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Concept of Asthi Dhatu w.s.r. to Sharirkriya - A Review Article

Upesh M.Likhar*

*Faculty of Ayurveda Science, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan, India

ABSTRACT

Asthi, one amongst the seven *dhatu*s, is blessed with the function of *sharira dharana*, providing shape to the body and protecting the vital organs. The state of equilibrium of *dhatu*s is health and its disturbance is termed as disease. This disequilibrium may either be *vriddhi* (increase-qualitative or quantitative) or *kshaya* (decrease-qualitative or quantitative). Understanding *dhatu* is important to understand the underlying pathology of disease. We find many people today suffering from bone disorders which has hampered their living. It is necessary to understand the normal *Asthi dhatu* to get the knowledge of its abnormality. A healthy *Asthi dhatu* leads to strong bones capable of carrying us through our lifetime.

KEYWORDS

Asthi dhatu, Health, Asthi-kshaya, Bone disorders



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INTRODUCTION

Ayurveda, a science of life described in Atharvaveda, is considered as only and foremost ancient Indian system of medicine. The whole physiology of Ayurveda is based on achieving maintaining and promoting positive health. The equilibrium of various structural and functional units of the body named as *Doshas*, *Dhatu*, *Mala* and *Agni* result in health and disequilibrium causes diseases¹. The function of *dhatu* is *dharana*. *Asthi* is blessed with the function of *sharira dharana* which gives shape to the body and protects the vital organ. Without *Asthi*, human body would have just been an amorphous bolus of soft tissue. Hence, *Asthi dhatu* can precisely be termed as the framework on which man can stand tall. The state of equilibrium of *dhatu*s is health and its disturbance is termed as disease. This disequilibrium may either be *vridhhi* (increase-qualitative or quantitative) or *kshaya* (decrease-qualitative or quantitative). Generally bones are considered as *Asthi*. There are two types of *dhatu* i.e. *sthayi* and *poshaka dhatu*. *Asthi* or bone can be considered as *sthayi dhatu* and not whole *Asthi dhatu*. Chakrapani commenting on charaka vimanasthana 5/8 mentioned that *Asthi dhatu* is in liquid form called *Poshaka Asthi dhatu* that

flows through *Asthivaha strotas* and nourishes *sthayi Asthi dhatu*. Recent researches predict that the osseous tissue can be taken as *sthayi Asthi dhatu* and the nutrients that are responsible for nourishment of bone tissue such as calcium, phosphorus, magnesium, etc, can be considered as the *poshaka Asthi dhatu*.

Basic understanding of *dhatu* is vital to understand the underlying pathology of disease. We find many people today suffering from bone disorders which has hampered their living. It is necessary to understand the normal *Asthi dhatu* to get the knowledge of its abnormality.

Just as plants are supported by solid and strong stem, the strong bones support the human body.

AIMS AND OBJECTIVES

1. To re-evaluate and elaborate the various Ayurvedic concepts related to *Asthi dhatu*.
2. To compare and evaluate literary data available on *Asthi dhatu*.

STUDY TYPE

It is a conceptual literary search.

MATERIALS AND METHODS

Ayurvedic texts, mainly *Charak Samhita*, *Sushrut Samhita*, *Ashtang Hridaya*, *Ashtang Sangraha*, *Sharangdhara*

Samhita, and their commentaries, Modern physiology textbooks, websites and articles related to the topic were reviewed to collect the literary material. The compiled data was compared and presented to explore the knowledge of *Asthi dhatu* and conclusions were drawn at the end of study.

LITERARY REVIEW

Asthi is the hard substance, which is present inside the soft *Mamsa dhatu*².

As tree stand with the help of inner hard core or *sara*, human being also stands with the help of inner hard core named *Asthi*. It is the hardest *dhatu* of the body. *Medoj*, *medateja*, *majjakruta*, *dehadharakam*, *kulya*, *kikasa*, *shwadayitam*, *bharadwaja* and *sara* are the synonyms of *Asthi dhatu*.

Panchabhautik constitution of Asthi dhatu

Prithvi and *vayu mahabhoot* are predominant in *Asthi dhatu*.

