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Ayurvedic perspective of osteoporosis –in old age and geriatrics Reena Shivasgar Mishra^{*1}, Harish. B. Singh²

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ABSTRACT:

In the beginning, that is from the 1960's, when a link between menopause and osteoporosis was first identified; estrogen treatment was the standard for preventing bone loss, however there was no fracture data, even though it was thought to be effective. This continued until the Women's Health Initiative (WHI) study in 2001 that published data on 6 years of treatment with hormone therapy that showed an increase in heart attacks and breast cancer. Even though the risks were small, 1 per 1500 users annually, patients were worried and there was a large drop off in estrogen use. In later analyses the WHI study showed that estrogen reduced fractures and actually prevented heart attacks in the 50-60 year age group. Estrogen alone appeared to be safer to use than estrogen the progestin +medroxyprogesterone acetate and actually reduced breast cancer.

Keywords: Osteoporosis, estrogen, fracture, breast cancer, geriatrics

INTRODUCTION:

In Ayurveda asthishunyata may be taken as the osteoporosis seem to be more common in the female having symptoms like wise as in asthi- majja kshaya. Osteoporosis is a condition that weakens bones, making them fragile and more likely to break. It develops slowly over several years and is often only diagnosed when a minor fall or sudden impact causes a bone fracture. The most common injuries in people with osteoporosis are: wrist fractures, hip fractures.

OSTEOPOROSIS

In Ayurveda acharyas explain the dhatus are the main elements of the body which control (dharan) ou body , basically they explain 7(seven)dhatus of the body which balance body , accordingly to their karma.

The word Asthikshaya is composed of twowords Asthi and Kshaya. The word Asthi is derived fromthe root 'As' + 'Kthin' meaning "To Stay" or

in thesense of "Stability". The definitions of asthi are

'asyate kshipyateyat';

'asyate iti asthi';

'mamsabhyantarasthah-sharirastha

sapta dhatvantargata dhatuvisheshaha'. Asthi nirmetee:-

"पृथिव्यग्र्यनिलादीनां सङ्घातः स्वोष्मणा कृतः ॥३०॥

खरत्वं प्रकरोत्यस्य जायतेऽस्थि ततो नृणाम् ।

करोति तत्र *सौषिर्यमस्थ्नां* मध्ये समीरणः ॥३१॥

मेदसस्तानि पूर्यन्ते स्नेहो मज्जा ततः स्मृतः ।

तस्मान्मज्ज्ञस्तु यः स्नेहः शुक्रं सञ्जायते ततः ॥३२॥

वाय्वाकाशादिभिर्भावैः सौषिर्यं जायतेऽस्थिषु ।"

च.चि .15/30-32

That which is present in its own state for a long time is called asthi. Sushruta mentions that twacha, mamsa etc. tissues gets destroyed soon (after death), but asthi persists in its own state for a long time. Hence, it is called as the sara of

the Sharira. Similarly the definitions of Kshaya are- 'Kriya kshayakaratwat tu Kshaya ityucyatebudhaihi';

> " क्षियते अनेन इति क्षय"; "क्षय व्याधि विशेषः"

That which decreases is called as Kshaya or the kriva which causes the decrease either qualitatively or quantitatively is known as Kshaya and it is a vyadhi vishesha. So, the combined meaning of asthi kshaya is decrease in bone tissue. Asthi Dhatu Guna and Karma Asthi is guru (heavy), khara (rough], kathina (hard), sthula (bulkiness), sthira (stable) and murtimad. Its function is deha dharana (provides structural framework to the body). Majja pushti (nutrition to the bone marrow) and it is the seat of vata. The etiological factors for asthi kshaya are not mentioned separately in the texts. Charaka has explained the However. (general samanya nidana etiological factors) which lead to the kshayaof 18 types which includes mostly the vataprakopak nidan like excessive exercise and intake of dry vegetables, irregular dietary habits which includes excessive fasting, dieting and limited foods, excess of food also, excess of worry, grief, fear,

