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## **Osteoporosis**

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Bone tissue consists of two types of material: (1) an extracellular material which includes organic matrix or osteoid tissue (collagen fibrils within a mucopolysaccharide ground substance) and an inorganic crystalline component (calcium phosphate or hydroxyapatite), (2) a cellular material which includes osteoblasts and osteoclasts. The osteoblasts are cells that induce bone formation and the osteoclasts are cells that induce bone resorption.

Bone is dynamic tissue that is constantly being removed and replaced with new bone. Normally there is a balance between bone formation and bone resorption. If there is an imbalance in this equilibrium between bone formation and resorption, there is either a decrease or increase in bone density.

Osteoporosis is a specific term defining a state in which bone tissue is reduced, but mineralization of the organic matrix is normal. Osteoporosis has a variety of possible causes, and consequently manifests in a number of different forms. The basic distinction between forms of osteoporosis is between those types that are generalized or diffuse, involving the entire skeleton, and those that are localized to a single region or bone. Table I lists the numerous causes of osteoporosis.

The most common type of osteoporosis seen in a chiropractic practice is postmenopausal osteoporosis. Estrogen replacement therapy will often help reduce the effects of osteoporosis in patients with postmenopausal osteoporosis; however, this therapy alone is not sufficient in many instances. Adequate exercise and diet including calcium and vitamin D are generally necessary to halt the progress of osteoporosis. It often takes up to two years to see a noticeable difference radiographically in the bone matrix, provided the patient responds to therapy.

There are several radiologic techniques for evaluating osteoporosis. Plain film radiographic is the simplest and most widely used method of evaluation. This technique can easily detect even very small increases in bone density; however, it generally fails to detect decreases in overall skeletal mineralization unless the

reduction reaches at least 30 percent. As is well-known, normal bone can acquire an abnormal radiographic appearance as a result of technical factors. For this reason, inspection of a standard radiograph should focus less on apparent increases or decreases in bone density and more on the thickness of the cortex of bone. Cortical thickness objectively measured and compared, either with a normal standard or with subsequent studies in the same patient, is a useful technique for assessing bone density. The cortical thickness measurement is obtained by adding the width of the two cortices in the midpoint of the given bone, and the sum should roughly be one-half of the overall diameter of the bone. This number can also be expressed as an index of bony mass, derived by dividing the combined cortical thickness by the total diameter of the bone. The second and third metacarpal bone is frequently used to obtain these measurements.

A similar method for assessing bone density is the photodensitometry technique. This technique is based on the observation that the photographic density of bone on radiographic film is proportional to its mass. Through use of a photodensitometer, the photographic density of a given bone can be compared with that of a known standard.

Computerized tomography (CT) also plays an important role in the evaluation of metabolic and endocrine disorders. With CT we are able to define a specific volume and accurately measure the density of the volume, making it possible to perform quantitative analysis of bone mineral content.

If you plan to treat patients with postmenopausal osteoporosis, baseline of bone density should be obtained and followed up with future evaluations at least on a yearly basis. The best technique for evaluating bone density is CT.

**Table I: Causes of Osteoporosis**

<i>Generalized diffuse</i>	<i>Generalized (Diffuse)</i>	<i>Localized (Regional)</i>
<b>Genetic (congenital)</b>	<b>Deficiency states</b>	Immobilization (cast)
Osteogenesis imperfecta	Scurvy	Disuse
Gonadal dysgenesis	Malnutrition	Pain
Turner's syndrome (XO)	Protein deficiency	Reflex sympathetic
Klinefelter's syndrome (XXY)	Alcoholism	dystrophy syndrome
Hypophosphatasia	Liver disease	(Sudeck's atrophy)
Homocystinuria		Transient regional osteoporosis
Mucopolysaccharidosis	<b>Iatrogenic</b>	Transient osteoporosis of the hip
Gaucher's disease	Heparin-induced	Regional migratory osteoporosis
Anemias	Dilantin-induced	Paget's disease (hot phase)
Sickle-cell syndrome	Steroid-induced	
Thalassemia		
Hemophilia	<b>Miscellaneous</b>	
Christmas disease	Involitional (senescent/postmenopausal)	
<b>Endocrine</b>	Amyloidosis	
Hyperthyroidism	Ochronosis	
Hyperparathyroidism	Neoplastic conditions (myeloma,	
Cushing's syndrome	leukemia, metastatic disease)	
Acromegaly	Paraplegia	
Estrogen deficiency	Weightlessness	
Hypogonadism	Idiopathic	
Diabetes mellitus		
Pregnancy		

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