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Special Article - Vitamin D Deficiency

What Caused the Fracture? The Tale of the Three Metabolic Bone Diseases

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Abstract

Paget's disease of bone, osteoporosis and osteomalacia are known collectively as metabolic bone diseases and if left untreated, can result in fractures with serious, debilitating effects. These metabolic bone diseases are commonly found in geriatric population. There are several case reports for each of these diseases, but there have been only sporadic cases reported involving all three comorbities. We present a case of an elderly woman with all three metabolic bone diseases resulting in hip fracture. A review of these metabolic disorders will be discussed.

Keywords: Fracture; Metabolic bone diseases; Paget's disease of bone; Osteomalacia; Osteoporosis

Introduction

Geriatric populations are prone to metabolic bone diseases that can affect their activities of daily living and make them more susceptible to fractures. Osteoporosis, Paget's disease of bone and osteomalacia, together and in combination, are commonly encountered in geriatric patients, presenting a triple fracture risk.

This is a case of an elderly woman with Paget's disease of bone who presented with hip fracture. Work-up revealed the presence of all three metabolic bone diseases cited above. A review of these metabolic disorders will be discussed.

Case

An 88-year-old African American woman was brought to the hospital by her son due to inability to ambulate. Ordinarily, she walks with a walker, but three days prior to admission she refused to walk at all and preferred immobilization of the left leg. She denied a history of fall. Her past history included diabetes, hypertension, coronary artery disease, Paget's disease of bone and dementia. Her medications include lisinopril, atenolol, amlodipine, senna, colace, metformin, aspirin and esomeprazole. She was previously treated with a bisphosphonate for her Paget's disease, but due to intolerance of the medication, was switched to methadone targeting her chronic bone pains. She presented with stable vital signs and on examination of the left leg revealed an abducted and externally rotated hip with leg-length discrepancy. There was a limited range of motion due to pain. No leg edema was seen and pulses were palpable. The rest of the examinations were unremarkable. Initial laboratory revealed chronic anemia, normal renal function, elevated alkaline phosphatase activity of 163 U/L (normal: 25-100 U/L), and noraml serum calcium of 9.7 mg/dl (normal: 8.0-10.4 mg/dl). Imaging of the pelvis showed impacted fracture of left femoral neck and Paget's disease involving the left ilium, ischium and pubis. She was referred to Orthopedic Surgery and Endocrinology, who requested additional tests of dual–energy x-ray absorptiometry (DEXA) scan, thyroid function test, serum parathyroid hormone, phosphate and calcifediol level. Risedronate was started and patient underwent hip hemi-arthroplasty. Result of DEXA revealed osteoporosis with T-score of ≤ -2.5. Blood tests showed elevated serum parathyroid hormone level of 70.9 pg/ml (normal value: 10-65 pg/ml), low phosphate level of 1.9 mg/dl (normal value: 2.7-4.5 mg/dl), low 25-hydroxycholecalciferol level of 4 ng/ml (normal value: 30-100 ng/ml) and normal TSH of 1.5 IU/ml (normal 0.35-4.8 IU/ml). These tests were consistent with osteomalacia. Femoral head biopsy results were consistent with Paget's disease of bone and fracture callus. She was given ergocalciferol 50,000 international units weekly for 8 weeks and maintained on calcium + vitamin D supplement.Rrisedronate was later shifted to pamidronate disodium intravenous infusion. She tolerated surgery and was transferred to the acute rehabilitation unit for physical therapy.

Discussion

Metabolic bone disease is an umbrella term referring to a broad spectrum of disorders. These disorders includes osteoporosis, Paget's disease of bone, osteomalacia and osteitis fibrosa cystica. The latter is a skeletal disorder caused by hyperparathyroidism secondary to parathyroid gland disease or as a consequence of end stage renal disease.

While there is a known increase in the prevalence of osteoporosis, Paget's disease of bone, and osteomalacia are with age, the presence of vitamin D deficiency among pagetic and osteoporotic patients has been reported in only few cases [1]. Osteomalacia and osteoporosis are most often presented as adverse effects of bisphosphonates in the treatment of Paget's disease. These three bone diseases produce characteristic pathological features distinguishable from each other: Paget's disease of bone, also known as osteitis deformans, is a focal skeletal disorder characterized by excessive resorption and formation of bone, resulting in a disorganized pattern of bone. Osteoporosis is a progressive bone disease characterized by a decrease in bone mass and density and osteomalacia is a disorder of mineralization of newly formed matrices in adults. Paget's disease can be both symptomatic and asymptomatic while osteomalacia is often symptomatic. Bone pains, the most common presentation of both diseases is present in approximately 40-45% of patients with Paget's disease [2]. Bone

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pain in osteomalacia is associated with either isolated or global throbbing bone pain that is often misdiagnosed as fibromyalgia, myositis, or chronic fatigue syndrome. It is the most disabling and most remediable bone disease of the elderly [3]. Osteoporosis on the other hand is asymptomatic; its chief consequence is increased risk of bone fracture. Both Paget's disease of bone and osteomalacia are also associated with bone fracture.

Diagnosis in Paget's disease is usually made incidentally by a routine chemistry screen showing an elevated serum alkaline phosphatase, or by a plain radiograph obtained for some other reason. Measurement of urinary hydroxyproline excretion is useful to confirm Paget's disease, but is not readily available. Bone scan is a sensitive test in identifying pagetic bone lesions which appear as areas of increased uptake due to increased activity [2,4]. On the other hand, x-ray of osteomalacia shows non-specific findings. Laboratory confirmation reveals elevated alkaline phosphatase, low or normal calcium and low phosphorous while parathyroid hormone level is elevated, manifesting as secondary hyperparathyroidism.

Bisphosphonates are the standard therapy for symptomatic Paget's disease and in osteoporosis [1,2,4,5].

In osteomalacia, body stores of vitamin D need to be replaced, followed by supplementation with calcium + vitamin D [5]. Therefore, calciferdiol levels should be obtained prior to initiating therapy in Paget's disease as bisphosphonates can induce osteomalacia [5].

It is imperative to work-up geriatric patients who present with fractures to determine the possible presence of overlapping metabolic bone diseases. These diseases will require additional treatment to help lower the risk of future fractures.

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