20 Year Experience with Segmental Sublaminar Instrumentation for Guided Growth in Early Onset Scoliosis

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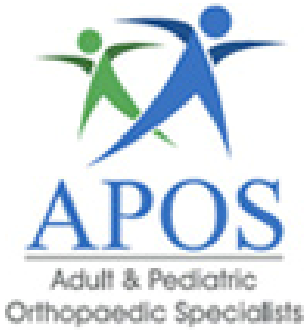


Disclosures

- Samuel Rosenfeld, M.D.
  - Consultant Medicrea Spine
  - Consultant OrthoPediatrics Spine

I have no potential conflicts with this presentation

- Guided segmental spinal instrumentation in early onset scoliosis (EOS) results in growth and correction of deformity.
- The purpose of this study is to report the long-term outcome of a series of patients with EOS and a subset with spinal muscular atrophy who were all treated surgically with posterior segmental spinal instrumentation without fusion.

Methods

- Twenty consecutive patients underwent segmental spinal instrumentation without fusion from 1998 to 2013.
  - Ten SMA (4 Type I and 6 Type II)
  - Ten non-SMA (2 spina bifida, 2 cerebral palsy, 1 Ullrich, 1 Rett Syndrome, 1 Shunted hydrocephalus, 1 Crouzon syndrome, 1 Prader-Willie, and 1 Neoplasm)
- The mean age at surgery was 6 years, 8 months.
- On average, 15 spinal segments were instrumented
- No post-operative spinal orthosis was utilized.

Surgical Technique

- A standard posterior approach
- Subperiosteal dissection of the lamina was carried laterally to the facet joints which were preserved.
- Sublaminar cables were passed at each level
- Two paired stainless steel unit rods were cut and contoured for maximal curve correction, normal sagittal alignment, and secured in the illium.

Surgical Technique

- A crosslink was placed at the caudal end of the construct when possible
- The cephalad rod ends were left long
  - To Allow spinal growth along the construct
  - Obviate the need for further lengthening surgeries
- Postoperative bracing was not utilized

Methods

- Radiographs were evaluated via Surgimap spine software (Nemeric Inc, 306 E 15th Street, New York, NY 10003) for:
  - Correction and maintenance of deformity
  - Spinal growth (T1-12 and T1-S1)
  - PJK
  - Evidence of hardware failure

Results

- Average follow up for the 20 patients was over 8 years
- All patients had greater than 5 year follow up

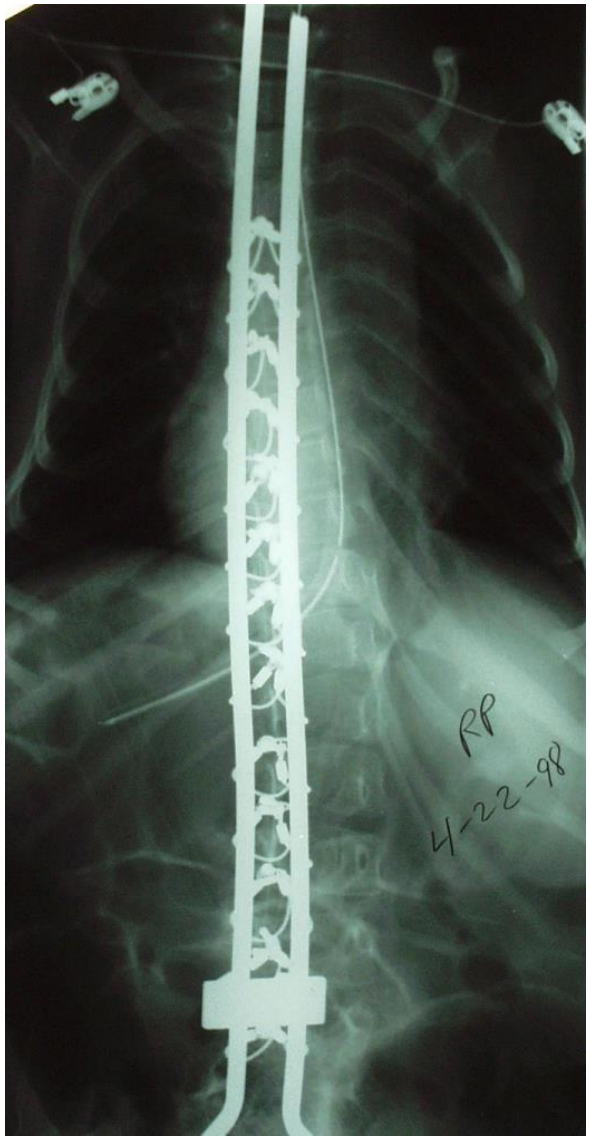
	Age	Pre-op Cobb	Post-op Cobb	Current Cobb	PJK
SMA	83 mo.	47 deg.	21 deg.	30 deg.	11 deg.
Non-SMA	103 mo.	60 deg.	21 deg.	29 deg.	7 deg.

