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## Review study on *Asthi Sharir* (Osteology) In Ayurveda

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### Abstract

Ayurveda, the science of life, emphasizes the health of each individual. It introduces various concepts such as *Tridosha*, *Sapta Dhatu*, *Trimala*, and *Agni*, which aim to enhance human well-being. Among these, *Dhatu* are the elements that support the body and maintain equilibrium. *Asthi Dhatu*, one of the seven *Dhatu*, provides structure and support to the human body. It plays a crucial role in sustaining the body's posture through its function of "*Dharana*." A healthy state of *Asthi Dhatu* leads to strong bones. Understanding *Asthi Sharir* (bones and joints) is essential for addressing abnormalities related to these body components. According to Ayurveda, the major functions of *Asthi Sharira* include *Deha Dharana* (supporting the body), *Majja Pushti* (nourishing the marrow), and providing support to *Mamsa* (muscles) and *Snayu* (ligaments). *Asthi* plays a vital role in connecting and supporting the entire body.

**Keywords:** *Asthi Dhatu*; *Aagni*; *Deha Dharana*; *Sharira*

### 1. Introduction

*Dhatu* are the tissue humoral systems of the body. Through various permutations and combinations, *Dhatu* form different physical organs according to genetically coded information. *Asthi* is one of the seven *Dhatu* (*Sapta Dhatu*) present in the body (*Sharira*). The form of *Dhatu* located within *Mamsa Dhatu* (muscle tissue) is known as *Asthi* (bone tissue). These *Dhatu* are always formed in a fixed sequence. Galen's teachings clearly highlight the importance of understanding bones, as they form the foundation of the body, with all other parts relying on and being supported by this primary base. As we know, the entire world can be categorized into two types of materials: soft and hard. Although these are opposites, both are essential for sustainability. This division is also evident in the human body, where some parts are soft organs and others are hard structures. The hard part of the body is the skeletal system, which provides support, shape, and protection to the soft organs. It includes components like bones and teeth, which collectively form the framework that supports movement and protects vital organs, acting as the hard shell of the human body.

The formation of *Dhatu* occurs in the following sequence: *Rasa*, *Rakta*, *Mamsa*, *Meda*, *Asthi*, *Majja*, and *Sukra*. Among the seven *Dhatu*, *Asthi Dhatu* corresponds to bone tissue in the body and is formed from *Meda Dhatu*. Its primary function is to support the body's framework, providing stability and forming the skeleton. *Asthi* is often referred to as the essence of the body, as it endures even after the destruction of all other body components. In nature, trees are supported by solid stems, just as the human body is supported by strong bones. All muscles, tendons, and ligaments are attached to *Asthi* (bones), which provide support to these structures and shape our body.

### 2. Etymology of *Asthi Dhatu*

The word "*Asthi*" is derived from the combination of two Sanskrit words: "*As*" and "*Kthin*." Together, they form the word "*Asthi*," which signifies stability.

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## 2.1. Nirukti

Just as trees stand upright with the support of their inner hard core called "Sara," humans stand with the help of their inner hard core known as "Asthi."

## 2.2. Asthi Definition

*Asthi* is that which resides within *Mamsa* (muscle). In practice, we observe that (bones) *Asthi* are encased by layers of muscle. *Asthi* is considered a *Pitruja Avayava*, meaning a paternal organ or a part of the body derived from the father (*shonita*). All hard structures are said to be *Pitruja*. *Asthi* is predominantly composed of the *Prithvi* (earth) *Mahabhuta*, one of the primary elements of creation. Other elements—wind, fire, water, and space—are also present but in a latent and recessive form. The function of *Asthi* is primarily "*Dharana*," which refers to supporting or adorning the body. It is clear that bones form the structural framework of the body. Among the *Tridosha* (the three fundamental physiological components of the body), *Vata* is said to reside in the *Asthi* (bones). *Asthi* is an important seat of *Vata*. When *Vata* increases, *Asthi* mass decreases *Asthi Kshaya*, as seen in conditions like osteoporosis and osteopenia. Conversely, when *Vata* pathologically decreases, bone tissue tends to increase *Asthi Vriddhi*.

## 2.3. Synonyms of Asthi Dhatu

Following synonyms are used for –

- *Kikasam*: Round structures.
- *Kulyam*: Tubular or canal like structure.
- *Svadayitam*: Animals like dogs like it.
- *Medasteja*: Essence of *Meda Dhatu*.
- *Sara*: Extract of body which remains even after death.
- *Majjakrit*: Which produces *Majja Dhatu*.
- *Dehadharakam*: This maintains body skeleton and bears body weight.
- *Karkaram*: Rough

*Asthi Karma - Deha Dharana.*

*Majja Pushti Asthi* support the *Mamsa, Sira and Snayu*.

