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Understanding the Concept of Asthikshaya at the level of Kati Kasheruka

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INTRODUCTION

Asthi:

आभ्यन्तरगतै: सारैर्यथा तिष्टन्ति भूरुहा:!

अस्थिसारैस्तथा देहा घ्रीयन्ते देहीनाम् ध्रुवम्!!
तस्माच्चिरविनष्टेषु त्वग्मांसेषु शरीरिणाम्!
आस्थीनि न विनश्यन्ति साराण्येतानि देहिनाम्!!
मांसान्यत्र निबद्धानि सिराभि: स्नायुभिस्तथा!
अस्थीन्यालम्बन कृत्वा न शीर्यन्ते पतन्ति वा!!

- सु. शा. ५/२१-२३

As how the trunk of the tree is stable because of the inside pith, same way, the shareera is dependent on the Asthi for the Sthiratha or stability. This is so much strong that, even after the complete disintegration of the skin, muscles and other avayavas, asthidoesn't get deteriorated easily. And also, the muscles, vessels, ligaments and tendons are seen taking support on to the asthi itself for the proper mobility and facilitation of the vessels.

Prusthavamsha, the Vertebral column forms the Central axis for whole of the skeletal frame work of the body. It is a long bony structure lying in the midline, starting from the base of the Kapaala (skull), till the base of the shroniphalaka. This is formed by the stacks of Kasheruka arranged vertically. The whole prusthavamsha is dynamically coordinated with the kandaras and helps in maintaining the posture, stability and flexibility. Most of us take this juxta position of strength, structure and flexibility for granted until something goes wrong.

Prusthavamsha is a complex, intricate construct that includes variety of nerves, bones, joints, tendons, ligaments and muscles woven together. It is designed to be incredibly strong, protecting the highly sensitive nerve routes, yet highly flexible, providing the mobility on different planes. This Whole column of vertebrae has four curvatures anteroposteriorly alternating each other, in order to maintain the stability and posture of the body.

Accordingly, they are:

7 – GreevaKasherukas (Cervical Vertebrae)

12 – UraKasherukas (Thoracic Vertebrae)

5 – Kati Kasherukas (Lumbar vertebrae)

1 – Trikasthi (Sacrum)

1 – Anutrikasthi (Coccyx) arranged from top to bottom

This Spine is designed to be remarkably strong, with great deal of flexibility in low back and neck. The Cervical and Lumbar portions of spine are the unsupported coloumn of vertebral bodies laterally and bear the weight of head and torso respectively.

Anatomy of Lumbar Spine (Kati bhaaga of Prusthavamsha)

Lumbar spine is the third major region of the spine below cervical & thoracic regions, where in there are five vertebrae (5 kasherukas), stacked one above the other and between each vertebra, gel like cushion called Intervertebral disc is seen, helping into absorbing the pressure, distribute stress and keep vertebrae from grinding each other.

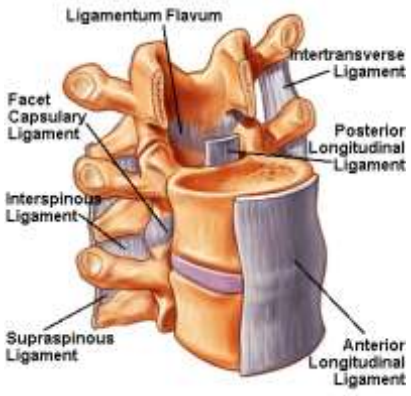
AsthiPoshana:

पृथिव्यग्न्यनिलादीनां संघात: स्वोष्मणाकृत:!
खरत्वं प्रकरोत्यस्य जायते अस्थि ततो नृणाम्!!
करोति तत्र सौषीर्यमस्थ्नां मध्ये समीरण:!
मेदसात्तानि पूर्यन्ते स्नेहो मज्जा तत: स्मृत:!
वाय्वाकाशादिभिर्भावै: सौषीर्य जायते अस्थिषु !!

- च. चि. १५/३०-३२

Asthi is formed by the ooshmatha of agni over Pruthvi and vayu, and usually get vitiated because of the vayu and aakasha, leading to the sushiratha of the Asthi.

Ligaments attached to Lumbar vertebrae



Supporting structures:

The Whole part of the Vertebral column is supported by means of Ligaments and Tendons.

