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# Vertebral Column Resection



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# Introduction

**The main purpose of vertebral column resection is:**

- Adolescent and adults: to achieve spinal balance by means of radical correction
- Early onset deformity: prevent structural deformities in secondary curves and achieve spinal balance (full correction when possible)

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# Introduction

- Vertebral column resection is useful for a few patients with complex and rigid spinal deformities associated with coronal and sagittal imbalance

# Introduction

- The deformities are usually advanced and in most cases rigid
  - Untreated idiopathic or paralytic curvatures
  - Congenital scoliosis or kyphosis
  - Tumors treated by previous surgery and radiation
  - Curvatures unsuccessfully treated by previous surgery

# Introduction

- Technique
  - Vertebral column resection involves both anterior and posterior 360° removal of one or more spinal segments
  - The resection may be performed in the same or a separate surgical procedure
  - Vertebral column resection is a spinal shortening procedure that makes it possible to correct the most severe deformities safely without distraction, thus avoiding the high risk of neurologic deficit associated with other techniques

# Surgical indications

- Severe (and rigid) early onset deformity (where radicality is needed)
- Rapid progression (verified or anticipated)
- Decompensated spinal balance
- Neurological deterioration
- Independent of age, as early as possible

# Our techniques

- **One, two or three-stage procedure in the same session**
- **Beginning in prone position**
- **Anterior surgery in the prone position**
- **Only polyaxial (single and dual-innie) screws are used**
- **All correction techniques are used**
- **Rib resection on one/both sides …..** morselized rib graft
- **When necessary cut one or two nerve roots (only at thoracic level, above T10)**
- **Anterior support with Ti-cage and/or bone graft**

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# Our techniques

- **Bone on bone when possible**
- **Additional osteotomies**
- **The rib bone and additional iliac bone grafts are then placed over the spine posteriorly and anteriorly**
- **We preformed one stage procedure in the prone position whenever it was possible**
- **In special cases simultaneous postero-anterior approach is necessary**
- **Halo-extension preoperatively if necessary**
- **IOM during all surgical procedures, D-wave monitoring when necessary (only in the last 4 years)**

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# Case Report 1

- ML., Birth 22.01.2005, 2/6, female
- Weight: 9.8 kg
- Unknown syndrome
- 2 months halo traction
  - Without traction surgery is not possible
- One-stage posterior surgery, T5 resection
  - Failed
- Revision surgery 3 weeks later

