

Thoracic AIS

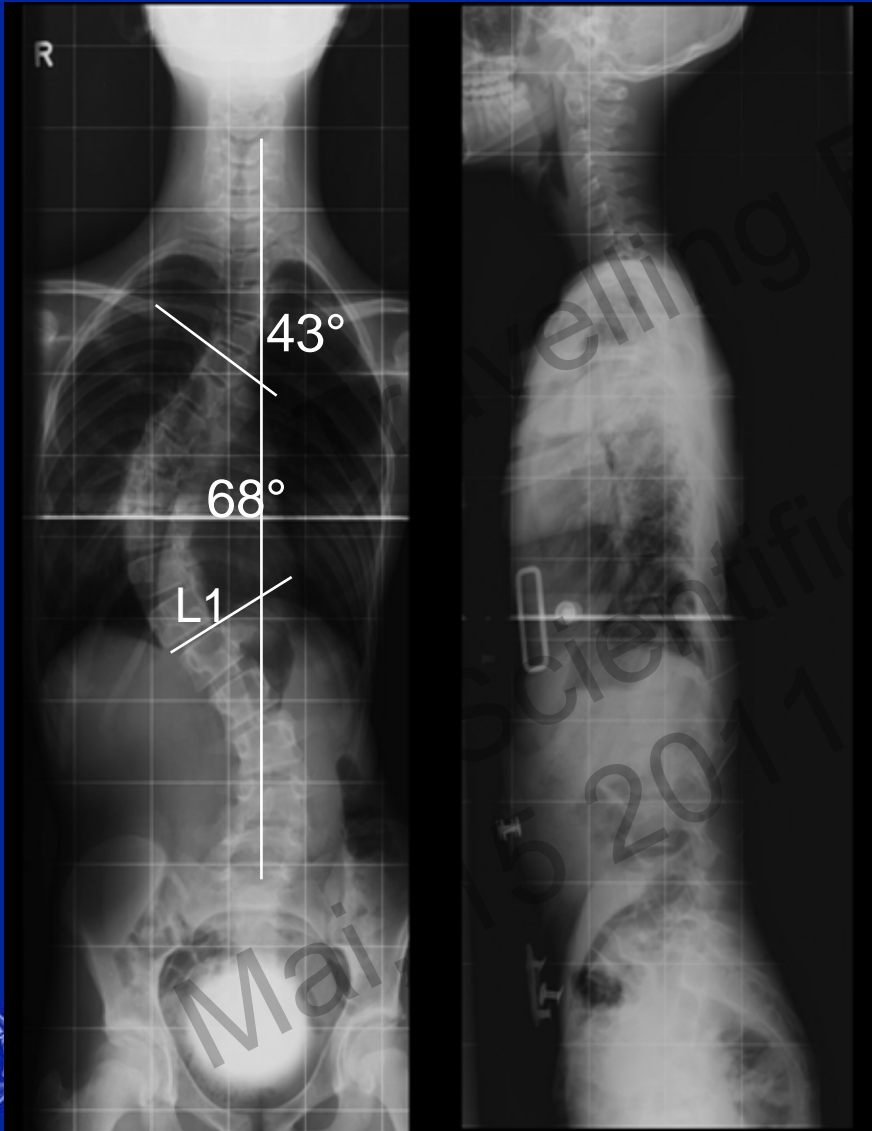
Mini-open Short Anterior Fusion

Kan Min, MD

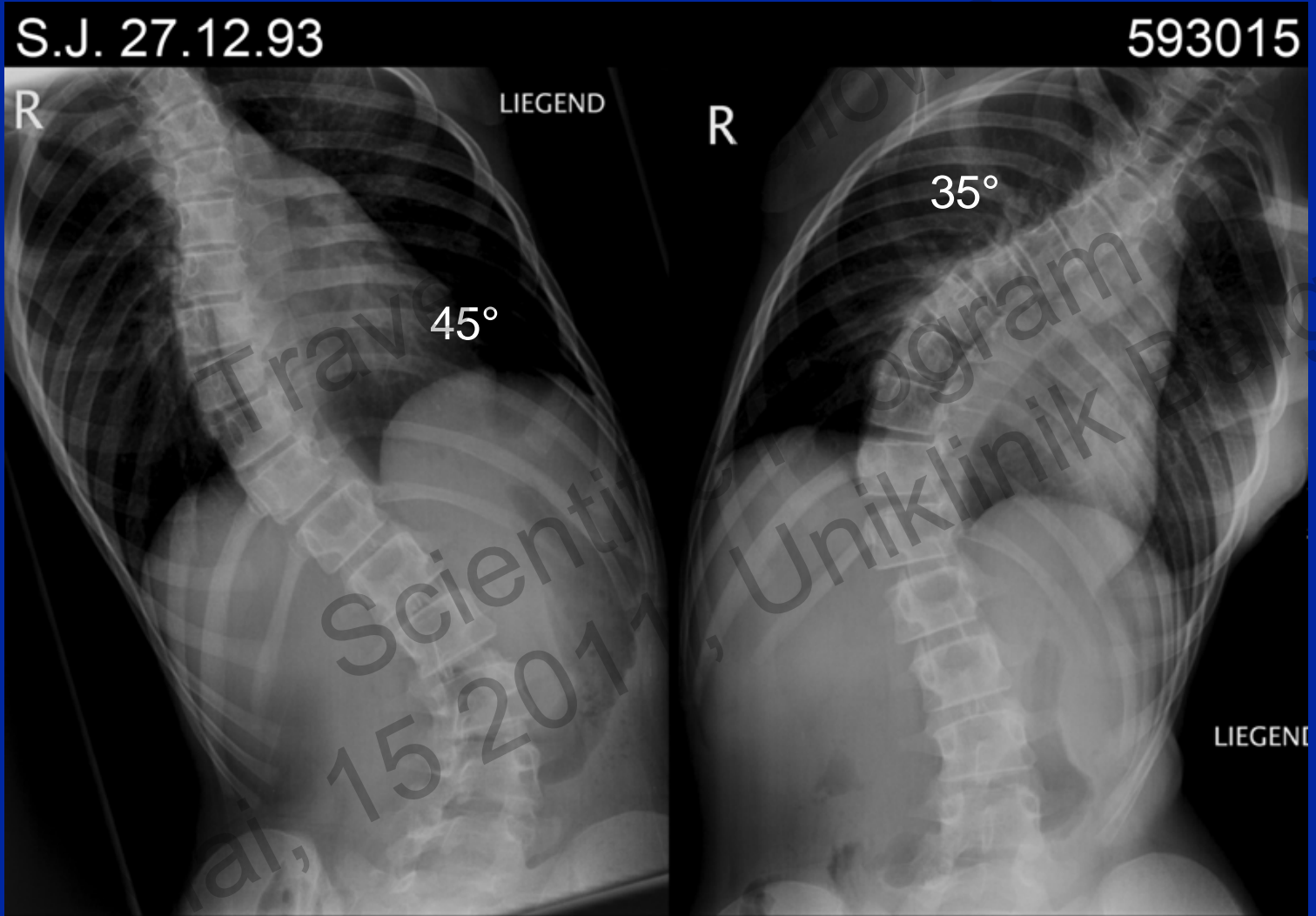
Travelling Fellows
Scientific Program
Mai, 15 2011, Uniklinik Balgrist



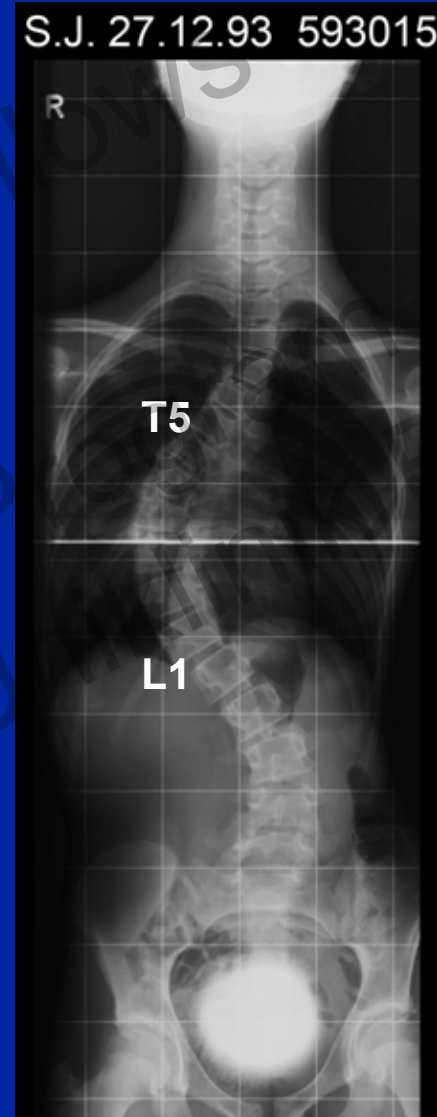
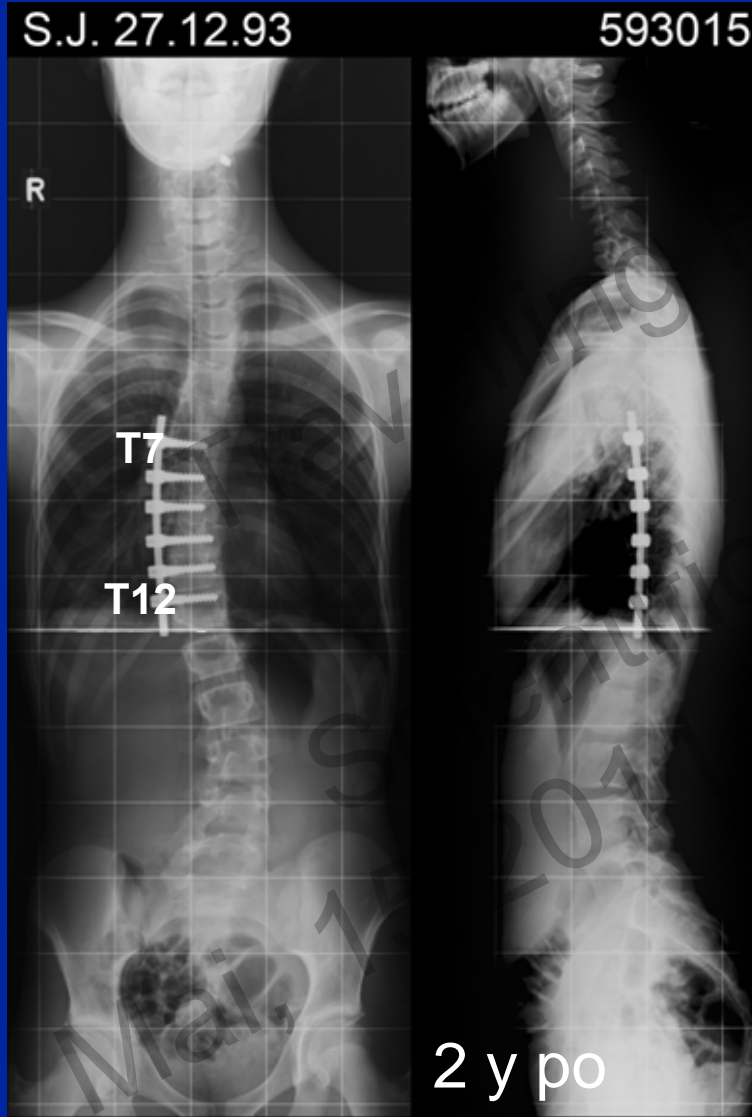
14 y, L2 A