Ligaments – These are tiny slip of ligaments holding the structures of vertebrae together. They are Anterior longitudinal ligament, Posterior longitudinal ligament, Ligamentum flavum, Intertransverse ligament, Interspinous ligament.

Tendons – These are bits of Lumbar part of the Erector spinae muscles which form the tendons and withhold the lumbar vertebral bodies in shape and coordinate in different movements of the lumbar part of the spine.

Anatomy of the Vertebra

Each Vertebra consists of a body, a round arch posterior to bdoy made up of two pedicles, 2 laminae and the spine posteriorly, forming the Vertebral foramen. This Vertebral foramen lie in a vertical line making Vertebral canal, which lodges the spinal cord and facilitate the exit of the spinal nerves through the Intervertebral notches.

The Bone formation and Remodelling

Bone is continually remodeled throughout our lives in response to microtrauma. Bone remodeling occurs at discrete sites within the skeleton and proceeds in an orderly fashion, and bone resorption is always followed by bone formation, a phenomenon referred to as coupling.

Bone strength is determined by collagenous proteins (tensile strength) and mineralized osteoid (Compressive strength). The greater the concentration of calcium, the greater thecompressive strength. In adults, approximately 25% of trabecular bone is resorbed and replaced each year, compared with only 3% of cortical bone.

Osteoclasts, derived from haemopoitic precursors, are responsible for bone resorption, where as osteoblasts, from mesenchymal cells, are responsible for bone formation. The two types of cells are dependent on each other for production and linked in the process of bone remodeling.

Osteoblasts not only secrete and mineralize osteoid, but also appear to control the bone resorption carried out by osteoclasts.

Osteocytes, which are terminally differentiated osteoblasts embedded in mineralized bone, direct the timing and location of bone remodeling. In Osteoporosis, the coupling mechanism between Osteoclasts and Osteoblasts is thought to be unable to keep up with the constant microtrauma to trabecular bone. Osteoclasts require weeks to resorb bone, where as Osteoblasts need months to produce new bone. Therefore, any process that increases the rate of bone remodeling results in net bone loss over time.

AsthiKshaya

This is usually caused as the failure of the Asthidhatwagni and its poorvadhatwaagnis, resulting in the alpa or no nourishment to these gambheeradhatus, resulting in symptoms like pain in the bones (Asthi shola), Sadana, Rookshatha (Dryness), and falling of the Danta (Teeth), Nakha (Nails) and Kesha (Hair), Shrama (Tiredness), Sandhi shaitilya (Looseness in joints).

केशलोमनखश्मश्रुद्विजप्रपतनंश्रम:!
ज्ञेयमस्थिक्षयेरूपंसन्धिशैथिल्यमेव च!!

च. सू. १७/६४

Bone tissue is inversely related with Vaatadosha. This means that, increase of Vatadosha causes depletion of bone tissue and vice versa.

Symptoms

a. AsthiShoola – Lack of nourishment to the Asthi (Mal nourishment) (Mal absorption) and other digestive disorders resulting in restricted supply of nourishment to the Ashti
b. Sadana – Due to the lack of satwa in the asthi, the dharanashakthi decrease leading to sadana
c. Kesha, Nakha, Smashru, Dwijaprapatana – Falling of the Hair, Nails, Moustache, Beard and Teeth
    1. Kesha, Nakha, Smashru – Being the mala of Asthi, the satwa in these elements too decrease and leading to falling away. This according to modern, can be assessed as the altered flow in the endocrinal function of oestrogen, leading to Osteoporosis.
    2. Dwija patina – Lack of blood supply or nourishment to the Teeth, leads to premature falling off the teeth
d. Sandhi Shithilitha – Lack of the nourishment to the bones, referring to the decreased poshana to the joints, causing the grinding of the opposing surfaces of the bones within the joints causing Osteoarthritis, Rheumatoid and any inflammatory conditions of the joints.

Osteoporosis

Osteoporosis is a skeletal disorder characterized by low bone mass and micro architectural deterioration with a subsequent increase in bone fragility and susceptibility to fractures.

More than 95% of Osteoporosis in women and about 80% in men is primary type. Most cases occur in post menopausal women and older men. Gonadal insufficiency is an important factor in both men and women. Other contributing factors may include decreased calcium intake, low Vitamin D levels, certain drugs, and Hyperparathyroidism. Some patients have an inadequate intake of calcium during the bone growth years of adolescence and thus never achieve peak bone mass.

