ApiFix Treatment For Adolescent Idiopathic Scoliosis (AIS): The importance of Schroth method exercises after the minimal invasive operation

Nikos Karavidas, MSc, PT

Certified Schroth (BSPTS) Therapist
Certified Schroth Best Practice Therapist
Certified SEAS Therapist
Certified McKenzie Therapist
MSc Sports Physiotherapy, Cardiff University

Disclosures

I am the Physiotherapist who treated all the ApiFix patients in Greece

I received some financial support from the ApiFix Ltd company to attend the SOSORT – IRSSD 2016 Meeting

Objectives

- Present the short-term results of ApiFix system

- Present the necessity of Schroth method exercises post-operation

ApiFix – The “internal brace”

PSSE

≤25°

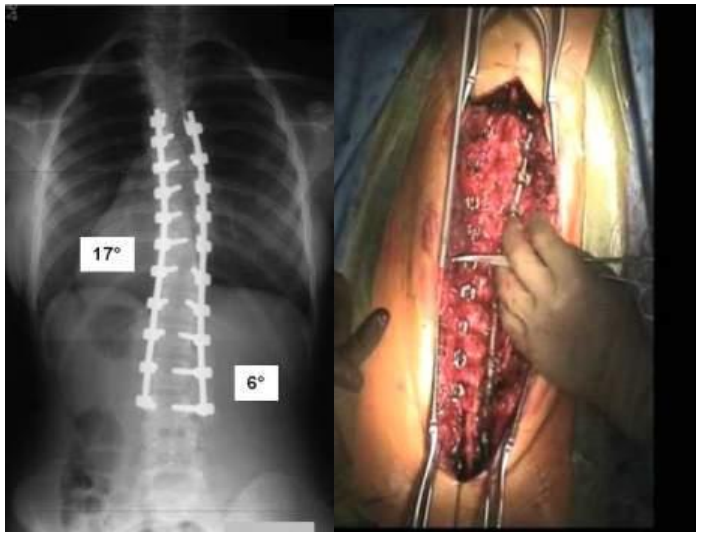
Brace

25°- 40°

Treatment Severity

ApiFix®

Spinal Fusion



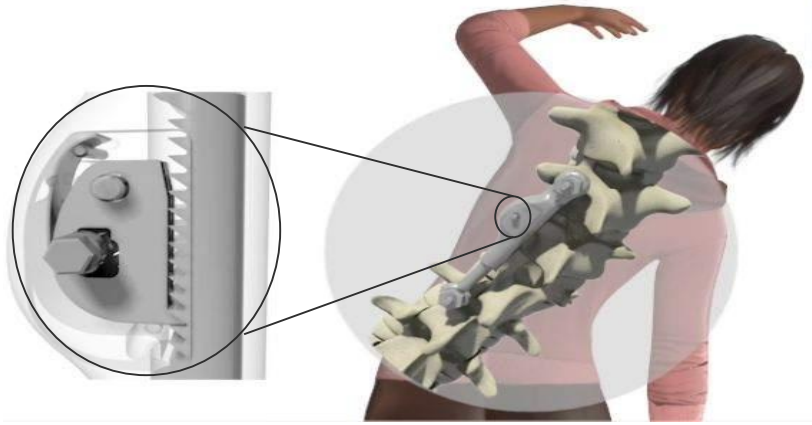
>45° - 50°

Nowadays, there is a missing step between conservative treatment and spinal fusion. This gap can be covered (for some cases) by ApiFix, which offers the “internal brace” option

Treatment process

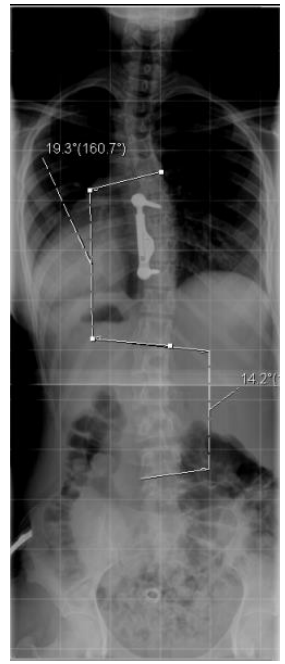
Scoliotic deformity

ApiFix Implant attaches to the pedicle with 2 screws – peri apical and a relative correction of the deformity is achieved



A miniature ratchet mechanism allows the elongation of an expandable rod

The implant gradually elongates by Scoliosis Specific exercises, enlarging the distance between the two screws. This gradual correction targets to bring the curvature into the “safe zone” , below 30º - 35º



Spinal fusion Vs ApiFix

Spinal fusion

- Surgical incision approx. 30- 45 cm
- Duration of operation 6-8 hours
- Hospitalization 6-7 days
- Blood loss 800-1500cc

ApiFix

- Surgical incision approx. 10 cm
- Duration of operation 45-60 min
- Hospitalization 1-2 days
- Blood loss 50 cc
- No fusion, no effect on growth plates, does not affect growth
- Normal range of motion of spine after surgery
- Potential option to remove the device after maturity
- Option for spinal fusion in the future
- Lower rate of surgical complications

Fatigue test

Fatigue Test per ASTM F 1717

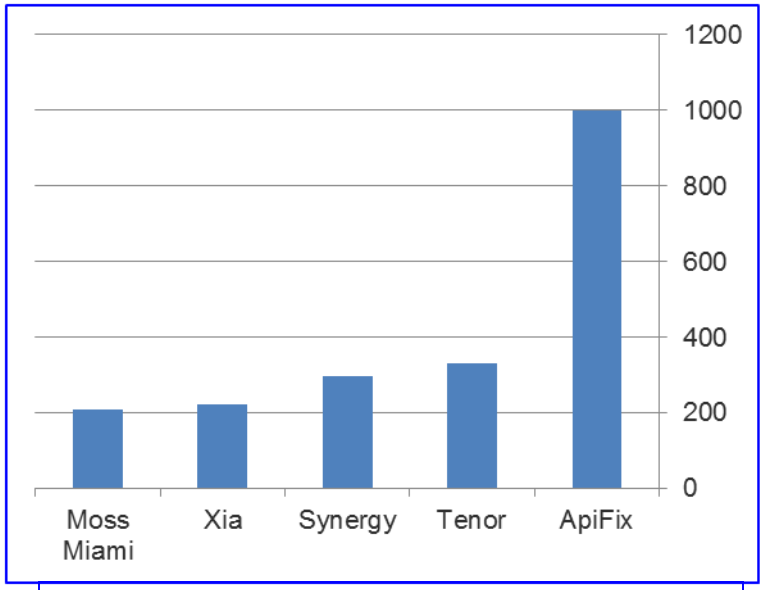
- Test performed by EndoLab GMBH (Germany)

