Comparison of Kinematics Between Thoracolumbar T11-T12 and T12-L1 Functional Spinal Units

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Abstract

The purpose of this study was to compare the kinematics in terms of the locations and loci of instantaneous axes of rotation (IARs) at levels T11-T12 and T12-L1 of thoracolumbar junction (TLJ). The IAR is one of the kinematics characteristics of a functional spinal unit (FSU) in a plane under load. There is little information about loci of IARs in TLJ. Validated finite element (FE) models of T11-T12 and T12-L1 FSUs were used to determine the locations and loci of IARs in three anatomical planes.

In sagittal plane, the locations and loci of the IARs were located below the intervertebral disc for T11-T12, situated in the intervertebral disc for T12-L1. In frontal plane, they were all located around the mid-sagittal plane for T11-T12 and T12-L1. In transverse plane, they fell in the medioanterior region of the movable vertebra T11 for the T11-T12, and located near the cortical shell of the upper vertebra T12 for T12-L1. These findings may offer an insight to better understanding the kinematics of the human thoracolumbar spine and provide clinically relevant information for the evaluation of spinal stability and implant devices functionality.
Keywords: Kinematics, Thoracolumbar, Instantaneous axis of rotation, Finite element analysis.