Alterations in bone formation and resorption

The hallmark of osteoporosis is a reduction in skeletal mass caused by an imbalance between bone resorption and bone formation. Under physiologic conditions, bone formation and resorption are in a fair balance. A change in either – that is, increased bone resorption or decreased bone formation – may result in osteoporosis.

Osteopenia is decreased bone mass. Two metabolic bone diseases decrease bone mass: Osteoporosis and Osteomalacia.

In Osteoporosis, bone mass decreases, but the ratio of bone mineral to bone matrix is normal.

In Osteomalacia, the ratio of bone mineral to bone matrix is low.

Osteoporosis results from a combination of low peak bone mass, increased bone resorption, and impaired bone formation. Osteomalacia is due to impaired mineralization, usually because of severe Vitamin D deficiency or abnormal D metabolism may coexist, and their clinical expression is similar; moreover, mild to moderate vitamin D deficiency can occur in osteoporosis.

Osteomalacia should be suspected if the Vitamin D level is consistently very low, to definitively differentiate between the two disorders.

Grossly, Osteoporosis, affects the entire skeleton, but the spongy bone of the vertebra is most vulnerable. For this reason, compression fractures of the the vertebrae are common in people with Osteoporosis. Other parts which are also susceptible are Neck of Femur.

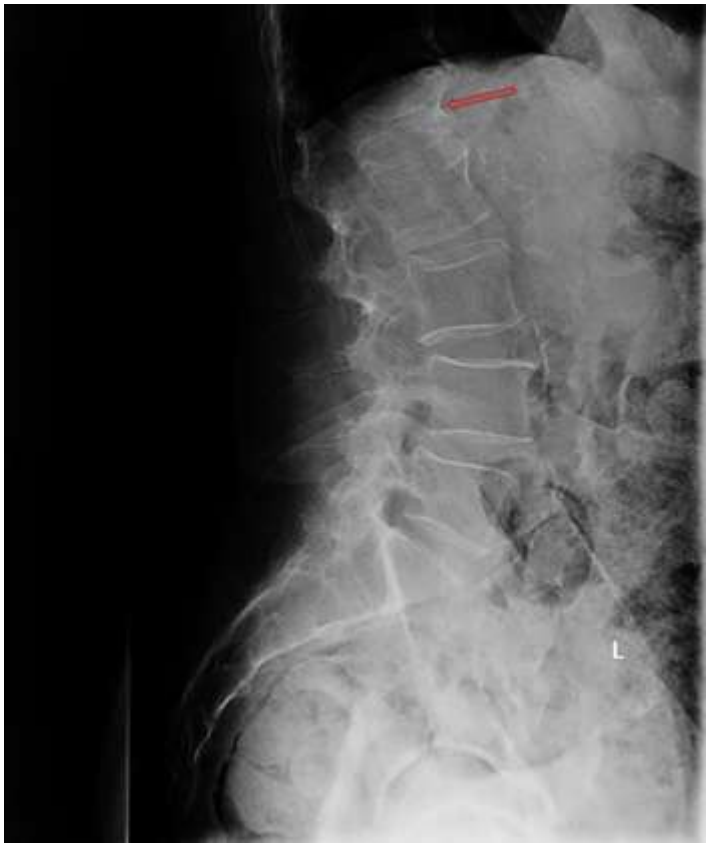
Lumbar spine or the Kati Kasheruka being weight bearing part, the porosity in the vertebral bodiesare much susceptible for the compression fractures

DIAGNOSIS

Using the technology, a clinician can easily identify the strength with in the affected part through

a. DXA – Dual energy X ray Absorptiometry
b. Plain X ray
c. Bone Mineral Densitometry

Compression fracture of the Osteoporotic Vertebra



UNDERSTANDING

Hence, collectively Osteopenia and Osteoporosis can be taken in relation to the Asthikshaya caused because of the Asthidhatwagnimaandyata caused because of the Vataprakopa (caused by virudhakaraaaharavihaara, Lack of vyaayaama, Manasikadurbalatha, and as secondary complication of Arbuda and all Vataprakopa conditions like Deerghakaalinavikaaras)

Osteomalacia – Can be taken in relating to the Asthikshaya caused because of the imbalance in the bone modelling to the resorption, caused by imbalance in the Anthasraavigranthikriya or endocrinal dysfunction and Vitamin D imbalance.