Sthiratva (stability), *kathinta* (hardness), *chirasthayita* (durability), *gurutva* (heaviness) and *ghanatva* (density) are the attributes contributed by *prithvi mahabhoot* to *Asthi dhatu*. *Vayu* creates sinuses (cavities) in bones with the assistance of *akasha mahabhoot*.

Utpatti and Poshana of Asthi Dhatu

Formation of *Asthi dhatu* takes place in the early embryonic stage i.e. in *garbhavastha* and after birth, it is nourished by *ahararasa*. *Asthidhatvagni* transforms nutrients of *Asthi* present in *ahararasa* in *Asthivahastrotas* into *poshya Asthi dhatu* and *mala* of *Asthi dhatu*. Dalahana has explained *trividha dhatu poshan* of *dhatu*s. Under the control of *Asthidhatvagni*, three constituents are formed in the metabolism of *Asthi dhatu*- 1. *Sthoola Asthidhatu* or *poshya Asthi*, 2. *Asthi mala* and 3. Precursor of *Majjadhatu* or *sukshma majja*.

Asthidhatu gets nourished by *Meda dhatu*³. There are innumerable products which nourish *Asthi dhatu*, like *Godhuma*, *dugdha*, *ghrita*, etc which are *snigdha* in quality. *Ruksha*, *kathin* products are also termed as *Asthi dhatu poshak*, but these *poshakansha* are carried to *poshak Asthi dhatu* with the help of *snigdha* attribute of *Meda dhatu*. For example-Calcium is the main nutrient of *Asthi* or bone. But absorption of calcium is possible only in presence of Vitamin D. Vitamin D is a Fat soluble vitamin. It is synthesized dermally from cholesterol on sun exposure.

Panchabhautikagni also plays role in synthesis of *Asthi dhatu*. *Agni* of predominant *mahabhoot* of *Asthi dhatu*, viz., *prithvi* and *vayu*, modifies the constituents of *prithvi* and *vayu*

mahabhoot in *ahara* and *ahararasa* and makes it similar with *prithvi* and *vayu mahabhoot* in *Asthi dhatu* and nourishes the *Asthi dhatu*.

Pareenati kala of Asthi dhatu

According to Parashara- *Asthi dhatu* gets nourished on 6th day⁴.

According to Sushruta - *Asthi* gets nourished on 20th day (*Ahararasa* stays in every *dhatu* for 3015 *kala* or 5 days)⁵.

According to Charaka- the entire process of nourishment of *dhatu*s take place in cyclic and continuous manner. Hence one cannot predict the definite time of nourishment for every *dhatu*⁶.

Sthana of Asthi dhatu

As it is one of the seven *dhatu*s, it should be present in entire body. It may be present in large quantity in some places and may be functioning specifically in context to some organs. Such places are the location of this *dhatu*.

Location of *Asthi dhatu* is in *Asthivaha srotas* as well as in all the body organs directed in *Asthi-sara* individuals.

Mulasthanas of *Asthivaha srotas* are principles organs as far as *Asthi dhatu* is concerned. For this reason they have to be included in location of *Asthi dhatu*. *Meda* and *Jaghana* (bones of pelvic girdle) are the *mulasthanas* of *Asthivaha srotas*. *Asthi dhatu* gets nourished by *Medadhātu*. Bones of pelvic girdle serve as functional

root of *Asthivaha srotas*. It is the strongest and is situated in the middle of body. It is in contact with Lower limb and vertebra. Also, it is the site of treatment called *Basti*, which is considered as line of treatment of *Asthivikara*.

Upadhātu of Asthi dhatu

According to Sharangdhara- *Danta* are the *upadhātu* or secondary tissue of *Asthi dhatu*⁷.

According to Sushruta- *Danta* are considered as one of the type of *Asthi dhatu* named *Ruchakasthi*.

Most patients are not diagnosed with osteoporosis until their bone density has decreased to the point that a major fracture occurs. However, people with low bone mass may experience oral health problems that can detect and recognize as the first stages of osteoporosis. Signs that alert possibility of osteoporosis are tooth loss, loose or ill-fitting dentures, gum disease, etc.

Mala of Asthi dhatu

Kesha (hairs) and *nakha* (nails) are the *mala* i.e waste products of *Asthi dhatu*⁸.

