converge within or immediately beneath the stated location. Depending on the region, injury may interrupt perfusion, damage motor or sensory pathways, destabilize a joint, cause severe pain, or threaten life.

The resemblance to a peripheral neurovascular bundle is clinically interesting, but it requires restraint. Classical descriptions grew from observation, surgery, and surface landmarks; modern descriptions depend on dissection, histology, imaging, and standardized terminology. The purpose of comparison is not to rename one system in the language of the other. It is to ask whether both identify some of the same dangerous anatomical territories and whether that shared insight can generate useful research.

2. Aim and Objectives

This review aims to examine the anatomical relationship between *Marma Sharir* and peripheral neurovascular bundles. It describes the classical basis and classification of *Marma*, outlines the organization of modern neurovascular complexes, evaluates selected regional correlations, considers their clinical relevance, and identifies questions suitable for cadaveric, radiological, and clinical investigation.

3. Review Approach

A narrative synthesis was prepared from classical Ayurvedic texts and contemporary literature on regional, clinical, surgical, and surface anatomy. The *Charaka Samhita* provides a broader account of bodily structures and functional organization within the classical tradition [3]. The *Ashtanga Hridaya* offers a later, influential presentation of Ayurvedic anatomy and clinical reasoning [4]. These sources were considered with textbooks, atlases, dissection manuals, reviews, and papers specifically addressing *Marma*.

Potential correlations were judged by four features: agreement of the surface location, the structures expected beneath that location, the reported consequence of injury, and the practical relevance of the proposed relationship. Because this was not a registered systematic review and no formal risk-of-bias tool was used, the conclusions are interpretive rather than definitive.

4. Classical Basis of *Marma Sharir*

Sushruta describes *Marma* as regions where *Mamsa*, *Sira*, *Snayu*, *Asthi*, and *Sandhi* meet and where *Prana* has particular importance. The definition does not imply that every component is equally prominent at every site. Instead, it presents vulnerability as the result of several tissues acting together within a limited space.

This is a practical rather than merely descriptive anatomy. A surgeon was expected to know which regions should be avoided during incision, cauterization, probing, or removal of a foreign body. The likely outcome after injury was part of the anatomical description. In that sense, *Marma Sharir* joins structure with prognosis: it asks not only what lies in a region, but what may happen if that region is disturbed.

The concept of *Prana* cannot be reduced to a nerve impulse, blood flow, or any single physiological variable. In comparative anatomy, it is more defensible to retain the classical meaning and observe that many *Marma* protect functions that depend on coordinated neural, vascular, respiratory, and musculoskeletal activity.

5. Classification and Distribution

The 107 *Marma* are classified by the tissue considered predominant at the site. The categories are *Mamsa Marma*, *Sira Marma*, *Snayu Marma*, *Asthi Marma*, and *Sandhi Marma*. The counts are summarized below.

Structural category	Number	Predominant tissue
Mamsa Marma	11	Muscle
Sira Marma	41	Blood vessels
Snayu Marma	27	Ligaments, tendons, ar
Asthi Marma	8	Bone
Sandhi Marma	20	Joint

Table 1. Structural classification of the 107 *Marma*.

6. Prognostic Meaning

The prognostic classification adds a second layer of clinical information. *Sadyah Pranahara* sites are associated with an immediately fatal outcome, whereas *Kalantara Pranahara* sites are linked with death after an interval. *Vishalyaghna* describes the distinctive danger associated with removing an embedded object. *Vaikalyakara* sites are expected to leave permanent impairment, and *Rujakara* sites are chiefly associated with severe pain.

These categories should not be converted into modern diagnostic labels. Their enduring value lies in the recognition that the timing and character of deterioration vary with the structures injured. Rapid exsanguination, progressive intracranial pressure, ischemia, infection, and permanent nerve damage are different clinical pathways, even when the external wound initially appears similar.

Regional distribution reinforces this point. The classical count assigns 22 *Marma* to each upper and lower limb, 12 to the thorax and abdomen, 14 to the back, and 37 to the head and neck. The concentration in the head and neck is consistent with the density of sensory organs, cranial pathways, airway structures, and major vessels in a relatively small area.