hunger, waking at nights, letting out dosha, dhatumalaand excess of blood, time factor (adana kala and vridhavastha). Majja dhatu which is present inside the asthi dhatu provides nutrition to asthi. The factors responsible for the vitiation of asthivaha and majjavaha srotas are also responsible for asthi kshaya. The dietary factor such as intake of abhishyandi and incompetent foods of majjavaha sroto dushti nprovocates vata due to obstruction leads to vitiation of vata. Vitiation of asthivaha srotas directly leads to aggravation of vata, resulting in asthi kshaya.

"रसासृकमासमेदो ऽस्थिमज्जाशुक्राणि धातवः। सप्त दूष्या......।" (अ.ह्र.सु १\१३)

"प्रिणनं जिवनं लेपः स्नेहो धरण पुरणं गर्भो उत्पादश्च धातुनां सम्यकक्रिया क्रमात स्मृतम् ॥ "

As according to above reference osteo means bones which concluded as asthi dhatu of our body which do dharna karma of body.

As per pathology we can conclude majja dhatu is also play an important role in maintaining density and toughness to make bone strong .We can conclude it as as a bone marrow which remain inside the bone always to provide nutrition to the bone.

As in Ayurveda -

- sthana of majja "अस्थानां मज्जानी......।
- karma of majja

"मज्जा प्रीति स्नेहं बलं शुक्र पुष्टि पुरणं अस्थानां च।"

There are two types of dhatu, i.e. sthayi and poshaka dhatu. Asthi or bone can be considered as sthayi dhatu and not the whole Asthi dhatu. But in this condition, the decrease is not so remarkable as compared to Osteoporosis. Majja is the next Dhatu of Asthi. Acharya Chakrapani commenting on Charaka vimana sthana 5/8 mentions that Asthi dhatu is also in liquid form called as poshaka Asthi which flows through the Asthivaha srotas and nourishes the sthayi Asthi dhatu.

According to recent advances, the osseous tissue can be taken as the sthayi Asthi dhatu and the nutrients that are responsible for the nourishment of the bone tissue such as calcium, phosphorus, magnesium etc. can be considered as the poshaka Asthi dhatu.

The etiological factors can be classified as Aharaja (dietary), Viharaja (lifestyle), Manasika (mental) and Anya (others).

Acharya Charaka explained the general etiological factors i.e. samanya nidana which leads to the kshaya of all 18 types.

Asthi kshaya is a condition in which there is decrease in the Asthi dhatu or Bone tissue leading to undesirable effects.

It can be compared with Osteoporosis in which there is decrease in the Bone Mineral Density (BMD) causing increased risk of fractures.

The signs and symptoms of Asthi kshaya i.e. Asthi-sandhi shula, kesha, roma, nakha, danta vikara/ pata and daurbalya are same as the updated signs and symptoms of osteoporosis mentioned in contemporary science.

Asthi kshaya is more suitable condition than Asthi saushirya to be correlated to osteoporosis. Asthi kshaya is 'decrease in the bone tissue' and Asthi saushirya means 'porous bones'.

Hemadri has commented on the word 'Saushirya' as 'Sarandhratvam' which means 'with pores', this condition is explained in the context of Majja kshaya.

Osteoporosis means the decrease in the bone tissue and not the bone marrow.

Another condition termed as Osteopenia is a pre stage or Purvarupavastha of Osteoporosis in which there is decrease in the Bone Mineral Density too. In the process of kshaya, Majja kshaya occurs when there is no proper supply of nutrients from Asthi dhatu.

Thus Majja kshaya may occur after Asthi kshaya as per the basic principles of anuloma kshaya.

Since there is decrease of bone tissue in both the conditions i.e. Osteopenia and Osteoporosis, they may be commonly compared with Asthi kshaya.