- ApiFix Run-out load at 5,000,000 cycles was 1000N

- Standard fusion systems of good quality holds around 300N*

Testing Jig

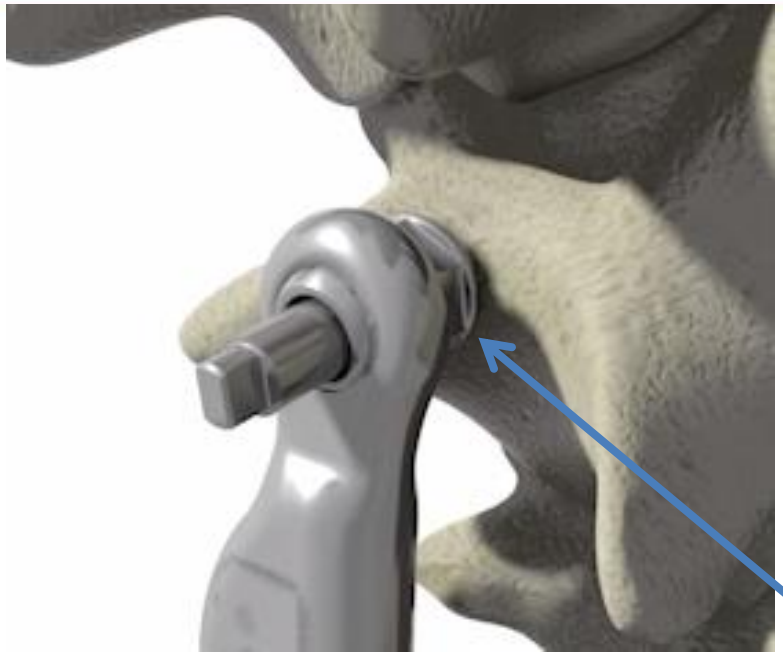
Test Sample

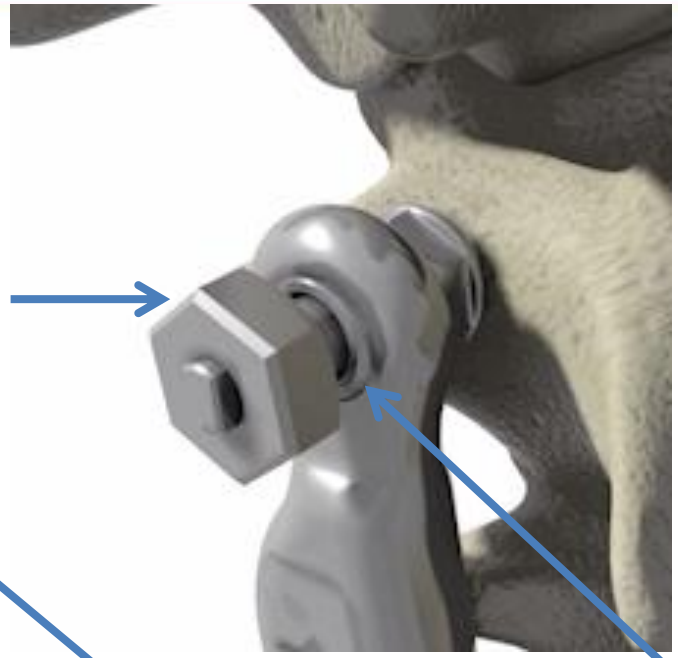


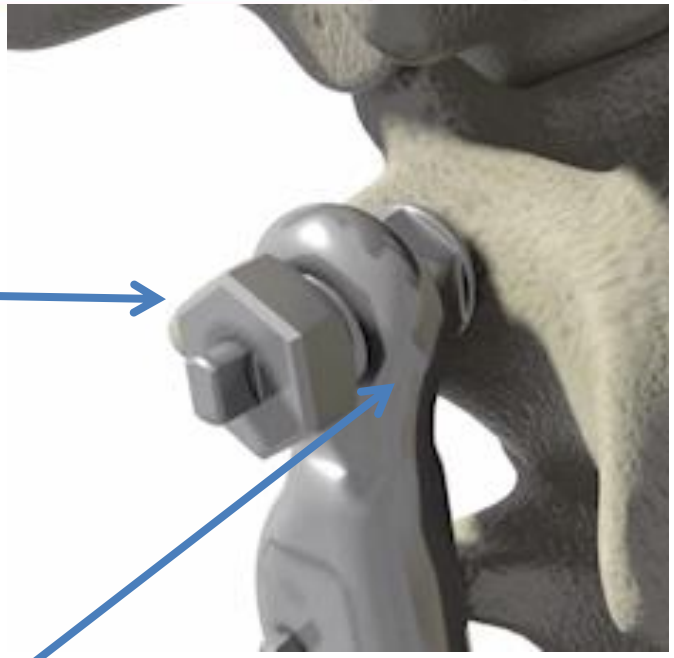
Run out load [N] of standard fusion systems* and the ApiFix system

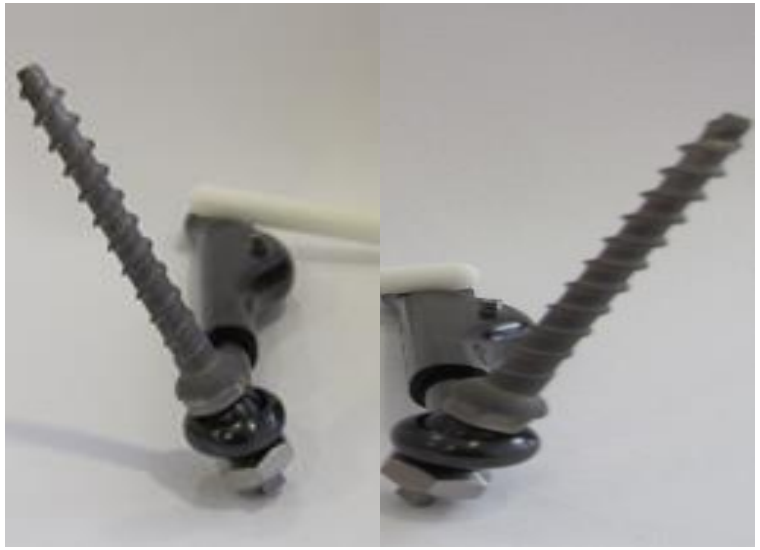
* Multiaxial Pedicle Screw Designs: Static and Dynamic Mechanical Testing. Ralph E. Stanford et al, Spine Vol. 29, No. 4 , 2004

Risk reduction









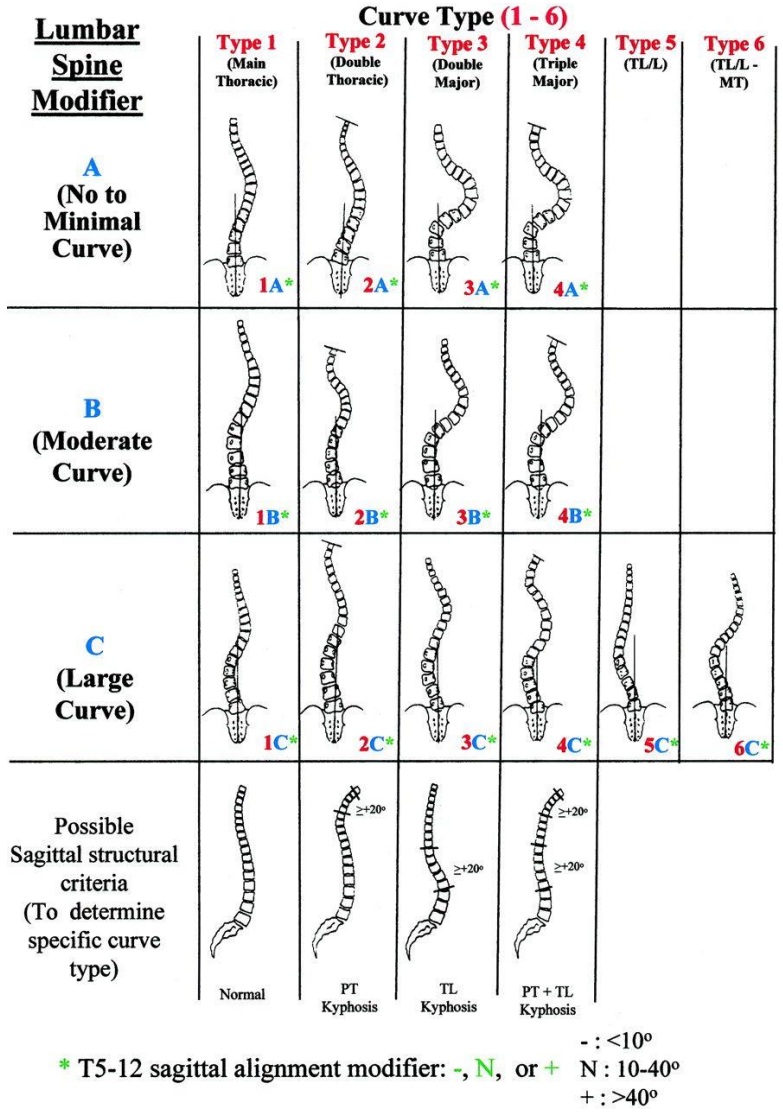
Spherical joint between the Implant and the Screw.
No moments can be transferred, only pure axial loads.

The Nut firmly holds the spherical ring but the joint is still free to move 3D.