	T1-T12 Growth	T1-S1 Growth
SMA (9)	0.9 cm/year	1.5 cm/year
Non-SMA (6)	1.3 cm/year	1.9 cm/year

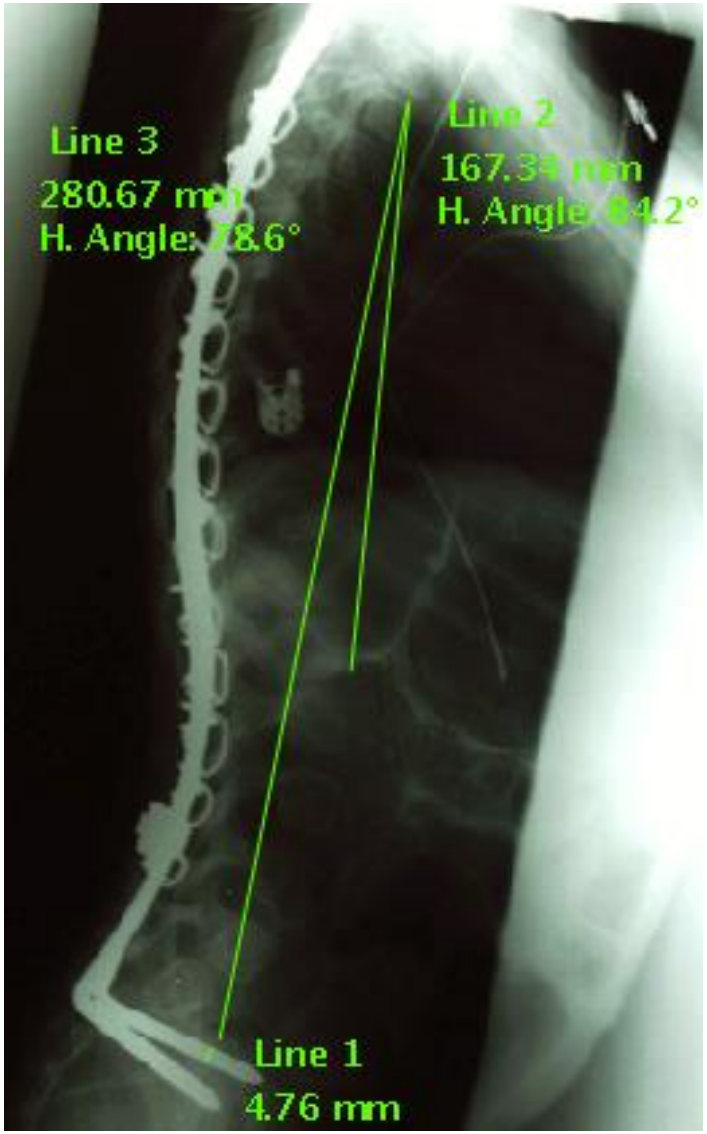
Complications

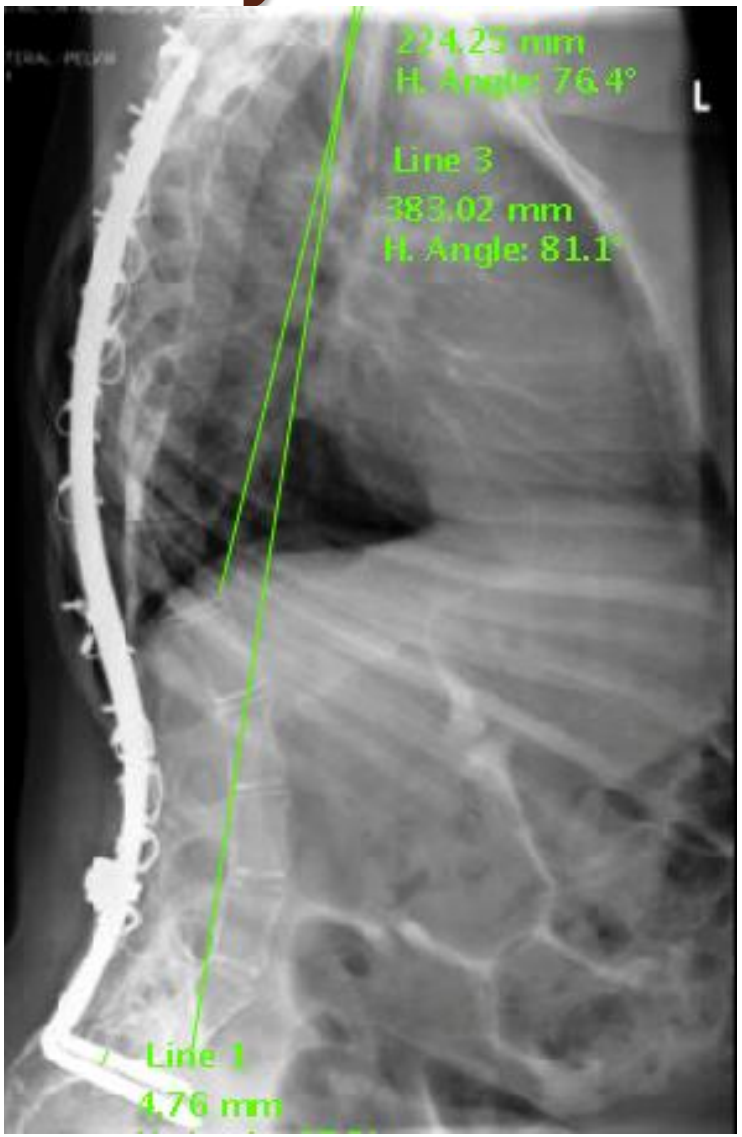
- 4 additional surgeries in 3 patients:
- 1 infection
- 1 pelvic fixation displacement after a motor vehicle accident
- 1 implant failure in a Spina Bifida patient after 5 years requiring revision and arthrodesis at 13 years of age (no spontaneous fusion encountered)