*Asthi Upadhatu* : The *upadhatu* of *Asthi* is *Danta* (teeth).

*Asthi Mala - Kesha, Loma, Nakha, Roma.*

*Asthi Sankhya* (Classification of Bones) :

According to Ayurveda *Asthi* are 5 types –

*Ruchaka Asthi* - Teeth - the teeth are classified under *Ruchaka Asthi*.

*Kapala Asthi* - Flat bones. - the bones of *Shira* (head), *Shankha* (temple region), *Talu* (palate, upper part of oral cavity),

*Kapala* (cranial vault), *Amsa* (scapula region, shoulder blade) and *Janu* (knee) are classified under *Kapala Asthi*.

*Nalaka Asthi* - Long bones. Long bones present in *Hasta Tala* (plantar region), *Pada Tala*

(plantar or lower portion of foot),

*Kurcha - Manibandha* (wrist joints), *Anguli* (fingers and toes), *Arms (Bahu), Jangha Dvaya*

(both legs) are classified in *Nalaka Asthi*.

- *Taruna Asthi* - cartilages. The cartilages found in the region of *Akshiksha* (orbital sac, eye socket), *Sruti* (auditory apparatus, ear canal), *Ghrana* (nasal cavity or passages, olfactory region) and *Greeva* classified under *Taruna Asthi*.

- *Valaya Asthi* - curved Bones. - curved bones situated in the *Pani* (hand), *Pada* (foot), *Yuga* (Sides of trunk, ribs), *Payu* (anal region, butt), *Vaksha* (chest, ribs), *Prushta* (back vertebrae).

### 3. Effect of Trauma on *Asthi Dhatu*

The bones sustain trauma in different ways. *Acharya Susruta* has paid due attention to this fact and observed that all the bones do not show similar type of effect due to trauma.

- *Tarunasthi* (Cartilage) – Bend
- *Nalkasthi* (Long bones) – Break
- *Kapalasthi* (Flat bones) – Crack
- *Ruchkasthi* (Teeth) – Fragmented
- *Valayasthi* (Curved bones) - Crack or Break

**Table 1** Number of *Asthi*

<b>Samhita</b>	<b>Numbers</b>
<i>Sushruta Samhita</i>	300
<i>Charaka Samhita</i>	360
<i>Ashtaang Sangraha</i>	360
<i>Ashtaang hridaya</i>	360
<i>Bhela Samhita</i>	360
<i>kashyap Samhita</i>	360
<i>Bhavprakasha</i>	300

#### 3.1. *Asthi Poshana and Utpatti*

*Chakrapani* explains that each *Dhatu* is formed sequentially through digestion by its specific *Agni Rasa*, when digested by *Rasagni*, is converted into *Rakta*; similarly, *Rakta*, when digested by *Raktagni*, is converted into *Mamsa*. Each *Dhatu* is transformed into the subsequent one. As stated by *Acharya Charaka* in *Chikitsa Sthana*, after *Rasa*, *Rakta* is formed; from *Rakta*, *Mamsa* is formed; from *Mamsa*, *Meda* is formed; from *Meda*, *Asthi* is formed; from *Asthi*, *Majja* is formed; and from *Majja*, *Shukra Dhatu* is formed, which under suitable conditions develops into *Garbha* (embryo). *Asthidhatwagni* acts on the *Prithvi* (earth), *Agni* (fire), and *Vata* (air) predominant portions of nutrients derived from *Ahararasa* (digested food), digesting these elements to solidify *Medodhatu* (fat tissue), thereby generating *Asthidhatu* (bone tissue).

- According to *Kashyap* - *Asthi* and *Mamsa* of embryo are develop from this *Sukra* and from these 2 *Snayu* are develop in first 2 month of foetal development.

#### 3.2. *Asthidhara Kala*

*Purisha Dhara Kala* is the fifth *Kala*, located in the large intestine, known as *Pakvashaya*. Its function is to separate the constituents of *Kitta* (waste products) in the colon. The *Vayu* produced in *Pakvashaya* is known as *Poshaka Vayu*, which nourishes the *Poshya Vayu* of the body. Both *Pakvashaya* and *Asthi* are primary seats of *Vata Dosha*. Changes in *Vata* formation and function affect all sites of *Vata*, particularly *Asthi Dhatu*. Therefore, *Purisha Dhara Kala* is closely related to *Asthi Dhara Kala*.