Indications for ApiFix

- Apifix is not applied to every type of scoliosis
- Lenke type 1 (Main Thoracic), Lenke type 5 (Thoracolumbar)
- Cobb angle 40° – 60°
- Moderate rotation
- Flexible curve

  (significant correction in side-bending x-rays)



Treatment protocol

ApiFix

Pre-operation

- Curvature classification
- X-ray evaluation and estimation of Cobb angle
- Evaluation of flexibility by lateral bending x-rays
- Start of PSSE approx. 1 month pre-op
- Improve body awareness, flexibility and mobility
- Detailed information to the patient and their family, expectation management

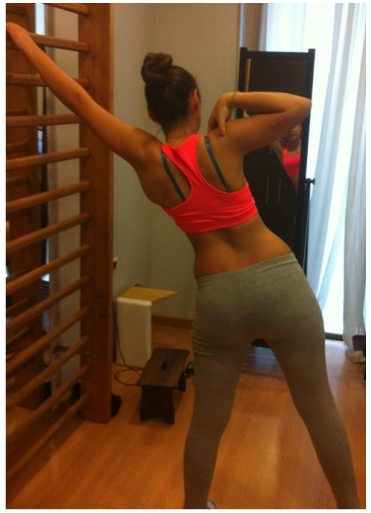
Post-operation

- Exit of the hospital 1-2 days after the operation
- Commencement of PSSE 2 weeks post-op
- Radiological assessment at 1st ,3rd and 6th month
- Continuation of the exercises for at least 6 months
- Long follow-up

Schroth method

Goals of treatment:

- Personalized exercises based on the curvature type (Physiotherapeutic Scoliosis Specific Exercises-PSSE)
- 3D auto-correction of scoliosis and active self elongation
- Cobb angle and Angle Trunk Rotation (ATR) improvement
- Improvement of posture and clinical appearance
- Reduction or elimination of pain
- Improvement of spinal mobility and flexibility
- Improvement of Vital Capacity (VC) and breathing function
- Activities of Daily Living (ADL) training
- Reduction of mechanical forces that promote progression



The exercises must be prescribed only by Schroth Certified Therapists

Methods

- Prospective on-going case-series study

- 6 female patients
- Mean age 15.6 years, Risser sign 3.7, Cobb angle 41.8^{o}

- Scoliosis Specific Exercises program for 6 months post-op (at least), Schroth method (Barcelona Scoliosis Physical Therapy School - BSPTS)

- Outcome parameters: Cobb angle, Angle Trunk Rotation (ATR), Aesthetics (TAPS – TRACE), Pain (VAS)

- Average follow-up 17.5 months
- Unpaired student t-test for statistical analysis

Results

ApiFix

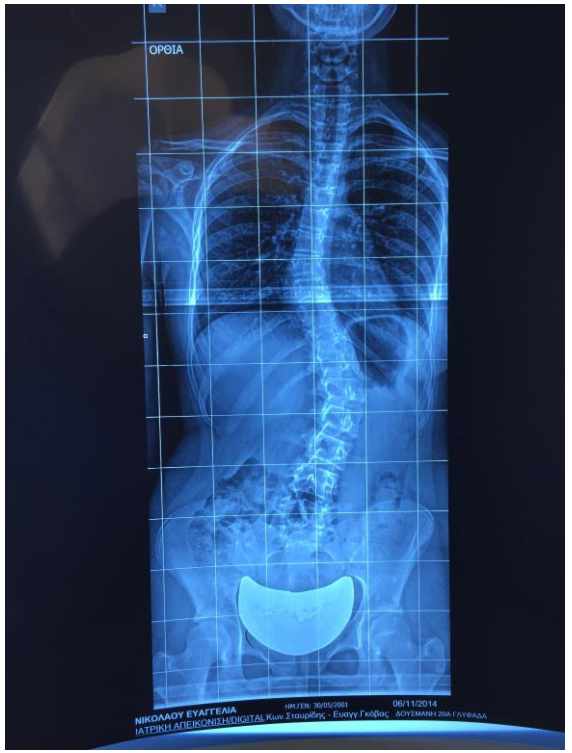
Age	Risser	Cobb pre-op	Cobb post-op	Cobb change	% correction
19	5	37	23	14	37,8%
15.5	4	30	6	24	80,0%
14	0	54	35	19	35,2%
17	5	59	39	20	33,9%
14	4	40	23	17	42,5%
14	4	37	28	9	24,3%
15,6	3,7	42,8	25,7	17,2	40,08%

Significant Cobb angle reduction (35.9%,p= 0.031)

Significant Cobb angle reduction (40.08%, p= 0.017)

Results

- Better results compared with previous research from Israel (avg Correction 32%)
- Not clear indication for ApiFix in some patients, might restricted the percentage of correction
- Complications: (1/6 patients) Revision surgery, due to a backup of the ratchet that was corrected by locking the mechanism
- Another patient had no chance for elongation/further correction due to improper length of the mechanism



Pre/Post Schroth exercises Results

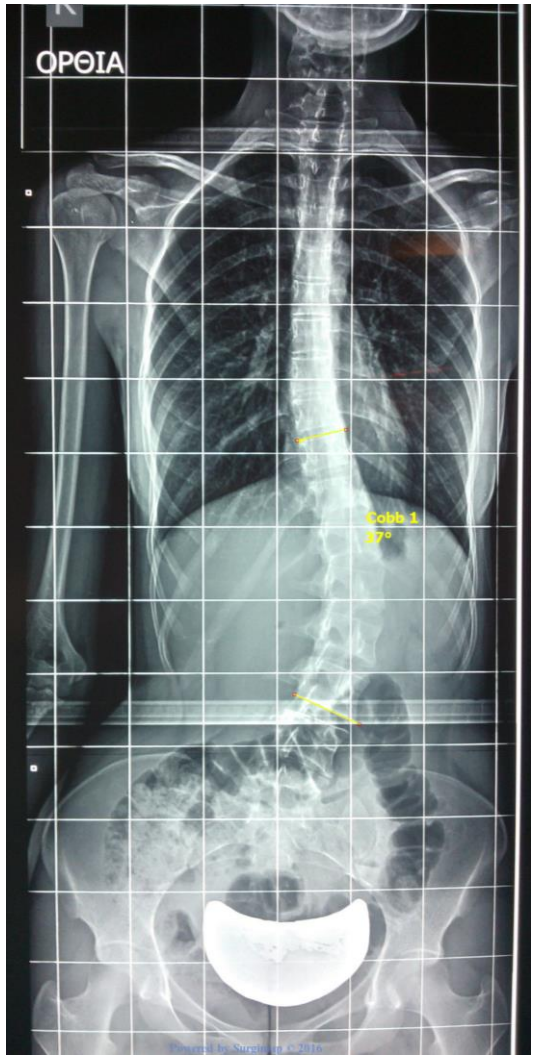
- 4 patients analyzed

- ***Cobb angle*** *improvement by* ***3.3º*** *(from 26.3º to 23º , p=0.603)*

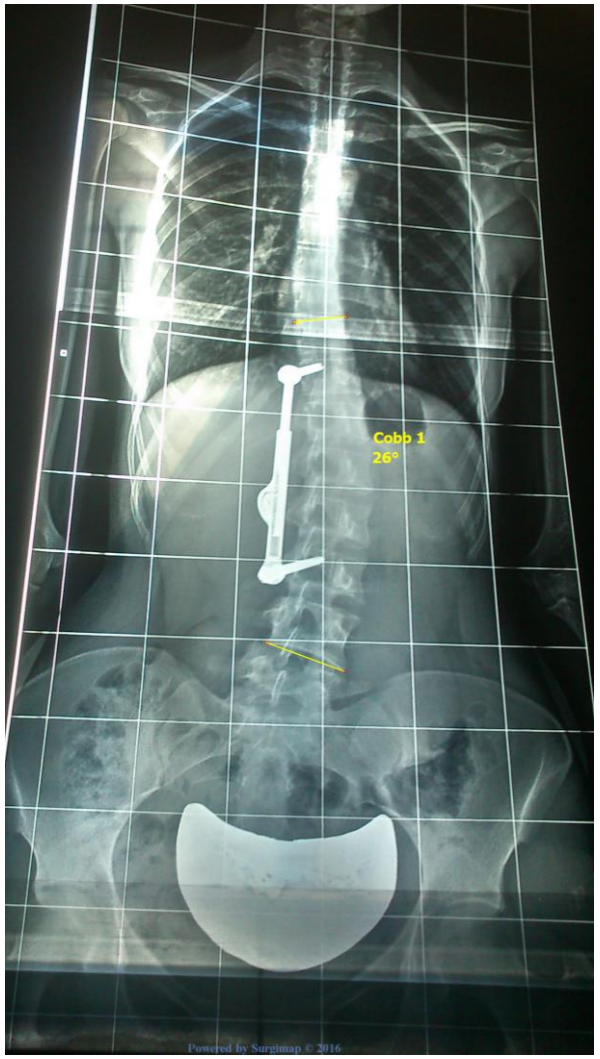
Cobb angle improvement by **4.6º** (from 26.3º to 21.7º , p= 0.53)

- **ATR** improvement by **2.3º** (from 10.5º to 8.2º , p=0.252)
- **TAPS** score improvement by **0.7** (from 3.2 to 3.9, p=0.113)
- **TRACE** score improvement by **2** (from 3.75 to 1.75, p=0.001)
- Pain score(**VAS**) improvement by **1.3** (from 2 to 0.7, p=0.11)

