ABSTRACT:

Ayurveda postulates the unique principals of Tridosha, Dhatu, and Mala for homeostasis of the body. Dhatu nourishes the body, supply nutrients to other vital tissue, supports the body and keeps the body healthy. During formation of Asthi Dhatu or Bone, Vata creates spaces in bones. These spaces are filled with nourishing tissues of Medas or fat which is known as Majja or Bone marrow. Majja Dhatu is the second last Dhatu formed as - unstable (poshaka) Asthi Dhatu flows through the Majja Vaha Srotas into the Majja Dhara Kala and is digested by the Majjagni. Majja Dhatu nourishes body, strengthens body, fills bones and nourishes Shukra Dhatu.

When Majja Kshaya takes place due to disturbed equilibrium of Tridosha then Asthi Dhatu is most affected, because Asthipuranam is done by Majja Dhatu. Asthi Saushirya, Asthi Daurbalya, Asthi Laghuta, Asthi Nistoda, Pratam Vata Roga, Alapshukrata, Bhrama, Timir Darshnam etc. occur in Majja Kshaya. The symptoms of Majja Kshaya can be correlated in Modern Science with osteoporosis, vertigo, hollowness and lightness in bones and oligospermia etc. The management of Asthi-Majja related diseases is unique because of the Ashrayaashrayi relationship of Vata Dosha and Asthi Dhatu which is fundamental base to understand any pathological condition related to Majja Dhatu. Thus this review study gives complete glimpse of knowledge about every aspect of Majja Dhatu and its vitiation effects described in Classical texts.

Key words: Majja Dhatu, Majja Kshaya, Majjavaha Srotas, Majja Upatti, Osteoporosis

INTRODUCTION: Ayurveda postulates the unique principals of Tridosha, Dhatu and Mala for homeostasis of the body. In Samyavastha the Tridosha regulate all physiological functions of the body. Only Vata is capable of mobility and its force keeps the other two Dosha, Dhatu and Mala in motion. Dhatu nourishes the body, supply nutrients to other vital tissue, supports the body and keeps the body healthy. According to Acharya Susruta & Vagbhata there are seven Dhatu’s in body- Rasa (lymph), Rakta (blood), Maamsa (muscles), Medas (fat or adipose tissues), Asthi (bone), Majja (bone marrow), Sukra (semen, sex hormone). Majja Dhatu is the second last Dhatu formed as - unstable (poshaka) Asthi Dhatu flows through the Majja Vaha Srotas into the Majjas Dhara Kala and is digested by the Majjagni. During formation of Asthi Dhatu or Bone, Vata creates spaces in bones. These spaces are filled with nourishing tissues of Medas or fat which is known as Majja or Bone marrow as mentioned by Acharya Charaka. The final essence of the Asthi Dhatu which is a semisolid substance becomes Majja in the
process of metabolism. Majja Dhatu nourishes body, strengthens body, fills bones and nourishes Shukra Dhatu as described below by Acharya Sushruta. [5] For a healthy body it is important that these Dosha, Dhatu and Mala should remain in Samyavastha. Due to Pragyaparadha, Asatmyendriyarth Samyoga and Parinama, the equilibrium of Doshas, Dhatus and Malas is disturbed and homeostasis in the body is altered. When Majja Kshaya takes place due to disturbed equilibrium of Tridosha then Asthi Dhatu is most affected, because Asthipuranam is done by Majja Dhatu [6], as described by Acharya Charaka. Majja Dhatu nourishes Shukra Dhatu, so when Majja Kshaya occurs, it causes Alpa Shukrata, as described by Acharya Sushruta [7]. Also, as per Astanga Hridaya due to Majja Kshaya, Timira Darshanam which can be due to hypoxia.[8]

LITERAL REVIEW:

Majja: Ayurveda considers Majja to the sixth Dhatu of the body. All the bones contain this jelly like material. Charak enumerates the Asthi (bones) and Sandhis (joints) as the Moola of Majjavaha Srotas. The Majja fraction has been defined by Vaidikya Shabdha Sindhu, as Shudha – Sneha or pure –fat. Charak also refers to the filling up of the bones with Medas, which is Majja. According to Sushruta, Majja contributes to the formation of and an increase in the Shukra Dhatu; it fills in the internal cavities of bones and is the chief source of body strength. [9]

Majja Swarupa: Vayu causes porosity in the interior of bones and this porous space gets filled up with Medas (fat). This unctuous substance is called Majja (Bone-marrow). [10] Majja resides in long bones middle part specially. [11] According to Ayurveda, brain is made from Majja [12][13].