As by this it shows majja is the main dhatu help to rejuvenate nutrient to the bone by remaining inside them. As the age permits the quality and the quantitative changes our in majja leads to the degradation of the bone which leads to fracture and many other pathology. Mainly female sare more prone to this disease , whose pathology never resemble before by symptoms , it mainly found after fracture of bone mainly neck of femur or vise versa through various test like X-Ray or MRI.

In majja kshaya we get symptoms as

"अस्थानां मज्जानी सौषिर्य भ्रमस्तिमिर दर्शनम्।"(अ.ह्र.) शिर्यन्त् अस्थिनी दुर्बलानीलघुनि च। प्रततं वातरोगाणि अल्पशुक्रता पर्वभेदो अस्थिशन्यता॥(स)

As due to majja kshya, it leads to the asthi saushirya (loss of bone density), bhram (vertigo), timir darshan (blurred vision). Accrording to sushruta, is leads to asthi shirnata –weakening of bones, asthi durbalata, asthi laghuta, vaatroga, alpashukrata, parvabhedo, asthi shunyata(osteoporosis) As mention above majja kshaya leads to the vaatroga means it may leads to the vaat vruddhi it relates with asthi as it leads to asthi kshaya.

Asthikshaya lakshana:

"अस्थितोद सदनं दन्तकेशनखादिषु"

"केशलोमनख श्र्मश्रु द्विजप्रपतनं श्रमः। सन्धिशैथिल्य॥"(च)

As majja kshaya persist asthi leads to get deficit in their properties and asthikshaya lakshana will leads to be happen in future which shows symptoms as asthi thod– sadanam (bone & joints-pain) kasha, lom kshamashru- patan, dvijan-(hair fall, hair split ends) kshram(fatigue), sandhi Shaithilya(joints weakening).

भेदोऽस्थिपर्वणां सन्धिशूलं मांसबलक्षयः । अस्वप्नः सन्तता रुक् च मज्जास्थिकुपितेऽनिले ॥३३॥

सम्भज्यते सीदति च सूचीभिरिव तुद्यते ।

मज्जावृते विनामः स्याज्जृम्भणं परिवेष्टनम् ॥च.चि .२८/६७

Second theory which also leads to shukrakshaya as according to dhatu poshana nyaya majja dhatu is the poshak ansha of shukra dhatu which directly leads to shukra kshaya when majja kshaya occur

Pain in the bones and joints is the main symptom of Asthi kshaya which can be correlated to Asthi toda, Asthi Bheda, ruja and shoola stated in Ayurvedic text.

Normally when dhatu is affected, its upadhatu and mala are also affected; hence dental deformity/fall, falling of scalp hair, body hair, moustache and nail deformity are seen in Asthi kshaya. Teeth are considered as upadhatus of Asthi by Acharya Sharangdhara.

Anga bhanga (Fractures), Srama (Extreme fatigue), Sandhishoola (Joint pain), Vinamana(Forward bending of spine), Bala kshaya (Weakness), Asthi saushirya (Brittle and soft bones), SandhiSaithilya (Difficulty in Walking) stated in Ayurvedic texts can all be correlated with modern symptomatology of Osteoporosis. evidence including Current several prospective studies supports an association of osteoporosis with the onset and progression of periodontal disease in humans which can be correlated to the danta vikara and danta pata lakshana of Asthi Kshaya in Ayurveda.

In Osteoporosis, the first clue that the fingernail could play a role in diagnosing the disease came when a doctor noticed that hip osteoporosis patients had floppy nails (flimsy, soft & thin).

Recent studies of Osteoporosis have shown that deformity in the nail i.e brittle nails and teeth are definite indicative of risk of Osteoporosis.

It was found that levels of disulphide bond - needed to bind one protein molecule to another - were lower in people with osteoporosis.

In nails, this disulphide bond is needed to bind keratin which gives them strength, which is compromised is osteoporosis.

For bones, the protein collagen needs disulphide bonds to stick together, lowered levels of which makes bones susceptible to fractures.