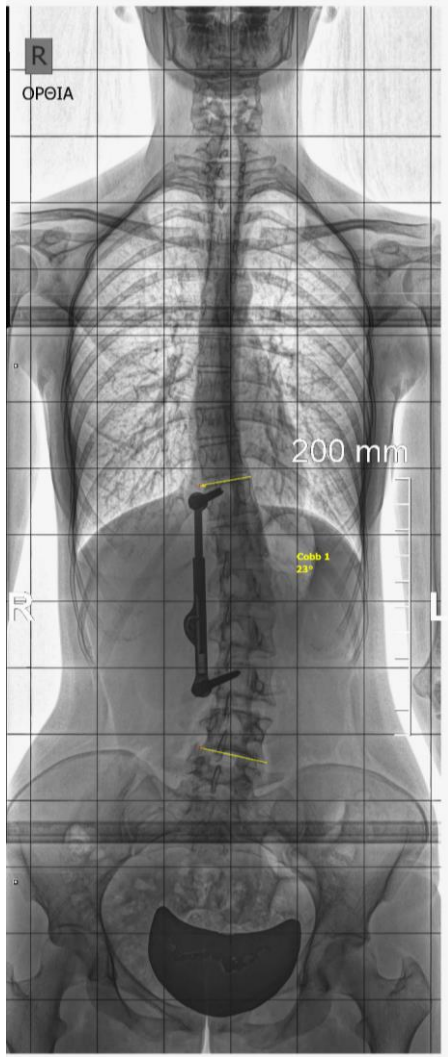
Case study 1



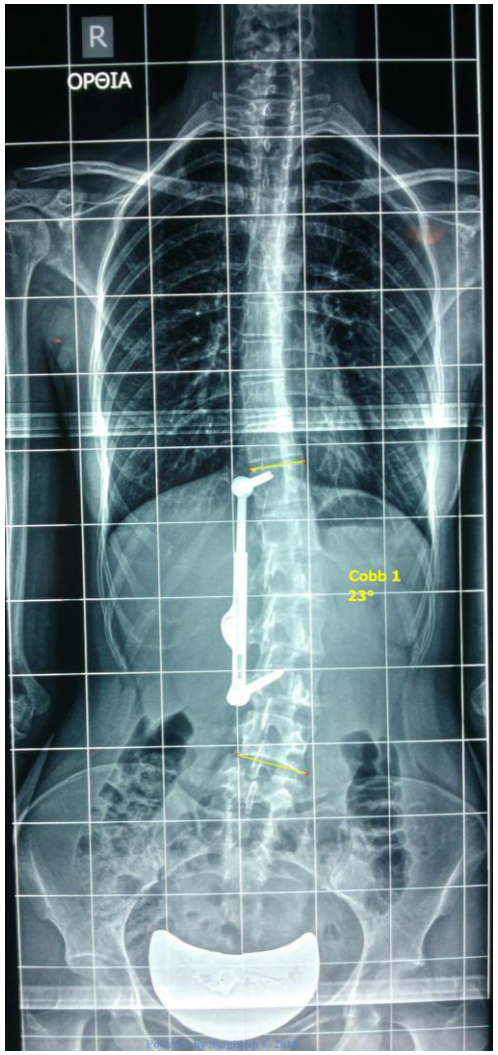
pre-op
Lu (L) 37°



2w post-op (no exerc.)
Lu (L) 26°



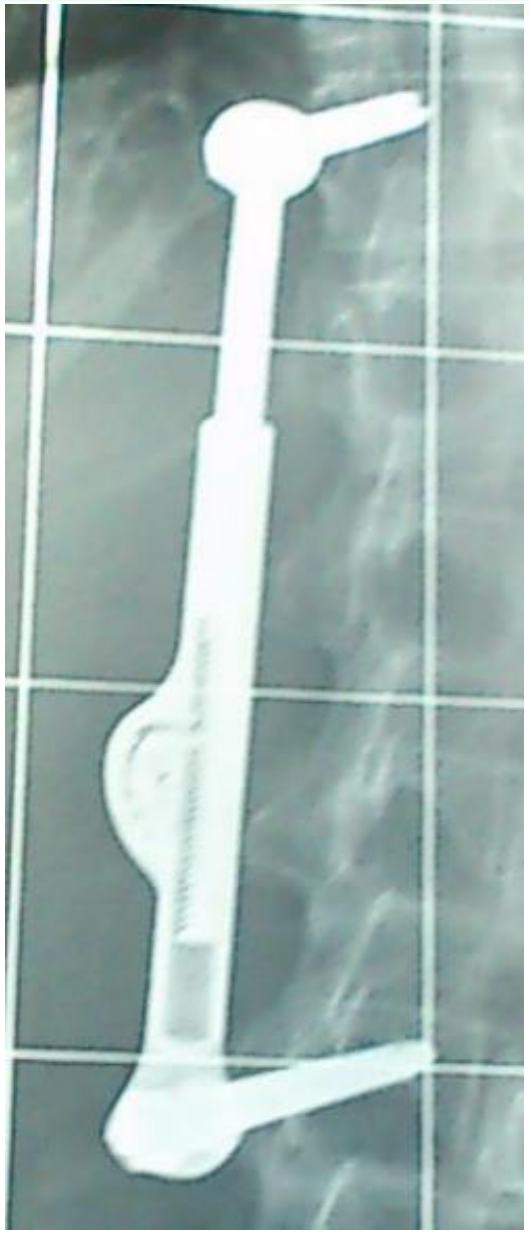
6m post-op
Lu (L) 23°

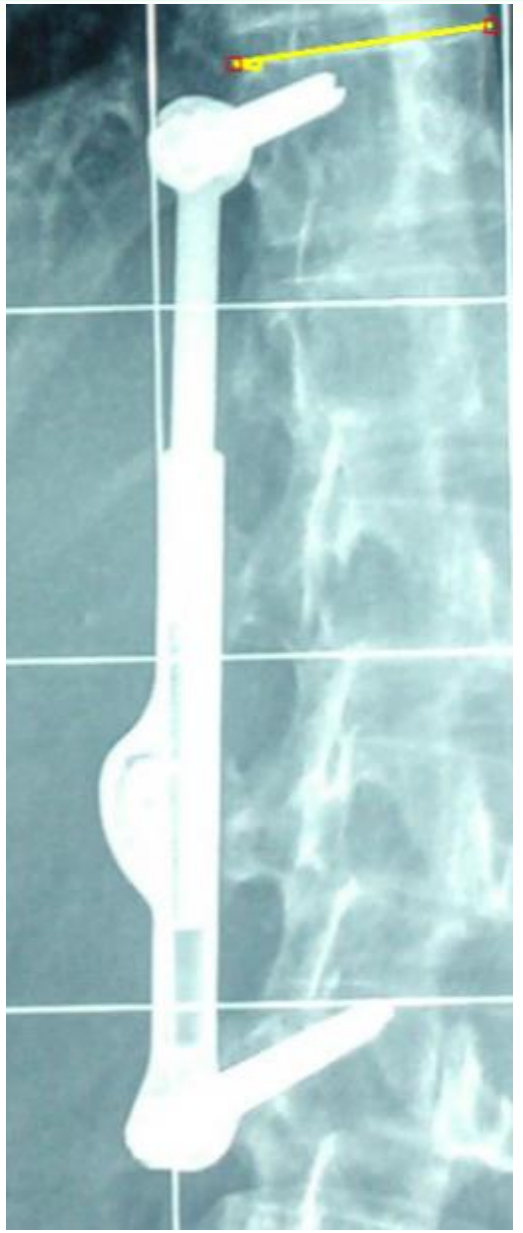


2y post-op
Lu (L) 23°

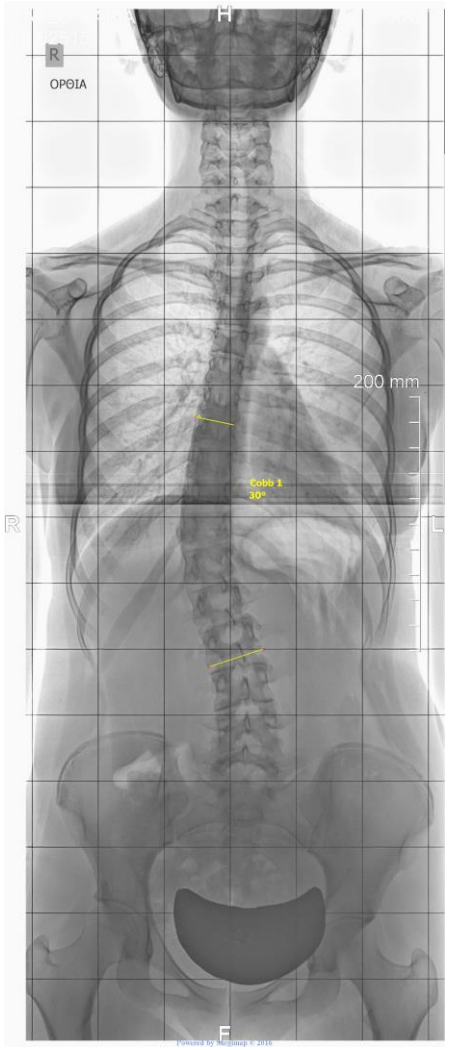
Case study 1

ApiFix

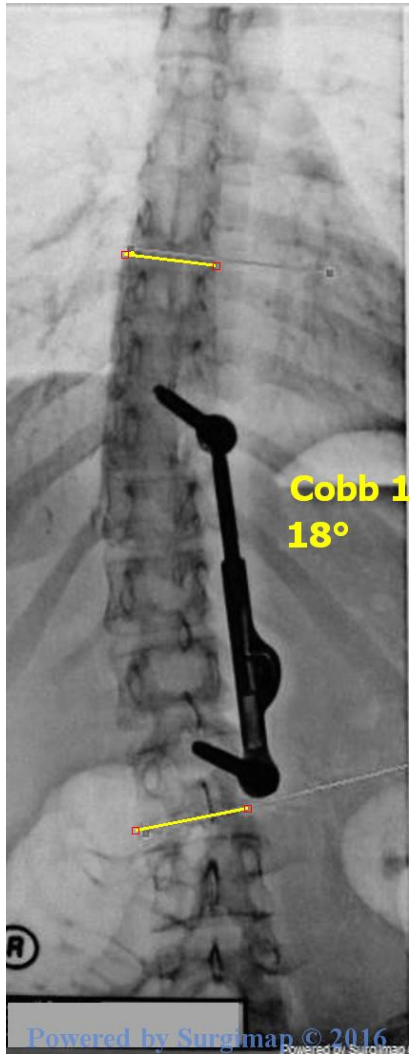




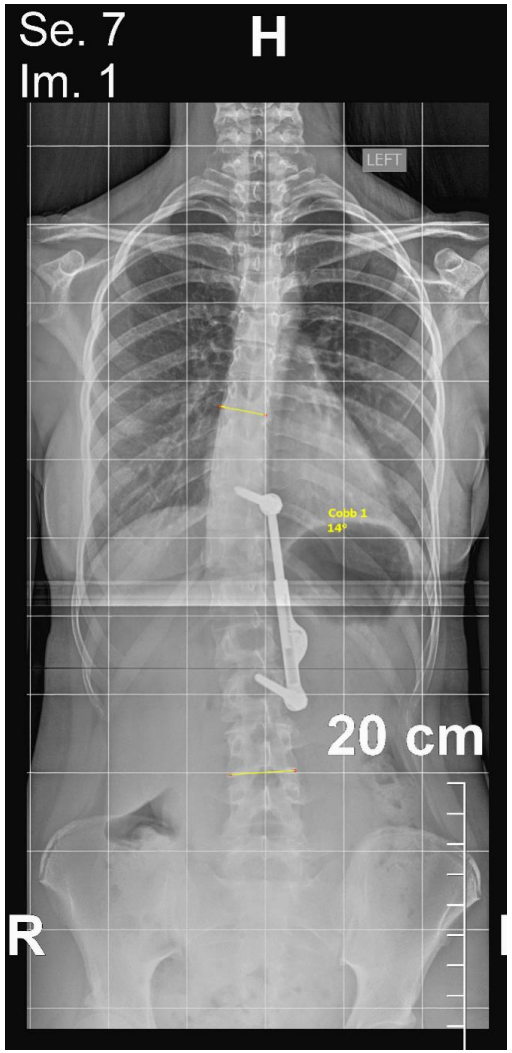