SMA #1 with 20 year f/u

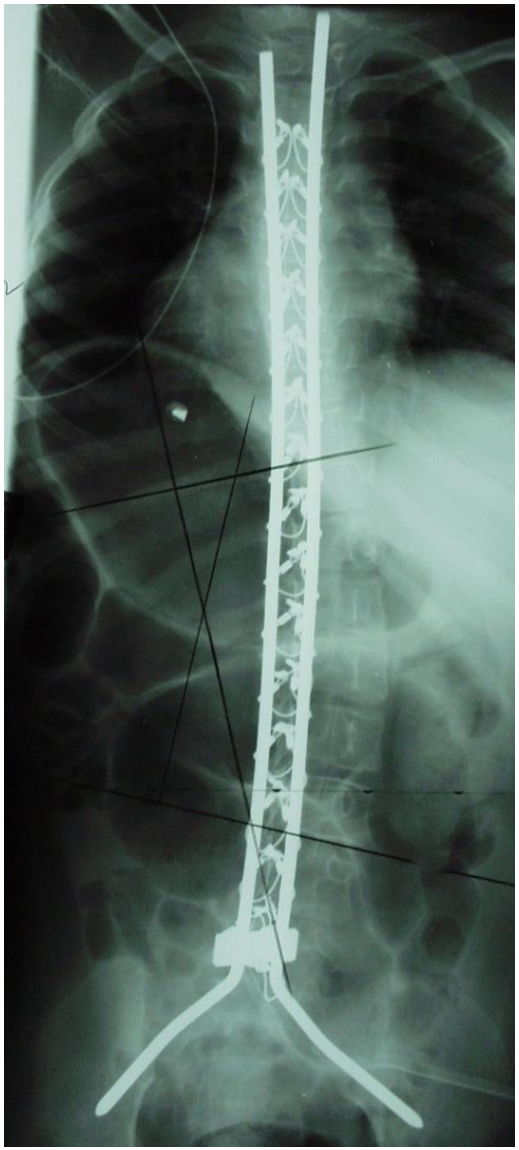


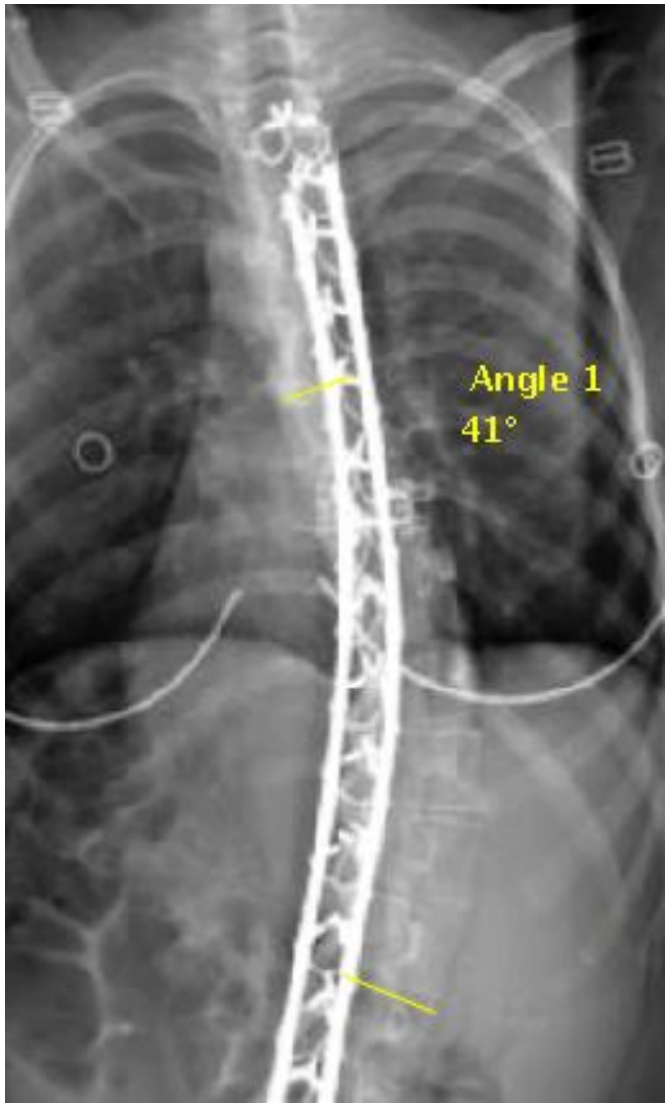
SMA #1 with 20 year f/u



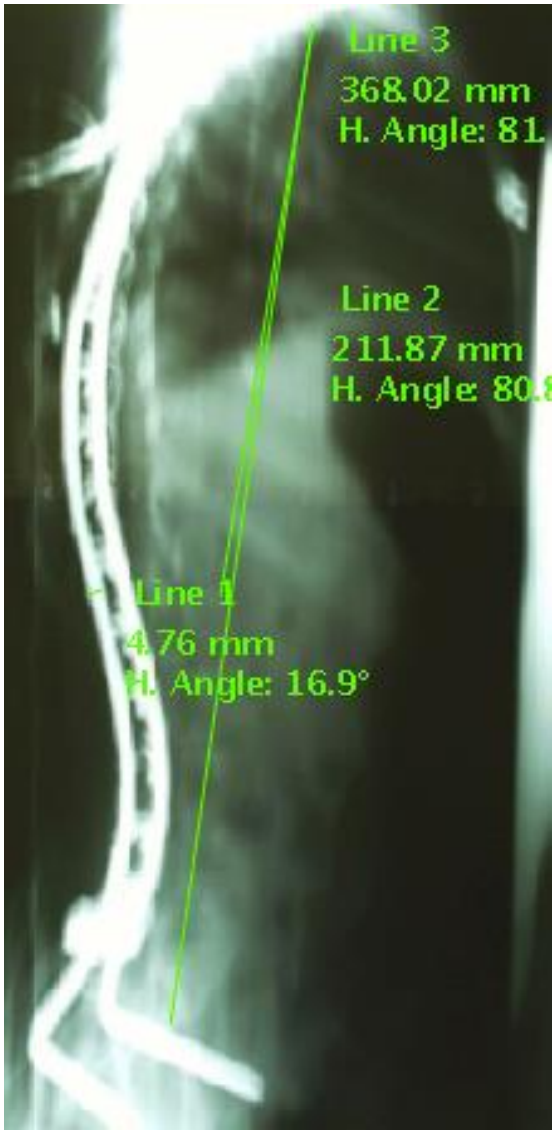


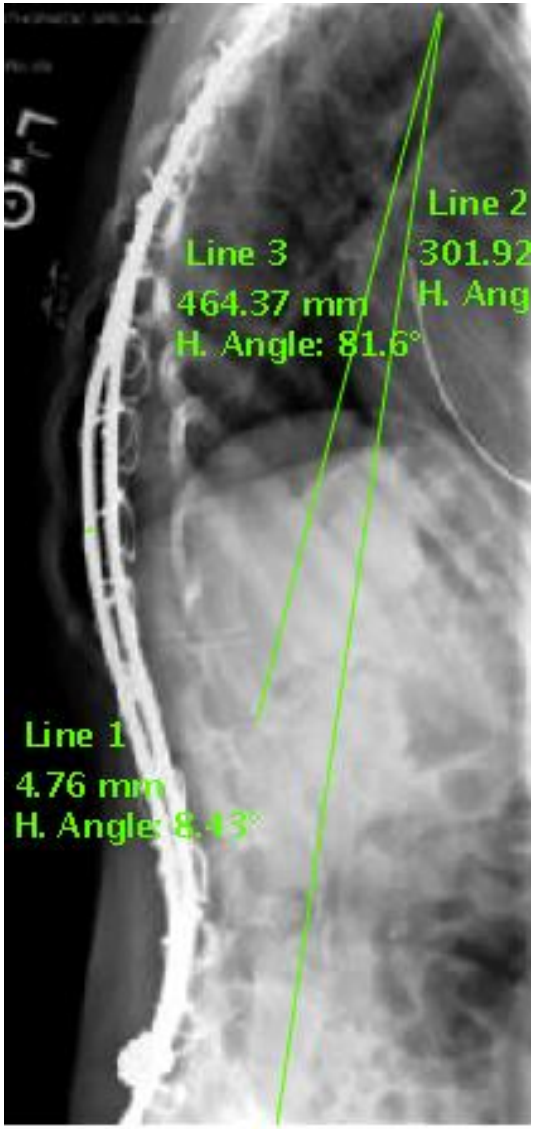
SMA #2 with 16 year f/u





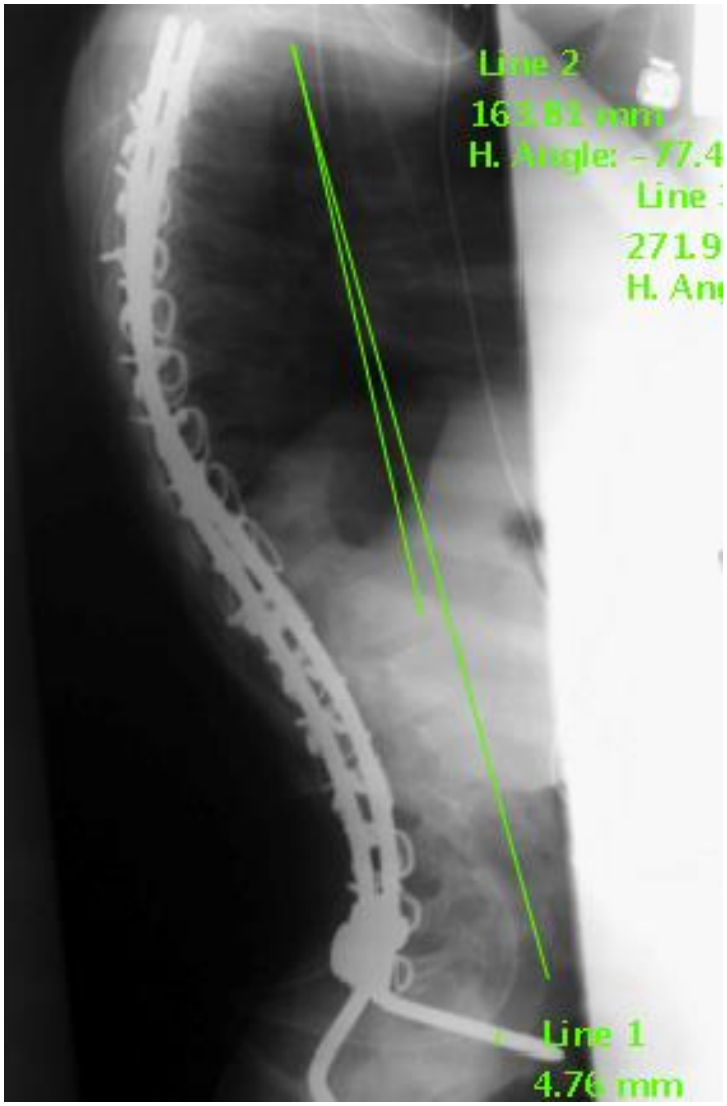
SMA #2 with 16 year f/u





SMA #3 with 15 year f/u

SMA #3 with 15 year f/u



Conclusion

- Segmental Spinal Instrumentation without fusion is a safe and effective procedure when treating the spinal deformity in the EOS patient population
- Scoliosis correction and sagittal alignment were maintained while allowing for continued growth without the use of external immobilization
- None of these patients exhibited progressive restrictive pulmonary disease during treatment and all patients are currently alive and doing well
- Complications did not interfere with the spinal growth or compromise the instrumentation

