

O-16

COMPLETE VALIDATION OF PLUMBLINE DISTANCES AS A SCREENING TOOL FOR SAGITTAL PLANE DEFORMITIES

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BACKGROUND

While for scoliosis screening Scoliometer has been widely validated, there is no validated screening instrument for sagittal plane deformities.

PURPOSE

To validate a screening tool for sagittal plane deformities (plumbline distances - PD).

METHODS

Surface measurements (Formetric) of kyphosis/lordosis were considered the Gold Standard.

Correlations between Human PD (HPD), Formetric PD (FPD) and Gold Standard were searched in 129 school screening pupils (age 11.8 ± 0.7): not correlated PD were eliminated. ROC-curve statistical technique was used to determine the best cut-off for remaining PDs.

Final FPD were verified in 7257 Formetric evaluations from the Diers database (3 age groups: 6-9y12m, 10-17y12m, 18-78). Final HPD were verified in 103 scoliosis/hyperkyphosis patients aged 14.3 ± 2.2 .

RESULTS

HPDs correlate with FPDs (0.49-0.57), C7+L3 with kyphosis (0.54-0.58), L3 with kyphosis and lordosis (0.42-0.56).

To identify 60° kyphosis, a cut-off of 90 mm for C7+L3 demonstrated an overall accuracy range of 75-93%, high specificity (78-95%), variable sensitivity (25-83%). HPDs very well ruled out normals (negative predictive value -PV 93-99%), even if with high numbers of false positives (positive predictive value +PV 8-25%).

Similarly, for 55° lordosis, a cut-off of 45 mm for L3 demonstrated a 75-94% overall accuracy, 70-94% specificity and 25-100% sensitivity, with -PV 93-100% and +PV 9-20%.

CONCLUSION

In all groups evaluated results were similar. Below 90mm C7+L3 (45mm L3) almost all pupils are below 60° kyphosis (55° lordosis); in the remaining 20% a non-ionizing surface evaluation (Formetric) should be proposed to identify real deformities (1 out of 4 to 10).

SCIENTIFIC SESSION IV: EVALUATION: CLINICAL, RADIOLOGICAL AND SURFACE TOPOGRAPHY

TIME: 13:30 - 14:25 / May, 19th

O-17

IS THE SURFACE TOPOGRAPHY A HELPFUL TOOL FOR THE MANAGEMENT OF SCOLIOSIS?

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BACKGROUND

The aim is to reveal the importance of surface topography in complement to the x-rays.

MATERIALS AND METHODS

We have used the Formetric 4D-Dicom II system, which is supplied also with lateral Cobb angle measurement. We have examined 616 patients (432 females and 184 males), age 5 y to 21 y. The patients have been visited clinically by inspection, Adams forward bending test and Perdriolle scoliometer. We have fit, to every patient, 4-8 reflectors on the apex of T1 through L4 spinal process and 2 shoulder reflectors to get the possibility for lateral Cobb angle measurement with the Formetric 4D.

RESULTS

We had various data through surface topography. Torsion, rotation, shoulder tilt, etc, but we have insisted on the Cobb angle measurement. We had a $>95\%$ accuracy in Scoliosis between 22° and 65° Cobb angle. The accuracy was lower, between 95% to 70%, if the measured curve was $> 65^\circ$ and very poor, less than 50%, when the curve was $<$ than 20° in x-rays. As it concerns the Kyphosis, the Cobb angle was very accurate as it was exceeded 90%.

CONCLUSION

We believe that the surface topography is a precious tool for the diagnosis and follow up of a complex three dimensional skeletal deformity, such as scoliosis. The accuracy of the Cobb angle measurement is excellent and we believe that we must move to the next step, which is the 3D dimension.