Electronic supplementary material

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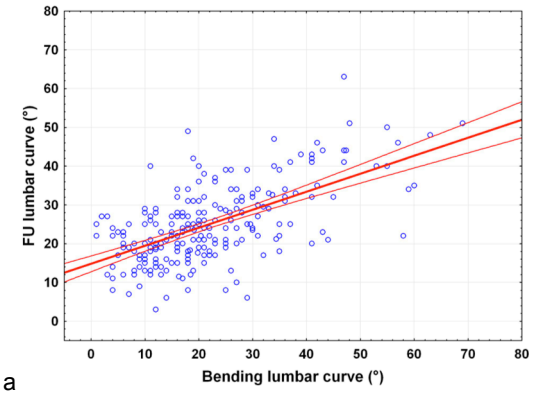
Author Names: Koller et al.

Affiliation: German Scoliosis Center
Werner-Wicker-Clinic
Im Kreuzfeld 4
D-34537 Bad Wildungen
heiko.koller@t-online.de

Article Title: **Criteria for successful correction of thoracolumbar / lumbar curves in AIS patients: Results of risk model calculations using target outcomes and failure analysis.**

Added statistical material



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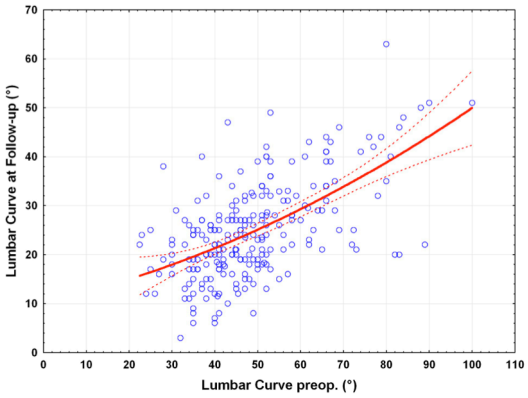

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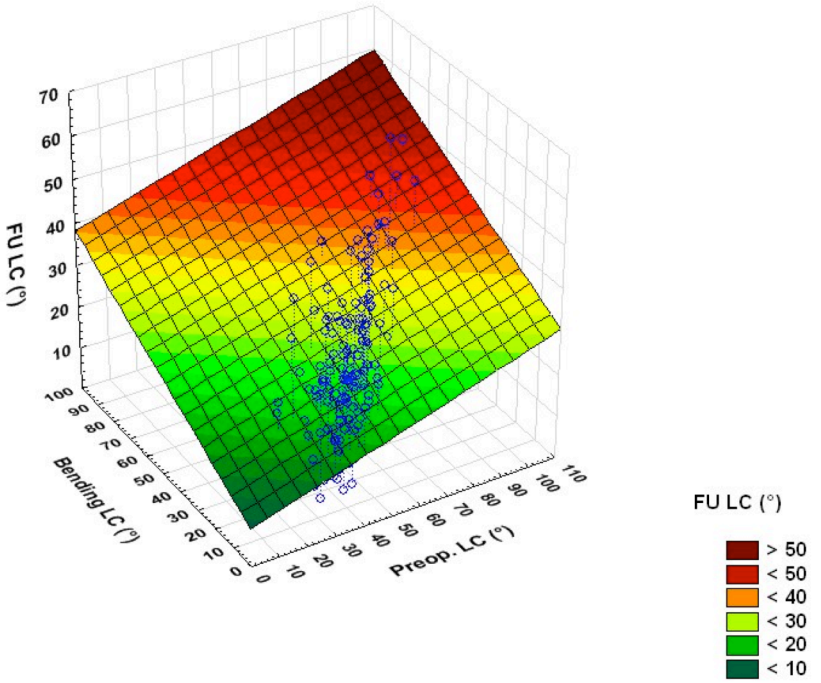

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Fig.E1a and E1b: Results of the linear regression analysis of the interaction of LC-bending and follow-up LC as well as the interaction of preoperative LC and follow-up LC.

Fig. E1: Interaction of preoperative LC, LC-bending and follow-up LC.
A statistical analysis based on a generalised linear model shows that LC-bending and preoperative LC are significantly related with follow-up LC (intercept: 2.69, p<.00001, preoperative LC regression coefficient: 0.0064 (95%CI:0.0018-0.011, p<.006); LC-bending regression coefficient: 0.01 (95%CI:0.005-0.015, p<.00006)). 94% of all subjects show a difference between observed and predicted follow-up LC of ±10º.