***Asthidhara Kala*⁹**

According to Dalhana, *Purishdharakala* and *Asthidharakala* are the same.

Functional Similarities between these two can be understood as - both are the sites of *Vata dosha*; Continuous diarrhoea affects bone development in children;

Manifestations of symptoms related to vitiated faeces occur while there is primary eruption of teeth in children; *Basti chikitsa* is the line of treatment of *Asthi* disorders and root of administration of *Basti* is *Pakvashaya*; In *Asthi vikruti* there is manifestation of symptoms related to *Purishvahastrotas vikruti*. For example - *malavashthambha*, *grahani* etc.

Karya of Asthi dhatu¹⁰

Dehadharanam - *Dehadharanam* function of *Asthi dhatu* includes *samrakshana*, *avalamban* and *nibandhan*. *Samrakshana*, i.e protection of soft organs like *mastishka*, *hridaya*, *phupphusa*, etc, *Avalamban*, i.e to keep body stand upright maintaining erect position of the body; *Nibandhan*, means Soft body constituents like *mamsa* and *sira* remain organized around *Asthi*. *Snayu* binds *mamsapeshi* with *Asthi* and prevents them from falling. Co-ordination of *Asthi*, *mamsa* and *sira* is important for proper body movements. It stays in body for longer period and is not degraded easily, hence provides support to the body with its *sthira* and *kathin* properties.

Majjakrita - *Asthi dhatu* encloses *majja dhatu* and controls quantity of *majja dhatu*. Hence *majja poshana* is the function of *Asthi dhatu*.

Mala poshana - To keep *kesha*, *nakha*, *loma*, etc *mala* of *Asthi dhatu* in

prakrutavastha and their nourishment is also the function of *Asthi dhatu*.

Asthi vriddhi lakshana

Adhyasthi (extra pointed bone growth over bone or calcification) and *adhidanta* (growth of extra teeth or hyperdontia) are the symptoms of increased state of *Asthi dhatu* or *Asthi vriddhi*¹¹

There are several diseases that cause excessive bone growth.

1. Acromegaly - It is a hormonal disorder caused by hyper secretion of growth hormone which is secreted by anterior pituitary gland. Abnormal growth of a person's hands and feet, protrusion of jaw, big nasal bone, spaced-out teeth etc. are the symptoms of acromegaly.
2. Paget's disease - Is a chronic condition that can cause bone enlargement and misshapen bones. The disease is often localized, affecting one or several bones. Most often occurs in a person's spine, pelvis, legs or skull.
3. Melorheostosis - Is a progressive disorder that involves hyperostosis or thickening of cortical bone.

Asthi kshaya lakshana

Asthishool (joint and bone pain), *nakhabhang* (brittle and easily breakable nails), *dantabhang* (weak, loose teeth which can easily fall off), *kasha-loma-shmashru patana* (loss of hairs of scalp, skin and beard), *dwija patana* (loss of

teeth), *shrama* (exertion) and *sandhishaitilya* (loosening of joints) are the symptoms of *Asthi kshaya*.

Asthi dhatu sarata

According to Charaka, heels (*parshi*), ankles (*gulpha*), knees (*janu*), forearm (*aratni*), collarbones (*jatru*), chin (*chibuk*), digits (*parva*), bones (*asthi*), nails (*nakha*), teeth (*danta*) of *Asthi sara* individuals are robust or big. *Asthi sara* individuals are very enthusiastic or energetic (*Mahotsaha*). *Asthi sarata* provides endurance to the individual (*kleshasaha*). *Asthi sara* individuals have well built (*sara sthira sharira*). *Asthi sara* individuals are very active (*kriyawanta*). They always keep themselves busy in doing work. Because of enthusiastic nature, activeness, endurance and strong-steady body, *Asthi sara* individuals live long life (*Ayushmanta*)¹³.

According to Sushruta, *Asthi sara* person is known to possess big head and shoulders (*Mahashira-skandha*). Teeth (*danta*), bone of chin (*hanvasthi*), nails (*nakha*) and bones (*asthi*) of *Asthi sara* individuals always remain replenished and doesn't worn out easily (*dridha-danta-hanuasthi-nakha-asthi*)¹⁴.

