

IMPROVEMENT OF KINEMATIC AND MUSCULOSKELETAL MODELS IS NECESSARY TO BETTER UNDERSTAND SHOULDER INJURIES IN ATHLETES.

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Shoulder injuries are common in sport especially when repetitive over-head movements are performed. A better understanding of shoulder mechanics, through kinematic and musculoskeletal models implementation, is necessary to improve the prevention and rehabilitation of shoulder injuries. The general purpose of this presentation is to discuss i) the interest of intra cortical pins to assess shoulder kinematics ii) kinematic model to improve shoulder movement tracking iii) musculoskeletal model to estimate muscle force during dynamic movements. Our researches using intra-cortical pins enabled to assess glenohumeral translation and subacromial space to determine dangerous movements. Analyses of intra-cortical pins coupled to skin markers have enabled to identify soft tissue artifacts of the upper-limb. These outcomes confirm that raw skin marker kinematics cannot be trusted to assess shoulder movements. Global optimization coupled to the implementation of an ellipsoid to constrain scapula movements may improve upper-limb movement tracking. Musculoskeletal model of the upper-limb, including constraint of glenohumeral non-dislocation and glenohumeral ligaments, has been implemented. From this model, index of co-activation and simulation of glenohumeral instability have been developed to assess the stabilization function of superficial and rotator cuff muscles. Efforts to improve kinematic and musculoskeletal models are still needed to assess accurately shoulder mechanics and get a better knowledge of shoulder injury risk in sports.