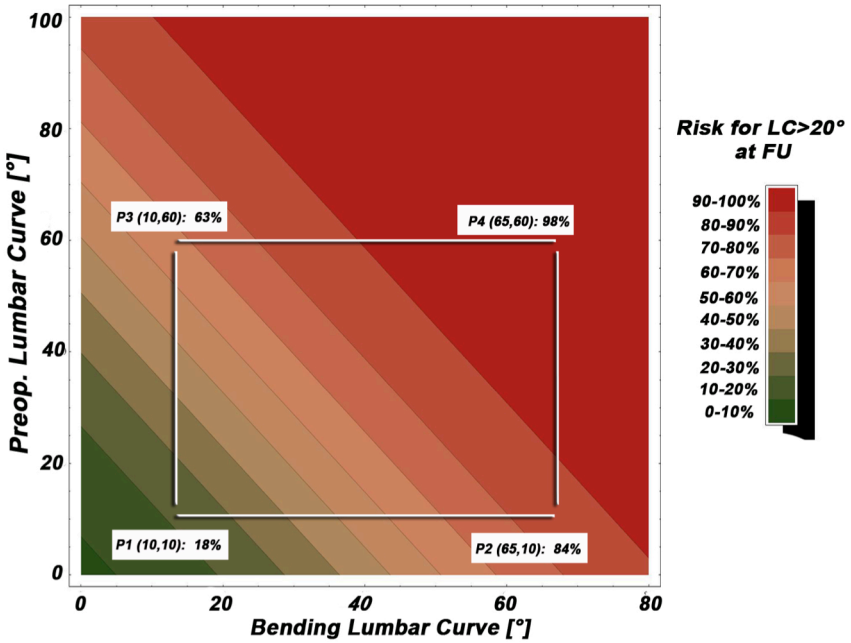

Fig.E2 Counter-plot
Counter-plot of the bivariate model of Fig.2 in the manuscript to assess the risk for an LC>20°. P1 through P4 reveal examples that have been calculated for a distinct combination of LC-bending and preoperative LC and the related risk according to the model. If we consider that a risk <25% or >75% resembles clinical reasonable estimates, an area of no decision can be defined between 25% and 75%. Accordingly, based on our data and the bivariate model, no prediction is made between 25% and 75%, as would be the case for Patient 'P3'.

