



Anatomical Basis of *Marmas* in *Ayurveda* and Their Correlation with Modern Surgical Anatomy

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Abstract

Background: *Marma Śārīra* constitutes one of the most critical anatomical doctrines in *Ayurveda*, describing 107 vital points (*Marmas*) where structural and functional integrity of the body is crucial for survival. These points are characterized by the confluence of muscles, vessels, nerves, bones, and joints, and injury to them produces severe consequences ranging from pain and deformity to death. Modern surgical anatomy similarly recognizes vital neurovascular structures and anatomical “danger zones,” injury to which leads to catastrophic outcomes.

Aim: To critically analyze the anatomical basis of *Marmas* described in classical *Ayurvedic* literature and to correlate them with contemporary concepts of surgical anatomy and trauma science.

Materials and Methods: Classical *Ayurvedic* texts including *Sushruta Samhita*, *Charaka Samhita*, and *Ashtanga Hridaya* were reviewed along with their authoritative commentaries. Modern anatomical and surgical references such as Gray’s Anatomy and clinically oriented anatomy texts were consulted. *Marmas* were analyzed based on structural composition, regional distribution, traumatic outcome, and functional significance.

Results: *Marmas* show a remarkable correlation with modern vital anatomical structures including neurovascular bundles, organ pedicles, joints, and autonomic plexuses. *Ayurvedic* classification of *Marmas* based on tissue dominance and injury prognosis closely parallels modern trauma assessment and surgical risk stratification.

Conclusion: *Marma Śārīra* reflects an advanced and clinically oriented anatomical science. Its principles are highly relevant to modern surgical anatomy, trauma management, pain physiology, and preventive healthcare, reinforcing *Ayurveda*’s contribution to foundational anatomical knowledge.

Keywords: *Marma Śārīra*, *Ayurvedic* anatomy, vital points, surgical anatomy, trauma, neurovascular structures.

Introduction

Anatomy in *Ayurveda* is not merely descriptive but fundamentally functional and clinical. Among all anatomical doctrines, the concept of *Marma* occupies a central position, particularly in *Śalya Tantra* (*Ayurvedic* surgery). *Marmas* are defined as vital anatomical sites where injury leads to serious consequences due to the presence of multiple essential structures and concentration of *Prāṇa* (life force).

The most detailed exposition of *Marmas* is found in *Sushruta Samhita*, where *Sushruta* enumerates 107 *Marmas*¹ and emphasizes their importance in surgery, trauma, and warfare injuries. He explicitly warns surgeons to avoid these points during operative procedures, highlighting their fatal potential. Modern surgical anatomy follows a similar principle by identifying regions containing critical vessels, nerves, and organs, such as the carotid triangle, cardiac area, popliteal fossa, and skull base. Injury to these regions can result in hemorrhage, neurological deficit, or death. This conceptual similarity suggests that *Marma Śārīra* represents an early and

sophisticated understanding of applied anatomy.

Materials and Methods

Study Design

A comprehensive literary and analytical review of classical *Ayurvedic* and modern anatomical literature.

Ayurvedic Sources

- *Sushruta Samhita* – *Śārīra Sthāna* and *Cikitsā Sthāna* with *Dalhana*’s *Nibandha saṅgraha* commentary
- *Charaka Samhita* – *Śārīra Sthāna* and *Siddhi Sthāna*
- *Ashtanga Hridaya* – *Śārīra Sthāna*

Modern Sources

- Gray’s Anatomy
- Clinically oriented anatomy and surgical textbooks

Methodology

- Compilation of classical descriptions of *Marmas*

- Analysis of structural components involved in each *Marma*
- Correlation with modern anatomical structures and surgical danger zones
- Interpretation of traumatic outcomes in contemporary clinical terms

Aim

To critically analyze the anatomical basis of *Marmas* described in classical *Ayurvedic* literature and to correlate them with contemporary concepts of surgical anatomy and trauma science.

Results

1. Anatomical Composition of *Marmas* ^[1]

Ayurveda defines *Marma* as the meeting point of five fundamental structures:

- *Māmsa* (muscle) – provides bulk and movement
- *Sirā* (blood vessels) – arteries and veins responsible for circulation
- *Snāyu* (ligaments, tendons, nerves) – structural stability and neural control
- *Asthi* (bone) – skeletal support and protection
- *Sandhi* (joint) – mobility and articulation

Modern anatomy similarly recognizes that areas where multiple tissues converge are highly vulnerable to trauma, especially when vital neurovascular structures are involved.

2. Classification and Modern Correlation ^[2]

Table 1: Classification Based on Dominant Tissue

Type of <i>Marma</i>	Number	Dominant Structure	Modern Correlation	Clinical Relevance
<i>Māmsa Marma</i>	11	Muscle	Muscular Compartments	Muscular injuries, hematoma
<i>Sirā Marma</i>	41	Blood vessels	Major arteries and veins	Hemorrhage, shock
<i>Snāyu Marma</i>	27	Ligaments/ Nerves	Peripheral nerves, tendons	Paralysis, contracture
<i>Asthi Marma</i>	8	Bone	Skull base, vertebrae	Fracture, CNS injury
<i>Sandhi Marma</i>	20	Joints	Major synovial joints	Joint instability, disability

Table 2: Classification Based on Traumatic Outcome ^[3, 4]

<i>Marma</i> Type	Effect of Injury	Clinical Interpretation
<i>Sadyapraṇahara</i>	Instant death	Cardiac or brainstem injury
<i>Kālantarapraṇahara</i>	Delayed death	Secondary hemorrhage, sepsis
<i>Viśalyaghna</i>	Death after removal of foreign body	Tamponade effect
<i>Vaikalyakar</i>	Deformity	Nerve or joint damage
<i>Rujākara</i>	Severe pain	Soft tissue trauma

3. Regional Correlation with Modern Anatomy ^[5, 6]

- Hṛdaya Marma:*** Corresponds to the heart and great vessels; injury causes immediate fatality.
- Śaṅkha Marma:*** Temporal region; correlates with the middle meningeal artery.
- Nābhi Marma:*** Umbilical region; linked with mesenteric

vessels and autonomic plexuses.

- Kūrpara and Jānu Marma:*** Elbow and knee joints; resemble modern joint injury classifications leading to disability.
- Mātrikā Marma*** corresponds to major cervical vessels, similar to the carotid sheath.

Discussion

The concept of *Marma* demonstrates that ancient *Ayurvedic* surgeons possessed a profound understanding of functional anatomy, derived from clinical experience, surgical practice, and trauma observation. The idea of *Prāṇa* localized at *Marma* sites can be interpreted in modern terms as the physiological importance of neurovascular integrity and organ function.

Sushruta's insistence on avoiding *Marmas* during surgery mirrors modern principles of preserving vital structures and maintaining safe surgical planes. The prognostic classification of *Marmas* reflects an early form of trauma triage and outcome prediction, comparable to modern injury severity scoring systems.

Furthermore, contemporary practices such as *Marma* therapy may be correlated with neuromodulation, myofascial release, and trigger point therapy, suggesting avenues for integrative research ^[7].

Conclusion

Marma Śārīra represents a highly developed anatomical and surgical doctrine in *Ayurveda*. Its close correlation with modern surgical anatomy underscores its scientific validity and clinical relevance. Understanding *Marmas* enhances surgical safety, trauma management, and integrative medical education, reaffirming *Ayurveda's* enduring contribution to anatomical science.

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