

Choosing distal instrumentation level in GR Where to stop?

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Growing Rods in EOS

- ▶ Global acceptance
- ▶ Selection of the instrumentation levels
 - ▶ No consensus
 - ▶ Harrington stable zone?
- ▶ Decision
 - ▶ Case-by-case basis
 - ▶ Surgeon's preferences



Selection of instrumentation levels

- ▶ Distal end
 - ▶ Residual mobility of the lumbar spine
- ▶ Final fusion levels
 - ▶ Almost always include the previously instrumented levels of GR
 - ▶ At least one level longer in 44% of GR graduates



Traction/Bending Radiographs

- ▶ The reliability has been well-demonstrated for AIS
 - ▶ Save more distal motion segments
- ▶ Value in idiopathic or idiopathic-like EOS???



Methods

- ▶ 2006-2011
- ▶ 2 institutions
 - ▶ Retrospective analysis of prospectively collected data
 - ▶ IRB approvals



Inclusion Criteria

- ▶ Early-onset idiopathic or idiopathic-like scoliosis
- ▶ Conventional dual growing rods with proximal and distal spine anchors (pedicle screws or hooks)
- ▶ Lengthening with 6 month interval
- ▶ Availability of pre-op standing, bending/TrUGA, immediate post-op and final FU images
- ▶ A minimum 2 years f/u



Methods

- ▶ 23 patients (11 F, 12 M)
- ▶ Age at index surgery
 - ▶ 83.6 (45-145) months
- ▶ Follow-up
 - ▶ 68.1 (25-107) months



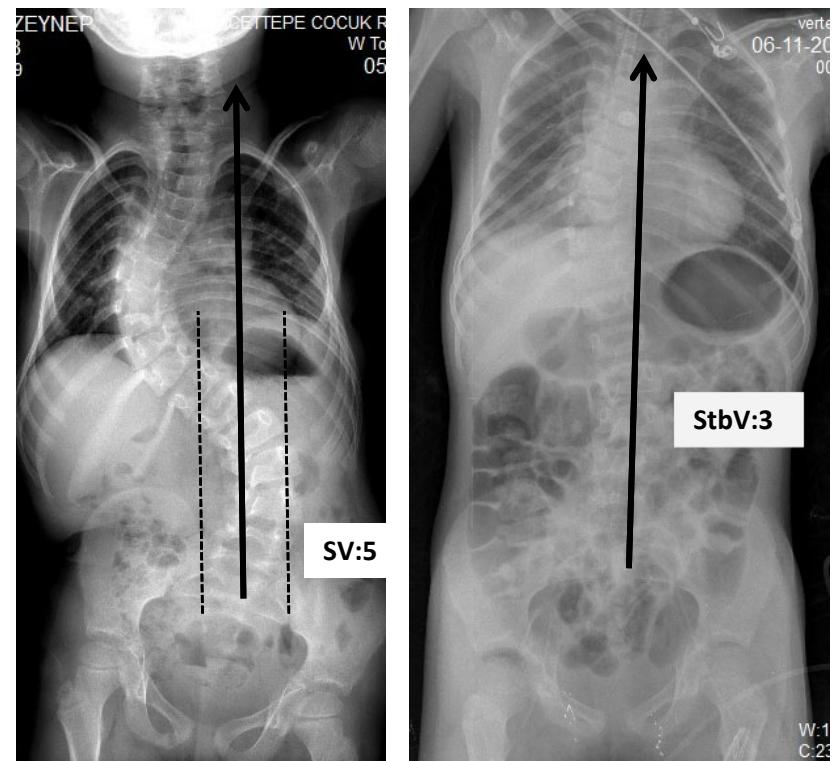
Radiographic Analysis

▶ Identification

- ▶ Preoperative x-ray
 - ▶ Stable vertebra (SV)
- ▶ Bending/traction x-ray
 - ▶ Stable-to-be vertebra

▶ Measurement

- ▶ Tilt
 - ▶ LIV
 - ▶ LIV+1
- ▶ Disc wedging



Groups

▶ LIV

▶ Group 1

- ▶ Proximal to the StbV
- ▶ 8 pts

▶ Group 2

- ▶ LIV was StbV
- ▶ 9 pts

▶ Group 3

- ▶ Distal to StbV
- ▶ 6 pts



Results

► LIV+1 tilt $\geq 10^\circ$!

