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Comparison of four radiographic angular measures of lumbar lordosis

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Background: Lumbar lordosis (LL) is the curvature assumed by intact lumbar spine to compensate for the inclination of the sacrum, restore an upward spinal orientation, and consequently avoid a forward inclination. In the mid-sagittal plane, it is anteriorly convex. It may be altered by birth defects, trauma, degenerative and inflammatory disorders; therefore, its reliable measurement is relevant to the diagnosis and continuing care of patients with these disorders. Several attempts (radiographic and non-radiographic) have been made to measure the lumbar lordosis (LL), but the results differ substantially as investigators have used different parameters. Radiography is the gold standard, and some of the methods include Lumbosacral angle (LSA), lumbosacral joint angle (LSJA), Cobb angle, and TRALL (Tangential Radiologic Assessment of Lumbar Lordosis) angle. The traditional method, the Cobb technique, has a wide range of normal mean values, with a large standard deviation. Using a more reliable radiographic angle will hopefully simply and standardize LL measurement in the diagnosis, treatment and follow-up of patients.

Aim: To compare the normal LSA, LSJA, TRALL and Cobb angles, by determining (a) if any Correlation exists between them; and, (b) the most reliable measure of LL, based on, least (i) number of measurement lines, (ii) range of values, (iii) standard deviation, and (iv) variance.

Methods: The four angles were retrospectively measured in each supine lateral lumbosacral spine radiograph of 100 males and 100 females. Data was analyzed with IBM SPSS Statistics 23.0 (New York, USA); $P < .05$ was considered significant.

Result: Each angle showed no male-versus-female Correlation; and, all four angles showed no Correlation between their mean values. The respective number of measurement lines, range of values, standard deviation and variance of (a) Cobb angle was 4, 61.0°, 12.8 °, and 162.9; (b) LSA was 2, 53°, 10.0 °, and 100.3; (c) TRALL angle was 5, 44°, 8.3 °, and 68.1; and, (d) LSJA was 2, 34°, 5.7 °, and 32.7.

Conclusion: In normal patients, there is no significant Pearson Correlation between the mean LSA, LSJA, TRALL and Cobb LL angles, and of the four angles, LSJA is the most reliable angular measure of LL.

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