Majjagni Swarupa and Karma: By virtue of their respective seven categories of Agni (enzymes), Dhatu (tissue elements), the sustainers of the body, undergo metabolic transformation in two different ways – Kittapaka (transformation of waste products) and Prasada-paka (transformation of nourishing material). [14] Majjagni as like other Dhatwaagni is Pittoshma inside Majja. It is the combination of Ushna and Aagney Dravya of Pitta group. Pitta Gana or Aagney Dravya resides as secretion of liver and pancreas in our Mahasrotas. These secretions in the intestine perform Agnikarma and with Anna-rasa and Rasa-Rakta circulates in the whole body. Parts of Pachakagni (Pachakansh) reach to the fatty particles inside bones. There these Pachakagni are in the form of Dhatwagni i.e. Majjagni. Due to Majjagni fatty particles inside bones are transformed to yellow marrow and red marrow. All changes in Rupa and Guna are done by Agnikarma that is ultimately performed by Majjagni. During formation of bone, with the help of Vata, Majjagni acts on the particles of Meda present in pores of bones, which results in the formation of WBC and yellow marrow. The shape and characteristics of Meda particles changes i.e. Majja.

Utpatti [15] [16] [17] The successive development of the fundamental or root principles of the body follows a distinct order. The essence of the assimilated food matter under the heat of digestion goes towards the formation of chyle and is ultimately transformed into it, its residue being passed out of the organism in the shape of stool etc. The chyle thus produced is called the immature rasa or the rasa in its nascent stage. Subsequently it enters into the bodily principle of rasa, becomes
mature by the native heat of rasa and is resolved into three factors – its excreted matter is transformed into phlegm, its thick or condensed portion is transformed into and assimilated in the mature rasa of body, whereas its subtle essence is metamorphosed into blood. The blood thus newly generated is merged into fundamental organic principle of blood and there by the heat of blood it is again resolved into three factors – that is its excreted portion is transformed into bile, its thick or condensed portion is transformed into the fundamental organic principle of blood and its subtle essence is metamorphosed into flesh. Then flesh by the same order resolved into three factors – excreted portion goes towards the formation of such excreta as are found to be deposited in the corners of eyes and inside the integuments of prepuce or about the region of glance penis, its thick or condensed part is transformed into organic principle of flesh and its subtle essence is metamorphosed into fat.Again by the same order newly generated fat is resolved into three factors – excreted portion is discharged through the pores of skin in drops of perspiration, its condensed portion is assimilated in the organic principle of fat and its subtle portion is metamorphosed into bones. Again the bone in its nascent stage enters into the organic principle of bone and thereby the inherent heat of that principle is resolved into three factors – its excreted portion contributes towards the formation of hairs, moustache etc. Its thick or condensed portion is assimilated into the organic principle of bone and its subtle portion is metamorphosed into Majja. The Majja in its nascent stage enters into the organic principle of Majja and there matured under the native heat of that principle is resolved into three factors – its excreted portion contributes towards the formation of gelatinous matter deposited into the corners of the eyes and the oily secretion of the skin, its condensed portion is assimilated into the organic principle of Majja and the subtle portion is metamorphosed into semen. The semen again in its nascent stage enters into the organic principle of semen and there matured under its native heat is resolved into two factors – that is thick and thin, the thick portion is assimilated into the organic principle of semen and the thin one being metamorphosed into semen, like gold a thousand times purified, cast off no dregs. Thus rasa is converted into semen or into menstrual blood in women in the course of a month.