Case study 2



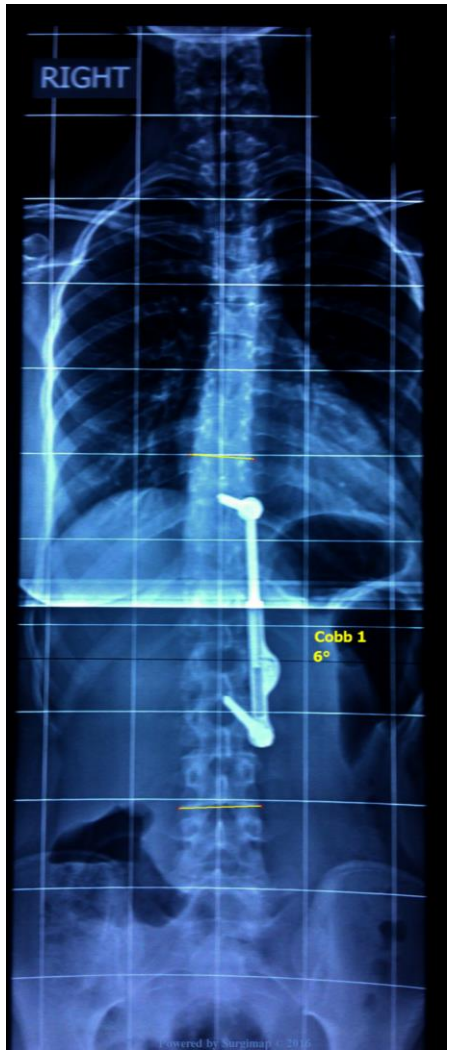
pre-op
Th-Lu (R) 30°



2w post-op (no exerc.)
Th-Lu (R) 18°



6m post-op
Th-Lu (R) 14°

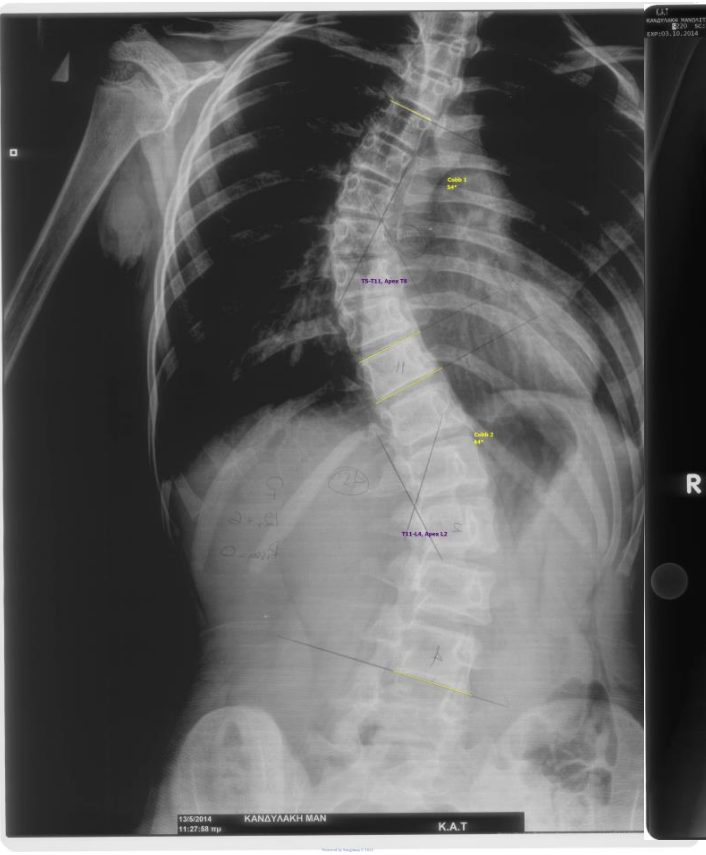


18m post-op
Th-Lu (R) 6°

Case study 2

Case study 3

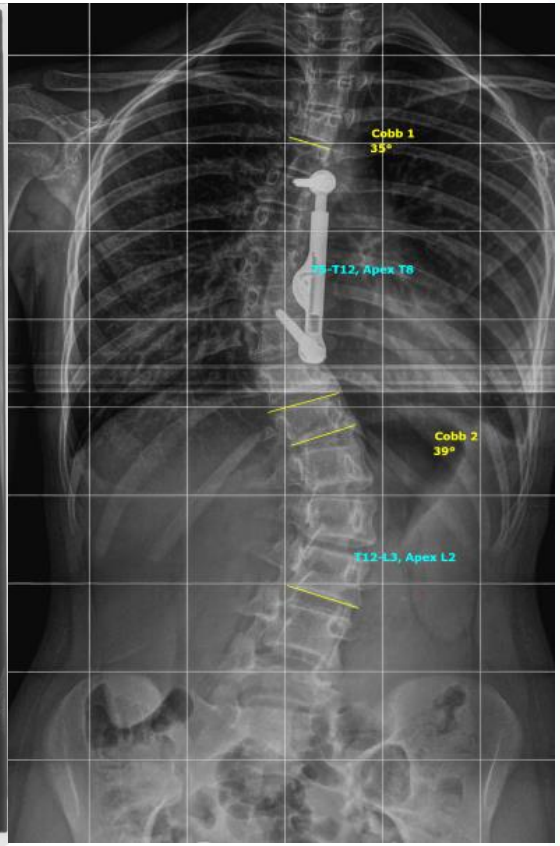
ApiFix



pre-op
Th (R) 54º – Lu (L) 44º

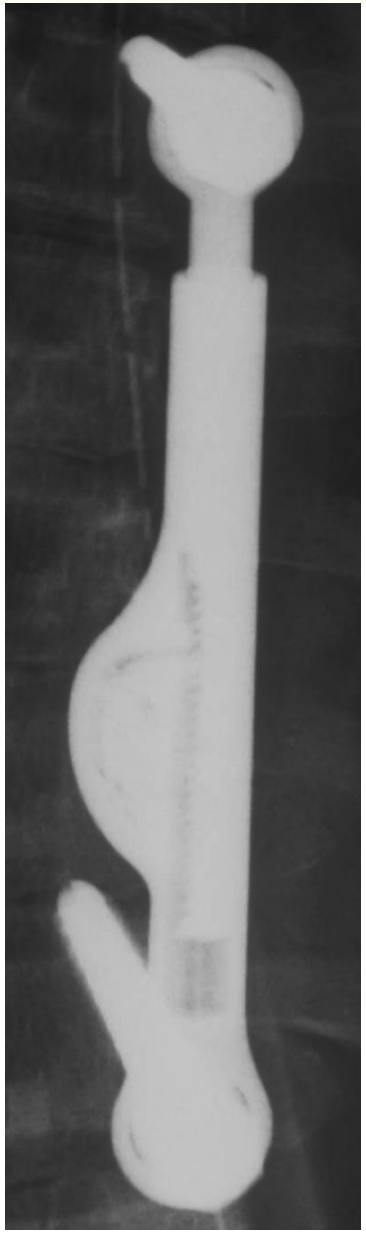
1d post-op
Th (R) 30º – Lu (L) 33º

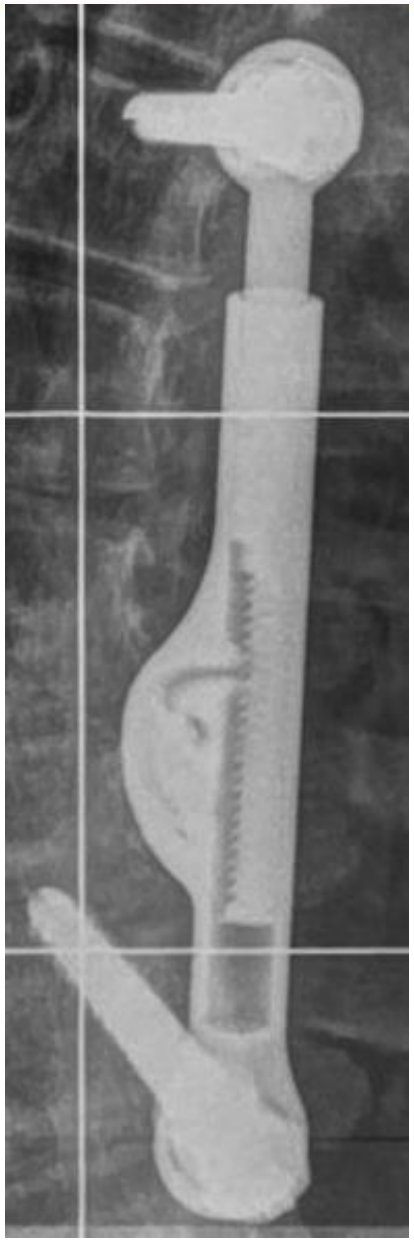