• Treatment of asthi –majja –shukra kshaya

कफपित्ताविरुद्धं यद्यच्च वातानुलोमनम् ॥२३९॥ सर्वस्थानावृतेऽप्याशु तत् कार्यं मारुते हितम् । यापना बस्तयः प्रायो मधुराः सानुवासनाः ॥२४०॥ प्रसमीक्ष्य बलाधिक्यं मृदु वा स्रंसनं हितम् । रसायनानां सर्वेषामुपयोगः प्रशस्यते ॥२४१॥ शैलस्य जतुनोऽत्पर्थं पयसा गुग्गुलोस्तथा । लेहं वा भार्गवप्रोक्तमभ्यसेत् क्षीरभुङ्नरः ॥२४२॥ अभयामलकीयोक्तमेकादशसिताशतम् ।

च.चि .28/240

स्वेदाभ्यङ्गावगाहाश्च वर्तयो बस्तिकर्म च । हितं प्रतिहते वर्चस्यन्नपानं प्रमाथि च॥ च.सू .7/9 ASTHI CHIKITSA SUTRA अस्थयाश्रयाणां व्याधीनां पंचकर्माणि भेषजम्। बस्तय्ः क्षीरसर्पीश्च तिक्तकोपहितानि च॥–(च. सु २८/२५) In asthi kshaya treatment acharya told about the panchakarma like basti as the main karma and the ksheer sarpi and tikta dravya is mainly used as drug of choice .As ksheer and sarpi is said to be as jivniyanam in agrya sangrah which promotes rejuvenating effect in body which increase the body ability to be in normal and strong enough for long term .As sneha guna ksheer and ghrit helps to reduce vayu from the asthi and increase their density. There are lots of controversies as tikta rasa increases vaat vitality in body as shown in samhita. but some researches shown that the gamitva of tikta ras dravya are more then any other ras which increase the efficacy of ksheer and ghrit towards bone. Here tikta rasa act as a mediator to promote action as ksheer and ghrut on bones.

मज्जशुक्रसमुत्थानामौषधं स्वादुतिक्तकम् । अन्नं व्यवायव्यायामौ शुद्धिः काले च मात्रया ॥च.सू.२८/28

MAJJA CHIKITSA SUTRA:-मज्जाशुक्रसमुत्थानामौषधं स्वादुतिक्तकम्। अन्नं व्यवायव्यायामौ शुद्धिः काले च मात्रया॥ (च.सु २८/२६)

Similarly in majja and shukra kshaya swadu and tikta aushad and aahara are used for the treatment .as by the siddhanta of samanya viparya , saman guna leads to increase in the saman guna of the dhatu which are interrelated with dosha and dhatu by ashrya ashrayi bhava.Madhu and tikta rasa helps also in majja kshaya as of ashthi, because majja are form from the asthi which act as a precurssor of majja.

Shamana:

वातघ्नानि अन्नपानानि श्लेश्ममेदोहरावि च। रुक्षोष्णा बस्तयस्तिक्क्ष्णा रुक्षाणि उद्वर्तानि च॥ सर्पिस्तैलवसामज्जसेकाभ्यञ्जनबस्तयः ॥१०४॥ स्निग्धाः स्वेदा निवातं च स्थानं प्रावरणानि च । -च.चि .28

The main aim of Ayurvedic therapy in asthigatvata includes vatashamak (asthi is the seat of vata), tarpak and brihman[38] treatment. Sushrut explained the principle of asthikshaya as Tatra Swayoni Vardhana Dravya Prayogaha Pratikaraha (Su.su.15). Described herbs have mainly Vatahar, brihman, tarpan. balya and asthisandhankar property. Research studies have also showed that drug like guduchi, samanga, ashwagandha, vacha, dadima have antiosteoporotic and phytooestrogenic properties which strengthen the bone. Similarly drugs were mostly rich in calcium as proven by their nutritional values. According to modern science there is calcium deficiency in asthikshaya (osteoporosis). So, it can be in osteoporosis. used Few recent experimental studies for supporting the study were given below:

