



## Final Results of Brace Treatment of Adolescents with Idiopathic Scoliosis prediction: out-of-brace is better than In-brace x-ray

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### Introduction

In-brace radiograph (IBR) shows the efficacy of the brace, while first out-of-brace radiograph (OBR) after some months of bracing demonstrates also the capacity of patients to keep the obtained correction. Consequently, OBR results for Adolescent Idiopathic Scoliosis (AIS) should predict final results better than IBR.

### Design

Retrospective study embedded in a prospective clinical collection of data including at search date (18-1-2019) 14,507 IS patients age 10-18.

### Methods

Participants: 304 consecutive patients (57 males, 250 females; age  $13.10 \pm 1.07$  yy.mm;  $35.7 \pm 11.2^\circ$  Cobb) with sub-groups by sex, Risser and curve severity. Inclusion criteria: AIS, Risser 0-4, brace treatment, availability of all radiographs (start [SR], IBR, OBR and end of treatment [EoTR]). Methods: paired ANOVA; correlations and  $r^2$ ; ROC curve to identify cut-offs to achieve improvement ( $-5^\circ$ ) and progression ( $5^\circ$ ), the correction rate was categorized in 4 class for the in brace correction and in 3 class for the out of brace correction.

### Results

Improvements from SR were: IBR  $-12.9 \pm 6.5^\circ$  ( $-19 \pm 36\%$ ), OBR  $-6.0 \pm 5.5^\circ$  ( $-4 \pm 27\%$ ), EoTR  $-4.7 \pm 6.1^\circ$  ( $-3 \pm 32\%$ ) ( $P < 0.001$ ). All radiographs were very well correlated among themselves, but the best correlations and  $r^2$  were between OBR and EoTR in all subgroups. EoTR was statistically different from IBR and OBR ( $P < 0.001$ ), but the difference was clinically significant only for OBR ( $+8.2 \pm 5.5^\circ$  vs  $+1.3 \pm 4.9^\circ$ ). While at IBR all locations were statistically different from EoTR, at OBR only the 247 thoracic curves changed (from  $-4.8 \pm 5.6^\circ$  to  $-2.9 \pm 6.1^\circ$ ) while the 90 thoracolumbar and 150 lumbar did not (from  $-6.5 \pm 5.5^\circ$  and  $-5.0 \pm 5.7^\circ$  to  $-6.1 \pm 5.5^\circ$  and  $-5.0 \pm 5.8^\circ$ , respectively). At EoTR, 10% of patients improved and 22% progressed comparing to OBR, versus 1% and 71% respectively comparing to IBR.

When the correction in brace is comprised between 20 and 30% the probability of improvement is increased with a sensitivity of 86.7% and a specificity of 47.62 with a with a rate of correctly classified subjects 84.0%; while for the patients with an IBR between 30 and 50% the sensitivity is 67.8% (LR+=1.65 and LR-0.48) and the specificity is 66.7%, the rate of correctly classified subjects is 67.8% (LR+=2.03 and LR-0.81). The AUC was 0.72 (SE=0.06 CI95% 0.59-0.84). An OBR of at least 20% is the best predictor of improvement with an AUC of 0.72 SE=0.05 CI95%(0.63-0.82) the sensitivity is 71.3% and the specificity is 66.7% with a rate of correctly classified subjects of 71.0% and LR+ of 2.1 and a LR- 0.65.

### Conclusion

IBR confirmed to be a useful and good predictor. OBR showed to be a better predictor, allowing to understand the real range of final results and giving a concrete target to physicians but also to patients and parents.