Intervertebral Disc Biomechanics in the Pathogenesis of Idiopathic Scoliosis

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Abstract

The aim of the present study is to investigate whether the deformation of the intervertebral disc contributes to the progression of idiopathic scoliotic curves. In the standing posteroanterior x-rays of 92 scoliotic curves the following readings were obtained: Cobb angle (CA), apical vertebral rotation (AVR), apical vertebral wedging (AVW) and the adjacent to the apical vertebra Upper (UIVDW) and Lower (LIVDW) InterVertebral Discs Wedging. The statistical analyses included inter - intraobserver reliability test, descriptives, monofactorial linear regression and Pearson correlation coefficient, with $p<0.05$ considered statistical significant (SS).

The mean thoracic CA was 13.4°, lumbar CA 13.8°, thoracic AVR 5.3°, lumbar AVR 4.7°, thoracic AVW 1.4°, lumbar AVW 1.5°, thoracic UIVDW 1.6°, thoracic LIVDW 1°, lumbar UIVDW 1.3° and lumbar LIVDW 2°. Both thoracic and lumbar CA regressed SS with lumbar LIVDW, lumbar UIVDW, thoracic LIVDW and thoracic AVW. Lumbar LIVDW correlates SS with thoracic CA, lumbar CA and thoracic LIVDW. An inter and intra-observer error was below 1°.

The eccentric intervertebral disc in the scoliotic spine, through variation in its water concentration produces asymmetrically cyclical load during the 24-hour period and an asymmetrical growth of the vertebral body (Hueter-Volkman's law). The statistical analysis revealed that AVW appears later when already CA increases, the IVDW is more important than AVW and the LIVDW, which is greater than UIVDW, is the most frequent correlated radiographic parameter.

The deformation of the apical intervertebral disc seems to be an important contributory factor in the progression of a scoliotic curve.