Table No. 1

<table>
<thead>
<tr>
<th>DHATWAGNI</th>
<th>RAW MATERIAL</th>
<th>PRASAD</th>
<th>KITTA</th>
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</thead>
<tbody>
<tr>
<td>Rasagni</td>
<td>Ahara rasa</td>
<td>Sthayi rasa</td>
<td>Shlesma</td>
</tr>
<tr>
<td>Raktaagni</td>
<td>Poshaka rasa(Raktasama Aaharansha)</td>
<td>Sthayi rakta</td>
<td>Pitta</td>
</tr>
<tr>
<td>Mamsaagni</td>
<td>Poshaka rakta</td>
<td>Sthayi mamsa</td>
<td>KhaMala</td>
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<td>Sthayi meda</td>
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<td>Asthyagni</td>
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<td>Asthisama aharansha</td>
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and is not dissimilar to Medas. Because of specialization in their functions, Medas and Majja have treated separately. According to Sushruta small Asthi have Meda and Sthula Asthi specially have Majja in their cavity.\[22\]

**Majja Dhatu Guna (Properties of Bone Marrow):** The marrow enhances strength, Sukra (semen), Rasa Dhatu, Kapha, Medo-Dhatu(fat) and Majja (marrow). It adds to the physical strength, especially of the bones and is useful for oleation. It is heavy and unctuous. \[23\]

**Measurement of Majja In the Body**
- Anjali pramana of Majja Dhatu is one Anjali \[24\] (160-170gms)

**Pancharhatuik Constitution of Majja Dhatu:** There is predominance of Jala Mahabhuta in Majja Dhatu. \[25\]

**Majja Dhatu and Mastulunga (Brain):** Indu teeka says it is Medodhatu, which turns into Mastulunga and it is Medodhatu again which gets turned into Majjadhatu. Mastulunga is a sadyahpranahara marma. Mastulunga is present inside the flat bones of skull. Astanga Sangraha describes Mastulunga as a Majja Dhatu and appearance of Mastulunga is like solid ghee (Avilina Ghra). \[26\]

**Updhatu (Secondary Tissue) of Majja:** According to Sharngadhar, hairs are Updhatu of Majja Dhatu. \[27\]

**Waste (Mala) Products of Majja Dhatu-Sneha** (oily substance) excreted through eyes, faeces, and skin is a waste product of Majja Dhatu. \[28\][29][30]

**Majjavaha Srotas-** Bones and joints are the sites of origin of channels carrying Majja. \[31\]
1. Majja Dhatu resides in the long bones, Poshaka Majja Dhatu is obtained from Asthi Dhatu, and hence bones are roots of Majjavaha Srotas. Asthi Dhatu is very light and dry. The hollow part in Asthi Dhatu is the main site of Vata Dosha. Long bones have cavity (Akasha) inside them. Unctuous Majja Dhatu inside the long bones keeps the balance between Asthi Dhatu and Vata Dosha.

2. Joints are also root of Majjavaha Srotas. The sixth Pittadhara Kala is considered as Majja Dhara Kala. [32]

FUNCTION OF MAJJA DHATU [33] [34] [35] [36]

1. Snehanam Karoti- Majja Dhatu is known as best for Snehan (oleation). So the special indications are given for Majjapan. It oletes and nourishes body organs.

2. Balakrita- It is the main source of strength in body, especially for bones. Bones contain small pores due to the activity of Akasha and Vayu Mahabhutha and Majja fills the porous gap with fatty tissues and provides strength to the bones of the body and thus strengthen the whole body. In the absence of Majja, Asthi, Daurbalya, Shunayta, Laghuta etc arises in the bones.

3. Shukra-Pushtim: Nourishment of Shukra Dhatu is the function of Majja Dhatu. Poshaka Shukra Dhatu is formed during the metabolism of Majja Dhatu. [37]

4. Asthnam Puurannam Karoti: Bones contain small pores due to the activity of Akasa and Vayu Mahabhutha and Majja fills the porous gap with fatty tissue and provides strength to the bones of the body otherwise due to Ruksha Guna in bones, Vata Dosha increases and Asthi Bhangurta will occur.

