Lumbar Spine Sagittal Kinetics: A Flexion-extension X-rays Based Study of Hospital Population

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Introduction

Limited data on the range of motion of lumbar spine in hospital populations exist. Knowing and understanding normal range of motion is essential in planning and preparing management strategies. We present norm data on a large set of hospital patients, selected for no radiological abnormality.

Methods

Lumbar flexion-extension roentgenograms performed at one institution between 2004 and 2010 were retrospectively reviewed and patients with normal images were selected. Lumbosacral angle between flexion and extension, as well as individual angles at each vertebral segment were measured.

Three observers analyzed 40 randomly selected patients, independently, to estimate inter-observer reliability (12 angles per patient and 480 measurements per rater).

Results

Total of 288 patients, ages 11 to 83 years, with unremarkable lumbar images were studied; 150 males (52%) and 138 females (48%).

The two-way random effects intra-class correlation coefficient (Figure 1), measuring inter-observer reliability, showed excellent consistency and agreement between raters ($r = 0.971$ (0.966-0.976), $p<0.001$).

The mean lumbosacral range of motion was 29.50, with greatest contributions from L4-5 and L5-S1 (Table 1). There was no statistically significant gender difference (Wilcoxon Rank-Sum tests) for any level (Table 2).

Spearman rank correlation coefficient for continuous age showed statistically significant decrease in range of movement with increasing age for all levels (Figures 2, 3 & 4).

Overall and individual segment motion was statistically decremental (Kruskal-Wallis test) between age groups < 40 (n=89), 41-60 (n=143) and > 60 (n=56) (Figures 5 & 6).

Conclusions

Lumbar range of movement is not static over different intervertebral

Learning Objectives

1. To describe normal lumbar spine characteristics.

2. To explain differences in motion between different spine levels.

3. To enumerate differences in lumbar kinetics with increasing age.

References

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