

Identification of High Stress Regions in Proximal Femur During Single-Leg Stance and Sideways Fall Using QCT-Based Finite Element Model

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Abstract : Studying stress and strain trends in the femur and recognizing femur failure mechanism is very important for preventing hip fracture in the elderly. The aim of this study was to identify high stress and strain regions in the femur during normal walking and falling to find the mechanical behavior and failure mechanism of the femur. We developed a finite element model of the femur from the subject's quantitative computed tomography (QCT) image and used it to identify potentially high stress and strain regions during the single-leg stance and the sideways fall. It was found that fracture may initiate from the superior region of femoral neck and propagate to the inferior region during a high impact force such as sideways fall. The results of this study showed that the femur bone is more sensitive to strain than stress which indicates the effect of strain, in addition to effect of stress, should be considered for failure analysis.

Keywords : finite element analysis, hip fracture, strain, stress

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