Supine Bending



Anterior Fusion T7-12



Balanced shoulders and spine





2 y po



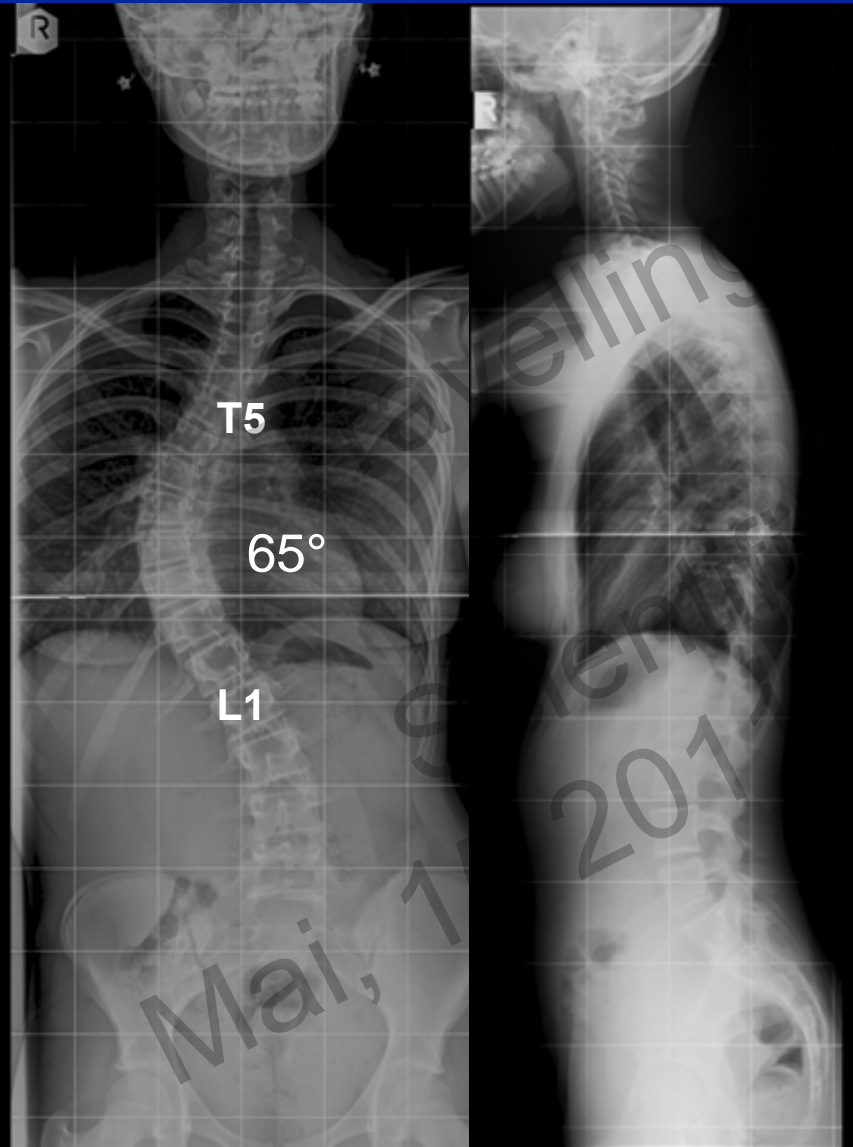
preop

uniklinik
balgrist



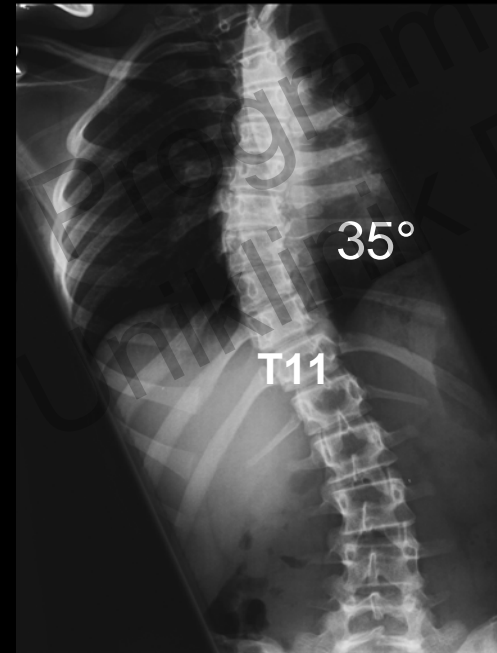
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14 y, 65°, K3, L1A



V.O.P. 07.02.94

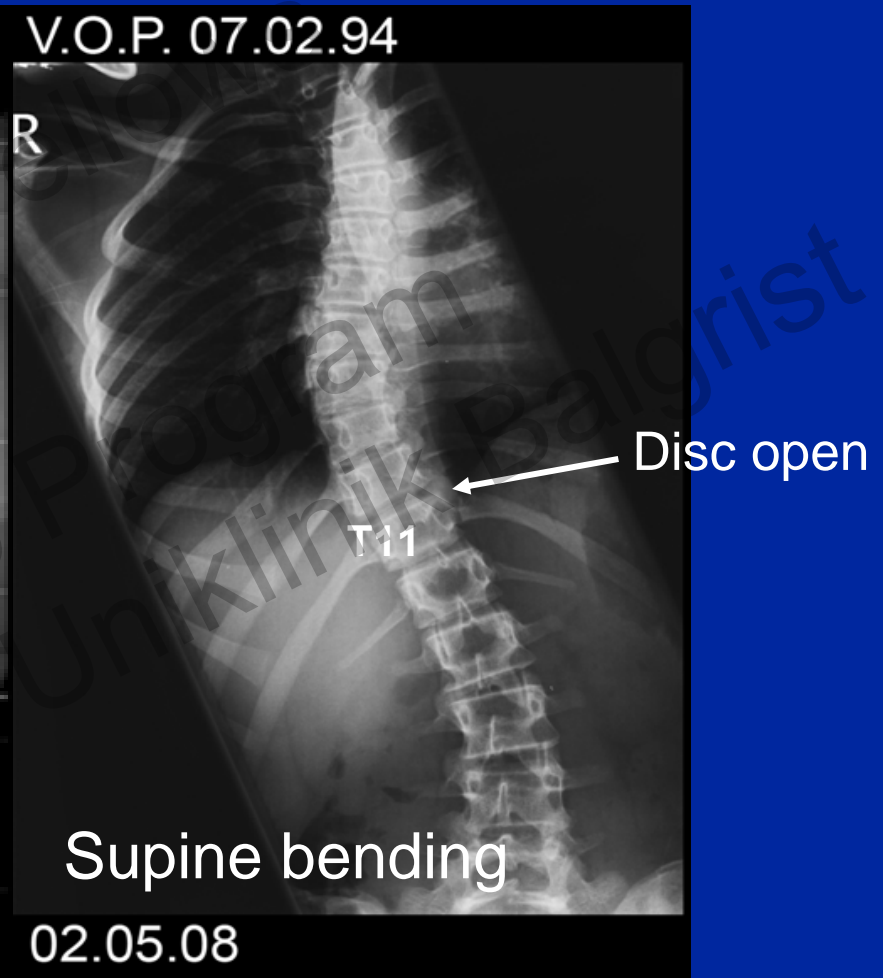
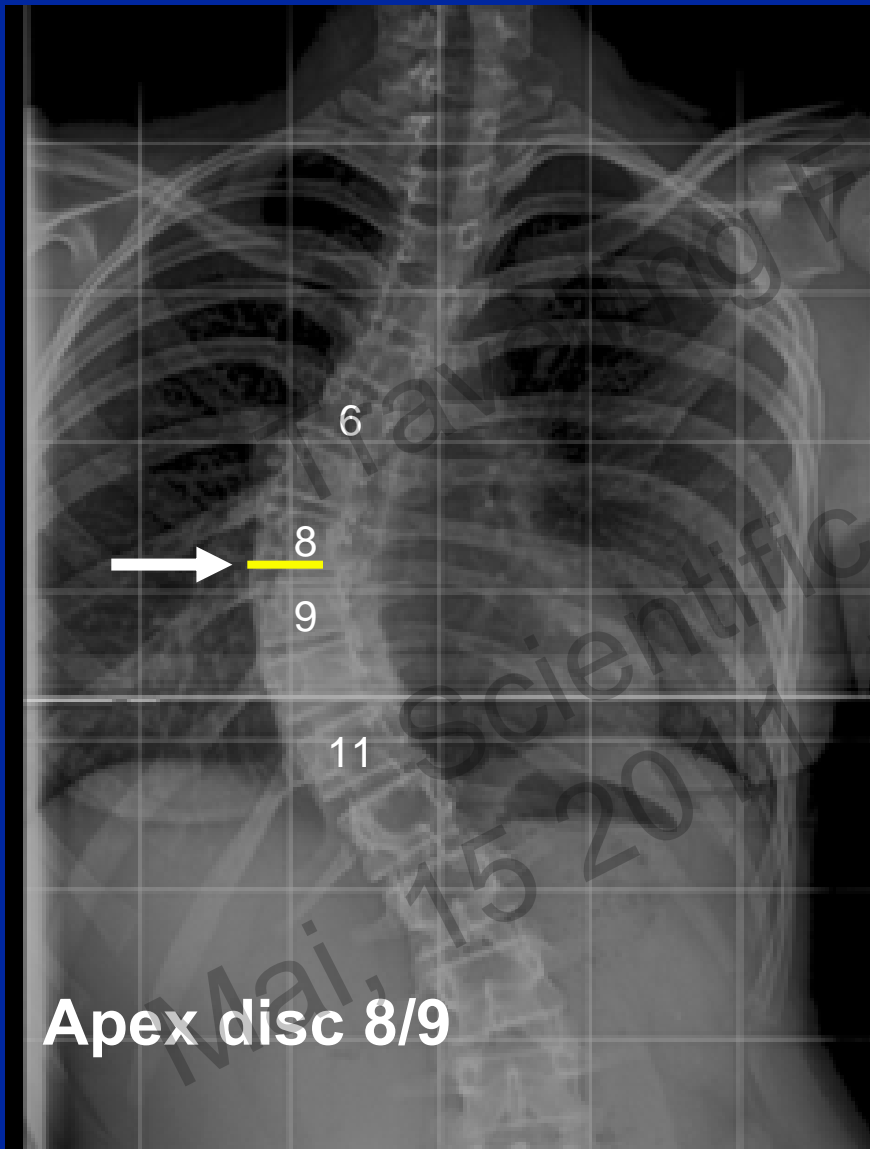
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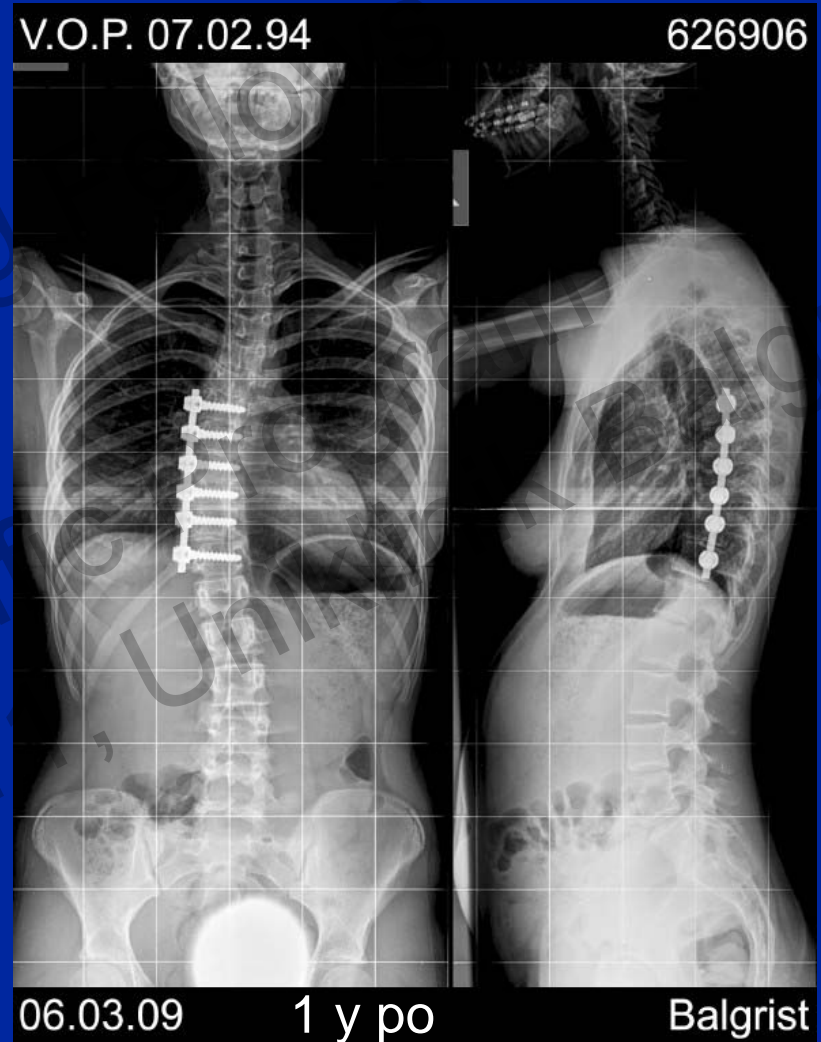
Balgrist

Choosing Levels



Anterior Fusion T6-11

3 vertebrae less than the curve



Balanced shoulders and spine



Short Anterior Correction Thoracic Idiopathic Scoliosis

1. 7- 8 cm thoracotomy
2. 360° discectomy
3. Vertebral body osteotomy
(remodelling)
4. Anterior instrumentation