Guduchi

Study was carried out on ethanolic stem extract of Tinospora cordifolia (TC) (10, 50, 100mg/kg b.wt.) subcutaneously for 4 weeks on ovariectomized rats. Study reveals that ovariectomized rats treated with TC (10 mg/kg b.wt.) showed estrogen like effects in bone as the bone loss in tibia was slower than ovariectomized control and thus has the potential for being used as antiosteoporotic agent. Samanga[45] –In vitro study was done on four medicinal plants for

evaluation of antiresorptive activity in the treatment of bone loss disease. All the four drug decoction inhibited osteoclastogenesis similarly to standard alendronate at the highest doses, but Hemidesmus indicus was found effective at lower concentrations also.

Shatavari-

Study was carried out on aqueous and methanolic

extracts of Asparagus racemosus root in ovarectomized rats to evaluate the antiosteoporotic activity. Study showed significant effecton mineralization, ossification and osteoclastic activity suppression in histopathological examination. It showed significant results in biochemical parameters, also reduced serum alkaline phosphatase activity, serum calcium significantly and also inhibited the ovariectomized induced excessive loss of calcium in urine.

Studies of ashwagandha[48], vacha[49], dadima[50], madhuyashti[51, 52], vidarikanda[53], parushak [54], padmabeeja[55] also shows antiosteoporotic properties.

Use of Rasayanas:-

"रसायनानां सर्वेषामुपयोगः प्रशस्यते ॥२४१॥"च.चि

Use of rasayana is always mentioned in texts always helpful in jara vyadhi nashanam so its always prescribed by acharyas in daily basis.

रसाः पयांसि भोज्यानि स्वाद्वम्ललवणानि च ॥ बृंहणं यच्च तत् सर्वं प्रशस्तं वातरोगिणाम् । च.चि .28/105

Regular use of milk and rasala, use of madhur amla lavan dravya in food are always bruhniya which nourishes body and also one of the best for treatment of vaatroga.

च्यवनप्राश , ब्राम्ह रसायन is the major ajastrik rasayanas usefull in regular basis. रसायनं - रसायनं च तज्ज्ञे यं यज्जराव्याधीनाशनम । च.चि .1

Rasayan is alwalys said to be the major sources for the individual as the to maintain health and regulate the prayojan sutra of Ayurveda as says to maintain the health and to treat the diseases. It regulate health and delay all senile changes and keep the individual away from the disease.

केवलं निरुपस्तम्भमादौ स्नेहैरुपाचरेत्॥ वायुं सर्पिर्वसातैलमज्जपानैर्नरं ततः ।-वा.सु.१३/७५

वृध्द्त्वं क्षीरघृते...।वा.उ.४०/५४

As it is also mentioned in Ayurveda that for vaat chikitsa sneha should always be used in day to day life as it is helpful to maintain the normal structure and tonicity of muscles and visceral organ.

As vagbhta also mentioned in agray dravaya as kshir (milk) and ghrut (ghee)is beneficial for vrudhatva patient.

Osteoporosis

Osteoporosis is a systemic skeletal disease characterized by the low bone mass and micro-architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture.

Causes of osteoporosis:

Losing bone is a normal part of the ageing process, but some people lose bone density much faster than normal. This can lead to osteoporosis and an increased risk of fractures.

Women also lose bone rapidly in the first few years after the menopause (when monthly periods stop and the ovaries stop producing an egg). Women are more at risk of osteoporosis than men, particularly if the menopause begins early (before the age of 45).

Many other factors can also increase the risk of developing osteoporosis, including:

- long-term use of high-dose oral corticosteroids
- other medical conditions such as inflammatory conditions, hormone-related conditions, or malabsorption problems
- a family history of osteoporosis particularly history of a hip fracture in a parent
- long-term use of certain medications which can affect bone strength or hormone levels
- having a low body mass index (BMI)
- heavy drinking and smoking
- Read more about the causes of osteoporosis.

