Two-Dimensional Glenoid Version Measurements Vary with Coronal and Sagittal Scapula Rotation

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Introduction: The purpose of this study was to test whether scapula rotation in the coronal and sagittal planes significantly alters glenoid version as measured on 2D images.

Materials and Methods: Thirty six 3D scapula models were generated from CT scans of cadaver shoulders. Scapula models were rotated in one degree increments in the coronal and sagittal planes. Glenoid version was measured on 2D axial images at the mid-glenoid level for each of the rotation increments. Version variability was found as the difference between measurements at rotated and the neutral position (plane of the scapula) as measured on the 3D model.

Results: Average version with the scapula in the neutral position was -2.0 ± 3.8° (-8.8° to 7.6°). Version measured with coronal or sagittal rotation of the scapula was significantly different from version at neutral rotation for all degrees of rotation (p<0.0001). With 20° of scapula abduction and adduction in the coronal plane, mean version variability was 9.4 ± 3.1° (3.5° to 14.6°) and -2.4 ± 1.1° (-4.7° to -0.3°), respectively. With 30° of internal rotation and 10° of external rotation in the sagittal plane, mean version variability was 6.4 ± 4.0° (-0.2° to 17.4°) and -2.0 ± 1.3° (-4.7° to 0.8°), respectively.

Discussion: Scapula rotation of 1° or greater in the coronal and sagittal planes significantly alters the glenoid version measurement. When the scapula is abducted or externally rotated, glenoid version measurements were more anteverted. Whereas, when the scapula was in adduction or external rotation the glenoid version measurements were more retroverted.