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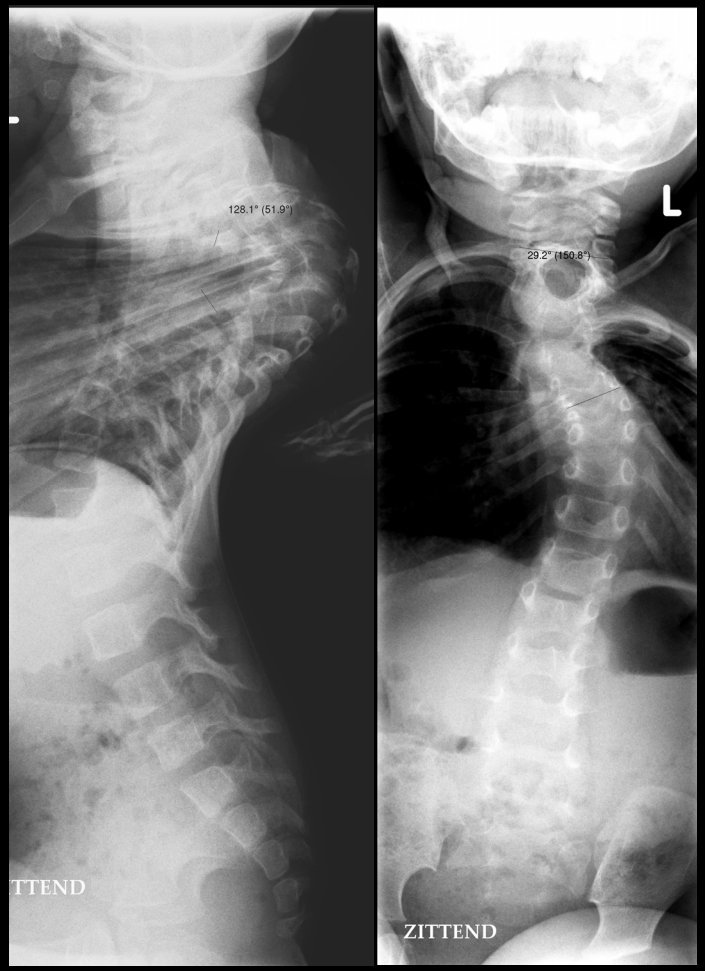
# Progression of kyphoscoliosis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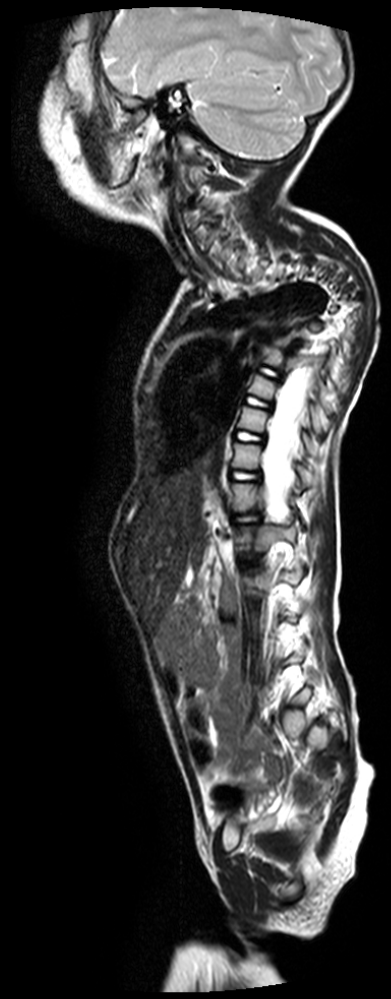

