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Title	The Four Fixation Methods in Two-tunnel Coracoclavicular Ligament Reconstruction Technique (biomechanical evaluation: finite element analysis)
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Abstract

To treat Acromioclavicular (AC) joint dislocation, the two-tunnel Coracoclavicular (CC) ligaments reconstruction is a recommended technique. However, failures including tunnel widening and loss of reduction are presented due to using of this treatment technique. Previous studies reported that some fixation methods might potentially be a cause of failure in dislocation treatment. Therefore, this study aimed to investigate the fixation stability and effect of four different fixation methods in two-tunnel CC ligament reconstruction technique using finite element analysis. The simplified constructs of various surgical procedures were divided into four models, which were different in tunnel location and fixation method. 70 N loads in three different directions were applied on all models. Displacement and peak von Mises stress output parameters were evaluated. The magnitude of maximum stress occurred on clavicle in all models showed lower values than the average yield strength of that bone (114 MPa). Interestingly, the perpendicular tunnel position with O-loop fixation method generated stress value lower than other models. This type of fixation also exhibited the lowest displacement value in superior direction, which could be used to determine a good fixation stability. Therefore, the perpendicular tunnel position with O-loop fixation method may help to decrease risk of failure after treatment due to a criterion of cumulative stress on the construct.