

Publication

A comparison of measuring mechanical axis alignment using three-dimensional position capture with skin markers and radiographic measurements in patients with bilateral medial compartment knee osteoarthritis

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The mechanical axis alignment of the lower extremity is typically measured from frontal plane radiographs of the entire lower extremity during double support standing. The purpose of this study was to test the hypothesis that the mechanical axis alignment can be predicted from skin markers on anatomical landmarks and anthropometric measurements and a stereophotogrammetric system based on significant correlation with the mechanical axis alignment measured from standing radiographs. Mechanical axis alignment was measured using full-limb radiographs for both knees of 62 patients with bilateral medial compartment knee osteoarthritis (OA). Mechanical axis alignment was also measured using a stereophotogrammetric system with markers on anatomical landmarks and anthropometric measurements to determine joint centers. The mechanical axis alignment from position capture correlated with that from radiographs ($R(2)=0.544$; $P<0.001$). This relationship did not depend on age, gender, BMI, or OA severity. A small but significant difference in the mechanical axis alignment between the two methods was observed (radiograph: 2.6 varus; position capture: 3.8 varus; $P=0.001$). Associations between mechanical axis alignment and OA severity were found for both methods (radiographic: $R(2)=0.563$; position capture: $R(2)=0.807$). The proposed method allows the measurement of the mechanical axis alignment without exposure to radiation. This method enables the establishment of the relationship between lower limb alignment and functional variables such as dynamic joint loading in degenerative joint disease and joint injury even in populations who typically do not undergo radiographic examination.

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