7. Peripheral Neurovascular Bundles

Modern anatomy describes nerves and vessels as structures that repeatedly share tissue planes and confined passages. Gray's Anatomy provides the detailed structural basis for these relationships [5]. Clinically oriented anatomy emphasizes how the same relationships guide examination, procedures, and interpretation of injury [6]. Student anatomy texts make the routes of the major bundles easier to follow across adjoining regions [7], while a region-by-region approach is particularly useful when a wound or operation crosses several fascial compartments [8].

In the upper limb, the axilla, arm, cubital fossa, forearm, wrist, and palm contain predictable relations

among nerves and vessels [9]. Comparable danger zones in the lower limb include the femoral triangle, adductor canal, popliteal fossa, and tarsal tunnel [10]. The head and neck demand even greater care because cranial nerves, cervical sympathetic pathways, carotid vessels, jugular veins, and the airway are closely packed [11].

An anatomical atlas helps relate these deep structures to visible landmarks [12]. Dissection manuals demonstrate how fascia preserves or separates neurovascular planes [13]. Clinical anatomy then explains why damage at one level can produce a recognizable pattern of bleeding, ischemia, sensory loss, weakness, or autonomic disturbance [14]. A neurovascular bundle is therefore not merely an artery placed beside a nerve; it is a spatial and functional unit whose components may be injured together.

8. How the Two Frameworks Can Be Compared

A useful correlation begins with a surface zone and proceeds inward. The investigator marks the classical location, defines its dimensions, documents normal anatomical variation, identifies every important structure within that volume, and then compares the predicted effects of injury with the classical account. This is more credible than selecting one familiar structure after the fact.

Contemporary reviews have renewed discussion of *Marma* as a clinically relevant anatomical system [15]. Work focused on *Urdhvajatrugata Marma* shows both the attraction and the difficulty of mapping classical head-and-neck regions onto present-day structures [16]. Location-based discussion of *Lohitaksha* has drawn attention to the femoral neurovascular complex [17], while analysis of *Kshipra* has considered the vessels, nerves, and soft tissues of the first web space [18].

Recent conceptual literature presents *Marma* as an interface between classical anatomy and modern clinical reasoning [19]. Reviews of clinical significance have expanded that discussion beyond historical description [20]. Brief contemporary reports also stress the need to connect location with functional consequence [21]. Regional traditions from South India add valuable context, although terminology and practice are not always uniform [22].

Structural work on *Urdhvajatrugata Marma* further illustrates the need for reproducible landmarks [23]. A recent scoping review found a growing body of *Marma* research but also identified methodological limitations and considerable variation in study design [24]. Taken together, this literature supports systematic investigation; it does not yet establish a complete one-to-one map of all 107 sites.

9. Selected Regional Correlations

In the upper limb, *Kurpara* corresponds broadly to the elbow and cubital fossa. The brachial artery, median nerve, superficial veins, and nearby branches of the radial nerve make this a clinically sensitive region. *Talahridaya* occupies the central palm, where the palmar arches and digital branches of the median and ulnar nerves support perfusion, sensation, and grip. *Kshipra* lies in the first web space, close to digital nerves and branches of the radial arterial system. None of these sites is a single dot; each is better represented as a small three-dimensional zone.

In the lower limb, *Lohitaksha* is plausibly related to the groin and femoral triangle. Major injury here can threaten life through hemorrhage and threaten the limb through ischemia. *Urvi* is commonly interpreted in relation to the middle thigh and adductor canal, where femoral vessels and the saphenous nerve travel in a protected but clinically important passage.

Several head-and-neck comparisons are particularly compelling. *Shankha* overlies the temporal region and pterion, deep to which the middle meningeal artery is vulnerable in cranial trauma. *Manya*, *Nila*, and *Matrika* are described in cervical regions that contain the carotid system, internal jugular vein, vagus nerve, sympathetic pathways, and lower cranial nerves. *Apanga* lies near the lateral canthus and orbital structures, while *Vidhura* is placed behind and below the auricle near facial, sensory, vascular, and mastoid structures. The classical sites are not necessarily identical to these named structures, but the proposed zones contain anatomy capable of explaining the reported loss of function.