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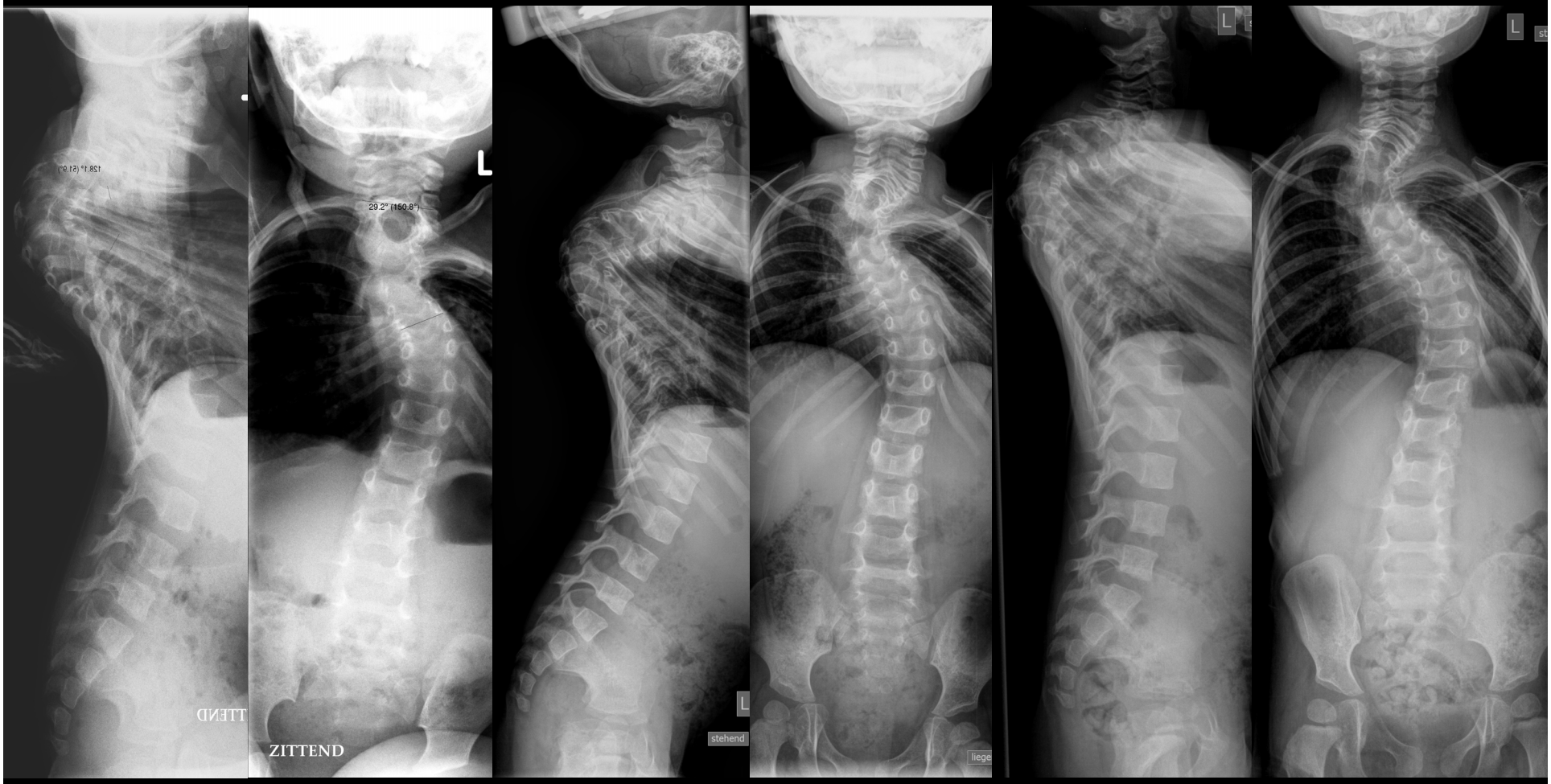
# Halo-traction




before 1 month 2 months

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# Patient positioning with traction

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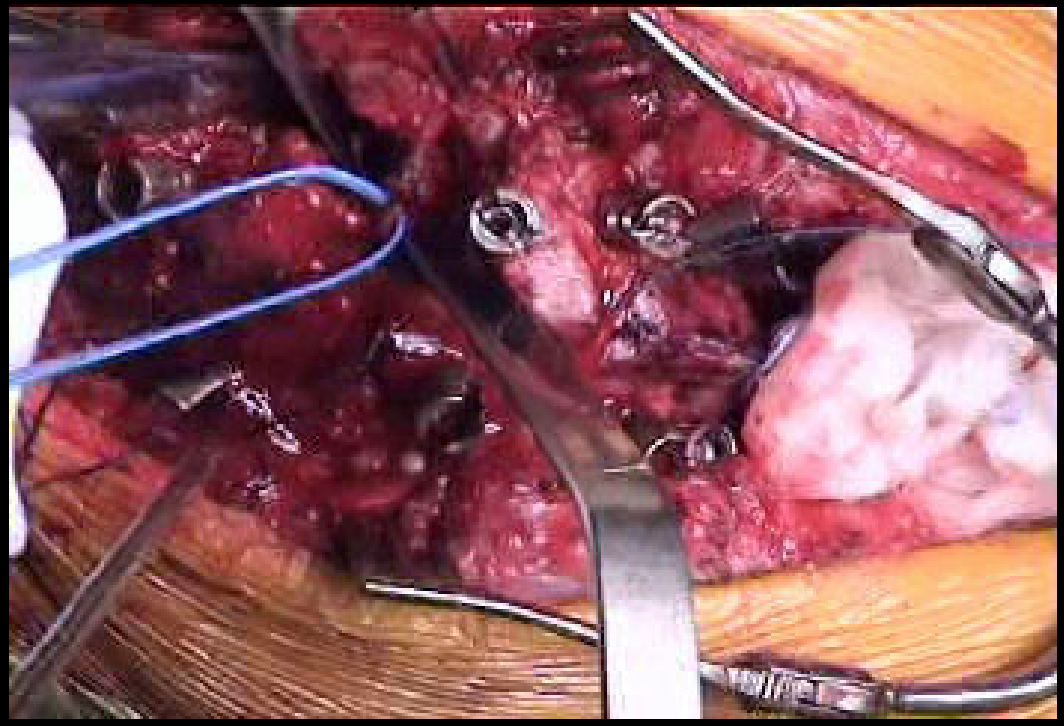
# Vertebral column resection