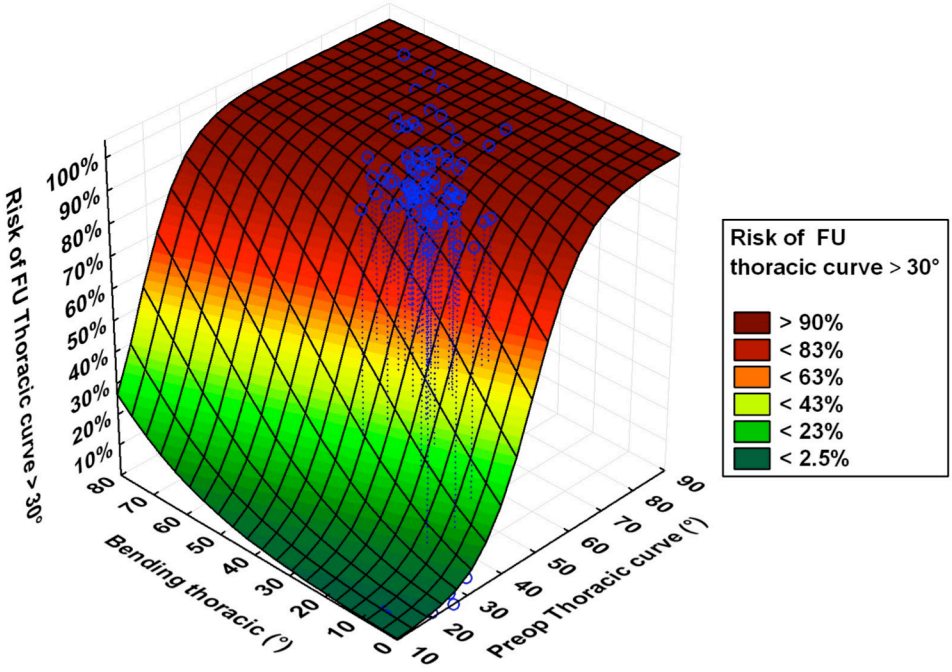

Fig.E3. Prediction model for TC≤30° and TC>30°.
Multivariate logistic regression model with preoperative TC (p<.00004, OR=1.16; 95% CI: 1.09-1.23) and TC-bending (p=.037, OR=1.06; 95%CI: 1.0-1.12) as significant predictors for a follow-up TC≤30°. A total of 84% (95%CI: 76-91%) of all subjects with TC≤30° were correctly classified as having a TC≤30° and the model correctly classsified 79% (95%CI: 69-87%) of all subjects with TC>30°.

Additional table

Table E4
Comparison of results with literature on selective fusion outcomes for major TL/L curves in AIS patients.

Study	Technique	Sample size	Preop TC (°)	Preop Cobb LC (°)	Preop LL (-°)	Flexibility TC (%)	Flexibility LC (%)	FU TC (°)	FU LC (°)	FU LL (-°)	Correction TC(%)	Correction LC (%)
Kelly[2]	SLF ASF	18	34	49	39	na	na	24	25	29	35	25
Li[3]	SLF ASF	22	24	50	45	na	na	na	na	48	17	54
	SLF PSF	24	22	52	47	na	na	na	na	50	19	55
Wang[6]	SLF ASF	35	30	46	46	76	75	18	14	39	40	70
Sweet[7]	SLFASF	47	25	50	na	na	na	16	15	na	82	70
Kusakabe[15]	SLF ASF	17	31	51	na	49	49	18	18	na	48	64
Wang[6]	SLF/non-SLF PSF	38	31	51	na	na	65	na	na	na	na	76
Hee[12]	SLF ASF	25	30	50	52	na	50*	18	16	49	40	68
	SLF PSF	11	28	46	51	na	50*	17	15	50	39	67
Bitani[35]	SLF ASF	29	28	49	na	na	na	23	23	na	21	54
Hurford[6,8,9,10,11,13]	SLF ASF	42	na	51	54	na	na	na	17	56	na	67
Satake[6,42]	SLF ASF	61	29	49	na	na	na	18	17	na	38	65
Wang	SLF ASF/ PSF	30	29	49	44	na	na	21	30	43	na	na
Verma[23]	SLF ASF	31	26	45	64	na	na	15	11	61	42*	74
Wang[52]	SLF ASF	30	31	49	na	62	67	19	12	na	39	76
Lark[8]	SLF ASF	29	26	46	na	65	65	22	19	na	15*	59*
	non-SLF	29	38	49	na	56	61	12	13	na	68*	73*
Kaneda[6,12,13,53]	SLF ASF	25	32	54	51	na	na	17	9	34	47	83
Li[13,55]	SLF PSF	27	na	45	36	na	73*	na	8	42	na	82
Schulte[2,6,11,17,54]	SLF ASF	27	36	54	na	57	56	25	24	na	31	59
Geck[13,57]	SLF ASF	31	na	49	na	na	59	na	16	na	na	67
	SLF PSF	31	na	50	na	na	50	na	8	na	na	84
Lowe[2,6,9,10,12,16,17]	SLF ASF w/ cages	21	25	47	61	71	na	13	13	58	48	72*
	SLF ASF w/o cages	20	30	45	63	72	na	18	13	59	40	71*
Shufflebarger[9,10,11,13,16,17,58]	SLF/ non-SLF PSF	61	27	52	41	na	52	15	11	42	na	79*
Tao[6,11]	SLF ASF	23	na	50	39	na	na	na	13	31	na	74*
	SLF PSF	26	na	50	42	na	na	na	11	40	na	78*
Ding	SLF ASF	130	25	46	na	na	na	11	9	n	56	81
Hwang[2,65]**	non-SLF PSF	34	33	46	59	58	62	13	14	na	61	70
Guille[17,66]**	SLF ASF dual-rod	61	24	48	59	na	na	16	18	57	33*	63*
	SLF ASF single-rod	39	26	46	61	na	na	16	14	58	38	71
Chen[16,41]	SLF PSF	39	na	49	46	na	70	na	14	46	na	72
Sudo[27]	SLF ASF	30	34	56	46	73	75	19	11	48	44*	80
Bullmann[69] †	SLF ASF	33	na	53	50	na	55	na	22	48	na	58[x]
Mean		35	29	49	50	64	61	18	15	47	41	69
1SD		21	4	3	8	9	9	4	5	9	16	11
Min		11	22	45	36	49	49	11	8	29	15	25
Max		130	38	56	64	76	75	25	30	61	82	84
Current	**SLF ASF**	**245**	**39**	**49**	**54**	**48**	**57**	**30**	**25**	**54**	**24**	**59**