#### 3.3. *Mahabhut Pradhanya*

Although every substance is composed of all five *Mahabhuta* (*Akasha*, *Vayu*, *Agni*, *Jala*, and *Prithvi*), *Asthi* predominantly features *Prithvi* (earth) and *Vayu* (air) *Mahabhuta*. Consequently, *Asthi Dhatu* exhibits the dominant qualities of these two elements. Due to the influence of *Prithvi Mahabhuta*, *Asthi* is strong and heavy, while the influence of *Vayu Mahabhuta* makes *Asthi* dry and rough. Together, these *Mahabhuta* contribute to the characteristic qualities of toughness, roughness, dryness, and hardness in *Asthi Dhatu* primarily consists of *Prithvi* (earth), *Agni* (fire), and *Vayu* (air) in its constitution

- *Sthan of Asthi Dhatu: All bones, Asthivaha strotas, Asthidhara kala.*

#### 4. Time Span

The *Asthi Dhatu* is formed on 6th day from the *Ahara Rasa* (nutrient fluid). However, *Sushruta* opines that the *Asthi Dhatu* is formed in a time span of twenty days.

##### 4.1. Ashraya Aashrayi Bhava of Asthi

*Vata* resides in *Asthi*. Typically, changes in *Ahara* (diet), *Vihara* (lifestyle), or *Aushadha* (medicines) affect the corresponding *Dhatu* (tissue) and *Mala* (waste products). However, the relationship between *Vata* and *Asthi* is unique. When *Vata* increases, *Asthi* decreases, and vice versa.

*Asthivaha Strotas: Asthivaha Strotas* is mentioned only by *Charaka* and *Vagbhata*. *Acharya Charaka* describes its *Mulasthan* (root location), *Dushti Karana* (causes of disturbance), and *Dushti Lakshana* (symptoms of disturbance). *Acharya Sushruta* does not include *Asthivaha Strotas* in his list, likely due to his focus on anatomical structures and his description of *Mula Viddhi Lakshana* (indications of injury) related to surgical procedures. *Strotas* refer to the channels or tracts within the body that facilitate the circulation of nutrients, waste products, and doshas during metabolism. They ensure that these products reach their intended destinations and transport *Dhatu* that are undergoing transformation. *Strotas* play a crucial role in moving converted products from *Prakopa* (aggravation) and *Shamak Aahara* (pacifying food) throughout the human body. .

##### 4.2. Asthivaha Strotas Mula:

According to *Acharya Charaka*, *Medo Dhatu*, *Jaghana*, and *Asthi Sandhi* are key elements. In *Ashtanga Hridaya*, *Medo Dhatu* and *Jaghana* are mentioned. The *Dushti Lakshana* (symptoms of disturbance) of *Asthivaha Strotas* include *Abhidanta* (tooth decay), *Dantabheda* (tooth fractures), *Dantashula* (toothache), *Ashtishula* (bone pain), *Adhyasthi* (bone swelling), *Danta Vivaranta* (tooth gaps), and diseases of the hair and nails.

- *Asthivaha Strotas Dushti Karana* - Trauma, Excessive exercise, Excessive Stretching, *Vata Dosha Pradhaan Aahara Vihara*.

##### 4.3. Asthi Pradoshaja Vikar

*Adhyasthi*, *Adhi Danta*, *Danta Bheda*, *Asthibheda*, *Danta Shula*, *Asthisula*, *Asthi Toda*, *Vivarnata*, *Kesha Loma Dosha*, *Shamshru Doshaah* and *Kunakha* .

##### 4.4. Asthi Marma

In Chapter Six of *Sushruta Samhita*, *Marma* points are described in great detail. There are a total of 107 *Marma*, a number that is consistent across all *Samhita*. *Sushruta* emphasizes that surgeons must exercise great care during operations to avoid these critical points. According to anatomical classification, *Marma* are divided into five categories:

**Table 2** Asthi Marma

Sira Marma - 41
Asthi Marma - 8
Sandhi Marma - 20
Mamsa Marma - 11
Snayu Marma - 27.

*Asthi Marma* includes, *Katikataruna*, *Nitamba*, *Amsaphalaka* and *Sankha*.

##### 4.5. Katikataruna

- Location: Situated in the back; "*Kati*" means waist, and "*Taruna*" refers to cartilage.
- Number: 2
- Type: *Pristha*, *Asthi*, and *Kalantarapranahara Marma*
- Size: Half-finger breadth

- Anatomy: Located near the upper margin of the pelvic bone, a few centimeters from the lumbosacral joints. The underlying structures include the iliac bone, iliac artery, and the sacroiliac joint and ligaments.
- On Injury: Hemorrhage and potential death

#### 4.6. Nitamba

- Location: Refers to the sciatic nerve cord before it enters the femoral region.
- Type: *Pristha*, *Asthi*, and *Kalantarapranahara Marma*
- Size: Half-finger breadth
- Anatomy: Located above the pelvic crest, encompassing the pelvis and the united flanks, known collectively as *Nitamba Marma*. It is situated halfway between the sacral bone and the greater trochanter of the femur.
- On Injury: Edema and weakness in the legs