1m post-op
(before exercises)
Th (R) 37º – Lu (L) 39º



6m after
Schroth exercises
Th (R) 35º – Lu (L) 39º

Case study 3





Case study 3

ApiFix

Clinical appearance improvement (shoulders, pelvic asymmetry, ATR) after Schroth exercises

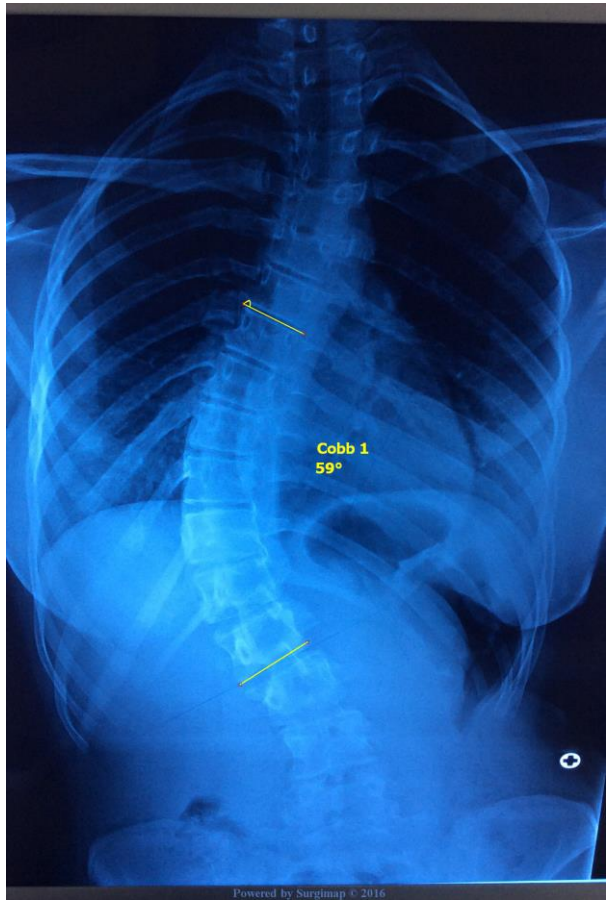
Before Schroth ex.

6 months after Schroth ex.

Before Schroth ex.

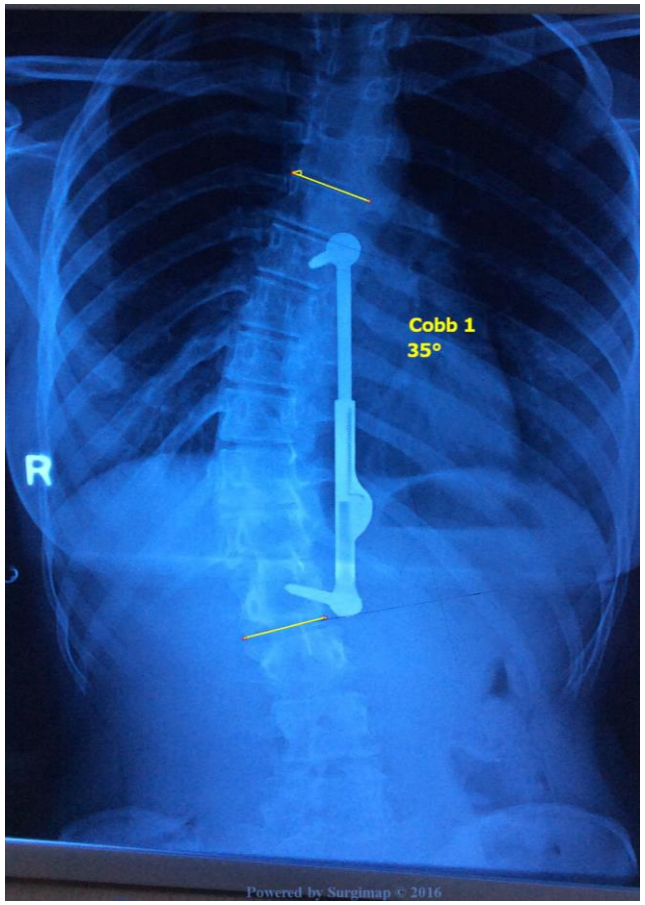
6 months after Schroth ex.