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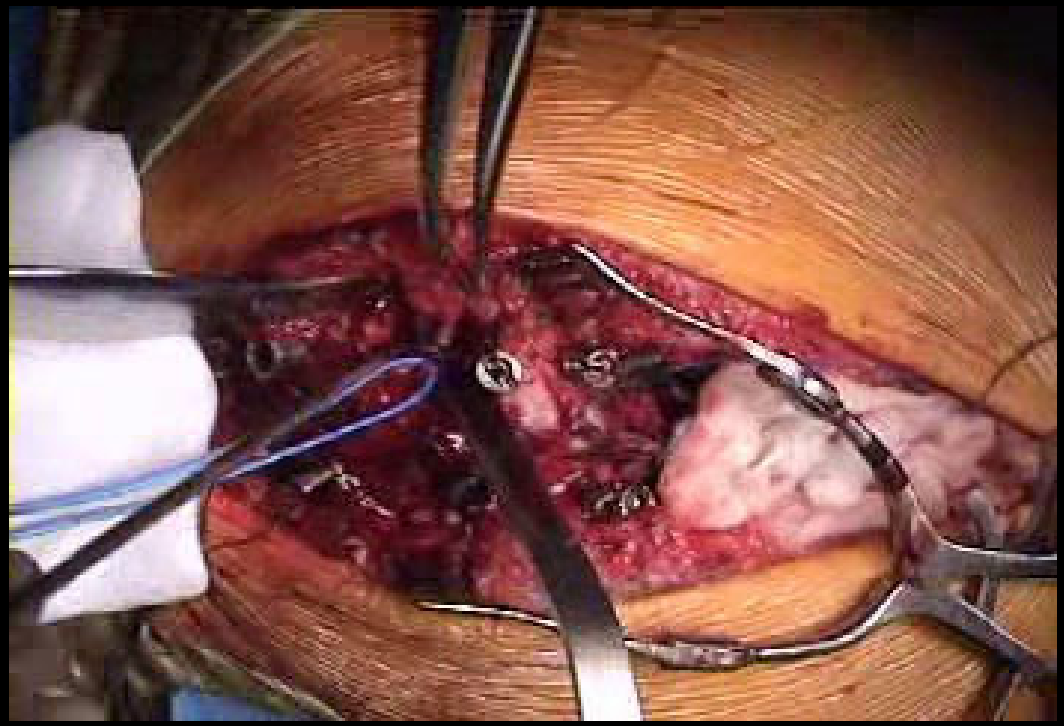
# Mobility