Marma	Surface zone	Plausible modern complex	Clinical concern
Kurpara	Elbow	Cubital fossa; brachial artery and major nerves	Bleeding or motor-sensory deficit
Talahridaya	Central palm	Palmar arches and median-ulnar branches	Grip, sensation, and perforation
Kshipra	First web space	Digital nerves and radial arterial branches	Bleeding, pain, or thumb dysfunction
Lohitaksha	Groin	Femoral neurovascular bundle	Major hemorrhage or limb ischemia
Urvi	Middle thigh	Adductor canal and femoral vessels	Vascular or sensory injury
Shankha	Temple	Pterion and middle meningeal artery	Intracranial hemorrhage
Manya	Lateral neck	Carotid sheath and adjacent nerves	Hemorrhage or cerebral ischemia
Apanga	Lateral canthus	Orbital neurovascular and fascial structures	Visual or ocular-motor impairment

Table 2. Selected location-based correlations. The entries represent anatomical zones, not exact equivalences.

10. Trauma and Emergency Care

Trauma care gives the comparison its clearest practical relevance. Modern trauma texts emphasize rapid recognition of vascular injury, occult hemorrhage, ischemia, and combined nerve damage [25]. Surgical principles likewise depend on exposure that controls bleeding while preserving viable tissue and critical neural pathways [26].

The classical warning attached to a *Marma* can be read as an early danger signal: do not judge an injury only by its surface appearance. A wound near the groin, axilla, side of the neck, temple, or cubital fossa deserves careful neurovascular examination. This observation does not alter current trauma protocols, but it offers a historically grounded way to teach why certain sites demand urgency.

11. Hand Surgery and Reconstruction

The hand illustrates how a small anatomical field can contain a large functional burden. Operative hand surgery depends on precise preservation or repair of digital nerves, arteries, tendon systems, pulleys, and fascial spaces [27]. This helps explain why trauma near *Talahridaya* or *Kshipra* may produce a combination of bleeding, sensory change, pain, and impaired movement.

Microsurgical reconstruction applies the same principle elsewhere. Free flaps and limb-salvage procedures require reliable recipient vessels, intact motor and sensory pathways, and careful handling of the surrounding soft tissue. A *Marma*-based surface map might supplement teaching, but it cannot replace imaging, Doppler assessment, magnification, or standard operative anatomy.

12. Peripheral Nerve Injury and Rehabilitation

Peripheral nerve injury may cause weakness, sensory loss, neuropathic pain, and long-term disability even when circulation remains intact. Outcome depends on the nerve involved, level and mechanism of injury, delay before repair, and distance to the target tissue [28]. This pattern is relevant to the *Vaikalyakara* and *Rujakara* categories, which foreground lasting functional loss and pain.

Rehabilitation must therefore address more than wound closure. Motor retraining, sensory re-education, protection of denervated skin, pain management, splinting, and psychological support may all be needed. *Marma Chikitsa* is sometimes discussed in this setting, but its techniques, dose, indications, and safety require clinical evaluation before they can be integrated into nerve-rehabilitation pathways.

13. Brachial Plexus, Axilla, and Regional Anaesthesia

The brachial plexus and axillary vessels change their relations as they pass from the neck into the upper limb. Their arrangement explains why traction, penetrating trauma, dislocation, or surgery may injure several functions at once [29]. *Kakshadhara* and nearby upper-limb *Marma* are therefore more plausibly interpreted as regional complexes than as isolated nerve points.

Regional anaesthesia deliberately approaches nerves near companion vessels. Ultrasound, aspiration, dose control, sterile technique, and continuous monitoring remain the basis of safe practice. Awareness of classical surface landmarks may be educational, but it should never be used as a substitute for validated block anatomy or real-time imaging.