Diagnosing osteoporosis:

Risk assessment tools

If your doctor suspects you have osteoporosis, they can make an assessment using an online programme, such as FRAX or Q-Fracture.

These tools help to predict a person's risk of fracture between the ages of 40 and 90. The algorithms used give a 10-year probability of hip fracture and a 10-year probability of a major fracture in the spine, hip, shoulder or forearm.

DEXA scan

They may also refer you for a DEXA (DXA) scan to measure your bone mineral density. It's a short, painless procedure that takes about 5 minutes, depending on the part of the body being scanned.

Your bone mineral density can be compared to the bone mineral density of a healthy young adult and someone who's the same age and sex as you. The difference is calculated as a standard deviation (SD) and is called a T score.

Standard deviation is a measure of variability based on an average or expected value. A T score of:

- above -1 SD is normal
- between -1 and -2.5 SD is defined as decreased bone mineral density compared with peak bone mass
- below -2.5 is defined as osteoporosis

Preventing osteoporosis

If you're at risk of developing osteoporosis, you should take steps to help keep your bones healthy. This may include:

- taking regular exercise
- healthy eating including foods rich in calcium and vitamin D
- taking a daily supplement containing 10 micrograms of vitamin D
- making lifestyle changes such as giving up smoking and reducing your alcohol consumption^{1}

How is osteoporosis related to menopause?

There is a direct relationship between the lack of estrogen after menopause and the development of osteoporosis. After menopause, bone resorption (breakdown) overtakes the building of new bone. Early menopause (before age 45) and any long phases in which the woman has low hormone levels and no or infrequent menstrual periods can cause loss of bone mass.

At menopause estrogen deficiency impairs the normal cycle by increasing osteoclastic resorption activity without a corresponding increase in osteoblastic activity and the amount of bone resorbed therefore is greater than the amount deposited leading to a net loss of bone. This process was originally described as 'uncoupling'. The cellular changes that occur in estrogen deficiency are now quite well understood. There is an increased production of Tumor necrosis factor (TNF α) and cells of the stromal / osteoblastic lineage become more sensitive to IL-1. IL-1 and TNF stimulate stromal cells / preosteoblasts to release several cytokines- IL-6, macrophage colony stimulating factor (M-CSF), IL-11, granulocyte macrophage colonystimulating factor (GM-CSF), transforming growth factor (TGF). The final cytokine in the osteoclastogenesis RANK ligand cascade is (receptor activator of nuclear factor B ligand) which is produced from osteoblasts and binds to its receptor RANK on osteoclasts (1, 2). antagonist RANKL has natural a osteoprotegerin (OPG) that is a soluble receptor that is secreted by the stromal osteoblast lineage cells (3). OPG is stimulated by estrogen (3). In retrospect we now realize that the uncoupling factor secreted by the osteoblasts is RANKL. These factors increase bone resorption by increasing the pool size of pre-osteoclasts in bone marrow (1) and are down regulated by estrogen. The important action of estrogen is to increase OPG secretion (3) and decrease M-CSF (1) and RANK (4).

Who should have a bone mineral density test?

- All post-menopausal women who suffer a fracture that is suspicious for osteoporosis.
- All post-menopausal women under age 65 who have one or more additional risk factors.
- All post-menopausal women age 65 and over, regardless of additional risk factors.

Should I consider hormone therapy for osteoporosis?

Hormone therapy (HT) is believed to be useful in preventing or decreasing the increased rate of bone loss that leads to osteoporosis. Hormone therapy is generally recommended for postmenopausal women who have:

- An early menopause
- A low bone mass, as measured by a bone density test and menopausal symptoms
- Several other risk factors for osteoporosis, such as: a petite, thin frame; family history of osteoporosis, or a medical problem associated with osteoporosis

While all of the risks associated with HT are not yet known, studies have shown that some types of HT may increase your risk of developing.