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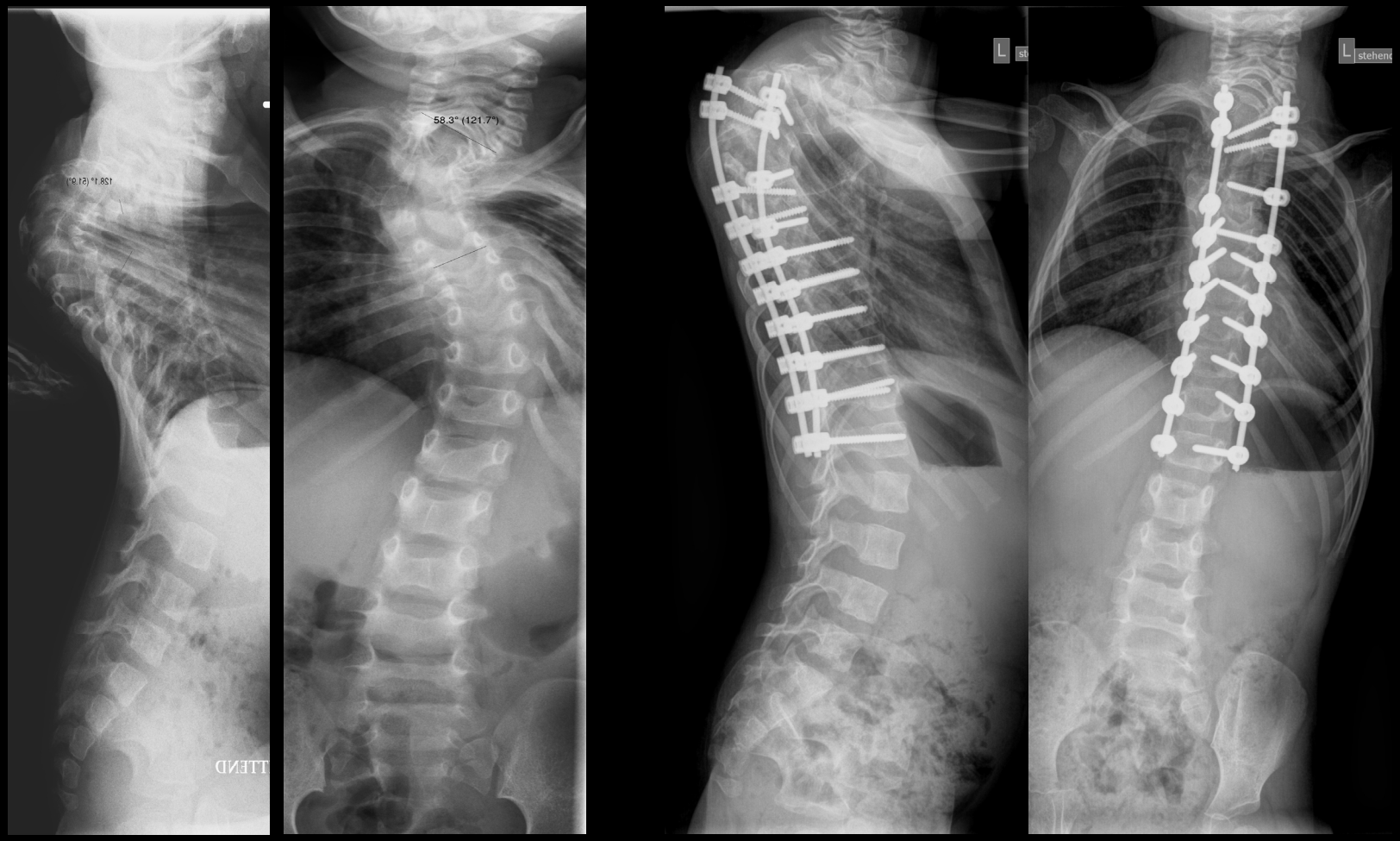
# First surgery failed:




Cause of failure:

1. Halo traction was maintained intraoperatively showing very nice sagittal profile
2. Trying to keep instrumentation as short as possible

