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

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ABSTRACT
Asthi, one amongst the seven dhatus, is blessed with the function of sharira dharana, providing shape to the body and protecting the vital organs. The state of equilibrium of dhatus is health and its disturbance is termed as disease. This disequilibrium may either be vridhi (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
INTRODUCTION

Ayurveda, a science of life described in Atharva Veda, 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 diseases. 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 dhatus 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). 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 Mansa dhatu. 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 dhatus. 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. 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.
mahabhooth in ahara and ahararasa and makes it similar with prithvi and vayu mahabhooth in Asthi dhatu and nourishes the Asthi dhatu.

Pareenati kala of Asthi dhatu
According to Parashara- Asthi dhatu gets nourished on 6th day.
According to Sushruta - Asthi gets nourished on 20th day (Ahararasa stays in every dhatu for 3015 kala or 5 days).
According to Charaka- the entire process of nourishment of dhatus take place in cyclic and continuous manner. Hence one cannot predict the definite time of nourishment for every dhatu.

Sthana of Asthi dhatu
As it is one of the seven dhatus, 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 srtotas as well as in all the body organs directed in Asthi-sara individuals.
Mulasthan of Asthivaha strotas 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 mulasthan of Asthivaha strotas. Asthi dhatu gets nourished by Medadhatus. Bones of pelvic girdle serve as functional root of Asthivaha strotas. 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.

Upadhatu of Asthi dhatu
According to Sharangdhara- Danta are the upadhatu or secondary tissue of Asthi dhatu.
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.

Asthidhara Kala- 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 - malavashtkambha, grahani etc.

**Karya of Asthi dhatu**

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 vridhitha. 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-lomashmarshru patana (loss of hairs of scalp, skin and beard), dwija patana (loss of
teeth), *shrama* (exertion) and *sandhishaithilya* (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 hetu**¹⁵

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 vridhi 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 Ashivaha srotas by dhatwagni. Dhatwagni 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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