Validity of the Scoliosis Spinal Stifness, a new clinical test to measure scoliosis curves stiffness in AIS

Vanossi M, Poggio M, Negrini A, S.Donzelli, S.Negrini

BACKGROUND measuring scoliosis curves stiffness is essential for prediction of treatment results and scoliosis progression. Side bending x-rays represent the most widely used method to check the flexibility of scoliosis curves. This method is mainly used by surgeons for pre-operative planning. This evaluation could be useful also when conservative treatment is planned, but the exposure to ionizing radiation inhibit its widespread use. A previous study showed a good repeatability of a new clinical tool to evaluate scoliosis curves rigidity called, Scoliosis Stiffness Test.

OBJECTIVES the present study was aimed to check the intra and inter rater reliability and to test the specificity and sensibility of this new Scoliosis Stiffness Test, utilized in adolescents with idiopathic scoliosis.

STUDY DESIGN repeatability study and diagnostic study.

METHODS: Inclusion criteria were AIS diagnosis, Risser 0-3, first brace prescription. The Scoliosis Stiffness Test consists in a measure of the Angle of Trunk Rotation (ATR) in forward bending and in forward plus lateral bending toward convexity of the curve. Scoliosis Stiffness Test value, is given by the difference between the two measurements . Three blinded expert physiotherapists in scoliosis treatment measured the Angle of Trunk Rotation (ATR) in forward bending and in forward plus lateral bending toward the convexity of the curve. The intra and inter-rater repeatability was investigated using Intra Class Correlation (ICC). The Bland and Altman statistics was also applied. For ethical reasons it was not possible to use bending x-rays intended as Gold Standard reference for comparisons, consequently we used a proxy, the difference in Cobb degrees between pre-brace and in-brace x-rays intended as a Reference Standard. We set the value of 50% as the reference threshold for the cut off to definition the presence or absence of stiffness. Difference values between cobb without brace and with brace less than 50% have been classified as presence of stiffness, vice versa for values equal higher than 50%. The cut-point with the best sensitivity and specificity was obtained with a Receiver Operating Characteristic (ROC) curve. All statistical analyses were conducted by using the Stata statistical package (version 14; Stata Corp).

RESULTS We included 21 patients (17 females), age 13 (SD=1,8) for a total of 30 curves. Mean cobb degrees pre-brace and in-brace were 37° (SD=9.2) and 23° (SD=6.2), respectively. Mean ATR in forward bending was 8° (SD=4.2). Mean Scoliosis Stifness Test value was -2,5° (SD=4,8) negative value intended as an inversion of the prominence. was 10.5°ATR (SD=4.4).

The obtained ICC coefficient intra-rater was a very good value, equal 0.85 (95% confidence interval 0,71 – 0,93) , the inter-rater was a good value equal 0,66 (95% confidence interval 0,45 – 0,83) .

The best Spinal Stifness Test cutpoint was ≥ 7° to predict a stiffness defined in according to our Reference Standard. The resulted sensitivity was 85%, with a specificity of 33%. The Positive Likelihood Ratio was 1.27. The Negative Likelihood Ratio was 0.44. The resulted Area under the ROC curve was 0.70, thus confirming a good validity.

CONCLUSION: the present study showed that the new Scoliosis Stiffness Test has a good intra and inter operator repeatability, the sensibility and specificity confirm that this new test has good statistical properties. The next step is to test its use in everyday clinical practice.