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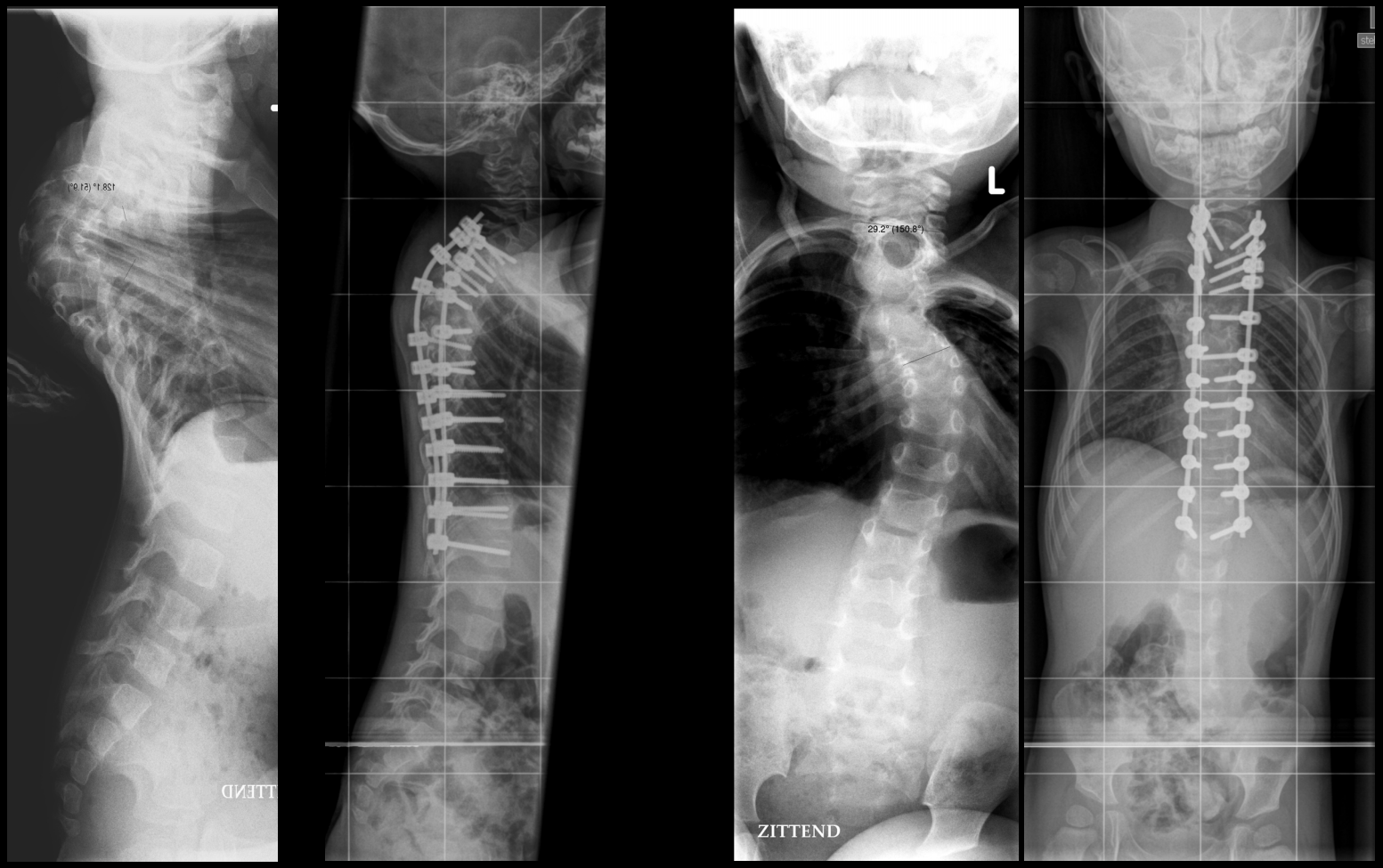
# Post op. after revision




