Osteoporosis is defined as a skeletal disorder characterized by compromised bone strength that predisposes a person to an increased risk of fracture. Bone strength primarily reflects the integration of bone density and bone quality. Bone density is expressed as grams of mineral per area or volume, and, in any given individual, is determined by peak bone mass and amount of bone loss. Bone quality refers to architecture, turnover, damage accumulation (e.g., microfractures), and mineralization. However, bone quality has not yet been clearly defined, and no measurement methods of bone quality have been established for the patients with osteoporosis. Recently, we introduced a computed tomography-based finite element analysis, which incorporates information on both the three-dimensional bone architecture and bone density distribution. We designed the analysis as a useful and non-invasive method of estimating bone strength, including bone quality. In addition, the evaluation of the relationship between bone strength and loading direction by using with this method provides the elderly patients with the more information concerning the risk of fracture risk due to falls.

Skin is the largest organ in humans and protects the body from environmental factors. The dermis is a layer that acts to protect the body from external physical force. Viscoelasticity is essential to facilitate the physical function of the skin. However, the clinical-biological-physical relevance of dermal connective tissue has not been fully investigated. We discussed the mechanical properties of the skin. It is obtained by estimating the mechanical properties of the skin from the results of measurement of the condition of the skin and subcutaneous tissue. Figure are those subcutaneous tissue is changed by the influence of an external force.

Loss of muscular strength and decline of balance in older adults impairs their ability to perform activities of daily living, such as walking or moving from a sitting to a standing position (sit-to-stand). To develop care methods to maintain their quality of life, it would be useful to evaluate the changes in their movement characteristics using conventional techniques. We investigated the potential of video analysis of the sit-to-stand motion in several applications, i.e., hemiplegia, a rucksack carrying model and physical battery, in older adults. As a result, the sit-to-stand motion reflected the changes in motor function due to muscle weakness and paralysis. Motion analysis using the sit-to-stand motion could be suitable for evaluating the physical abilities of older adults. We review these examples and discuss the research direction of video analysis for both the diagnosis of motor function, as well as supporting health promotion activities.