

Lumbar Axial Loading Device Alters Lumbar Sagittal Alignment Differently From Upright Standing Position: A Computed Tomography Study

Abstract

Study Design. A study was performed using an axial loading device in healthy young subjects.

Objective. To determine whether sagittal alignment during axial loading using a compression device can accurately simulate the standing posture.

Summary of Background Data. Axial compression devices are widely used for simulation of standing position during magnetic resonance imaging (MRI) or computed tomography (CT) scans. However, images taken during axial loading have not been compared with those obtained in a standing posture.

Methods. The study population comprised 14 asymptomatic healthy volunteers (7 men and 7 women: age 21–32, mean 27 years). Lumbar lateral radiograph films obtained in the standing posture (standing condition), lumbar CT images with axial loading using a DynaWell compression device (axial loading condition), and CT images without loading (control) were compared. Changes in spinal length, lumbar disc height, segmental lordotic angle, and total lumbar lordotic angle were compared among the conditions.

Results. Spinal length was significantly decreased in both the axial loading and standing conditions compared with controls. The magnitude of the changes was greater in the standing condition than in the axial loading condition. Segmental lordotic angle at L2/3 and L3/4 was significantly increased in both axial loading and standing conditions.

Conclusion. The compression device simulates the lumbar segmental alignment change from supine to standing posture in L1/2, L2/3, L3/4, and L4/5.