Legend:
**Multicenter study, TC=Thoracic curve, LC=lumbar Curve, SLF=Selective lumbar fusion, Non-SLF=Non-selective lumbar fusion with inclusion of the thoracic curve, ASF=Anterior spinal fusion; *=Values calculated based on the reported preoperative and follow-up data; †=Values calculated from the means of raw data reported; [x]=The correction of Fusion-Cobb was 73% postoperatively and 67% at follow-up. Remarks: The literature does not always clearly define whether the LC or Fusion-Cobb angles were measured.

References to table E 4

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Added radiographic case examples

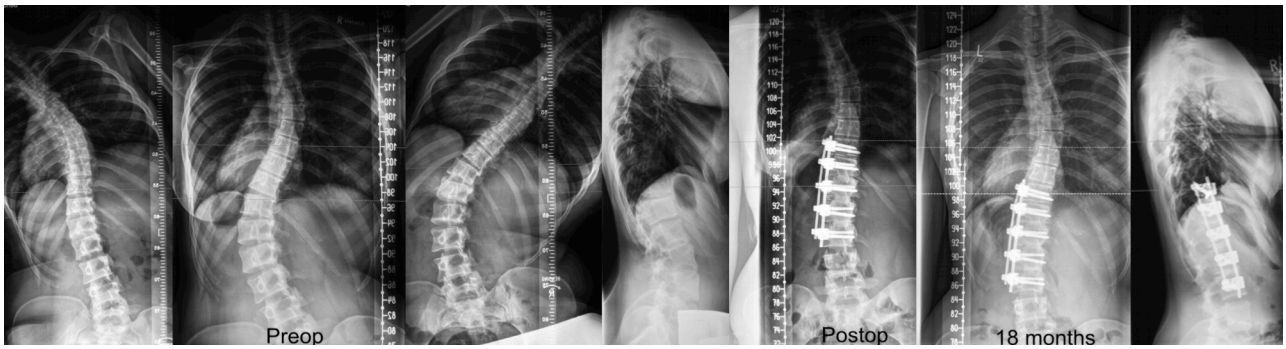

Fig.E4 - 1
Radiographic course of 18 years old male patient and Lenke 6C curve. ASF using 5.0/4.0mm dual-rod system. Note instrumentation to LIV (L3) with almost horizontal preoperative LIVDA. Adding-on postoperative and at 18 months follow-up without STCC.

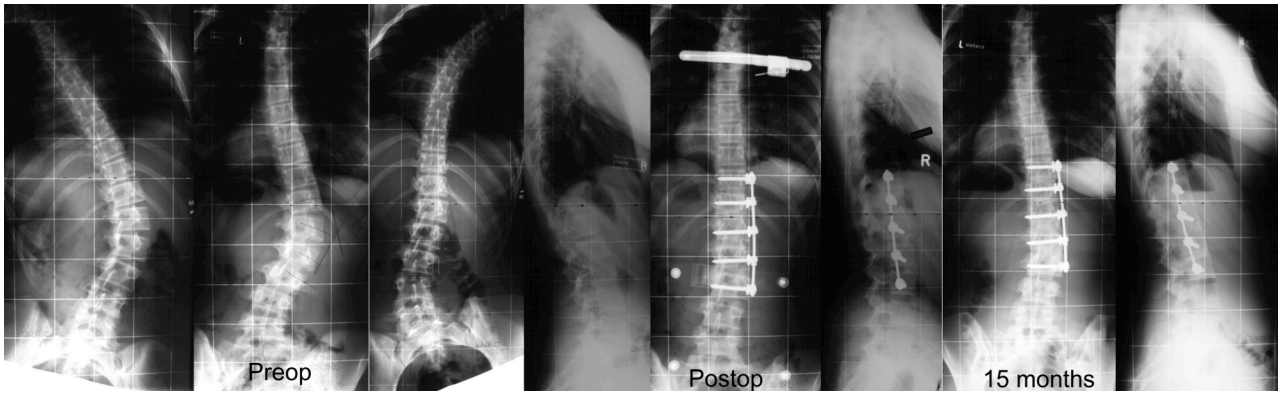

Fig.E4 - 2
Radiographic course of 13 years old female patient. ASF using 4.0mm single-rod system. Note instrumentation to SV-2 with albeit horizontal LIVDA. Distal adding-on postoperative and at 15 months follow-up, currently asymptomatic clinical course.