Positioning, Neuromonitor



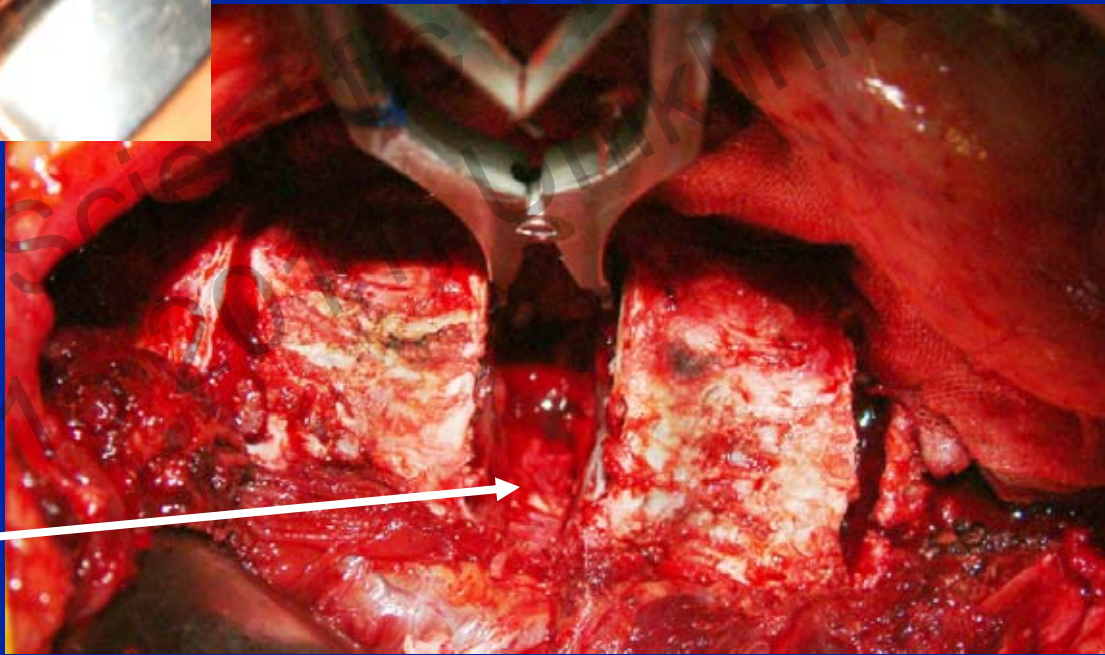
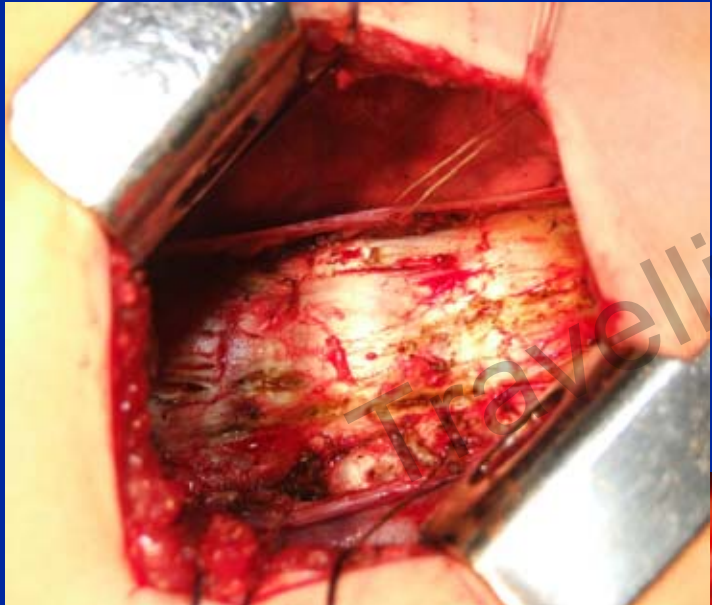
Mini-thoracotomy Exposure of spine



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Partial Rib head resection at apex 360° Discectomy

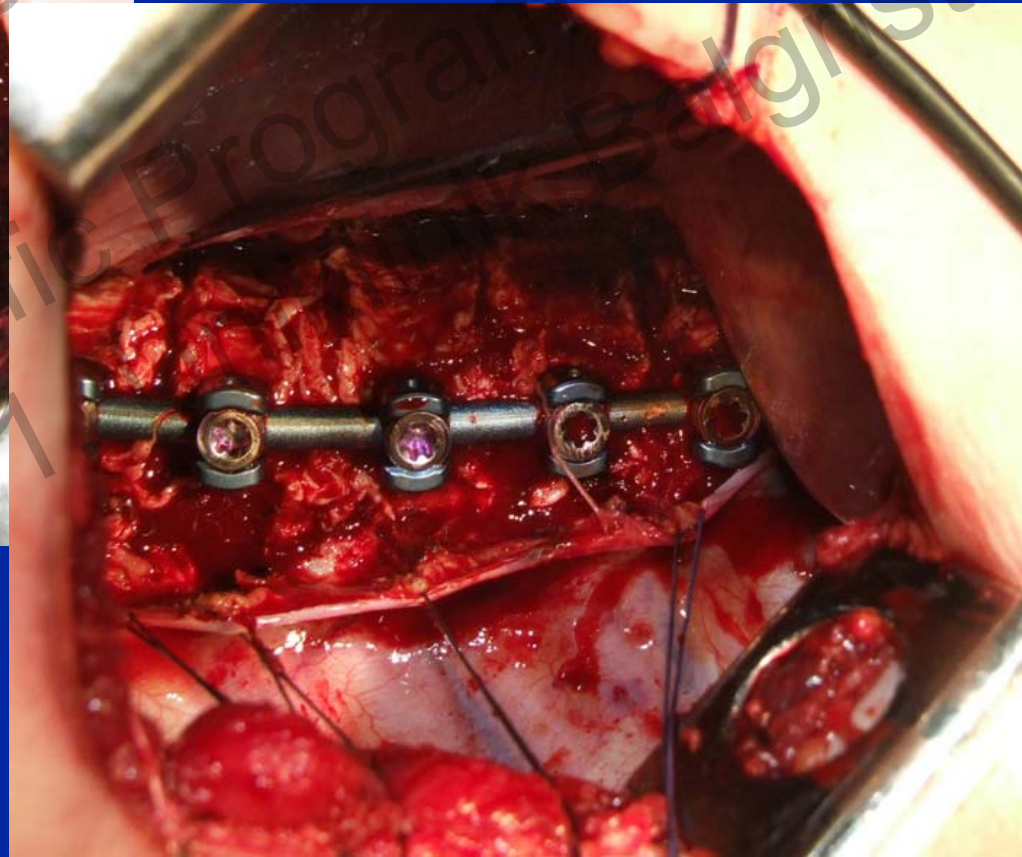
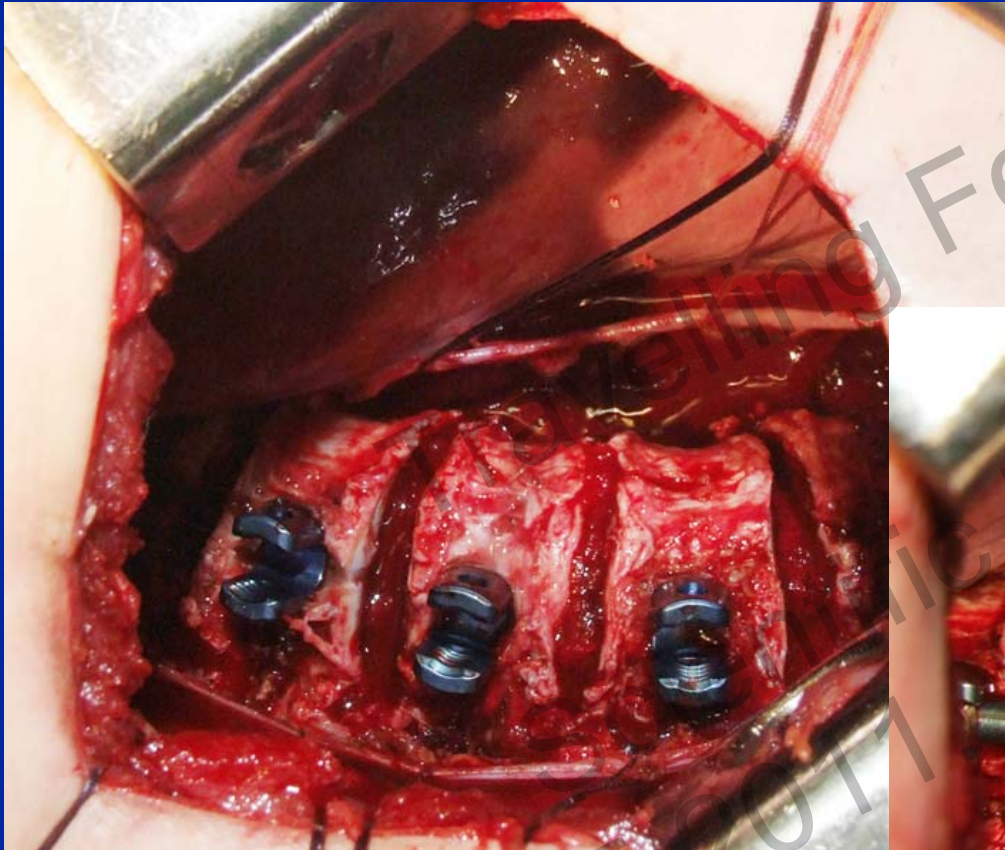


Spinal canal



Bicortical vertebral screws

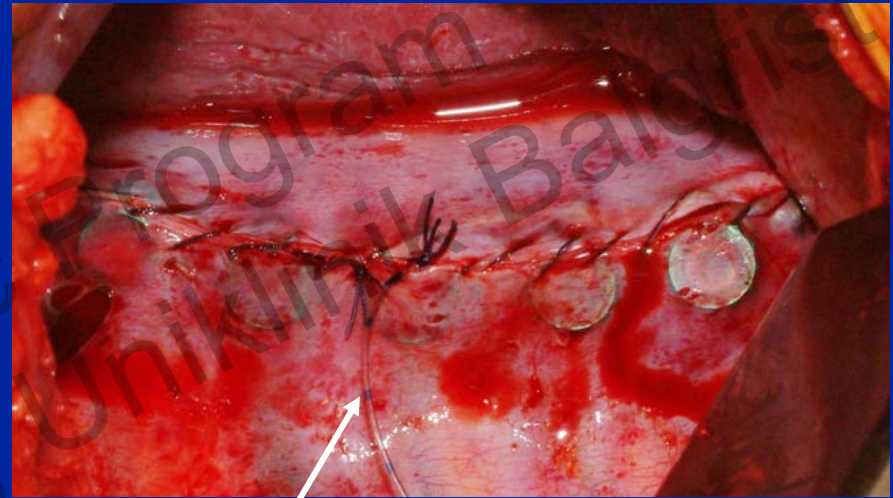
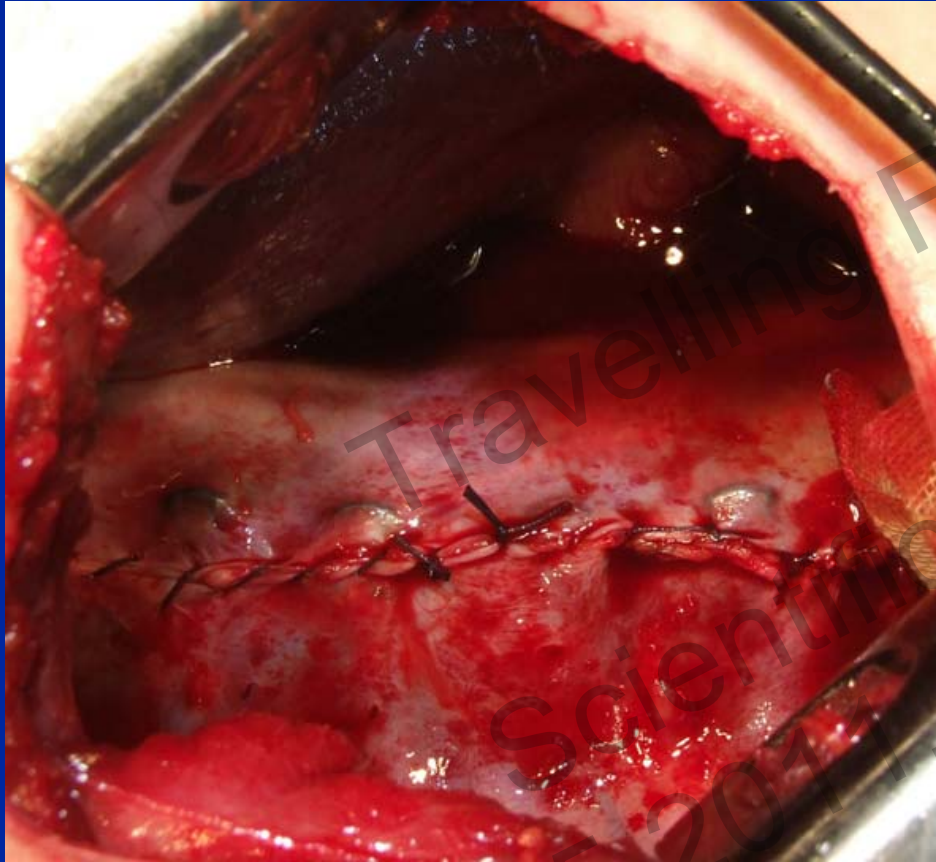
Correction with a single rod



Mai, 15 2011



Pleural closure



Mai, 15 2017



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16 2011, Uniklinik Balgrist

Patients Data (n=62)

Prospective, FU 24 -72 (mean 36) months

60 girls, 2 boys

Age 15.2 (SD 2.5) y

Risser

R0 = 19
R1 = 4
R2 = 6
R3 = 5
R4 = 26
R5 = 2



Curve Types

Lenke	Lumbar modifier
I = 56	A = 26
II = 5	B = 17
	C = 19



Fusion Length

Fusion length	Vertebrae	Motion segments
min	4	3
max	7	6
mean	5.5	4.5

Lowest Instrumented Vertebra

T10	19	L1	2
T11	32	L2	1
T12	8		



Correction

Cobb (°) instrumented thoracic curve

	preop	postop	f-up	bending
min	45	10	11	11
max	75	40	40	47
mean	55.67	23.23	24.31	30.08
SD	7.59	7.70	6.87	8.24

58.27%

56.32%

45.96%



Correction

AVR (°) instrumented thoracic curve

	preop	postop	f-up
min	10	0	0
max	35	30	25
mean	20.33	5.46	4.83
SD	5.92	5.67	5.01
		73.78%	76.24%
	T1-T2	T2-T3	T1-T3
min	0	-5	5
max	30	15	30
mean	14.88	0.63	15.50
SD	6.76	3.03	6.42
p-value	0.0000	0.1595	0.0000



Correction

Cobb (°) non-instrumented lumbar curve

	preop	postop	f-up	bending
min	19	8	8	0
max	52	40	37	25
mean	35.92	22.93	23.74	8.16
SD	8.04	7.93	6.84	6.78
	T1-T2	T2-T3	T1-T3	bending
Correction %	36.18	-3.56	33.90	77.28
p-value	0.0000	0.6910	0.0000	