Future Application

- Shilla constructs for segmental instrumentation for
  - neoplasm
  - congenital deformities
  - infantile / juvenile idiopathic scoliosis
- High tone neuromuscular early onset scoliosis

G.S. is a 8 year 10 month old female with a history of neuroblastoma left side of chest diagnosed in 2007. She completed chemotherapy followed by resection of the tumor in 2007. She developed progressive cervicothoracic kyphotic deformity. She was complaining of esophageal pressure with nausea. She had no neurological abnormalities, except for dysesthesias left axilla and left thorax. X rays, MRI, and computed tomography follow:


SOLARES GISELLE
Adult and Pediatric Orthopedics
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Birth: 12/9/2004
Desc: T-SPINE AP / CHEST
Exam Date: 10/30/2015
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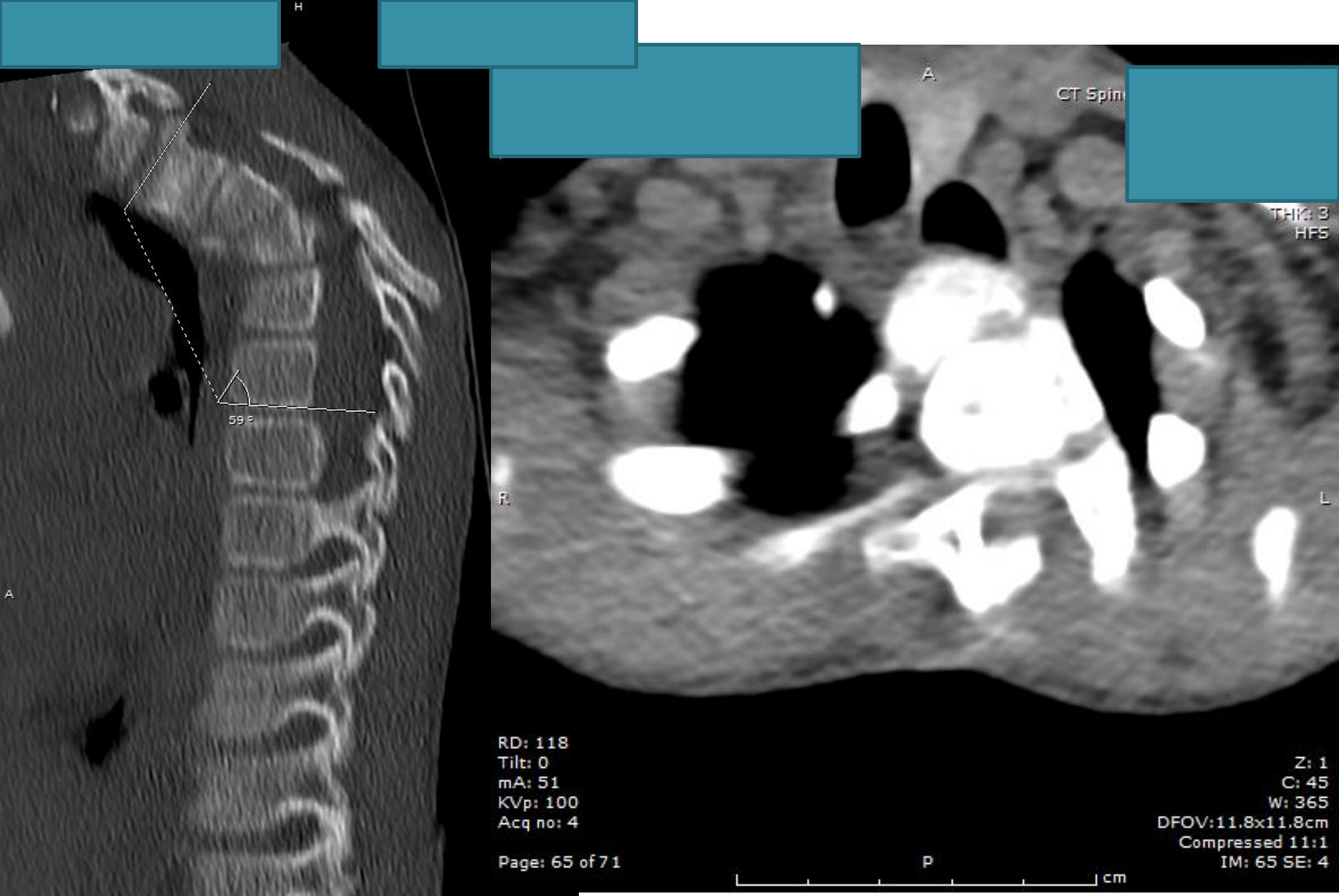
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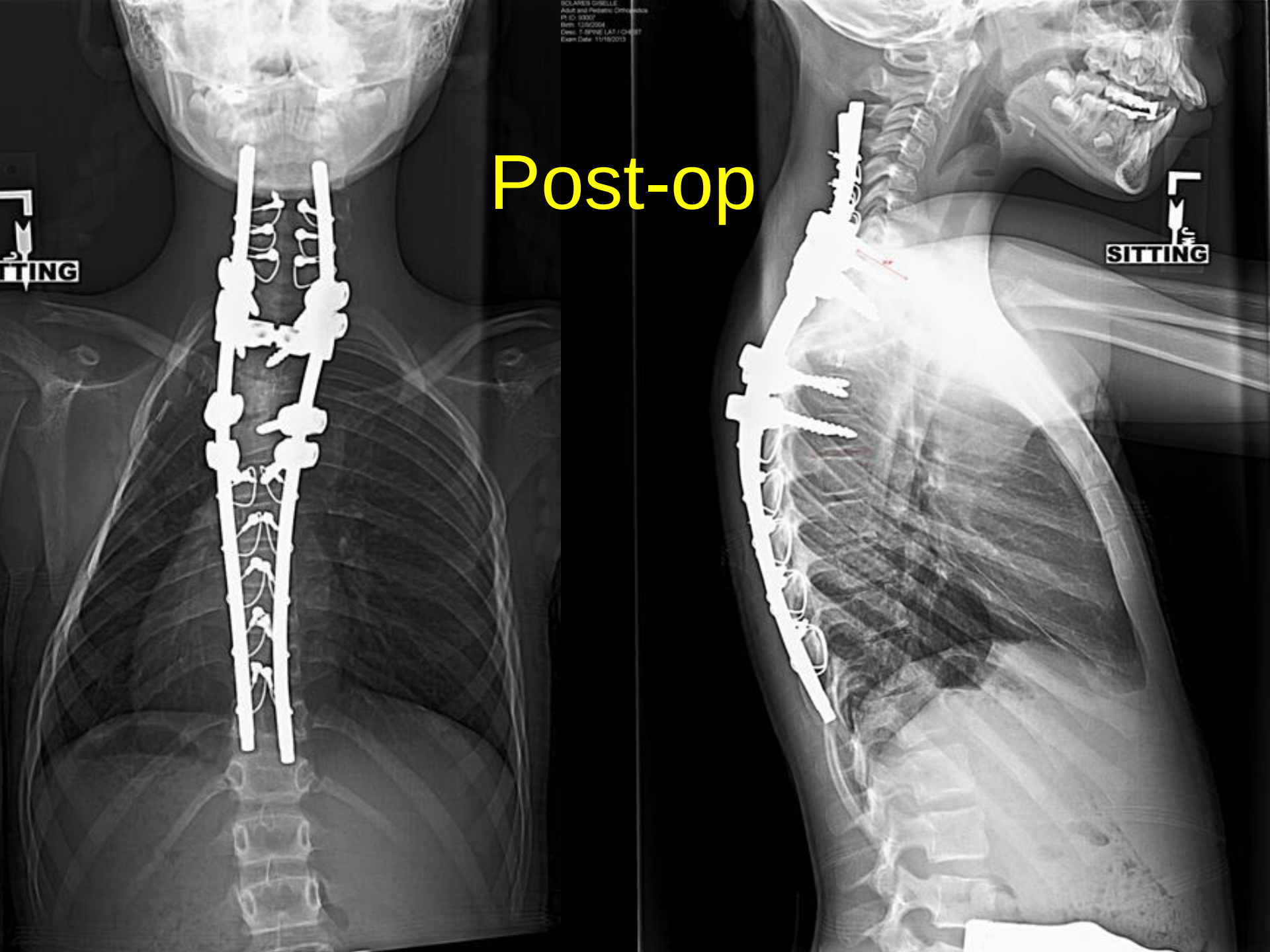
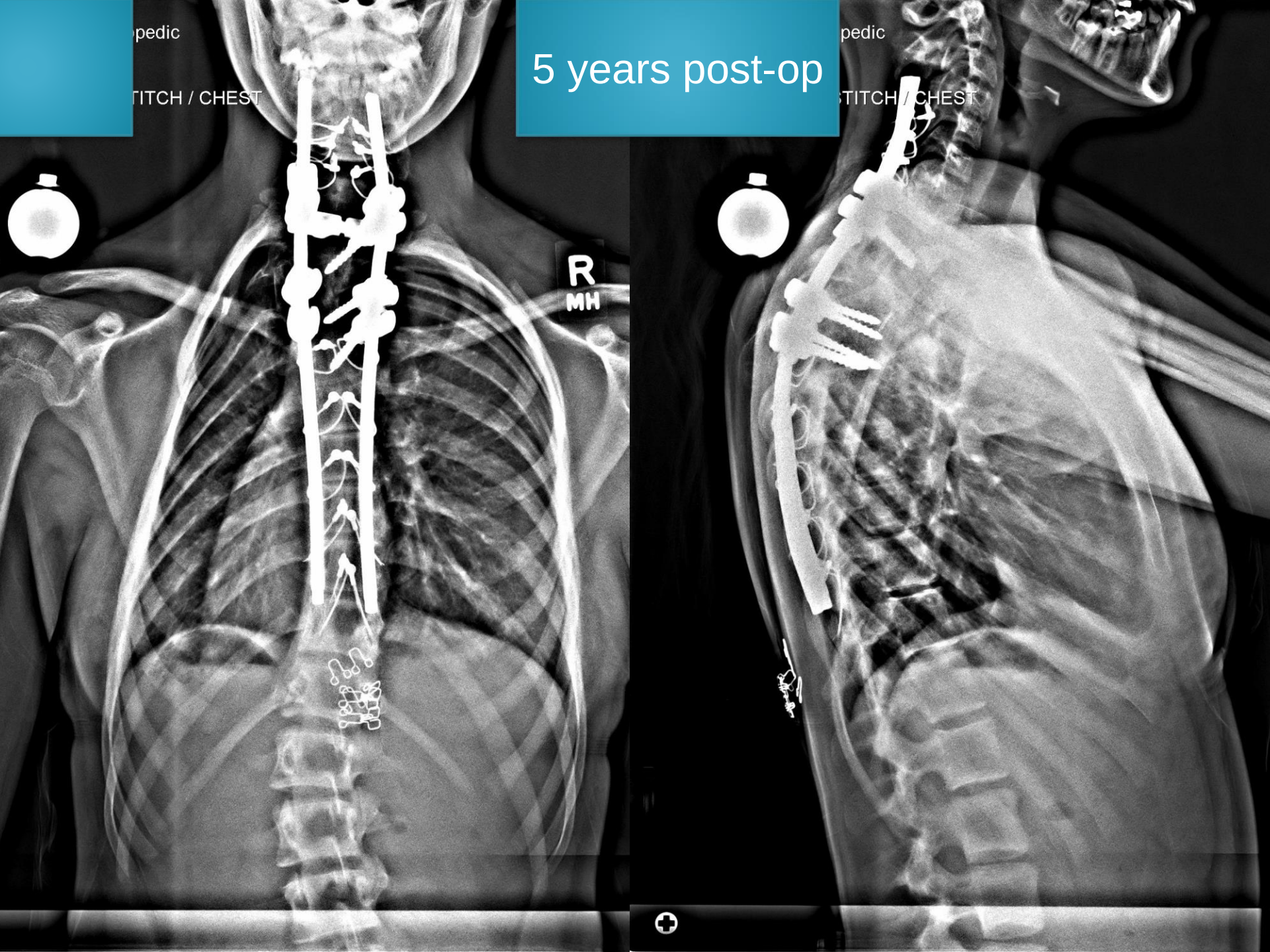
- The surgical procedure consisted of vertebral column resection with kyphectomy at T4, posterior spinal arthrodesis from T1 to T6, and segmental spinal instrumentation from C5 to T10 in a guided growth construct.
- One year post-op the growth from T1 to T12 was 0.9 cm., and the growth from T1 to S1 was 2.6 cm. based on Surgimap spine software (Nemeric, Inc.).


Post-op
SITTING

One year post-op


pedic
TITCH / CHEST
5 years post-op
R
MH
pedic
TITCH / CHEST

Conclusion

- Guided Segmental Spinal Instrumentation without fusion is a well-tolerated & effective surgical technique that avoids the morbidity associated with multiple surgeries in early onset neuromuscular scoliosis