Case study 4



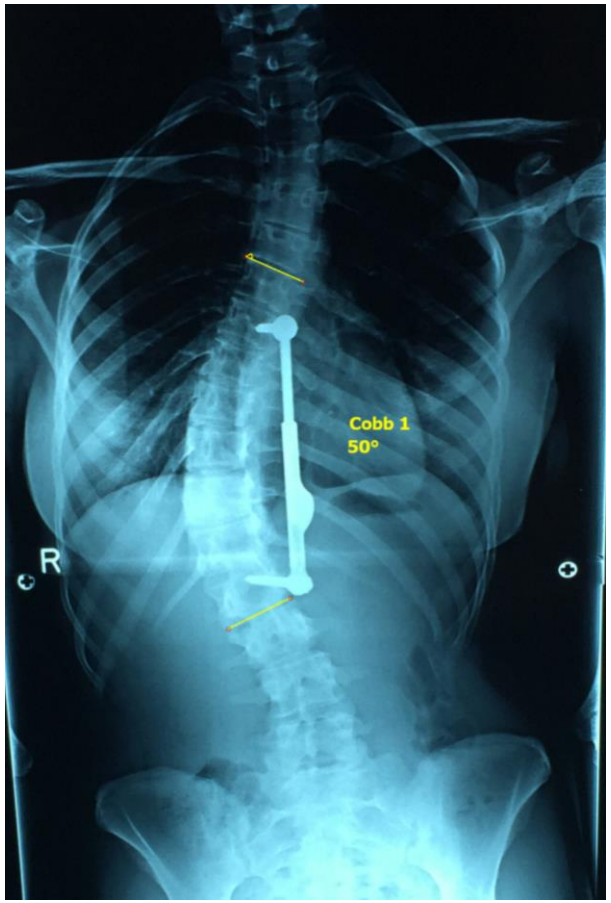
pre-op

59°



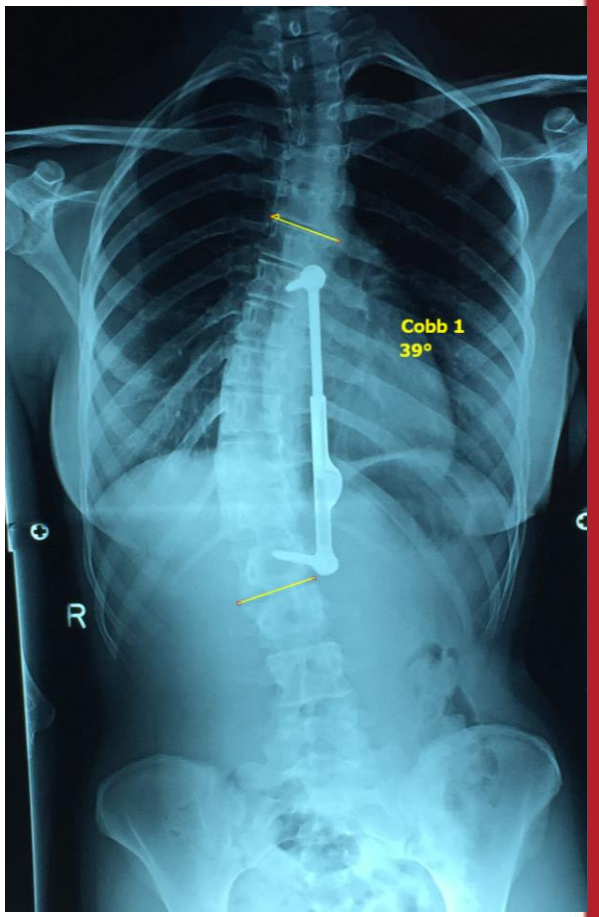
3m post-op

35°



6 m post-op (before revision)

