

Are Pendular Shoulder Exercises Worthwhile?

Gregory Cunningham,¹ MD, Caecilia Charbonnier,² PhD, Sylvain Chagué,² MS,
Alexandre Lädermann,^{1,3,4} MD, David H. Sonnabend,^{5,6} MD

¹Division of Orthopaedic and Trauma surgery, Geneva University Hospitals, Switzerland.

²Artanim Foundation, Medical Research Department, Geneva, Switzerland

³Faculty of Medicine, University of Geneva, Switzerland.

⁴Division of Orthopaedics and Trauma Surgery, Clinique La Colline, Geneva, Switzerland.

⁵Department of Orthopaedic and Traumatic Surgery, Royal North Shore Hospital, Sydney, Australia.

⁶Institute of Bone and Joint Surgery, University of Sydney

Abstract

Background: Codman's pendular exercises have been widely used for decades with the intention of passively mobilizing the glenohumeral (GH) joint while not compromising recently injured or repaired tissues. However, no studies have yet shown that they actually result in true GH movement. The aim of this study was thus to quantify GH motion during pendular exercises with the hypothesis was that they involved little if any true GH motion.

Methods: 10 healthy volunteers were involved in this study. Shoulder kinematics were analyzed based on a validated biomechanical model coupling patient-specific imaging and motion capture, during which participants were instructed to perform medio-lateral, antero-posterior and circular pendular exercises. GH range of motion (ROM), scapulothoracic (ST) ROM, thoracohumeral (TH) ROM and overall exercise amplitude were calculated for each sequence. Linear regression analyses were carried out to determine any association between different components of shoulder motion.

Results: Mean overall exercise amplitudes were $36.48^{\circ} \pm 9.74^{\circ}$ (range, 25.38 to 56.39°) for medio-lateral exercises, $38.3 \pm 14.97^{\circ}$ (range, 20.68 to 64.99°) for antero-posterior exercises, and $21.44^{\circ} \pm 7.72^{\circ}$ (range, 14.01 to 35.49°) for circular exercises. Mean GH and ST involvement remained minimal, ranging from 4.88 to 10.77° , and 1.4° to 4.19° , respectively. There was no significant correlation between overall exercise amplitudes and GH ($R = 0.38$, $p = 0.01$) or ST amplitudes (adjusted $R^2 = 0.3$, $p = 0.006$).

Conclusion: This study demonstrates that Codman pendular exercises depend mainly on truncal movement, and produce very little movement of the GH and ST joints. The use of these exercises for passive shoulder rehabilitation is thus questionable.