- Breast cancer
- Gallbladder disease
- Blood clots
- High blood pressure (in some women)

If you are using HT to prevent osteoporosis, be sure to talk to your doctor so that you can weigh the benefits of HT against your personal risk for heart attack, stroke, blood clots, and breast cancer. If needed, your doctor can prescribe different treatments to prevent osteoporosis and fractures. Finally, it's important to note that women who have had their uterus removed by hysterectomy are prescribed estrogen alone, not the combination of hormones found in HT. Estrogen therapy alone has been shown to have less risk than combination hormone therapy. Your doctor can provide you more information about how your health history fits in with the risks and benefits of hormone therapy.

DISCUSSION:

Acharya Chakrapani commenting on Charaka viman sthana 5/8 mentions that Asthi dhatu is also in liquid form called as poshaka Asthi which flows through the Asthivaha srotas and nourishes the sthayi Asthi dhatu.

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The etiological factors can be classified as Aharaja (dietary), Viharaja (lifestyle), Manasika (mental) and Anya (others).

Acharya Charaka explained the general etiological factors i.e. samanya nidana which leads to the kshaya of all 18 types.

Asthi kshaya is a condition in which there is decrease in the Asthi dhatu or Bone tissue leading to undesirable effects. It can be compared with Osteoporosis in which there is decrease in the Bone Mineral Density (BMD) causing increased risk of fractures. The signs and symptoms of Asthi kshaya i.e. Asthi-sandhi shula, kesha, roma, nakha, danta vikara/ pata and daurbalya are same as the updated signs and symptoms of osteoporosis mentioned in contemporary science. Asthi kshaya is more suitable condition than Asthi saushirya to be correlated to osteoporosis. Asthi kshaya is 'decrease in the bone tissue' and Asthi saushirya means 'porous bones'.

Hemadri has commented on the word 'Saushirya' as 'Sarandhratvam' which means 'with pores', this condition is explained in the context of Majja kshaya.

Osteoporosis means the decrease in the bone

tissue and not the bone marrow. Another condition termed as Osteopenia is a pre stage or Purvarupavastha of Osteoporosis in which there is decrease in the Bone Mineral Density too.

In the process of kshaya, Majja kshaya occurs when there is no proper supply of nutrients from Asthi dhatu. Thus Majja kshaya may occur after Asthi kshaya as per the basic principles of anuloma kshaya.

Since there is decrease of bone tissue in both the conditions i.e. Osteopenia and Osteoporosis, they may be commonly compared with Asthi kshaya.

Kala (time) is the age factor. Old age is the time of aggravation of Vata.

Sushruta says that the Anna Rasa can not nourish the old aged persons due to senile degeneration;

स एवान्नरसो वृद्धानां (जरा) परिप्कशरीरत्वाद्प्रीणनो भवति॥सू.सु १४/१९

The symptoms of ageing like loss of vigor, functioning of sense organs, courage etc. are related to degenerative changes in the body tissues.

Asthi kshaya may also be seen in patients of sthaulya (obesity).

Asthi kshaya in persons with increased Meda is surprising, because Asthi is the very next tissue to Meda and Meda nourishes the Asthi, so there should be increase of Asthi in persons of increased Meda.In Ayurveda, the context of Menopause is depicted as

"Jara Pakva Avastha" of body and Rajonivrutti.

According to Acharya Sushruta and various other references, 50 years is mentioned as the age of Rajonivrutti.

Menopause is linked with Vata dosha dominated stage of life. In this stage symptoms of menopausal phase like insomnia, anxiety, urinary symptoms, osteoporotic changes are due to dominance of Vata dosha. Rajonivrutti janya lakshan is a group of symptoms produced by degenerative process of body tissue.

Degenerative changes are explained in Ayurveda as Dhatukshaya lakshana and Asthi kshaya occurs when there is Asthi dhatu kshaya.

