Skeletal Risk Factors in Children and Adolescents with Leukemia or Eating Disorders

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Synopsis:
This study is to look at the differences between the most widely used device, dual-energy x-ray absorptiometry (DXA) and a new radiographic tool, the peripheral quantitative computed tomography (pQCT) in identifying the characteristics of skeletal health in children and adolescents with eating disorders and in the increasing number of Acute Lymphoblastic Leukemia survivors.

Bone health is established during childhood and adolescence since maximal bone mass, size and strength are reached by early adulthood. Weak bones break easily and a number of medical conditions acquired during childhood have been linked to bone fragility. Reduced bone mass has been reported in two chronic disorders, Anorexia Nervosa (AN) and Acute Lymphoblastic Leukemia (ALL), therefore their study will provide a better understanding of the causes of early bone fragility. Testing bone density by performing a radiology test is the surest way to check for bone health and identify children at risk for fracture before they occur. Our study proposes to evaluate the differences between the most widely used device, dual-energy x-ray absorptiometry (DXA) and a new radiographic tool, the peripheral quantitative computed tomography (pQCT) in identifying the different characteristics of skeletal health in children and adolescent with eating disorders (ED) and in the increasing number of ALL survivors.

Aim #1: To quantify the impact of ALL and ED on cortical and trabecular bone mass, bone geometry, bone strength indices, and body composition.
Hypotheses 1a-c: Our primary hypothesis is that patients with ALL and ED will have a clinically significant reduction in total bone diameter (Z-score difference greater than 0.5). Secondarily, we hypothesize that:
(a) Trabecular and cortical bone will be reduced in ED due to estrogen deficiency and undernutrition whereas ALL patients will have preserved trabecular bone mass but low cortical bone.
(b) Lean body mass will be reduced in both ALL and ED because of chronic illness and maturational delay.
(c) Bone mass will be reduced in ALL and ED but that the muscle-bone ratio will be normal.

Aim #2: To identify risk factors for reduced bone mass and strength and lean body mass.
Hypothesis 2: We hypothesize that low BMI, low calcium intake, amenorrhea, and exposure to chemotherapy and radiation therapy will be significantly correlated with measures of bone mass, geometry and lean body mass.

Aim #3: We will examine the potential for recovery of bone mass, bone strength and lean body mass as measured by DXA and pQCT after weight rehabilitation and/or return of menses (in ED) and with increasing time post treatment (for ALL).
Hypothesis 3: We hypothesize that densitometry data one year after study entry will demonstrate...
improvement in parameters of bone mass, strength and lean body mass only in patients with improved nutritional status (ALL and ED) and periods free of chemotherapy and radiation (ALL).

Despite the potential value of pQCT, there are no published data to date on the skeletal status of children with ALL or ED using this technique. This study will address not only the clinical correlates of bone growth and development but also the optimal method for examining it. These data will be helpful in developing disease-specific interventions to prevent or treat osteoporosis in these chronic disorders.