Asthivaha srotas dushti hetu¹⁵

Intake of food causes aggravation of *Vata* like excessive intake of dry vegetables, dry meat, pungent, bitter, astringent

substances, dry, light, cold, rough, porous substances, alcohol having dry property, improperly cooked food, fasting, dieting and having limited food, irregular dietary habits and eating in excess quantity. Excess of fighting with stronger person, exercise (walking/ running/ jumping/ swimming), lifting heavy weights, falling from fast moving vehicle, sexual intercourse, waking at nights, exposure to wind and sunlight, suppression of natural urges and using uneven seats and beds, trauma and injury. All these factors are responsible for vitiation of *Asthivaha srotas*.

Ashrayashrayee sambandha between Vata dosha and Asthi dhatu

Mahabhoot predominance of *Vata dosha* is *vayu* and *akasha*, whereas that of *Asthi dhatu* is *prithvi* and *vayu*. *Vayu mahabhoot* is common in both. Also *akash mahabhoot* is present in bones in the form of sinuses or cavities. Therefore any alteration in volume of these two *mahabhoot* leads to imbalance in *mahabhoot* constitution of *Asthi dhatu*.

Vata dosha and *Asthi dhatu* are reciprocal to each other. In *Vata vriddhi* i.e. increased state of *Vata dosha* causes osteopenia leading to *Asthi kshaya*, and *Vata kshaya* i.e. decreased state of *Vata* leads to *Asthi vriddhi*. *Asthi kshaya* due to *Vata vriddhi*

is seen more commonly than *Asthi vriddhi* because of *Vata kshaya*.

DISCUSSION

Ayurveda is a complete life science which includes prevention as well as cure. Ayurveda focuses to avoid diseases, recurrence of disease as well as its cure it from base. Therefore, Ayurveda has mentioned detailed physiology of *Asthi dhatu* which gives various aspects that are mentioned in modern science.

As per collected data, some conditions are discussed here on the classical base. When the *medadhatu* undergoes a refining then it is known as *Asthi dhatu*. The *Asthi dhatu* is mainly concerned with the basic structure to the human body. *Asthi dhatu* includes all the cartilaginous components in the human body. Macronutrients in *medadhatu* give nourishment to the *Asthi dhatu*, by undergoing processing in *Asthivaha srotas* by *dhatwagni*. *Dhatvagni* and *bhutagni* both bring heaviness and hardness to ground substance which constitutes the bone.

Physically, *Asthidhatu* is formed in an unstable form when *medodhatu* flows into the *Purishdharakala* and is digested by *Asthi-agni*. In addition to *Asthi* formation, the secondary tissue i.e. *upadhatu* of *Asthi*, *danta* (teeth) are formed. The *malas* of this metabolic pathway are *kesha* and *nakha*.

Just as the plants are supported by solid and strong stems, the strong bones support the human body. The muscles, tendons and ligaments are attached to bones and constitute extra-articular apparatus. Bones supports muscle, tendons and ligaments and gives shape to our body.

CONCLUSION

After collecting literary data, it was observed that in all the texts *Asthi dhatu* is described in one and same direction with few dissimilarities. Since birth to death, structure of *Asthi dhatu* remains unchanged because of its dominance in *prithvi mahabhoot* and stability. Alterations in *Asthi dhatu* are concerned to its *laghuta-guruta* (lightness-heaviness), *ghanatva-riktata* (density -vacuity) and *drithta-bhangurta* (tenacity-brittleness), but its form remain unchanged. *Asthi kshaya* has been explained in Ayurvedic system of medicine under *Ashtadasha kshayas*. In *Asthi kshaya*, there is decrease in *Asthi dhatu* content. Similar to *Asthi kshaya*, a disease condition called Osteoporosis, has been described in Allopathic system of medicine. Brittle bones result decrease in the bone tissues and increased risk of fractures. According to the concept of *Ashraya-ashrayee bhava*, *Asthi* is the seat of the biological air i.e. *Vata dosha*. There is an inversely

proportional relationship between *Asthi* and *Vata* regarding decrease and increase. If there is an increase in *Vata*, there is decrease of *Asthi*. Healing the *Asthi dhatu* means restoring the proper quantity and quality of *prithvi* and *Vata* in the body and normalizing their flow in body.

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