Thoracic kyphosis T4 -T12 (°)

	preop	postop	f-up
min	2	10	14
max	55	56	59
mean	27.38	33.19	36.42
SD	12.52	12.21	11.51
		23.12%	32.10%
	T1-T2	T2-T3	T1-T3
min			
max			
mean	-6.33	-2.46	-8.79
SD	5.85	5.01	7.25
p-value	0.0000	0.0014	0.0000



Clinical Rib Hump (°)

	preop	postop	f-up
min	5		0
max	31		15
mean	15.02		8.21
SD	3.84		2.88
			45.34%
	T1-T2	T2-T3	T1-T3
min			0
max			21
mean			6.81
SD			3.26
p-value			0.0000



Clinical Shoulder Balance (mm)

	preop	postop	f-up
min	0	0	0
max	30	20	10
mean	11.56	2.39	1.46
SD	8.30	4.83	3.22
	T1-T2	T2-T3	T1-T3
min	-5	-10	-10
max	30	20	30
mean	9.09	1.14	10.10
SD	8.97	4.68	9.31
P-value	0.0000	0.1148	0.0000



SRS-24 Questionnaire

	preop	6 m po	f-up
min	38	80	58
max	114	112	117
mean	61.40	100.50	98.62
SD	11.08	6.58	9.62



Pulmonary Function (% FVC)

	preop	6 m po	f-up
min	52	55	50
max	140	99	136
mean	81.04	76.41	80.38
SD	16.47	10.21	11.95

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Pulmonary Function (FVC ml)

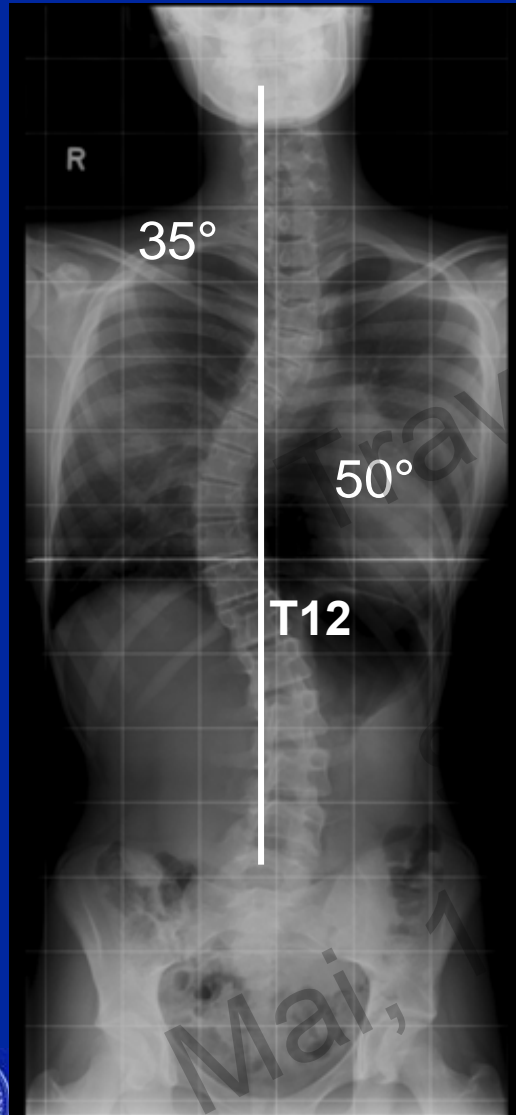
	preop	6 m po	f-up
min	1660	2310	1820
max	4980	3650	3680
mean	2842	2777	2812
SD	660	414	421



15 y, K5, L2B



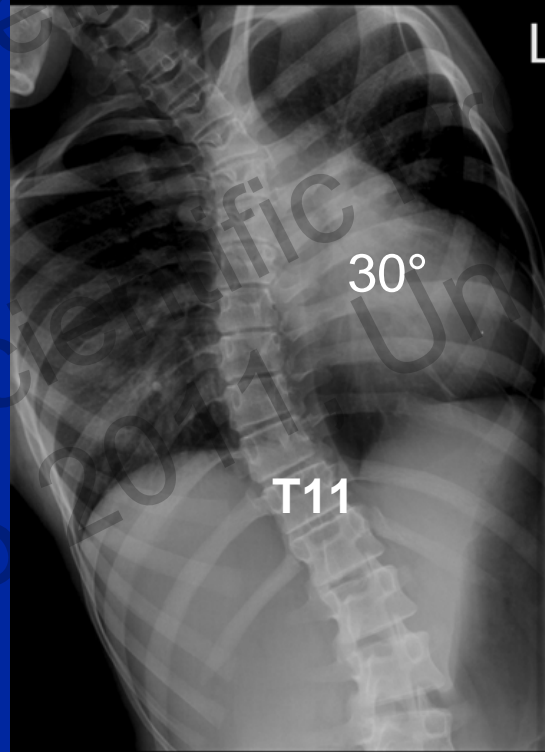
L shoulder up 15mm



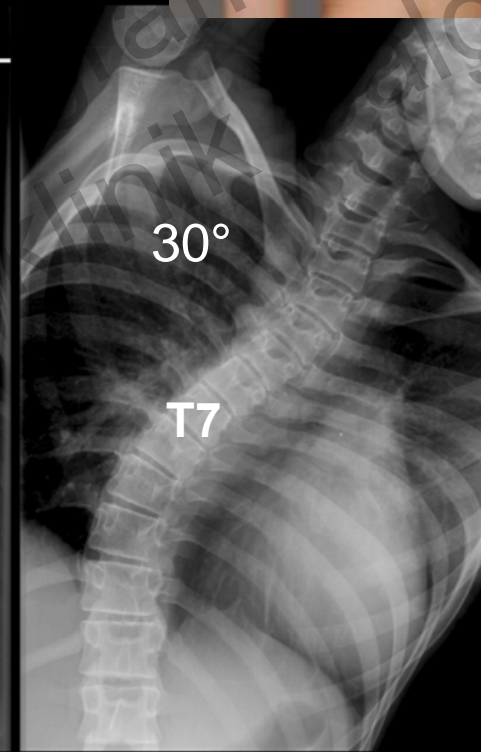
14.01.05

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H.S. 01.12.89

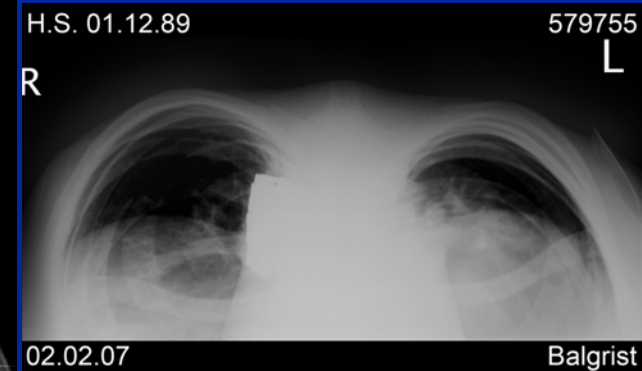
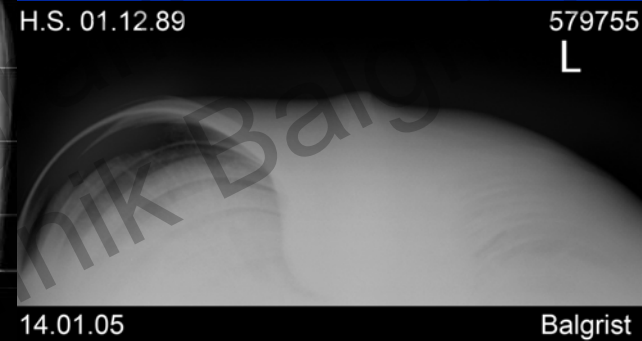
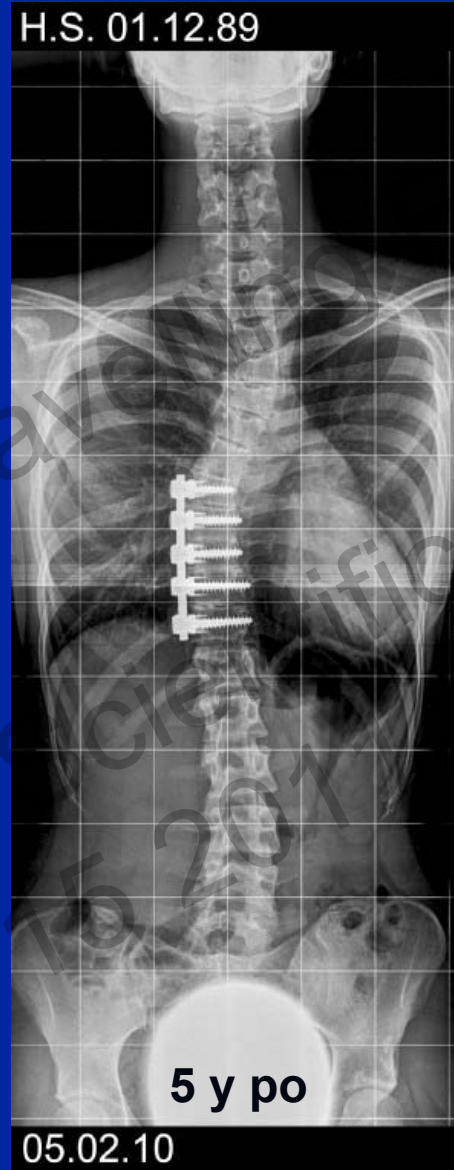
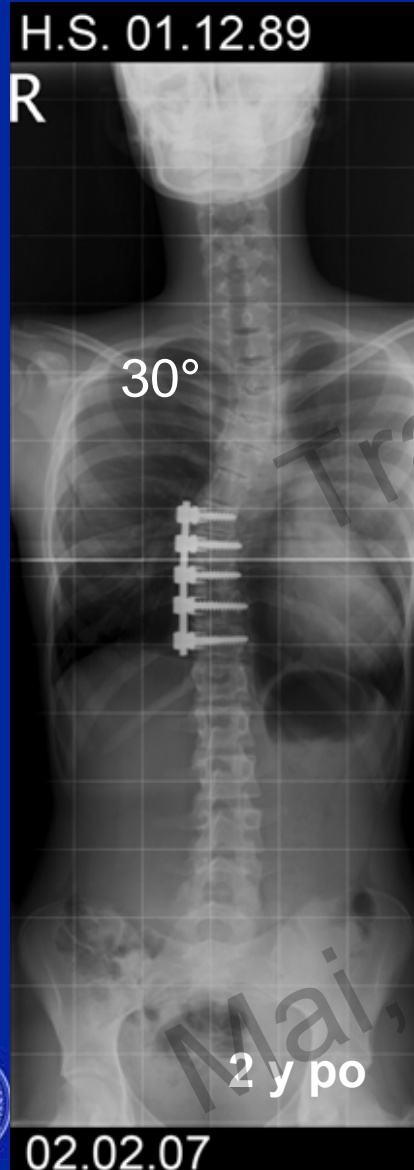


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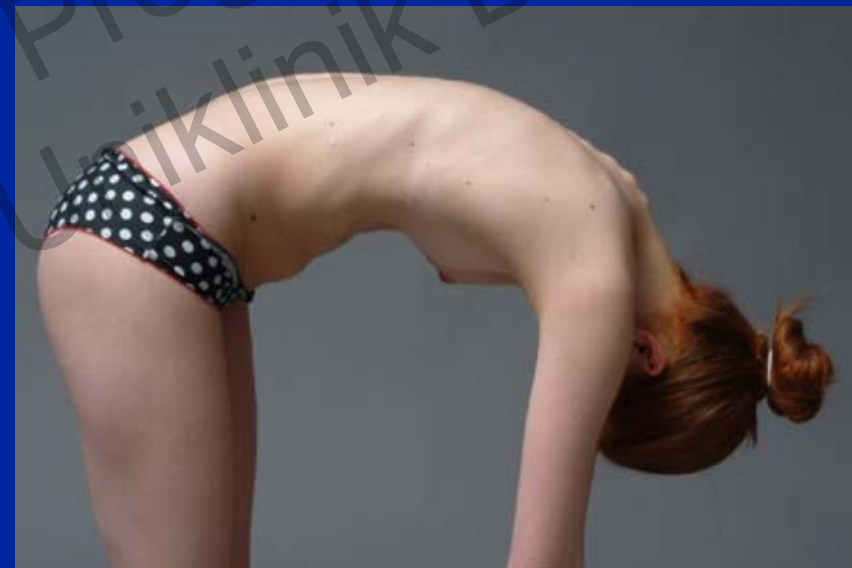