#### 4.7. Amsaphalaka

- Location: Refers to the scapular blade.
- Type: *Pristha*, *Asthi*, and *Vaikalyakara Marma*
- Size: Half-finger breadth
- Anatomy: Found at the upper medial edge of the scapular blade. This area is crucial due to the nerve and vascular supply beneath it, including the thoracocervical nerve fibers that supply the scapular muscles and reach the brachial plexus.
- On Injury: Disfigurement of the upper limb

#### 4.8. Sankha

- Location: Refers to the anatomical temporal bone.
- Type: *Sira*, *Asthi*, and *Sadyah Pranahara Marma*
- Size: Half-finger breadth
- Anatomy: Located between the parietal, frontal, and maxillary portions of the skull. Beneath it lies the temporal lobe of the cortex and its arterial branches.
- Location: Above the end of the eyebrow and between the ear and forehead
- On Injury: Death

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## 5. Clinical Importance of *Asthi Dhatu*

### 5.1. *Asthisaar Purusha*

An individual with *Asthisara* has large and sturdy bones, including those of the heel, ankle, knee, forearm, scapula, chin, head, and the joints of the fingers, as well as the bones, nails, and teeth. Such individuals are typically enthusiastic, active, capable of enduring strain, and possess robust and long-lasting bodies. They tend to live long lives.

### 5.2. Diseases of *Asthi Dhatu*

*Asthi Kshaya* and *Asthivridhi Lakshana* are considered under *Asthyashraya Vyadhi*

### 5.3. *Asthi vrudhi*

Due to increase in *Asthi Dhatu* bones are deposited on bones, teeth are deposited on teeth.

### 5.4. *Asthi kshaya*

Due to waning of *Asthi Dhatu* severe pain in bones, brittleness of teeth and nails along with dryness.

### 5.5. Functions of *Asthi Dhatu*

*Asthi Dhatu* is responsible for appropriate posture of the body. It also nourishes next *Dhatu* namely *Majja Dhatu*.

### 5.6. Features of *Asthi Dhatu* in *Vata Prakriti*

Crepitus produced in joints during movements in *Vata Prakriti* due to excessive dryness is a feature of *Vata-Prakriti*.

### 5.7. Features of *Asthi Dhatu* in *Pitta Prakriti*

- *Pitta* is *Drava* hence joints in *Pitta-Prakriti* are very soft due to excessive *Dravatva*.
- Features of *Asthi Dhatu* in *Kapha Prakriti* Due to excess viscosity, bony joints in *Kapha Prakriti* are very strong

## 6. Discussion and Conclusion

*Asthi* refers to bone, which provides the body with its solid structure. In Ayurveda, *Dhatu* refers to tissue. The seven *Dhatu* are *Rasa*, *Rakta*, *Mamsa*, *Meda*, *Asthi*, *Majja*, and *Shukra*. Anatomically, these correspond to plasma, blood, muscle, fat (adipose tissue), bone, bone marrow, and seminal fluid. A basic understanding of *Dhatu* is essential for grasping the underlying pathology of diseases. These seven *Dhatu* play a crucial role in the development of any illness and also in maintaining the body's immunity. The *Saptadhatu* are composed of the *Panchmahabhoota* (five great elements). Any imbalance in the equilibrium of these *Dhatu* can lead to specific diseases. For example, a decrease in *Asthi Dhatu* (*Asthi Dhatu Kshaya*) results in increased pain symptoms (*Vedana Lakshana*), which modern science identifies as osteoarthritis. *Asthi Dhatu* follows *Meda Dhatu* in the sequence of *Dhatu* formation. Understanding *Asthi Dhatu* through existing literature is valuable for studying bones anatomically and for treating disorders related to *Asthi Dhatu* and their clinical manifestations.

Ayurveda places significant emphasis on *Asthi Sharira*, considering it as the core (*Saara*) of the body in classical texts. *Asthi Sharira* is responsible for various bodily functions, including *Majja Pushti* (nourishment of bone marrow), *Deha Dharana* (supporting the body), and providing strength and rigidity to the body. It also supports other body parts such as *Mamsa* (muscle) and *Snayu* (ligaments). Different types of *Asthi* include *Kapala*, *Valaya*, *Taruna*, *Nalika*, and *Ruchaka*, which are found in various parts of the body. Similarly, Ayurveda describes *Sandhi Sharira* as the junction where two or more structures meet. Various types of *Sandhi* are found in different regions of the body and are classified based on their structure as *Kora*, *Samudga*, *Ulukhala*, *Pratara*, *Vayasatunda*, *Tunnasevani*, *Mandala*, and *Shankhavarta*. *Sandhi* connects tissues and is responsible for mobility and flexibility.

## Compliance with ethical standards

### Disclosure of conflict of interest

I hereby declare that there are no conflicts of interest to disclose.

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