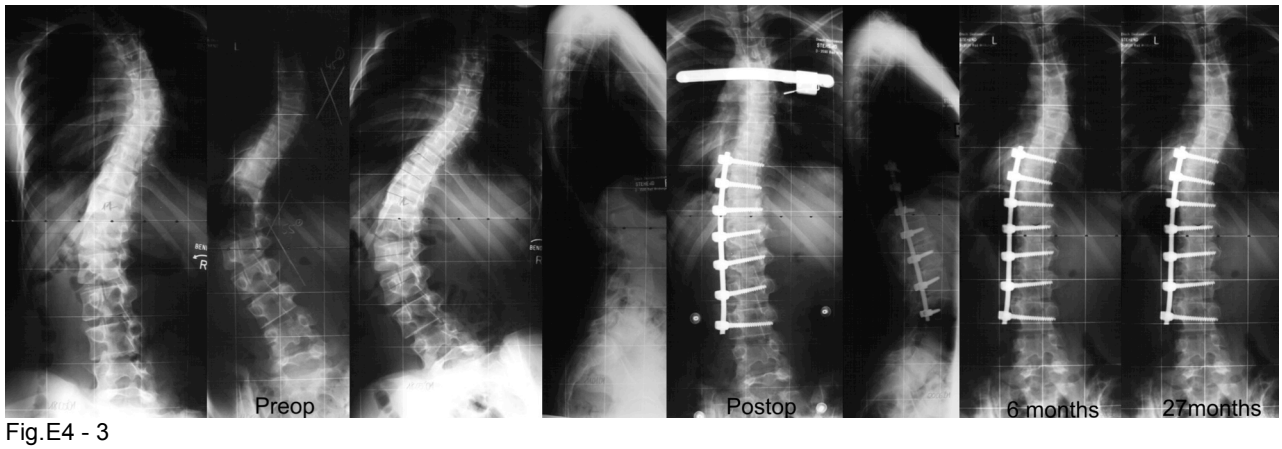

Fig.E4 - 3
Radiographic course of 16 years old male patient. ASF using 4.5mm single-rod system. Note excellent correction of large TL curve, but TC-progression (Lenke 6).

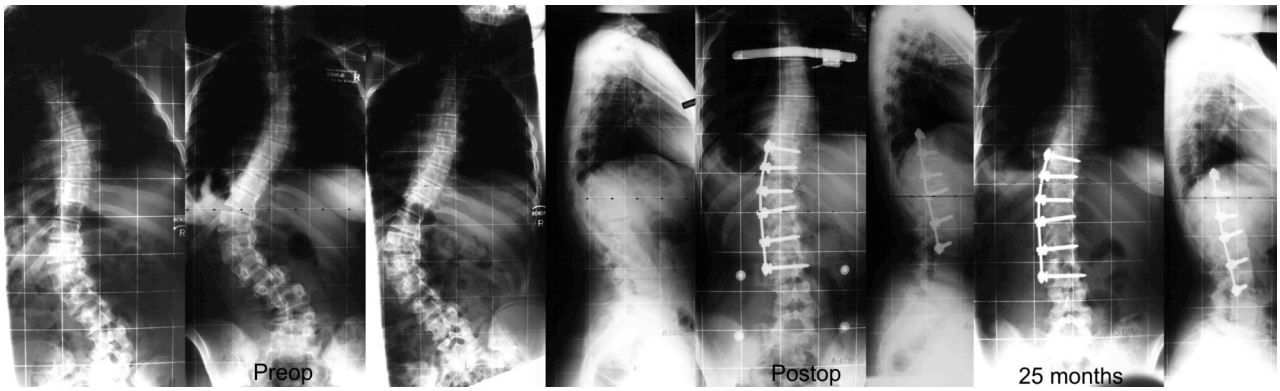

Fig.E4 - 4
Radiographic course of 15 years old female patient. ASF using 4.0mm single-rod system for a large thoracolumbar curve (Lenke 5) with excellent resolution and maintenance of curve correction.