	Cobb Angle			LIV tilt			LIV disc wedging		
	Pre	Post	FU	Pre	Post	FU	Pre	Post	FU
Group 1	62.5	28.3	33	27.1	11.4	10.4	4.8	2.4	2.5
Group 2	53.6	25.1	23.2	17.9	3.3	7	4.3	0.9	2.6
Group 3	65.2	31.5	36	16.7	3.2	7	9.2	2.2	4.5

	Cobb Angle			LIV+1 tilt			LIV+1 disc wedging		
	Pre	Post	FU	Pre	Post	FU	Pre	Post	FU
Group 1	62.5	28.3	33	23.5	13.5	14.6	5.4	2.6	2.9
Group 2	53.6	25.1	23.2	11.4	4.3	6.7	4.3	1.1	2.2
Group 3	65.2	31.5	36	7.2	1.3	6.2	4.5	0	3.1



Results

- ▶ LIV+1 tilt $\geq 10^\circ$ at latest FU
 - ▶ Group 1
 - ▶ 7 of the 8 patients
 - ▶ Group 2
 - ▶ 1 of 9 patients
 - ▶ Group 3
 - ▶ None



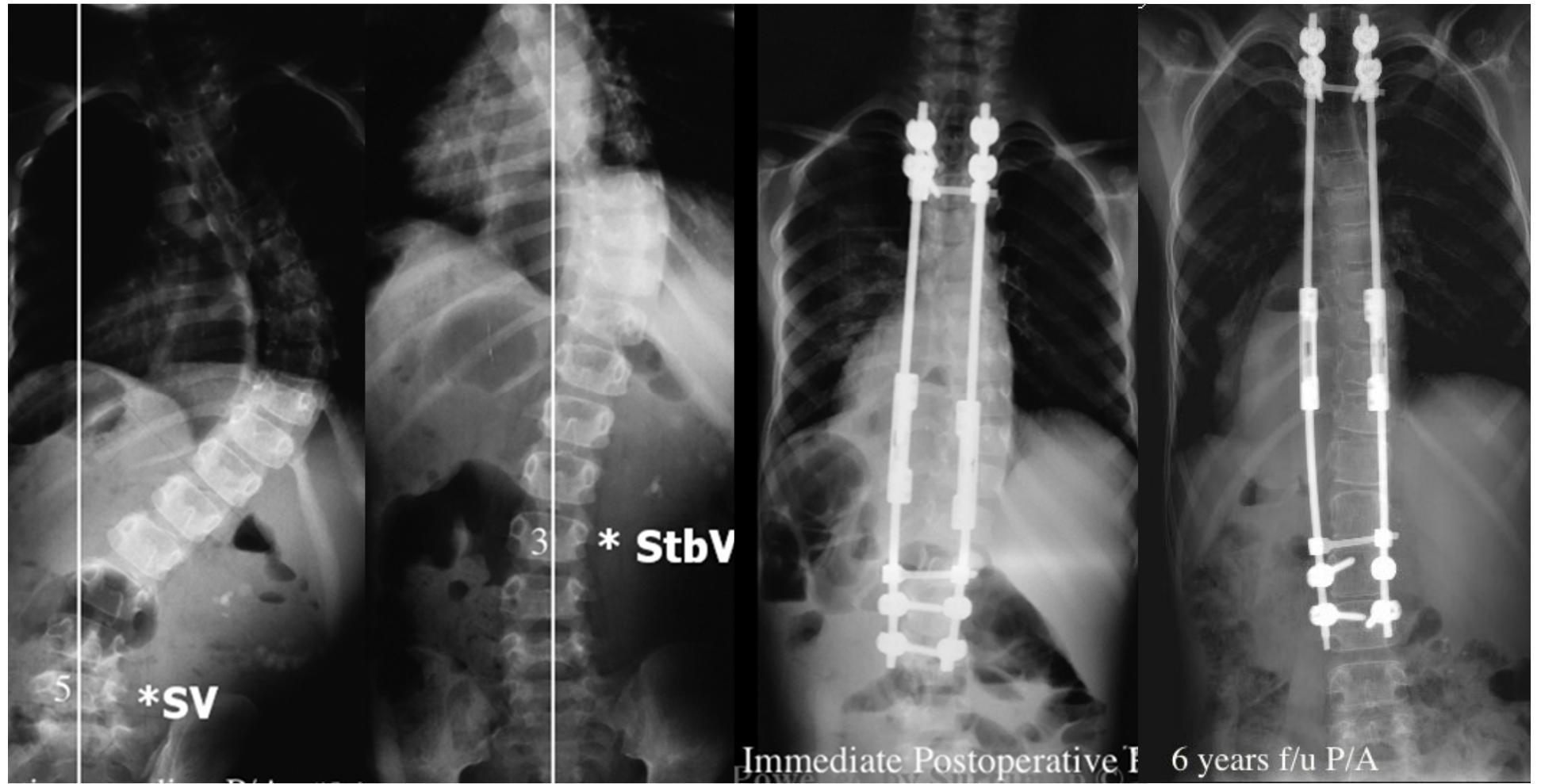
Results

	Patient	LEV	LIV	SV	StbV	LIV-SV
Group 1	1	L2	L2	L5	L5	-3
	2	L1	L2	L3	L3	-1
	3	L3	L3	L5	L5	-2