The involvement of the mind cannot be ruled out in the pathogenesis of disease, because body and mind are closely related and Asthi kshaya is not an exception to this rule.

विकाराणां शारीरमानसानां परस्परं संसर्गमाह-ते च विकारा इत्यादि| अत्र च परस्परशब्देन शारीराणां शारीरेण, मानसानां मानसेन, शारीराणां मानसेन, मानसानां शारीरेण चानुबन्धोज्ञेयः||८|| आयुर्वेददीपिका व्याख्या (चक्रपाणिदत्त कृत), विमानस्थानम् 6 (रोगानीकविमानम्)

Acharya Charaka opines that the sharirika roga and manasika roga have an interrelationship.

Acharya Chakrapani clarifies that this relationship may be in four ways;

i) Shariranam Sharirena,

ii) Manasanam Manasena,

iii) Shariranam Manasena and

iv) Manasanam Sharirena.

Psychic factors explained in Vata vyadhi such as worry, fear, grief and anger leads to both dhatu kshayajanya and margavaranajanya Vata prakopa.

कामादिभिर्मानस उपघातः प्रभावादेवान्नंदूषयति। एवमशुच्यप्यन्नमशुचित्वेन ज्ञातं मनस उपघातक त्वादामदूषकं भवति। आमस्यापक्वस्याहारस्य प्रदोष आमप्रदोषः। Chakrapani, Vimana sthana, 2/8. These factors produce ama resulting in obstruction.

Acharya Charaka says that although food is taken in proper quantity and is wholesome, still it is improperly digested if a person is suffering from worry, fear, grief and anger etc.

Hence these psychological factors have direct influence on functioning of agni and also results in vitiation of Vata leading to Asthi kshaya. As discussed Asthi kshaya is a disease caused by the increased Vata.

The purva rupa are in unmanifested (avyakta) stage and here avyakta can be taken as ishat or alpa vyakta or asampurna lakshana, so to say mildness in the symptoms, as clarified by Chakrapani.

In the initial stage of the disease, mild symptoms of Asthi kshaya like dull aching in the bones, joints, and mildness of other symptoms etc. can be considered as the purva rupa of Asthi kshaya.

Osteoporosis is totally asymptomatic in the initial stage, because low bone mass itself doesn't cause any symptoms and it is called as the "silent thief" which can be correlated to Alpa vyakta or ayakta lakshana in Ayurveda.

Sampraptivighatana (breaking of pathogenesis) is the prime line for the treatment of any disease in ayurveda. So, treatment of asthikshaya should be done considering both the facts for vata prakopa that is margavaran and dhatu kshayam.(6)

In margavaran, strotoshodhak treatment should be given which clears the channels and nourishes the next dhatu. Drugs or medicinal plants given above are mostly having katu, tikta rasa snigdha guna. tikta rasa is having strotoshodhak property which acts on margavaran. But tikta rasa is vata propaka. So, it should not be used in asthikshaya as vataprakopa increase the

asthikshaya. It can be explained like this; asvaghbhat have mentioned that asthikshava treatment with tiktaksheer sadhita basti. Arundatta commenting on it explains dravya which have snigdha, soshana and khara property are used in asthikshaya. khara is the main property of asthi. Dravya which have both snigdha and shoshan properties are not available that's why this principle was explained. Use of ksheera (snigdha), ghrita with tikta rasa (shoshan) produces khara properties which helps in asthivridhi. In the same way, drugs given can be given single or in combination with other drugs.In dhatu kshaya (asthikshaya) includes vatashamak (asthi is the seat of vata), tarpak and brihman treatment. Vata is having properties laghu, ruksha, sheeta, khara, chala. sukshma, vishada, medicinal plants described are mostly vatashamak due to predominance of guru, snigdha guna, madhura vipaka and ushna virya. Hence. it can be used directly in dhatukshaya condition.

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