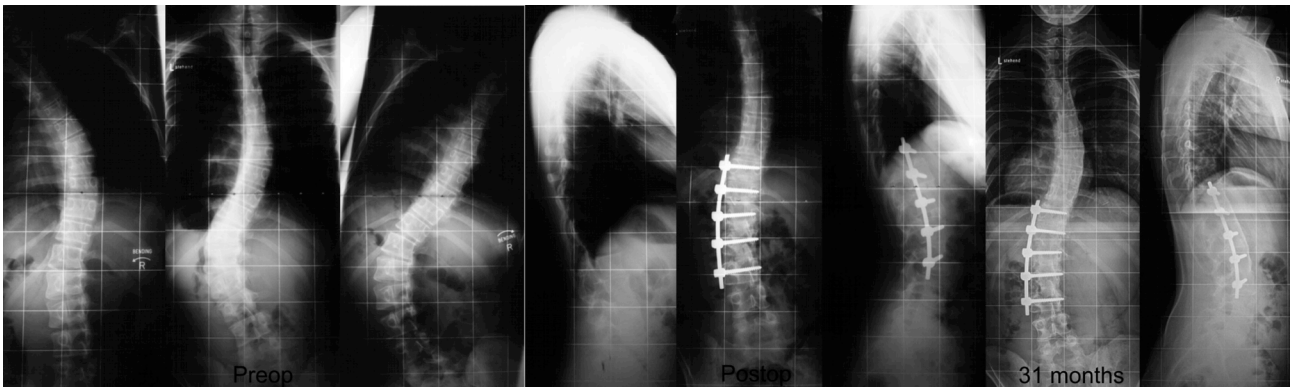

Fig.E4 - 5
Radiographic course of 16 years old male patient. ASF using 4.5mm single-rod system. Note instrumentation to LIV with almost horizontal LIVDA. Adding-on at 31 months follow-up without STCC.

Fig.E4 - 6
Radiographic course of a 22 years old female patient. ASF using 4.0mm single-rod system (Lenke 5 curve).

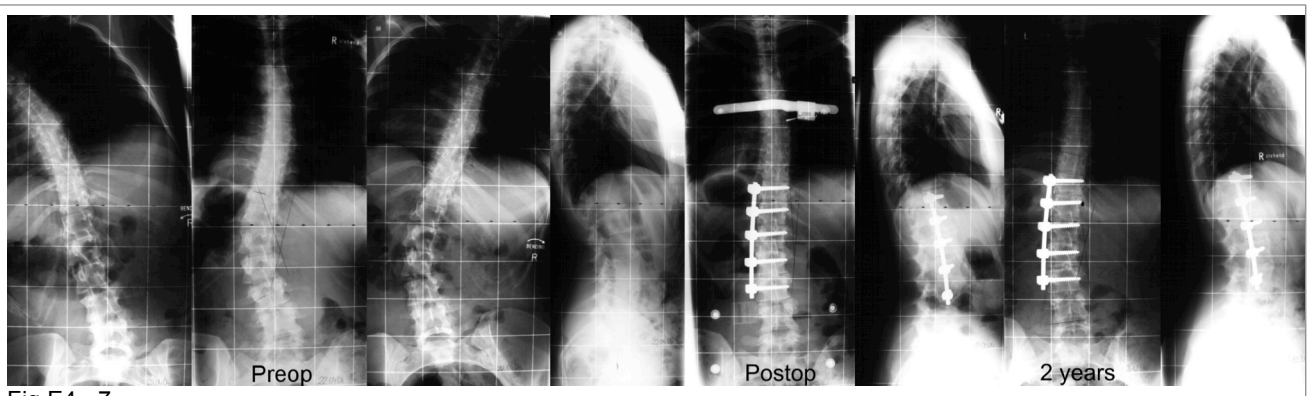

Fig.E4 - 7
Radiographic course of a 18 years old female patient. ASF using 4.5mm single-rod system (Lenke 5 curve)

