

Abstract

Osteoporosis is a condition that is characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. This paper develops an interconnectivity index for trabecular bone microarchitecture characterization for the discrimination of patients with different degrees of osteoporosis. A total of seventy one images of the calcaneus (heel bone) from subjects suffering from osteoporosis at different stages were analyzed. A fractal-based method (lacunarity), which quantifies the porosity of the bone, is used as a comparative tool to estimate correlations between interconnectivity indexes and the disease. Bone features are used to classify the subjects using a support vector machine (SVM) classifier. The correlation between the proposed interconnectivity index and the disease was found to be better than that between an existing index and the disease. Statistical analysis results suggest that the proposed parameter is efficient for monitoring bone strength and predicting future fracture risk. Moreover, results obtained using SVM with features from the proposed index provide better accuracy and smaller error for classifying patients compared to those obtained with an existing index