Balgrist

Short Anterior Fusion of lower curve T7-T11



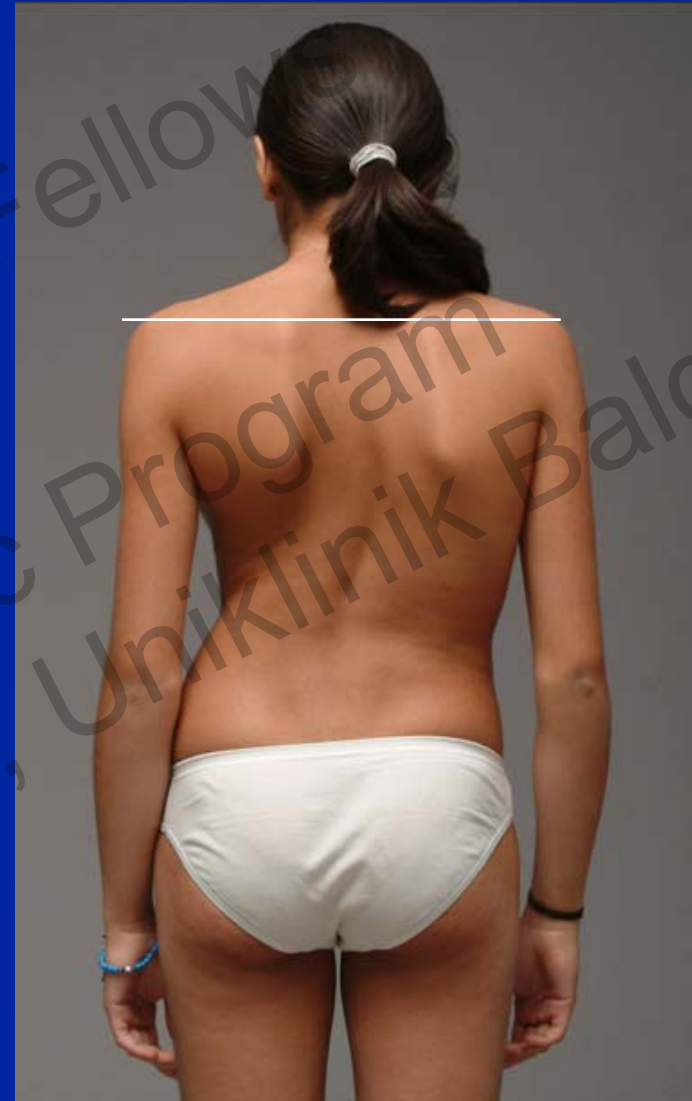
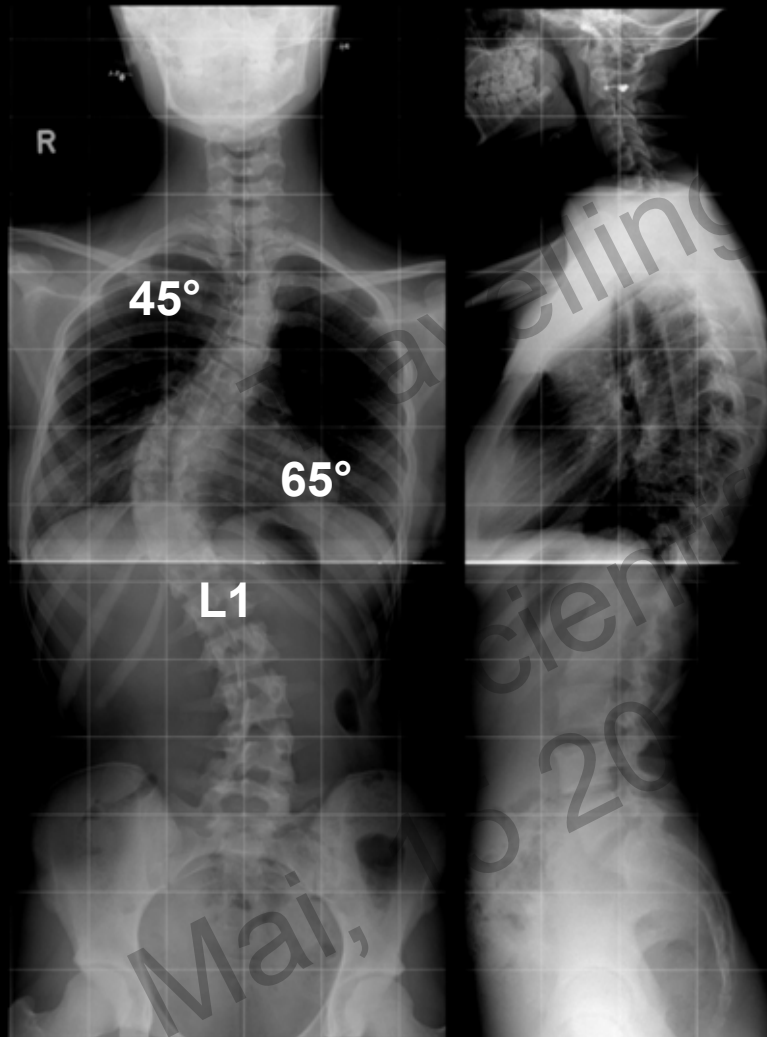
Good cosmetic result shoulder level, improves rib hump



15 y, K5, L2A

G.O. 27.01.89

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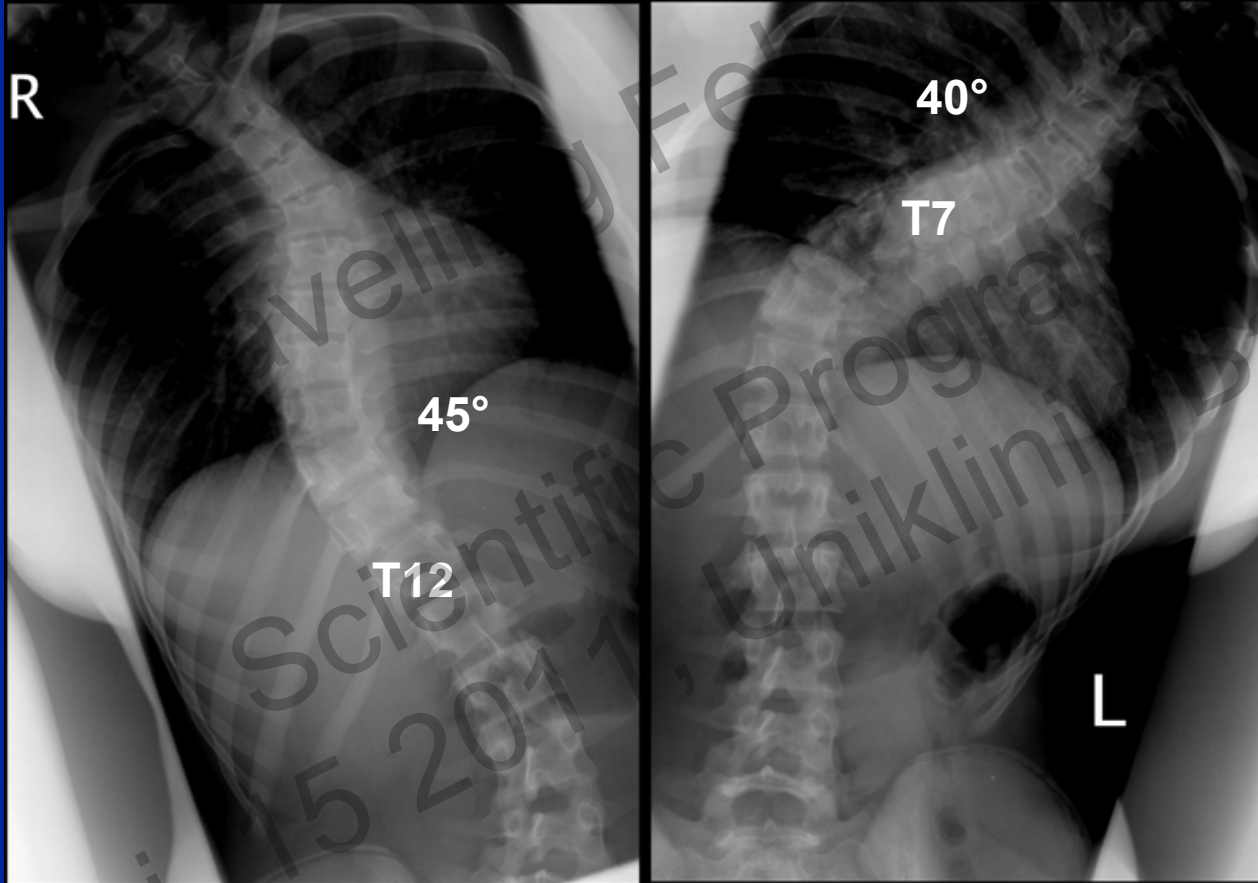
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Balgrist



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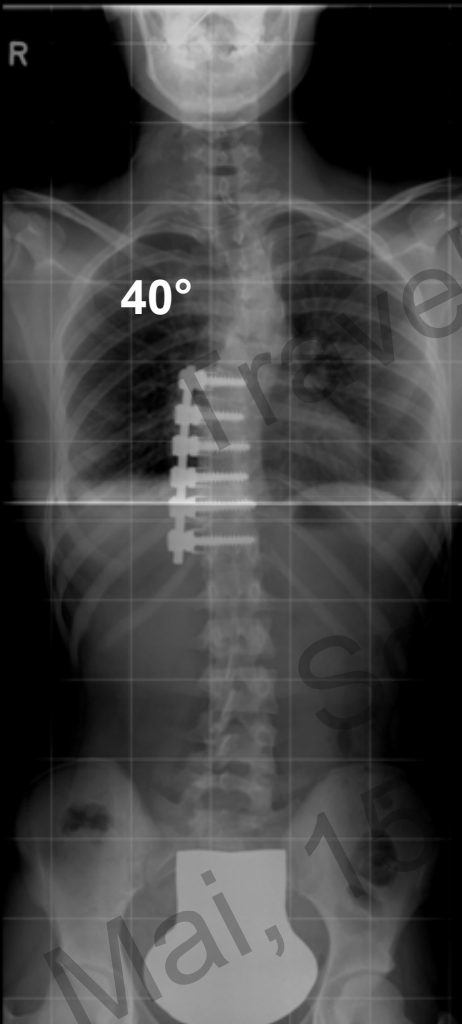


Post T2-12 ?

Short Anterior Fusion, Lower Curve T7-T12

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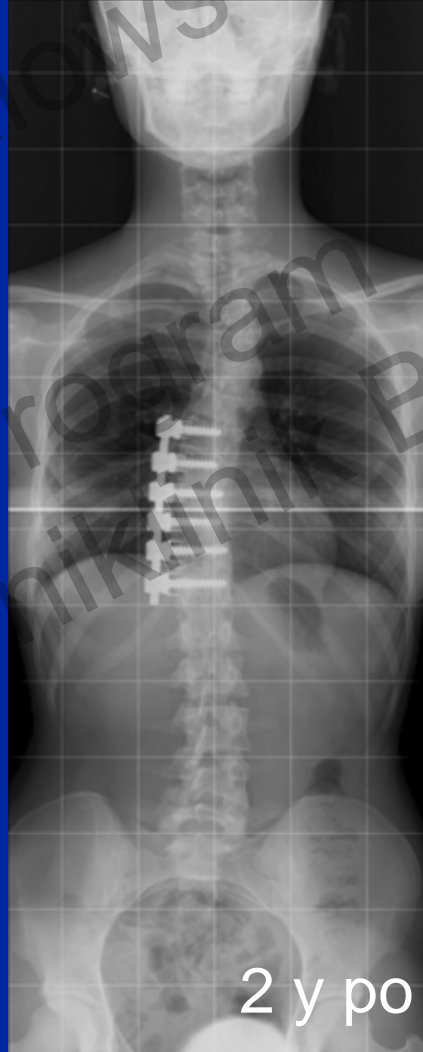
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05.11.04