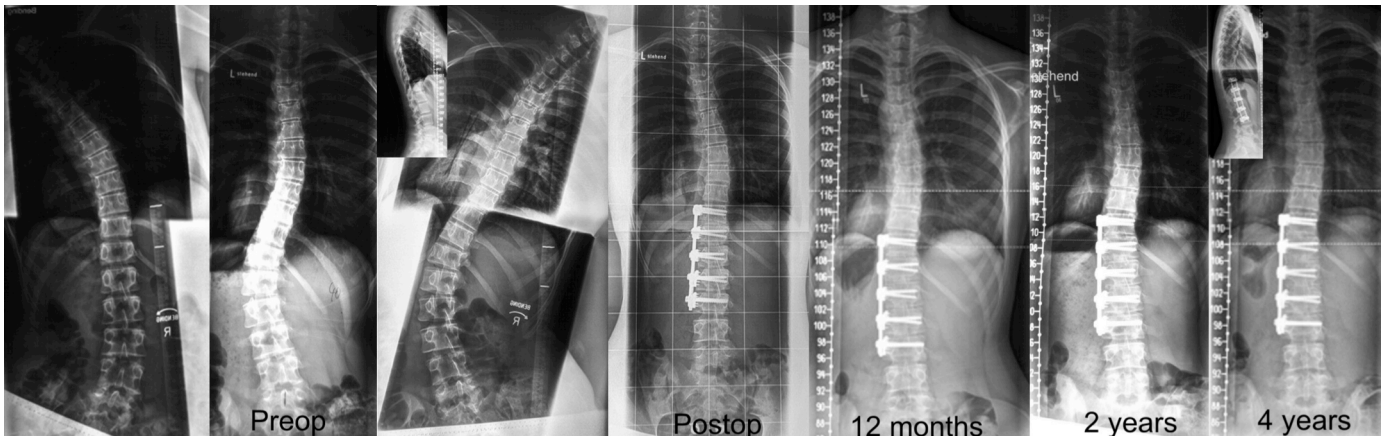

Fig.E4 - 8
Radiographic course of 14 years old female patient. ASF using 5.0/4.0mm dual-rod system (Lenke 5)

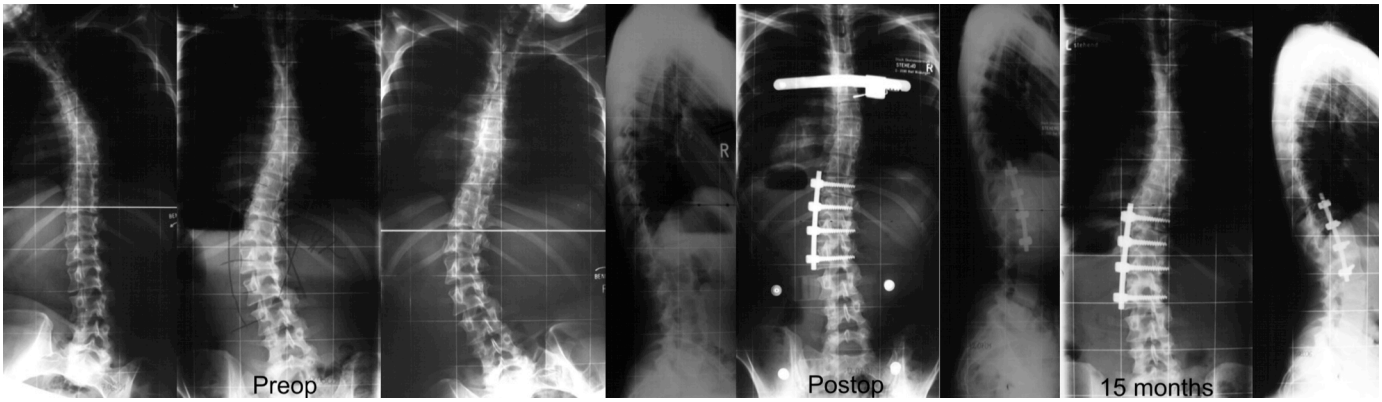

Fig.E4 - 9
Radiographic course of 22 years old female patient. Short ASF using 4.5mm single-rod system according to the 'Hall-pinciples' (Lenke 5). Note proximal thoracic and distal lumbar adding-on at follow-up.

Fig.E4 - 10
Radiographic course of 15 years old female patient. ASF using 5.0/4.0mm dual-rod system. Note instrumentation to LIV with almost horizontal LIVDA. Mild adding-on at 12 months follow-up.