Are Pendular Shoulder Exercises Worthwhile?

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Abstract

Introduction: Codman's pendular shoulder exercises have been widely used for decades as means of passively mobilizing the glenohumeral joint while not compromising recently injured or repaired tissues. Neurophysiological studies have confirmed the largely passive nature of the exercises, but no studies have actually shown that the exercises result in true glenohumeral movement. The aim of this study was thus to quantify glenohumeral motion during pendular exercises using a patient-specific measurement technique combining medical imaging and motion capture. The hypothesis was that these exercises involved little if any glenohumeral motion at all.

Methods: 7 healthy volunteers without hyperlaxity were recruited for this study (6 right-handed, 1 left-handed, mean age 26.7, range 17 to 44). Shoulder kinematics were reconstructed from computed tomography (CT), 24 infrared cameras and 69 retro-reflective skin markers based on a previously validated biomechanical model. During motion capture, participants were instructed to perform latero-medial, antero-posterior, and circular Codman pendular exercises. Glenohumeral, thoracohumeral, and humerus angles relative to the laboratory vertical axis, the latter measure reflecting the overall

amplitude of the performed exercises, were calculated for each sequence, as well as amplitudes. Linear regression analysis using Pearson coefficient (r) was carried out to establish a correlation between different components of shoulder motion.

Results: Glenohumeral involvement was minimal in all exercises. Mean glenohumeral amplitude was 5.4˚± 4.9° (range, 1.1 to 11.8) for latero-medial exercises with a mean overall amplitude of 36.1˚± 10.5° (range, 25.4 to 56.4), and 9.1˚± 6.1° (range, 3.3 to 19.7) for antero-posterior exercises with a mean overall amplitude of 37.30˚± 12.45° (range, 20.68 to 52.07). For circular exercises with mean overall amplitude of 23.60° ± 8.29° (range, 14.74 to 35.49), glenohumeral amplitude was 9.89˚± 4.13° (range, 2.54 to 15.23) and 11.84˚± 4.06° (range 6.02 to 16.86) for abduction-adduction and flexion-extension, respectively. There was no significant correlation between glenohumeral and overall exercise amplitude, or thoracohumeral amplitude. Thoracohumeral amplitude was moderately correlated with overall exercise amplitude (r=0.69, p=0.000005).

Conclusion: This study proves that Codman pendular exercises involve little if not negligible glenohumeral motion. This small involvement doesn’t seem to be influenced by the overall amplitude of the exercises. Codman exercises are therefore mainly the result of scapulothoracic and truncal movement, raising questions about their legitimacy in restoring passive range of motion in shoulder rehabilitation.