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29.09.06

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Spinal Derotation

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R



12.03.04

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29.09.06

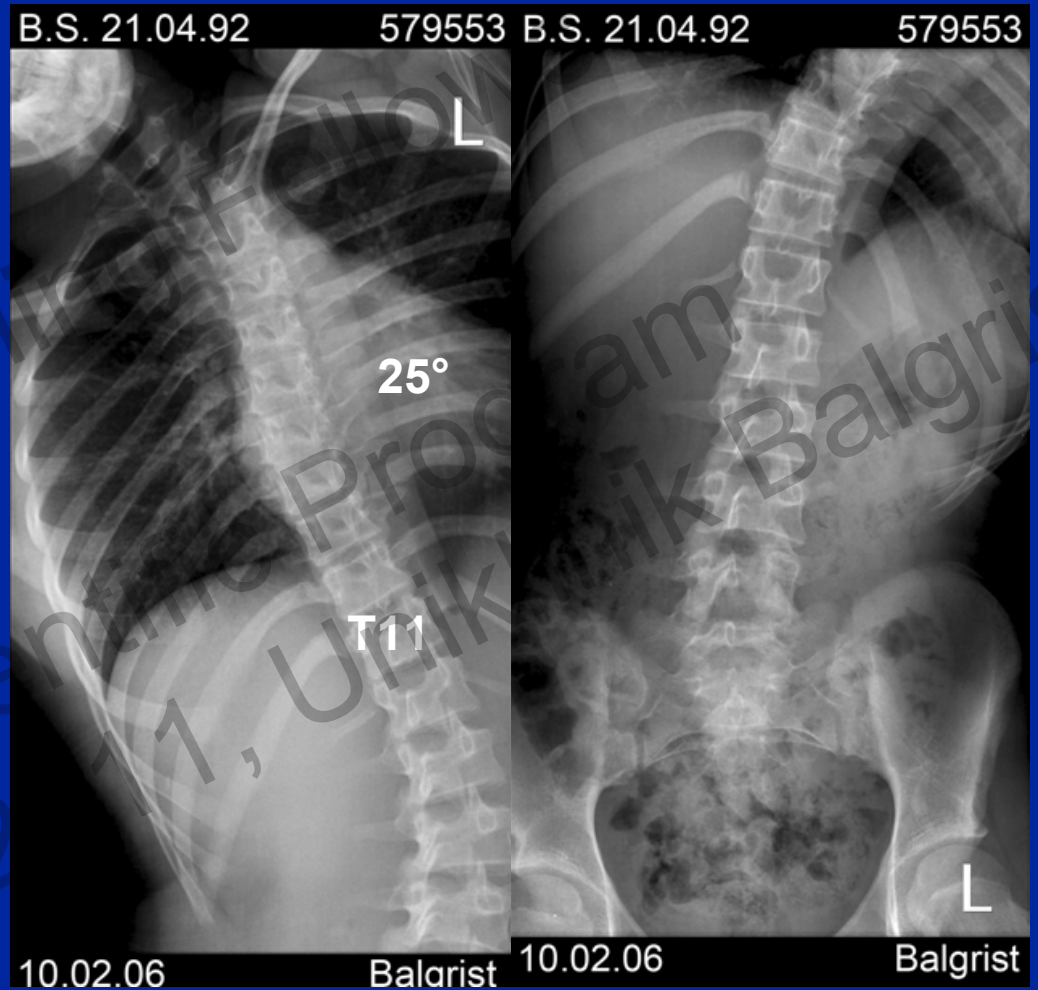
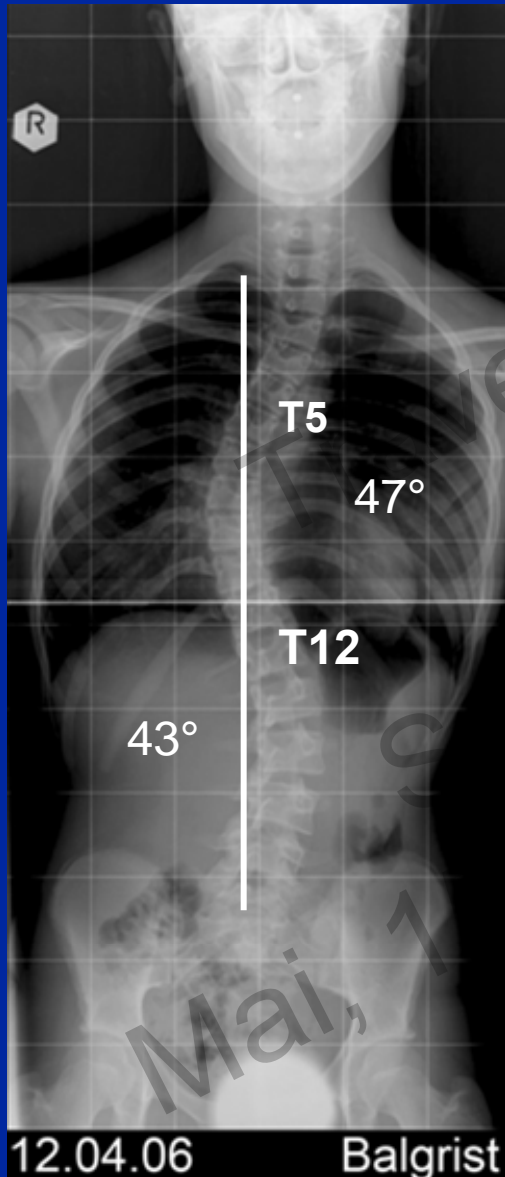
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Spinal Balance

