

SCOLIOSIS ANALYSES

The following study is published by the Journal of Arizona/ Nevada Academy of Science.

Likelihood-Evidential Support and Bayesian Re-Analysis on a Prospective Cohort of Children and Adolescents with Mild Scoliosis and Chiropractic Management

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This report was funded by the Foundation for Chiropractic Education and Research, Norwalk, IA, Life Chiropractic College West, Hayward, CA and the Gonstead Clinical Studies Society, Santa Cruz, CA.

Running Head: scoliosis analyses

Abstract

Background: A previous study using frequentist analytic methods on a single cohort showed no difference in forty-one patients undergoing chiropractic management for mild or early stage scoliosis. Participating chiropractors in the study suggested effects were obscured by method error. The grantor requested a re-analysis.

Objective: To re-analyze Cobb angle data from a previously published cohort study on the effects of chiropractic care in pediatric subjects with mild idiopathic scoliosis to gain insight on how the scoliosis progressed and what factors may have contributed to it.

Methods: Plain film radiographs of 41 children and adolescents were re-measured by Risser-

Ferguson and Cobb methods. Three magnitudes and three types of change were constructed to cover various notions of scoliosis change: magnitudes of 1°, 3°, or 5°, and types that alternatively included or omitted no change as a possible successful outcome (arrested progression). Thus, success could be assessed using the three filters across three definitions of success: 1) those whose curve improved or was stable versus the others, 2) those who improved only versus the others, and 3) those that either improve or progressed (stable curves omitted).

Data were then analyzed by evidential support methods and Bayesian analyses at each filter and type of improvement to establish whether any characteristics of the spine or frequency and duration of the care may have affected outcomes.

Results: Intra-class correlation for intra-examiner stability was 0.73 for Cobb method; reliability between the new and the previous examiner was 0.59 for pre- and 0.69 for post-treatment Cobb angles. Reliability increased dramatically with end vertebrae specified.

Ratio of the number of patients that improved to those who progressed to was at least 2:1 for all three levels of filter: 1°, 3°, and 5°. Number of treatments or duration, were not associated with improvement. Through inspection followed by general linear modeling, found number of segments below the curve apex (Apex) – a measure of curve compression – plus bone age accounted for 49% of adjusted R² in Cobb angle change. Three or fewer infra-apex segments were associated with improvement in scoliosis. Initial Cobb angle as a clinical predictor was not supported. One treating chiropractor experienced a greater rate of improvement at the highest level of change (5°) in his patients.

Conclusion: According to evidential support and Bayesian analysis, improvement was best predicted by curve compression and bone age. Patients with 3 or fewer infra-apex segments had at least 2:1 odds for improvement irrespective of initial Cobb angle. Filter size, likelihood ratios, and Bayesian analysis supported Apex over other predictors. This result could be from a either a transient type of scoliosis resolving on its own, or a subgroup of scoliosis responding to chiropractic manipulation. A predictive linear regression model equation was derived for further testing for clinical utility and validity. A larger variety of outcome measures would better describe and predict scoliosis progression and the need for care.

Key Words: cervical vertebrae; cohort; lumbar vertebrae; manipulation, chiropractic; scoliosis; thoracic vertebrae