14. Surface Anatomy and Clinical Education

Surface anatomy connects the visible body with structures that cannot be seen during routine examination. Contemporary teaching uses palpable bones, pulses, skin creases, muscle borders, and projected lines to locate clinically important structures [30]. Classical *Marma* descriptions rely on a related observational skill, often using regional landmarks and proportional measurements.

Teaching the two maps side by side could make anatomy more memorable if the boundaries remain explicit. Students can identify a proposed *Marma* zone, predict the tissues beneath it, trace the likely deficit from injury, and then verify the relation with an atlas, ultrasound, or dissection. The exercise encourages clinical reasoning without requiring that every traditional description be forced into a modern label.

15. Additional Clinical Applications

Potential applications extend to orthopaedic surgery, vascular access, pain medicine, and rehabilitation. Joint surgery around the shoulder, elbow, hip, and knee routinely requires protection of adjacent nerves and vessels. Vascular procedures use some of the same surface territories for cannulation or surgical exposure. In pain practice, selected *Marma* lie near nerve entrapment sites, tendon insertions, or fascial intersections.

Similarity of location does not establish similarity of mechanism. *Marma Chikitsa*, trigger-point therapy, peripheral nerve stimulation, and acupuncture arise from different theories and use different procedures. Comparative trials would need clearly defined

interventions, credible controls, adverse-event monitoring, and outcomes relevant to pain and function.

16. Critical Appraisal

The strongest correlations are those in which location, underlying anatomy, and consequences of injury all agree. *Shankha* and the pterion, *Lohitaksha* and the femoral triangle, *Kurpara* and the cubital fossa, and *Manya* and the carotid region meet this standard reasonably well. Even here, a *Marma* should be treated as a region with variable depth and extent rather than as a precisely measured modern structure.

Several limitations remain. Classical measurements may vary with body size and interpretation. Surface landmarks shift with posture, age, adiposity, and sex. Neurovascular branching patterns differ among individuals. Much of the present literature is narrative, and some proposed correlations repeat earlier opinions without independent anatomical testing.

There is also a risk of selective confirmation. A fatal classical description may appear to fit whichever important vessel lies nearby, while alternative structures are ignored. A rigorous study must specify the proposed location before dissection or imaging, record every structure within the defined volume, include independent observers, and report negative as well as positive findings.

17. Research Priorities

The first priority is a reproducible atlas of all 107 *Marma*. Classical landmarks and dimensions should be translated into a transparent surface-mapping protocol and tested for agreement among trained assessors. Cadaveric studies could then document nerves, vessels, fascia, muscles, bones, and joints at each site, including anatomical variation.

High-resolution ultrasound is well suited to superficial, living anatomy and could assess whether a proposed zone consistently overlies a neurovascular complex. Magnetic resonance imaging and three-dimensional reconstruction may be more useful for deeper regions. Researchers should define their hypotheses in advance and avoid altering a boundary after viewing the anatomy.

Clinical work could compare the pattern and severity of real injuries within and outside prespecified *Marma* zones. Educational studies could test whether an integrated map improves anatomical recall or recognition of surgical danger zones. Therapeutic research should remain separate from mapping research so that evidence for anatomical correspondence is not mistaken for evidence of treatment efficacy.

18. Conclusion

Marma Sharir is an early and clinically oriented account of anatomical vulnerability. Its distinctive contribution is to combine a surface location, dominant tissue, expected consequence of injury, and practical warning to the surgeon. Modern neurovascular anatomy uses different concepts and methods, yet it confirms the central observation that compact regions containing several essential structures can carry disproportionate risk.

Selected correlations are persuasive enough to merit careful teaching and investigation, particularly in the temporal region, neck, axilla, cubital fossa, palm, groin, and thigh. The comparison is most credible when *Marma* are treated as functional anatomical zones rather than as exact synonyms for nerves or vessels. Standardized mapping, cadaveric verification, imaging, and prospective clinical evidence are now needed to move the field beyond plausible interpretation.

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