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Perspective

Bone Mineral Densitometry Technique Involved in Osteoporosis

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DESCRIPTION

Low bone mass, which causes lower bone strength and an increased risk of vertebral body, distal forearm, and proximal femur fractures, is a hallmark of osteoporosis. If properly treated, osteoporosis may become a significant cause of morbidity in individuals with βTm, who will live longer.

Even though haemoglobin levels return to normal, the right hormone replacement is used, and the iron-chelation therapy is adjusted, patients with βTm frequently exhibit altered bone turnover with increased resorption, which leads to reduced bone mineral density. 40% to 50% of people who receive adequate treatment for βTm develop osteoporosis.

Failure to reach peak bone density during skeletal growth, anaemia with chronic disease-related reduced activity, hypogonadism, excessive bone reabsorption, DFO toxicity, and calcium/vitamin D inadequacy are some of the factors that contribute to the development of osteoporosis. Contrary to bone reabsorption, which is significantly increased and seems to be influenced by haemoglobin levels, bone production is not hindered.

The degree of osteoporosis in Tm patients has been the subject of numerous quantitative investigations using Dual-Energy X-ray Absorptiometry (DEXA). In a group of 82 patients with Tm who were receiving optimal care, osteoporosis was found in 42% of cases, with a pattern of spinal involvement in women and spinal and femoral involvement in men. Others with 50 patients also reported similar outcomes, demonstrating the significance and effectiveness of hormone replacement therapy in raising bone mineral density.

Others discovered a mismatch between DEXA and quantitative computed tomography (QCT), with QCT yielding greater T- and Z-scores. Another similar study with 48 patients revealed that, when using DEXA, the total prevalence of spinal osteoporosis was 44% and that of QCT, just 6%. The 10-year follow-up in the same study revealed that, despite the high prevalence of osteoporosis, as determined by DEXA, few patients had complained of symptoms like back discomfort, and only four had had fractures of the peripheral bone. Data from the two thalassemia centres on the island of Crete revealed that none of the 75 patients who had iron chelation treatment and optimum transfusions experienced any osteoporotic fractures (personal communication).

A statistically significant difference between the mean values of bone mineral density was discovered in another study using single-energy QCT in thalassemic patients and controls (173.4 and 158.2 mg/cm^3, respectively). Given that DEXA measures bone density across the entire vertebrae, and QCT examines trabecular density and cortical density individually, this divergence between the two methods may be related to differential involvement of cortical and trabecular bone. The transfusion-related iron deposition in the marrow is one possibility that might account for the elevated bone mineral density values in QCT.

CONCLUSION

Therefore, single-energy QCT may overestimate the actual mineral content of the vertebrae. The same problem also occurs with DEXA, though to a lesser extent due to the use of two X-ray energies. In conclusion, it appears that assessment of bone mineral density provides diverse results, depending greatly on the technique utilised and the underlying condition of the disease, with regard to the occurrence of osteopenia or osteoporosis in Tm patients.

DEXA should classify the majority of patients as osteopenic or osteoporotic, however this is inconsistent with the absence of osteoporotic fractures in patients who have received the best care. Reduced bone mass and at least one endocrinopathy linked to iron overload have both been linked to increased fracture risk. The upper extremities are where fractures occur most frequently, then the spine, hip, and pelvis.