FACTORS AFFECTING ASTHI-MAJJA DHATU:

1. Prakriti- Prakriti plays a major role in determining the quality of Dhatu which is indicated by description of specific characteristics of persons possessing Vata, Pitta and Kapha dominant Prakriti. This indicates that persons with Kapha dominant Prakriti possess better quality of Asthi Dhatu. Vata Prakriti persons are Alpa Sarira, possess AnavAshthita, Asthi Sandhi (Movable), Alpa and Parusaha Kesha, Roma, Nakha, Dashana. [38] This represents inferior quality of Asthi Dhatu. So, Majja Pusti is also of inferior quality. Persons of short stature and less body weight have low bone mass. Vata Prakriti persons are lean and thin- Alpa Sarira. [39]

2. Age- Because of diminishing Agni in older age, all the Dhatu decrease in quantity and quality. [40] Bone favours synthesis in youth and in old age favours resorption. Also peak bone mass is achieved at the age of 20 years and then bone loss begins which is accelerated in old age.


4. Physical Activities- Exercises etc. illuminate Dhatavagni. Bone responds to mechanical stimuli. When placed under mechanical stress, bone tissue increases deposition of mineral salts.
(5) Bala- Overall body weight affect Dhatus metabolism. In strong persons rate of bone formation is more. Compared to men and women, men possess better strength, bone mass is more in men whereas bone loss is more in women. The living body can function normally only when its Dosha, Dhatu and Mala are in a state of equilibrium. These Dosha, Dhatu and Mala constitute the basis of the physiological and pathological doctrines of Ayurveda. Dosha, Dhatu and Mala are equally important for health. Ayurveda has proved to be effective in managing and preventing chronic ailments till date. Concepts of Ayurveda have been helpful in treating new diseases arising due to changing lifestyles and environment. This study was an attempt to understand the Disease in Ayurvedic concept and find an effective therapy in preventing the disease.

Characteristics of Majja Sara Purusha: Individuals having the excellence of Majja or marrow are characterised by softness of organs, strength, unctuous complexion and voice and robust long and rounded joints. Such individuals are endowed with longevity, strength, learning, wealth, knowledge, progeny and honour. A man with a thin and sinewy body and who exhibits traits of excessive strength and possesses a deep resonant voice and who is successful in every walk of life, should be looked upon as one in whom the principle of marrow preponderates.

According to Sushruta, big eyes (Maha-Netra) are a differentiating symptom of Majja Sarata.

Causes for Vitiation of Majjavaha Srotas
a) Abhighata (injury)
b) Utpesa (crushing) of bone
c) Prapidanat (internal injury)
d) Ahar (food) Viruddha and Abhisyandi (foods which are unhealthy, contraindicated and which cause moisture inside the body).

Cause of Majjakshaya : Aharaja, Viharaja and Manasaja Nidanas which cause aggravation of Vata Doshas are said to be responsible for MajjaKshaya. On the other hand, Vata Prakopa also takes place due to the DhatuKshaya in the Parihani Kala that is the Vriddhavastha can be described as Kalaja Nidana of the disease. Vata Doshas plays main role in the disease. Due to Nidana Sevana (Vata Vardhaka Nidana and Kalaja Nidana both), there is occurrence of Vata Prakopa leads to Asthi-Majja Vaha Srotodushti. Due to this Asthi-Majja vaha Srotodushti which is due to Atipravarti, Silhasamshraya of Dosha occurs in the Asthi-Majja where Kha-Vaigunya, is already present and Dosha Dushya Sammurchhana takes place in the Asthi-Majja, gives rise to a Sthanika KaphaKshaya and Vata Vriddhi. Vata Vriddhi leads to MajjaKshaya.