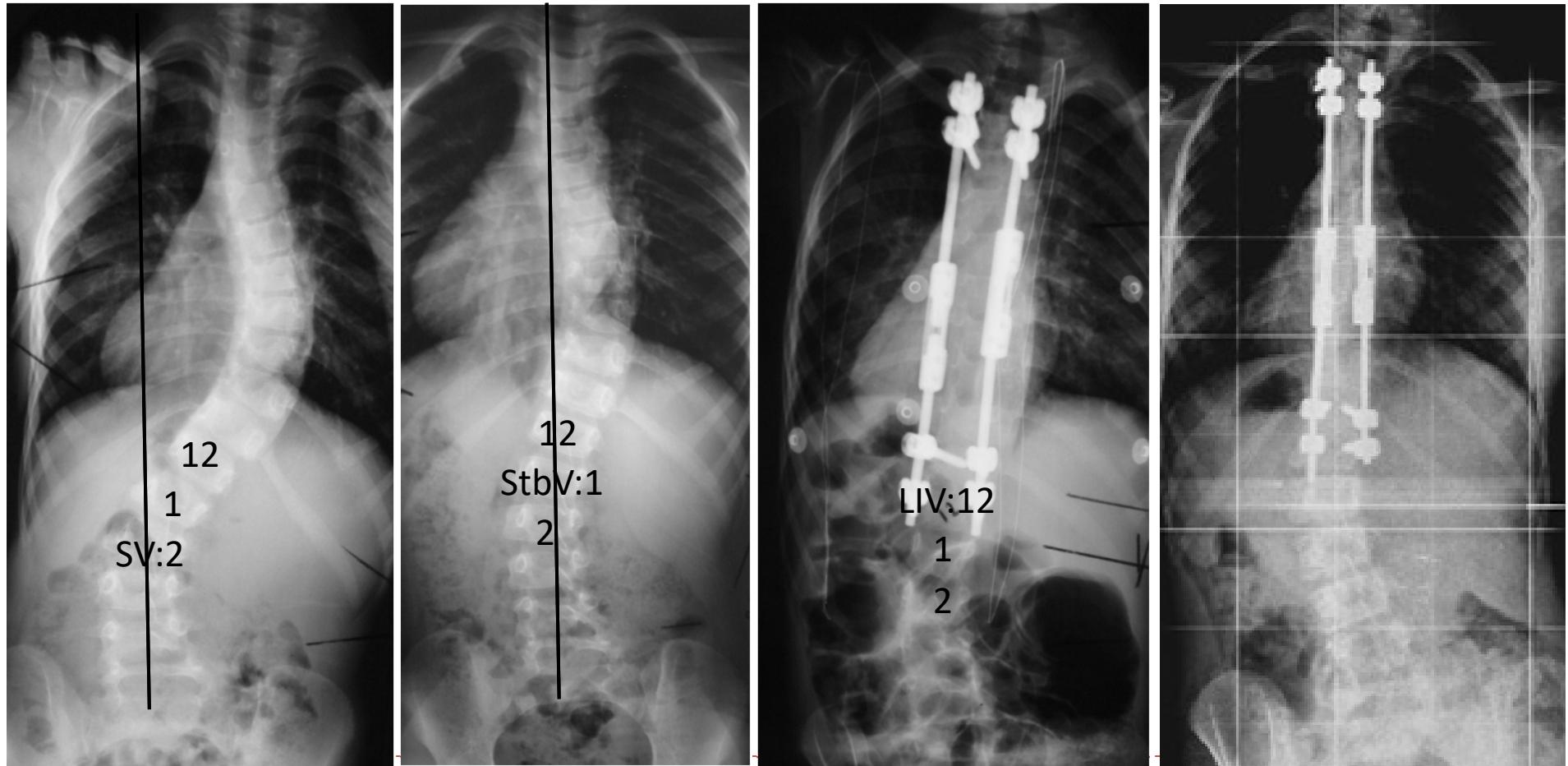
- Selection of StbV as LIV saved an average of 1.7 vertebral segments compared to selection of SV as LIV

	7	L1	L3	L5	L4	-2
	8	L4	L3	L5	L5	-2
Group 2	1	T11	L2	L2	L2	0
	2	L1	L3	L5	L3	-2
	3	T10	L3	L5	L3	-2
	4	L2	L2	L5	L2	-3
	5	L2	L3	L5	L3	-2
	6	T10	L1	L1	L1	0
	7	T11	L2	L5	L2	-3
	8	T11	L3	L5	L3	-2
	9	T12	L3	L5	L3	-2
Group 3	1	T12	L3	L3	L2	0
	2	T12	L2	L2	L1	0
	3	T11	L1	L2	T12	-1
	4	L1	L3	L3	L2	0
	5	L2	L4	L5	L3	-1
	6	T12	L3	L4	L2	-1

Group 2



Group 1



Conclusions

- ▶ Selection of LIV should be optimized to save more mobile lumbar segments while maintaining the deformity control
- ▶ Choosing StbV as the LIV instead of SV saves motion segments while providing good deformity control
- ▶ This study provides a simple method for distal instrumentation level selection in children with I-EOS