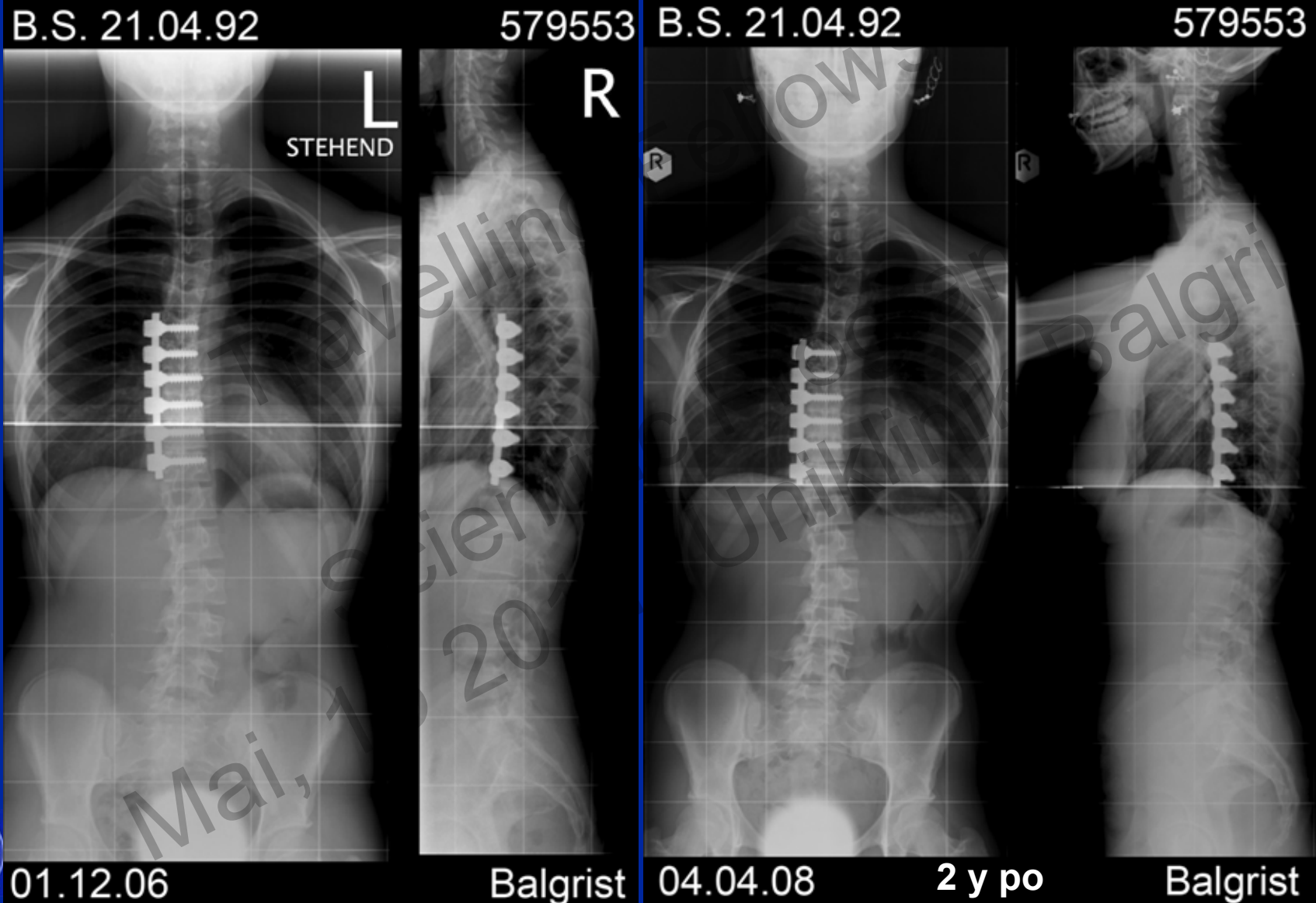


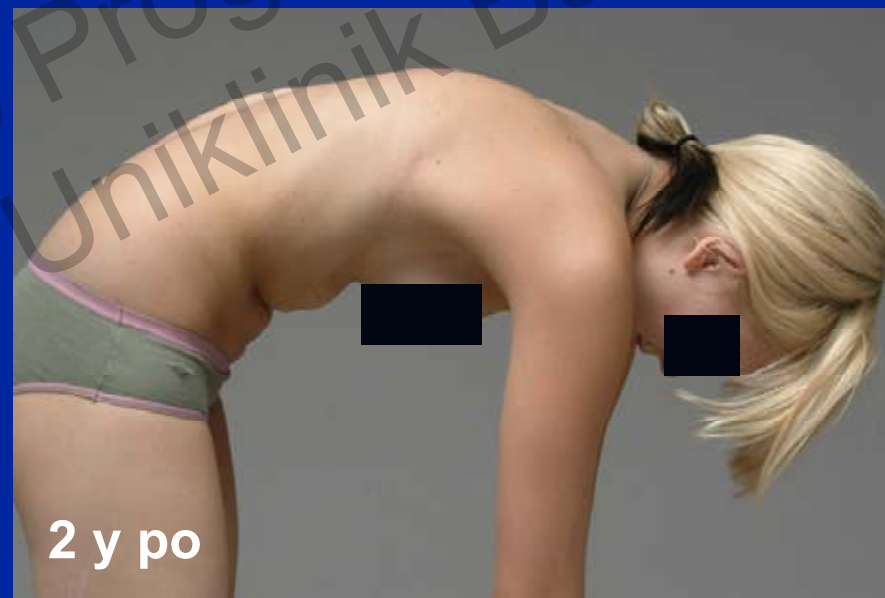
14 y, K2, L1C



Anterior Fusion T6-T11

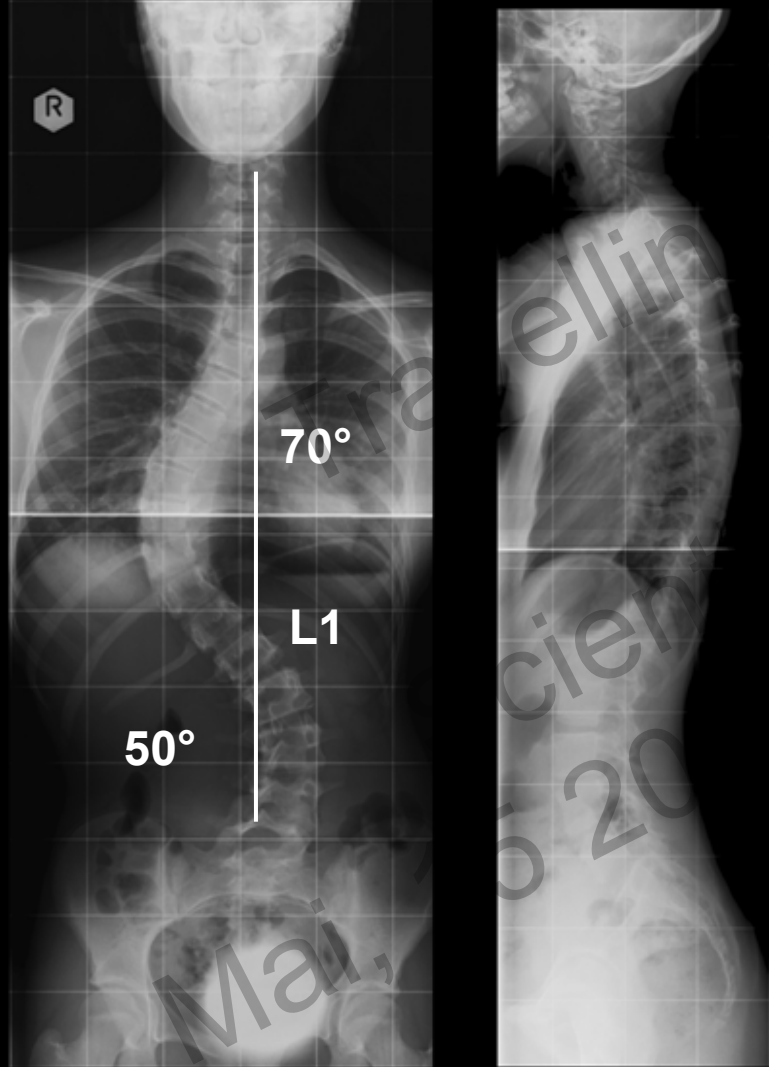
2 vertebrae less than the curve



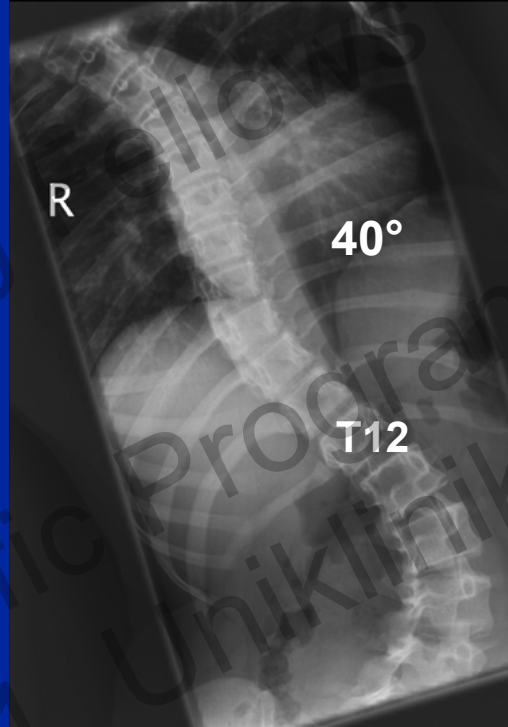


16 y, K2, L1C

B.J. 01.09.90 599989 J. 01.09.90 59



B.J. 01.09.90 599989



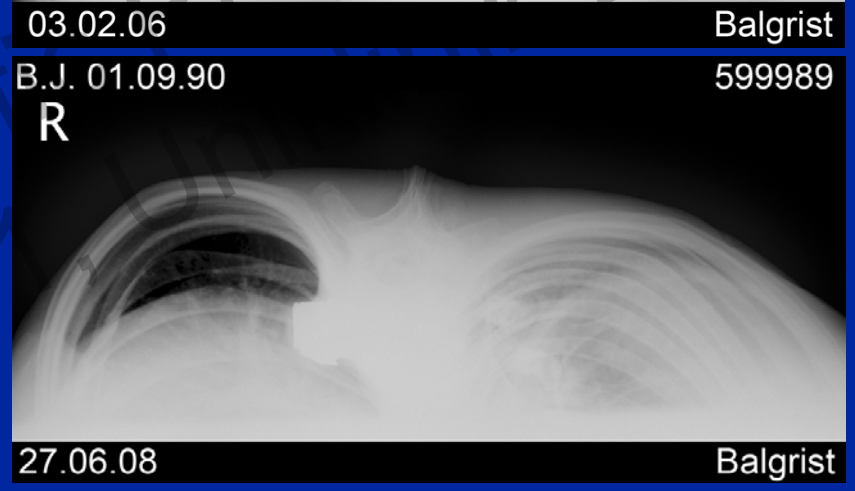
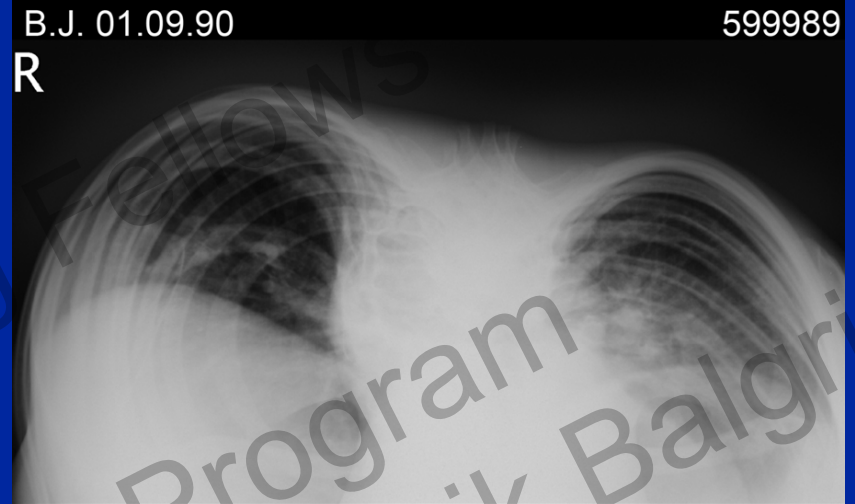
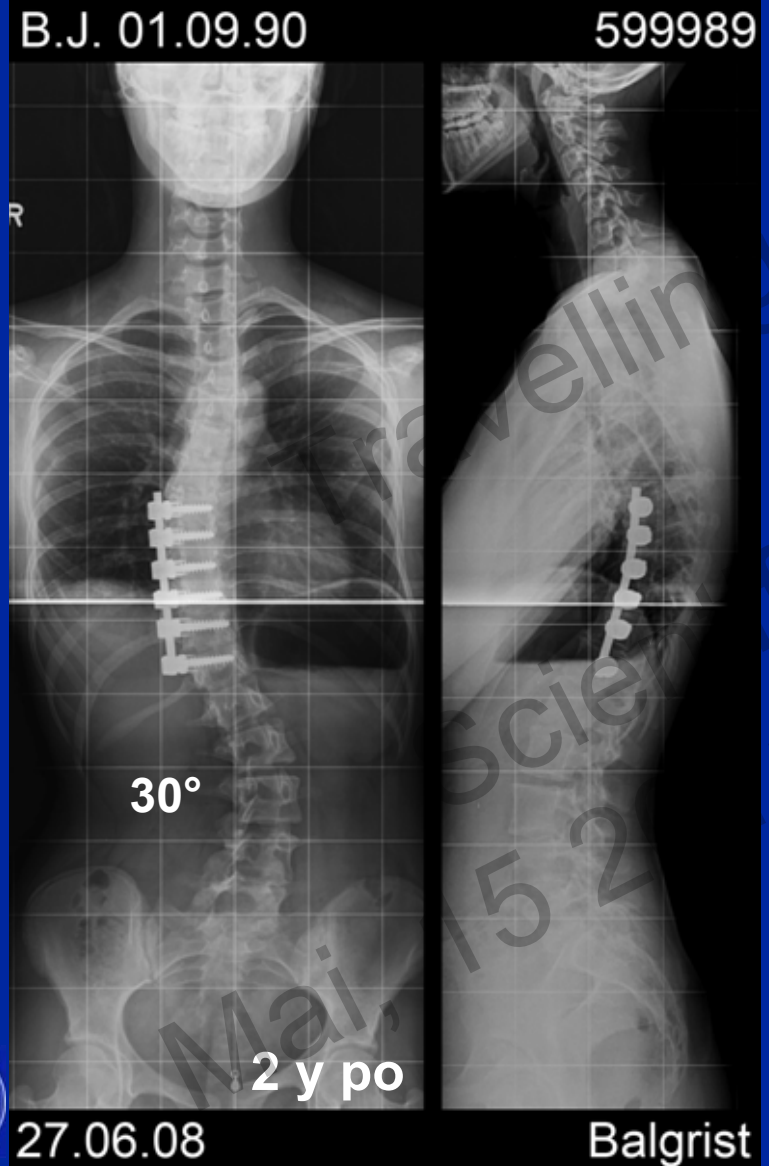
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03.02.06 Balgrist



Anterior Fusion T7-T12



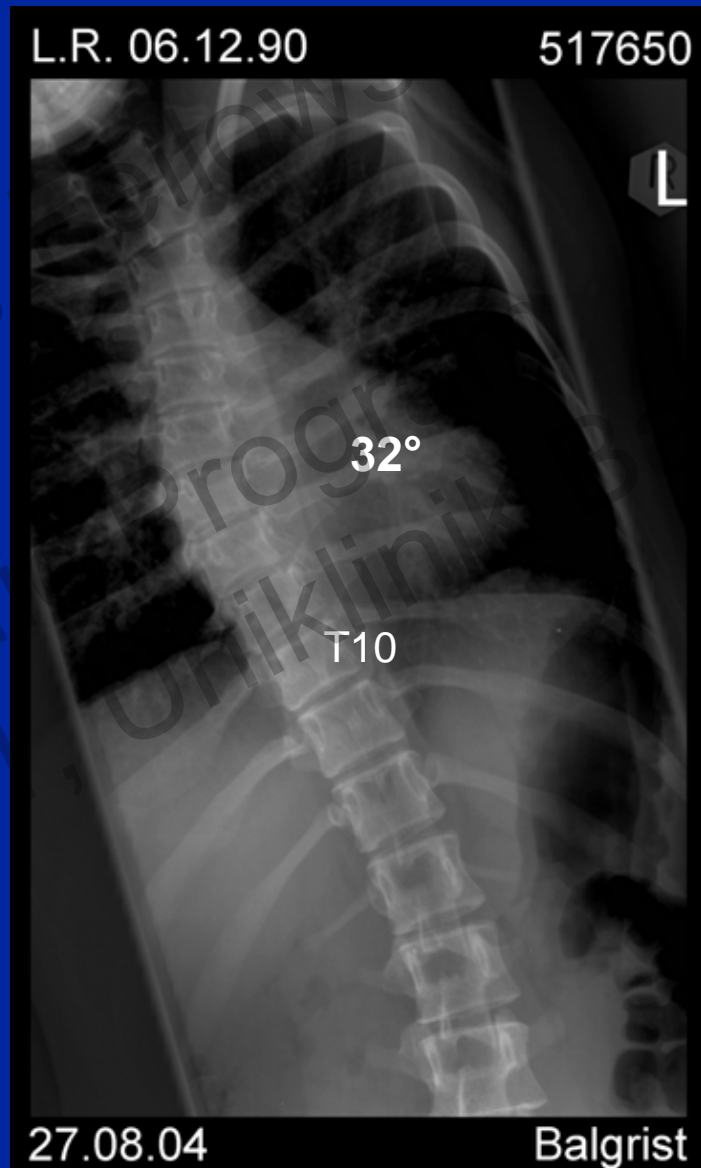
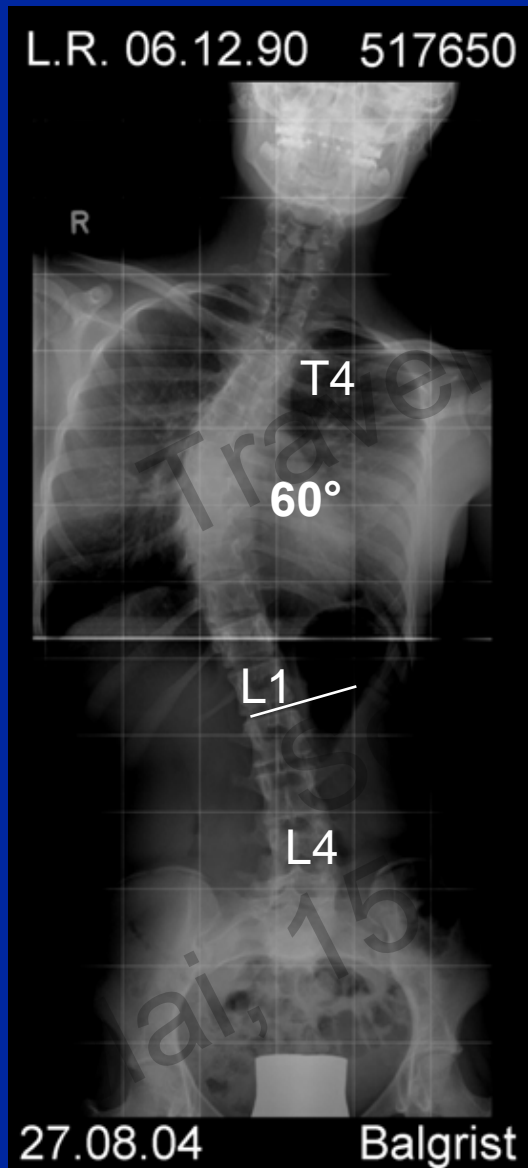
Post T4-L2 vs. Ant T7-12 



