World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:10, No:01, 2016

The Effects of Inferior Tilt Fixation on a Glenoid Components in Reverse Shoulder-Arthroplasty

Authors : Soo Min Kim, Soo-Won Chae, Soung-Yon Kim, Haea Lee, Ju Yong Kang, Juneyong Lee, Seung-Ho Han

Abstract : Reverse total shoulder arthroplasty (RTSA) has become an effective treatment option for cuff tear arthropathy and massive, irreparable rotator cuff tears and indications for its use are expanding. Numerous methods for optimal fixation of the glenoid component have been suggested, such as inferior overhang, inferior tilt, to maximize initial fixation and prevent glenoid component loosening. The inferior tilt fixation of a glenoid component has been suggested, which is expected to decrease scapular notching and to improve the stability of a glenoid component fixation in reverse total shoulder arthroplasty. Inferior tilt fixation of the glenoid component has been suggested, which can improve stability and, because it provides the most uniform compressive forces and imparts the least amount of tensile forces and micromotion, reduce the likelihood of mechanical failure. Another study reported that glenoid component inferior tilt improved impingement-free range of motion as well as minimized the scapular notching. Several authors have shown that inferior tilt of a glenoid component reduces scapular notching. However, controversy still exists regarding its importance in the literature. In this study the influence of inferior tilt fixation on the primary stability of a glenoid component has been investigated. Finite element models were constructed from cadaveric scapulae and glenoid components were implanted with neutral and 10° inferior tilts. Most previous biomechanical studies regarding the effect of glenoid component inferior tilt used a solid rigid polyurethane foam or sawbones block, not cadaveric scapulae, to evaluate the stability of the RTSA. Relative micromotions at the bone-glenoid component interface, and the distribution of bone stresses under the glenoid component and around the screws were analyzed and compared between neutral and 10° inferior tilt groups. Contact area between bone and screws and cut surface area of the cancellous bone exposed after reaming of the glenoid have also been investigated because of the fact that cancellous and cortical bone thickness vary depending on the resection level of the inferior glenoid bone. The greater relative micromotion of the bone-glenoid component interface occurred in the 10° inferior tilt group than in the neutral tilt group, especially at the inferior area of the bone-glenoid component interface. Bone stresses under the glenoid component and around the screws were also higher in the 10° inferior tilt group than in the neutral tilt group, especially at the inferior third of the glenoid bone surface under the glenoid component and inferior scapula. Thus inferior tilt fixation of the glenoid component may adversely affect the primary stability and longevity of the reverse total shoulder arthroplasty.

Keywords : finite element analysis, glenoid component, inferior tilt, reverse total shoulder arthroplasty
Conference Title : ICBBE 2016 : International Conference on Bioengineering and Biomedical Engineering
Conference Location : London, United Kingdom
Conference Dates : January 18-19, 2016