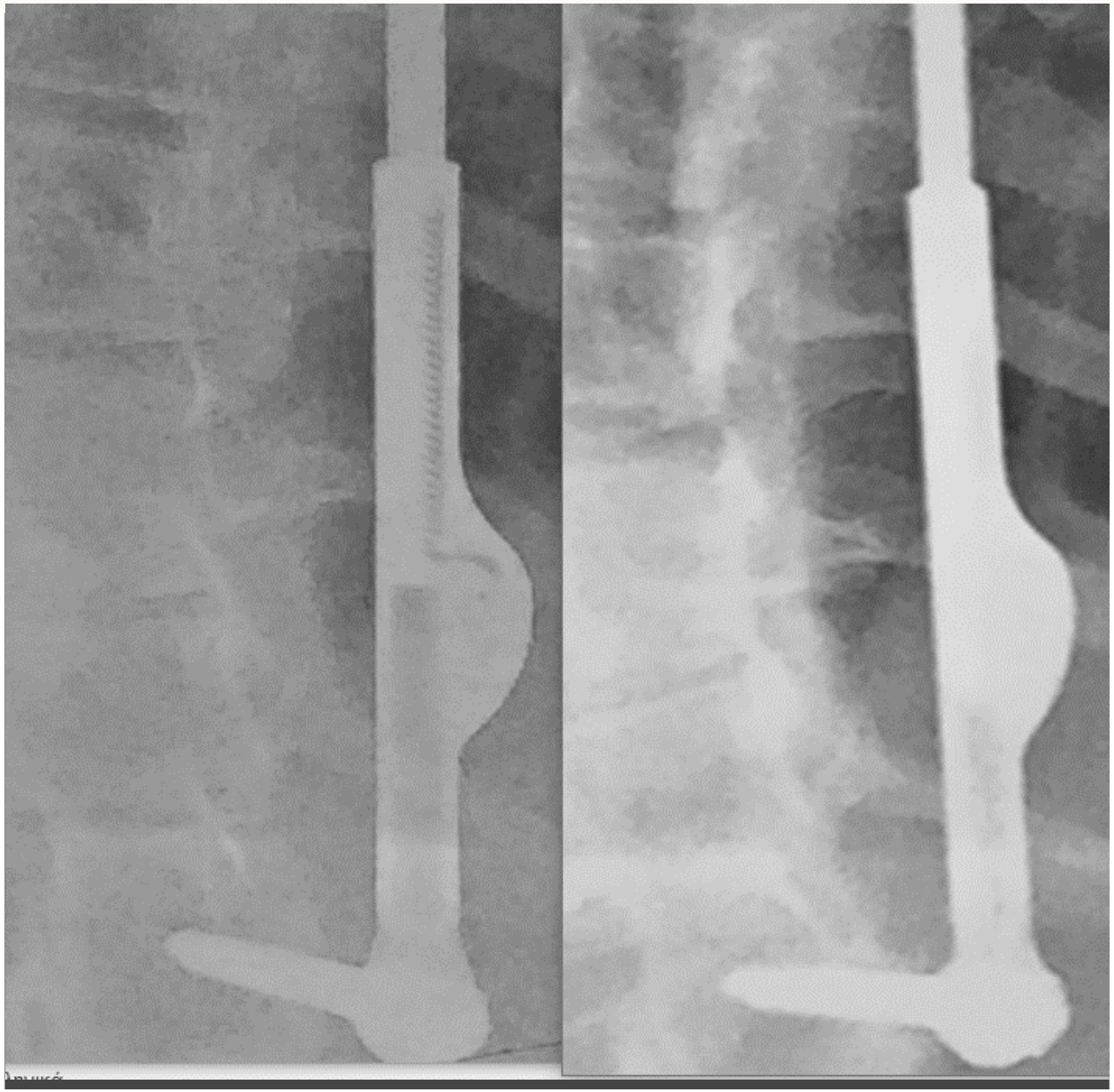
50°



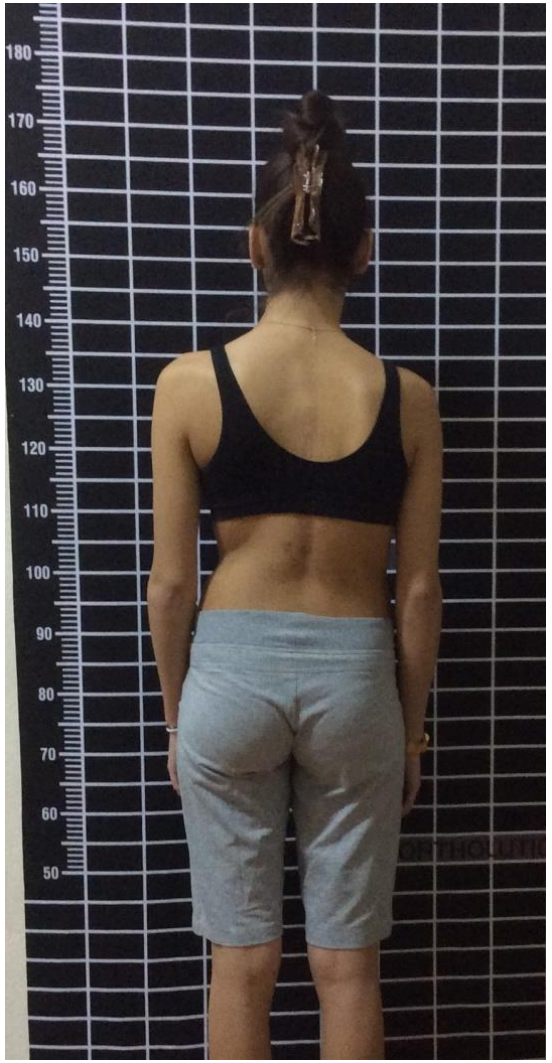
after revision surgery

39°

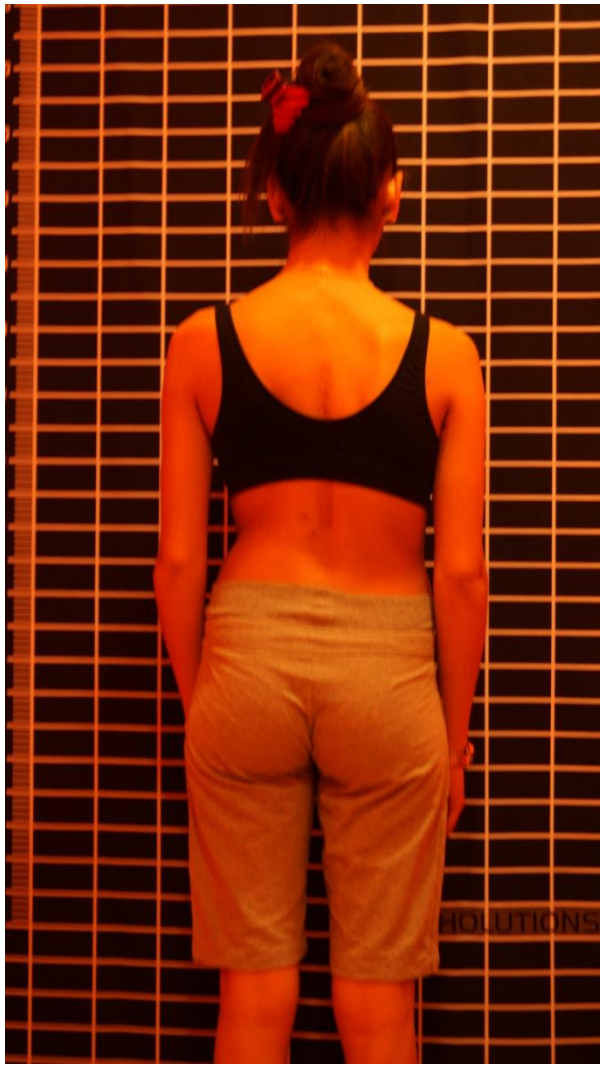
Case study 4



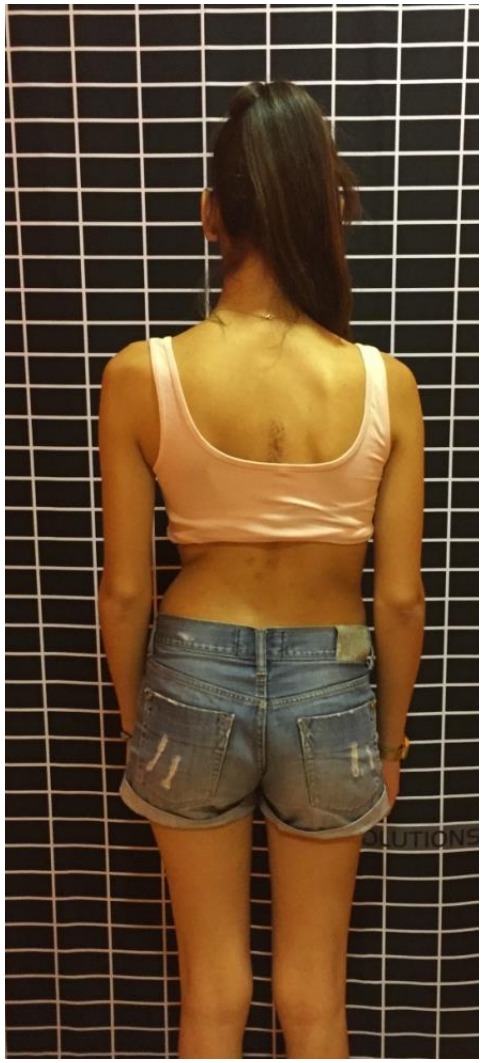
Case study 4



pre-op

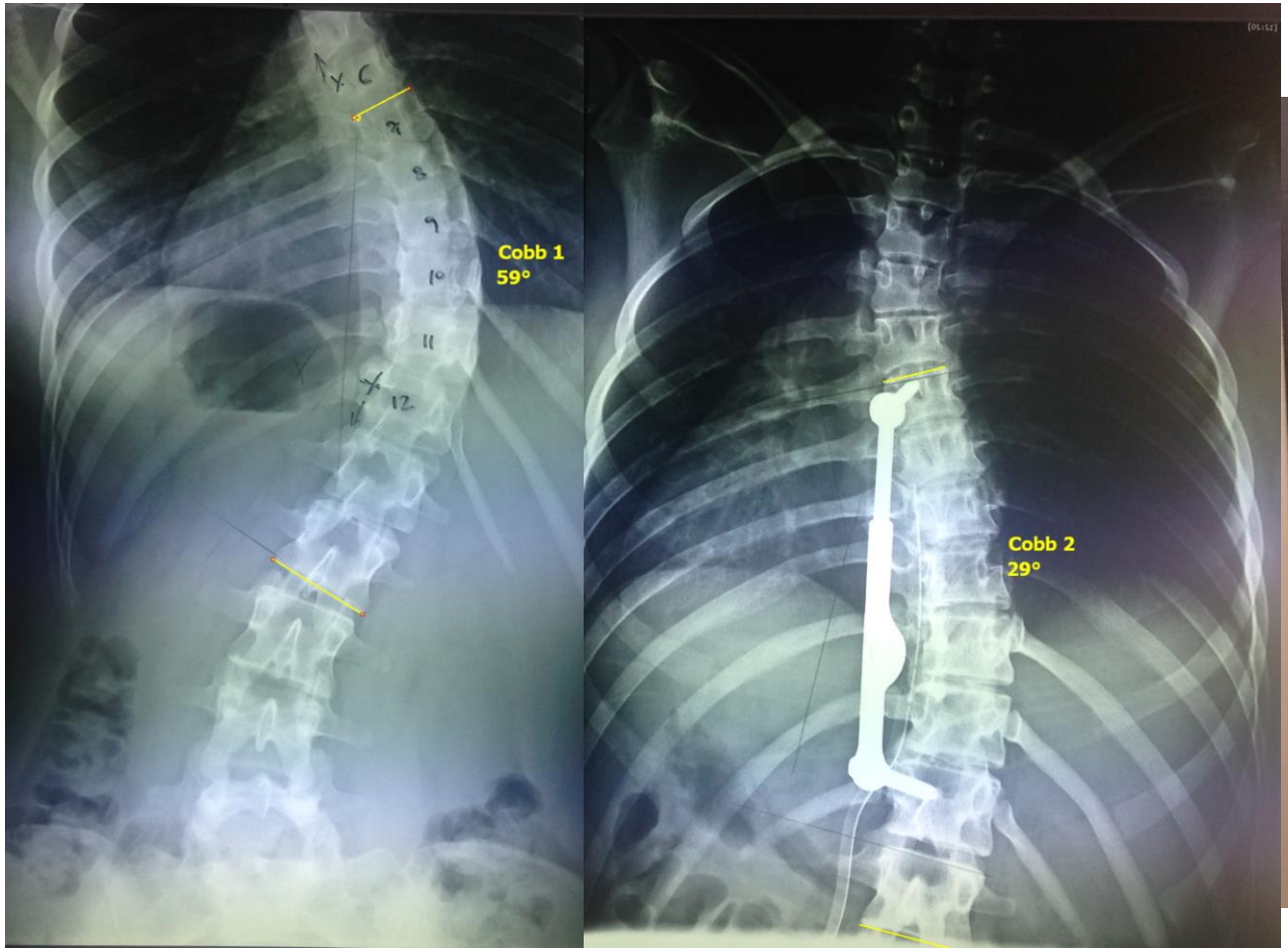


3m post-op



after revision surgery

Most recent ApiFix operation



Pre-op
59°

post-op
29°

Pre-op

3 months post-op

Most recent ApiFix operation

Pre-op

3 months post-op

Pre-op

3 months post-op

Conclusions - Discussion

- ApiFix system can offer an alternative treatment option for some scoliotic patients
- Proper patient selection and strict application of the ApiFix indications are very important and can potentially lead to even better results
- Schroth method exercises enhance the final treatment result and must always be applied
- Schroth method exercises achieved an improvement of Cobb angle, ATR, clinical appearance and pain
- Longer follow-up is needed to determine the long-term results, ADL training can play a key role

Thank you for your attention

Nikos Karavidas, MSc, PT

Certified Schroth Therapist (BSPTS)
Certified Schroth Best Practice Therapist
Certified SEAS Therapist
Certified McKenzie Therapist
MSc Sports Physiotherapy, Cardiff University

Website: www.skoliosi.com