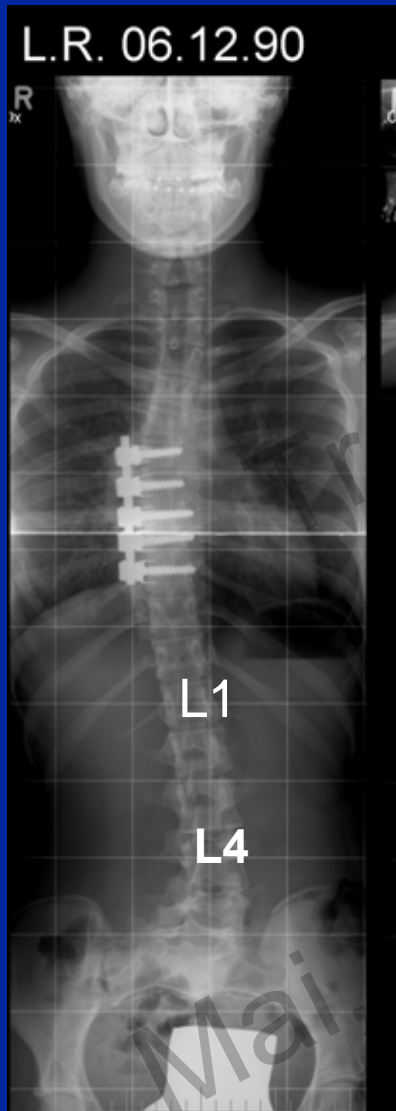
Excellent improvement of rib hump



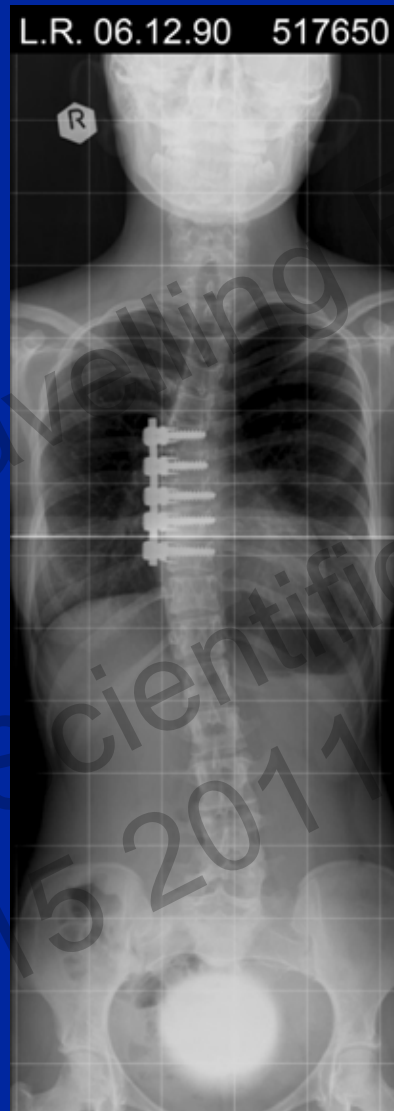
13 y, K4, L1A



Fusion T6-T10 (5 vertebrae) 5 vertebrae less than the curve

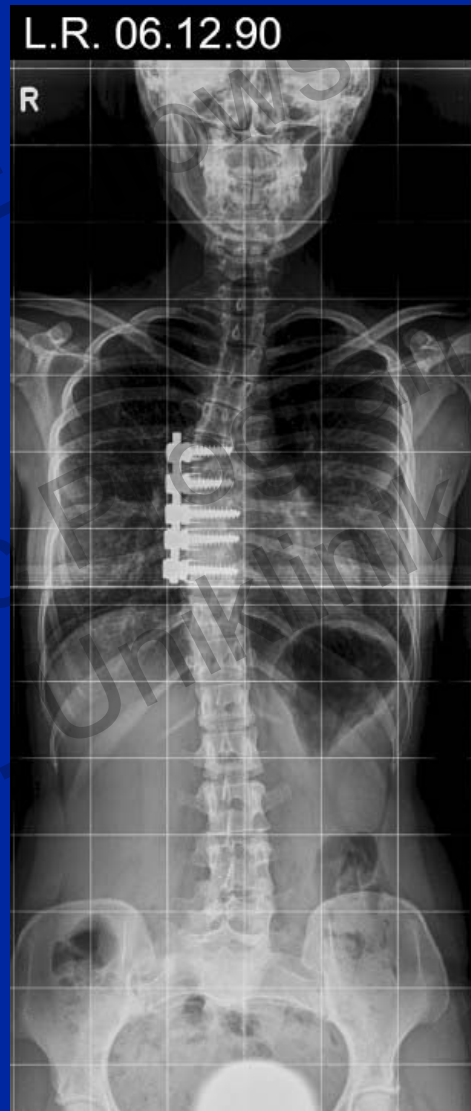


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5 y po



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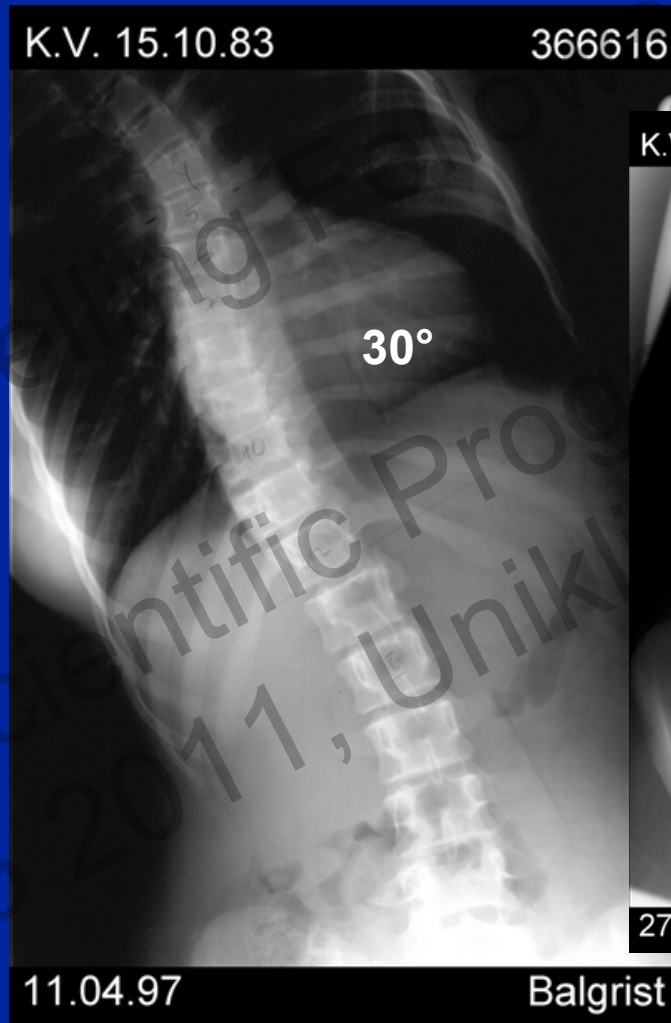
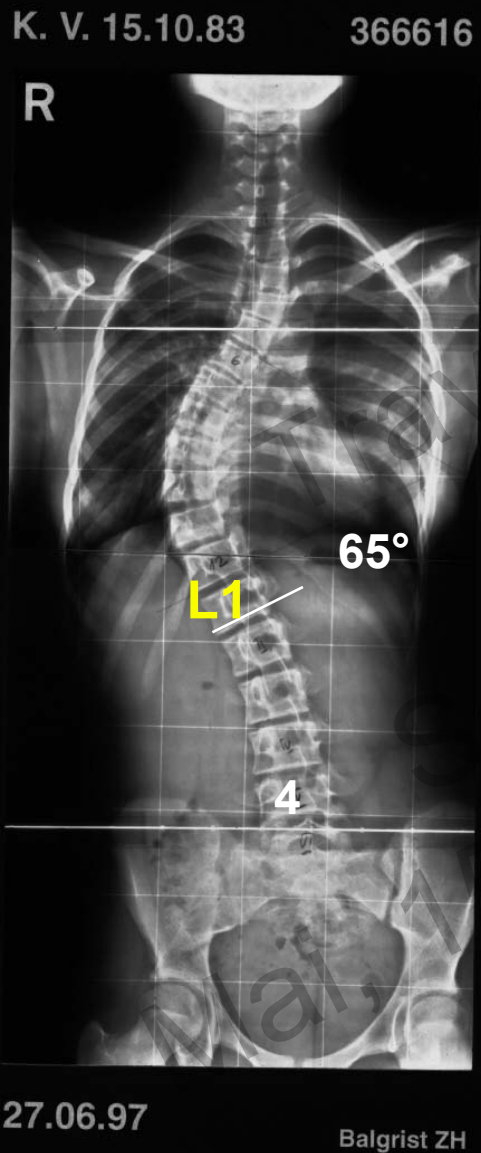


5 y po

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13 y, K4, L1A



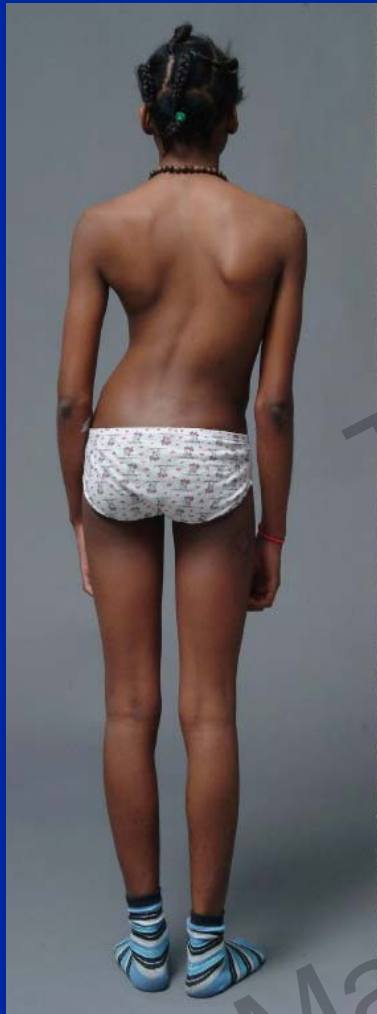
Post fusion T5-L2 (10 vertebrae)





7 y po

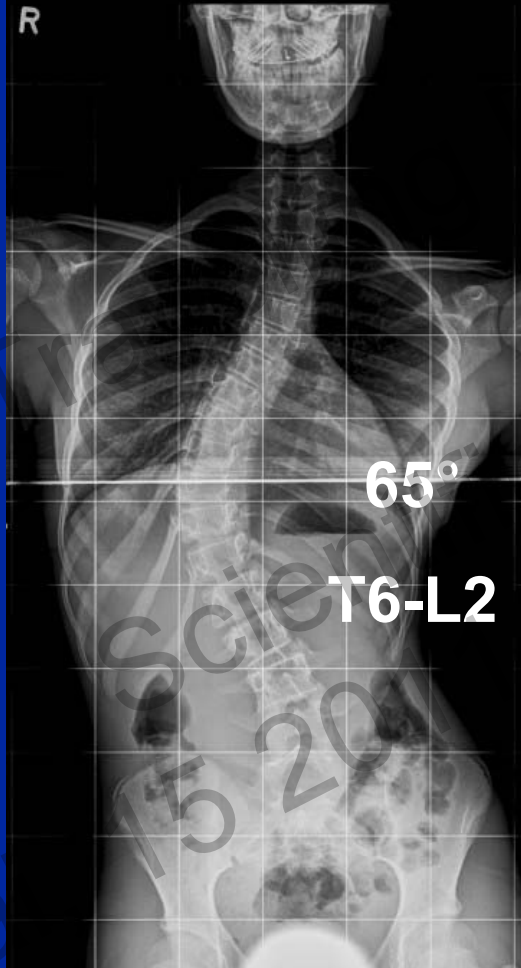




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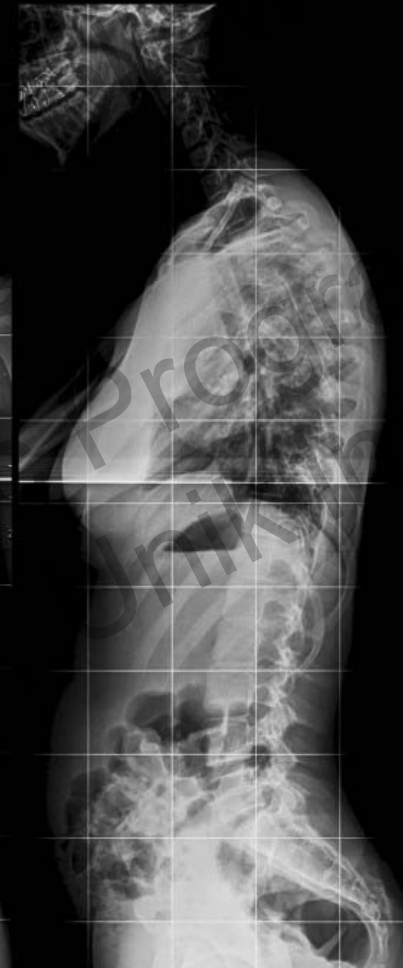
R



65°

T6-L2

20.01.10



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14.10.96

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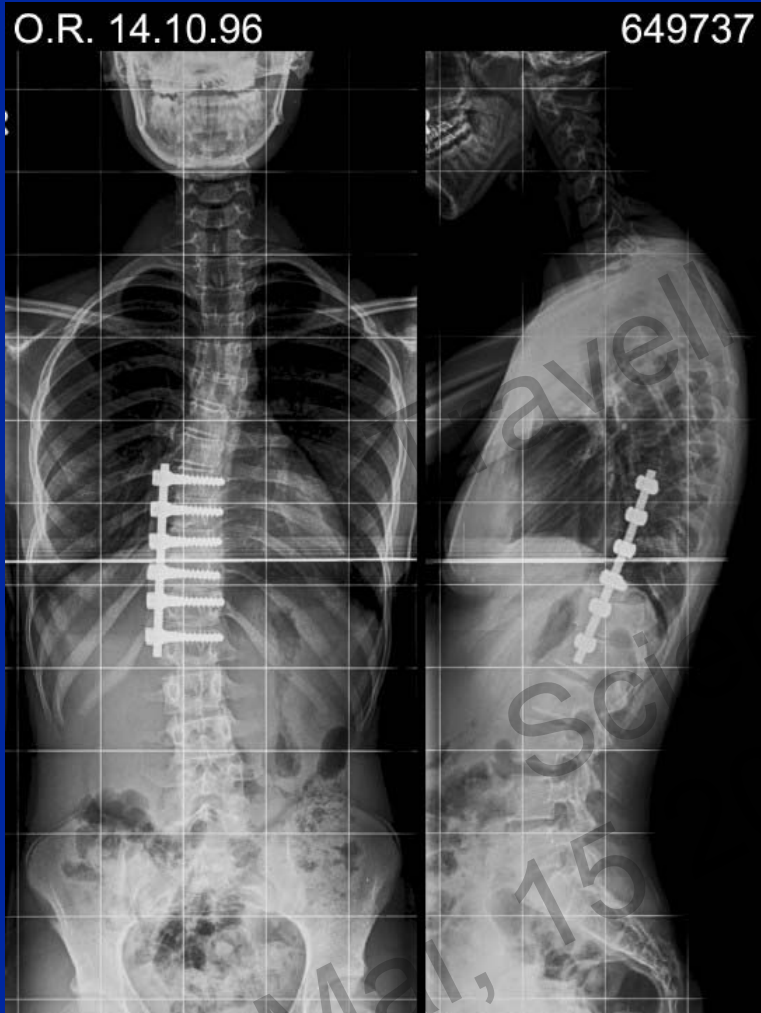


Bending



Anterior T7-T12

5 vertebrae less than the curve



1 y po



Mini-open anterior short fusion Thoracic AIS

57% Thoracic curve correction

45% rib hump improvement

32% increase in thoracic kyphosis

35% non-instrumented lumbar curve

Traveling Fellows
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Mai, 15 2011



Mini-open anterior short fusion Thoracic AIS

Good cosmetic results

Good patients satisfaction

No change in VC at 2 y f-up

Fusion average 2.5 segments < curve (2-5)

Spinal and shoulder balance achieved

**Short fusion leaves the spine mobile to
compensate for spinal balance**



Summary

Mini-open anterior short fusion

Best in single thoracic curves with, lumbar A, B

Cobb $\leq 70^\circ$

>45% improvement in supine bending

K5, L2 with shoulder level ≤ 20 mm

Low profile implant, small thoracotomy incision

Always cover the implant with pleura



Classifications

How helpful are they ?

Helpful to determine which curve needs fusion

Level of instrumentation depends on surgical approach, type and length of instrumentation

Accept residual deformity rather than do a long fusion



Fuse short and accept residual deformity