Chief Symptoms: Asthi Sauishiryas, Asthi Daurbalya, Asthi Laghuta, Asthi Nistoda, Pratam Vata Roga, AlapShukrata, Bhrama, Timir Darshnam etc. occur in MajjaKshaya. The symptoms of Majja Kshaya can be correlated in Modern Science with pain in joints, seeing dark in day light, extra hard root like formation in joints, vertigo, hollowness and lightness in bones and oligospermia etc. There is no exact clinical entity mentioned in classics for the above symptoms. Asthi Sauishiryas, Asthi Daurbalani, Asthi Laghuni, Asthi Shirinta, all these symptoms shows resemblance with osteoporosis. Asthi Kshaya is decrease in the bone tissue and Asthi Sauishiryas means ‘porous bones’. Hemadri as commented on the word
Sarandhratvam
ptarpan Janya.

Majja Dhatu

pathological condition related to
fundamental base to understand any Dosha.
Ashrayaashrayi

Dhatu

in nourishment of

Meda

Asthi

resides between bones in the formation of

Majja Dhatu

from

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Imbalance in

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of that particular Dhatu. For proper nourishment of Majja Dhatu, Majja Poshaka Amsa in Ahara Rasa is necessary.
Other way of its nourishment is from Asthi Dhatu (preceeding Dhatu). This signifies the importance of Asthi Dhatvagni. Imbalance in Asthi Dhatvagni leads to improper formation of Sthayi Asthi Dhatu from Poshaka Asthi Dhatu, and improper Majja formation. Meda Dhatu which resides between bones in the formation of Asthi Dhatu is known as Majja Dhatu. So, Meda Dhatu also plays an important role in nourishment of Majja Dhatu. Majja Dhatu resides in the Asthi Dhatu. The Ashrayaashrayi relationship of Vata Dosha and Asthi Dhatu forms a fundamental base to understand any pathological condition related to Majja Dhatu. Also the management of Asthi-Majja related diseases is unique because of this relationship. Majja is Apya Pradhan Dhatu. Vitiated Vata decreases Majja, means Kshaya of Majja Dhatu. Vata Prakopa and Kshaya of all Dhatu are a natural phenomena occurring during Jarawastha in men and women and also Vata Prakopa occurs by two processes either Santarpan Janya or Aptarpan Janya. Aptarpan Janya Vata Prakopa is due to taking Ahara and Vihara which vitiate Vata or due to Jara Janya and Santarpan Janya is due to creating Margavrodha causing vitiation of Vata. Vata Dosha is very much potent for the occurrence of Asthi-Majja related diseases because of unique relationship of Vata and Asthi. Gambhira Dhatu, Svabhavabalapravritta Vyadhi and Bhedawastha make Majjakshaya Asadhya. This disease can become Yapya by intervention at proper level, followed with Pathyapathaya. For minimizing Majja Kshaya and preventing, ideal period of intervention can be the beginning of age of Bumi (approx. 40 years) i.e. last phase of Madhyamawastha when Kshaya of all Dhatu begins. As the Nourishment to all Dhatus through Ahara Rasa is minimal in old age and it just supports life. In this stage Pitta Dosha is still dominant and Vata is yet to increase its activity and to overpower Pitta and Kapha.

CONCLUSION: Very little matter is available in our classics regarding Majja Dhatu. The nourishment to all Dhatus is supplied through Ahara Rasa. Imbalance in Asthi Dhatvagni leads to improper formation of Sthayi Asthi Dhatu from Poshaka Asthi Dhatu, and improper Majja formation. The management of Asthi-Majja related diseases is unique because of the Ashrayaashrayi relationship of Vata Dosha and Asthi Dhatu which is fundamental base to understand any
pathological condition related to Majja Dhatu. Vata Prakopa and Kshaya of all Dhatu are a natural phenomena occurring during Jarawastha. For minimizing Majja Kshaya and preventing, ideal period of intervention can be the beginning of age of Hani (40 years) i.e. last phase of Madhyamawastha when Kshaya of all Dhatu begins. As the Nourishment to all Dhatu through Ahara Rasa is minimal in old age and it just supports life.

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