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THE POWER OF IS-GROWTH AND BRAIST-CALC PREDICTION MODELS: A NEW WAY TO COMPARE THE EFFECTIVENESS OF DIFFERENT BRACES SHOWS THE RELEVANCE OF BRACE MATERIALS.

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Background

Comparing brace concepts is challenging in real-world settings due to varying populations in which they are implemented. Prediction models allow producing Risk-Adjusted Comparisons: instead of uniformising patients at the start as usual (requiring no difference among treated groups), they uniformise at the end, according to individual risks. BrAIST-Calc and IS-GROWTH provide reliable predictions and could allow Risk-Adjusted Comparisons.

Study Design

Secondary analysis of a retrospective study on prospectively collected data, comparing final to natural history outcomes.

Objective (s)

To verify if IS-GROWTH and BrAIST-Calc can be used to produce Risk-Adjusted Comparisons in Adolescents with Idiopathic Scoliosis (AIS).

Methods

Setting: tertiary-level spinal disorders rehabilitation institute. We included AIS patients braced until bone maturity, respecting the BrAIST criteria (20-40° Cobb, Risser 0-2 at start). We compared the effectiveness of three brace types: two 'push-up' action braces (very-rigid and rigid) and one elastic, movement-action brace. We calculated the risks of reaching the 30° (IS-GROWTH - IG30), 50° (IG50), and 45° (BrAIST Calc - BC45) thresholds. We compared final and expected outcomes, computing: Standardised Incidence Ratio (SIR) with 95% confidence intervals and Poisson statistics, Absolute Risk Reduction (ARR), Number Needed to Treat (NNT), and Relative Risk Reduction (RRR).

Results

We included 701 patients (Table): 318, 310 and 73 in the very-rigid, rigid and elastic bracing groups, respectively. The three groups differed statistically for almost all baseline parameters (age, weight, height, BMI, Risser sign, and Cobb degrees), with the very-rigid and elastic groups comprising the most and least demanding patients, respectively (Table). The comparison with the natural history showed the highest effectiveness of the very-rigid brace (ARR IG50 12%, BC45 16%) and the lowest for the elastic one (ARR IG50 and BC45 2%) . Conversely, IG30 showed the highest efficacy for rigid bracing (ARR 63%) over the others (50% elastic, 48% very-rigid).

		Braced			Very rigid brace			Rigid brace			Elastic brace		
Number		701			318			310			73		
Females		84%			80%			87%			92%		
		Av±SD			*Av±SD*			*Av±SD*			*Av±SD*		
Start Age		13±1.4			13.2±1.4			12.9±1.4			12.7±1.3		
Start Weight		48.1±9.2			50.1±9.7			46.7±8.6			45.2±7.6		
Start Height		158.6±8.8			159.6±8.8			158.1±8.9			156.8±8		
Start BMI		19.0±2.9			19.6±3.1			18.6±2.6			18.3±2.5		
Start Risser		0.8±0.9			0.9±0.9			0.8±0.9			0.5±0.8		
Start Cobb		29.4±5.6			33±4.9			26.7±4.1			24.8±3.5		
End Risser		3.9±0.8			4±0.8			3.9±0.8			3.9±0.8		
End Cobb		26.4±8.8			30.4±8.9			23±7.1			23.9±8.1		
Above 30° at start			280			226			53			1	
Predicted above 30° at the end				581			292			235			54
Above 30° at the end		196	70%	34%	139	62%	48%	40	75%	17%	17	1700%	31%
		IG30	**IG50**	**BC45**	**IG30**	**IG50**	**BC45**	**IG30**	**IG50**	**BC45**	**IG30**	**IG50**	**BC45**
Absolute Risk Reduction	ARR	55%	23%	35%	48%	12%	16%	63%	8%	13%	50%	2%	2%
Number Needed to Trea	NNT	1,8	4,3	2,9	2,1	8,7	6,4	1,6	12,6	7,8	2,0	60,2	58,5
Standardized Incidence	SIR	0,34	0,06	0,07	0,48	0,23	0,10	0,17	0,00	0,03	0,32	0,00	0,04
Ratio	95CI	0,29	0,03	0,04	0,40	0,04	0,06	0,12	0,00	0,01	0,18	0,00	0,00
	95CI	0,39	0,10	0,11	0,56	0,16	0,16	0,23	0,06	0,09	0,51	0,27	0,22
	P (Poisson	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
RR Reduction	RRR	296%	1569%	1214%	210%	434%	391%	587%	-	1093%	315%	-	225%

IG30: IS-GROWTH prediction at 30°; **IG50**: IS-GROWTH prediction at 50°; **BC45**: BrAIST-Calc prediction at 45°

Conclusion(s)

Our results confirm 1) the hypothesis that material rigidity is relevant to reducing surgical outcomes, and 2) RCT results that elastic braces are less effective than rigid ones. The prediction models proved to be powerful tools for assessing the effectiveness of different braces in clinical settings and for surgical outcomes. The results for the 30° outcome require further investigation.

Clinical significance

Comparing concepts and designs is key to understanding bracing. Prediction models enable comparison across clinical cases, although we identified some limitations that warrant further clarification in future work.