Note the difference in the chest

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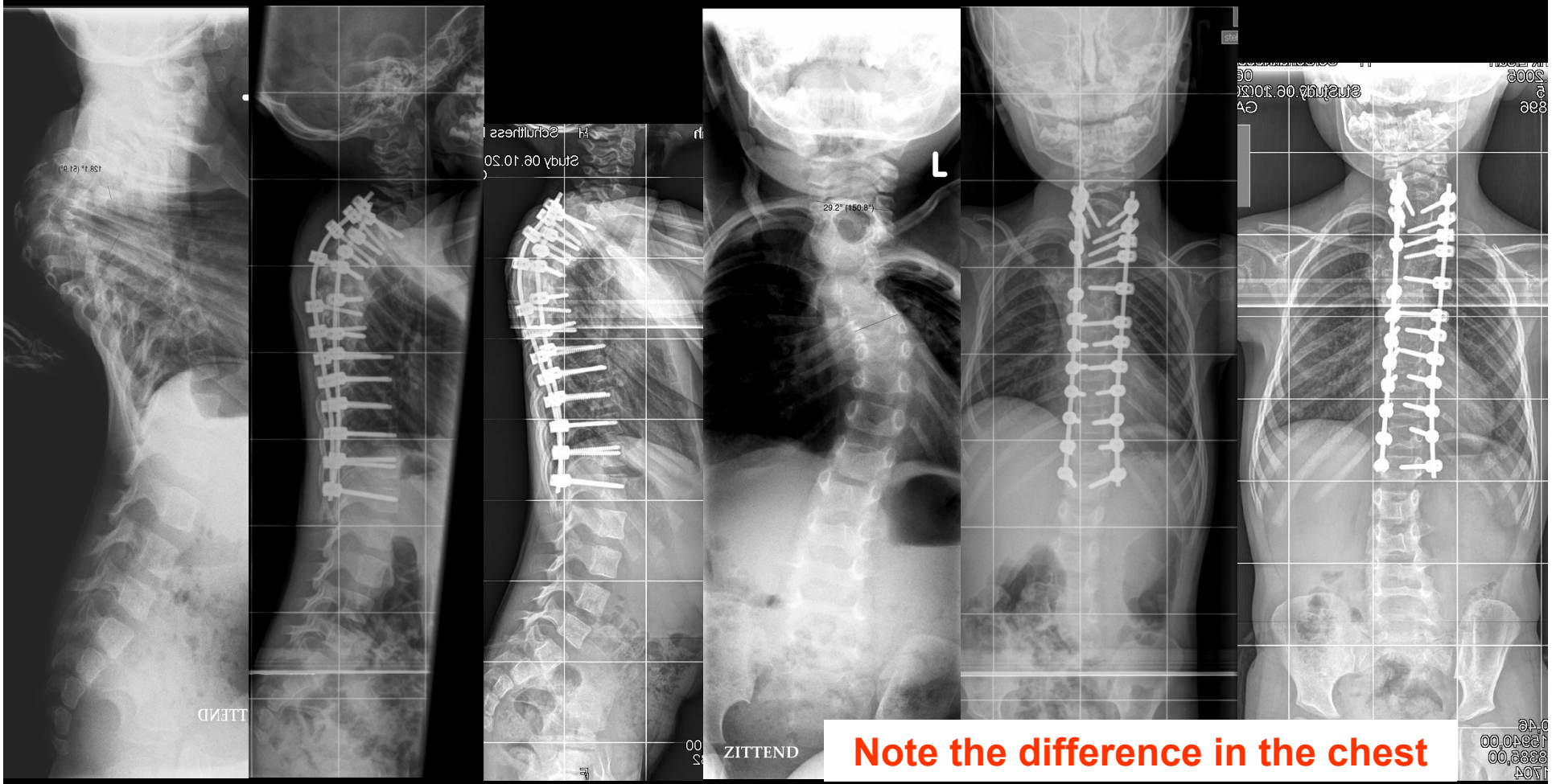
# Post op. after revision




preop postop 1 yr F/U preop postop 1 yr F/U

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1 year follow up

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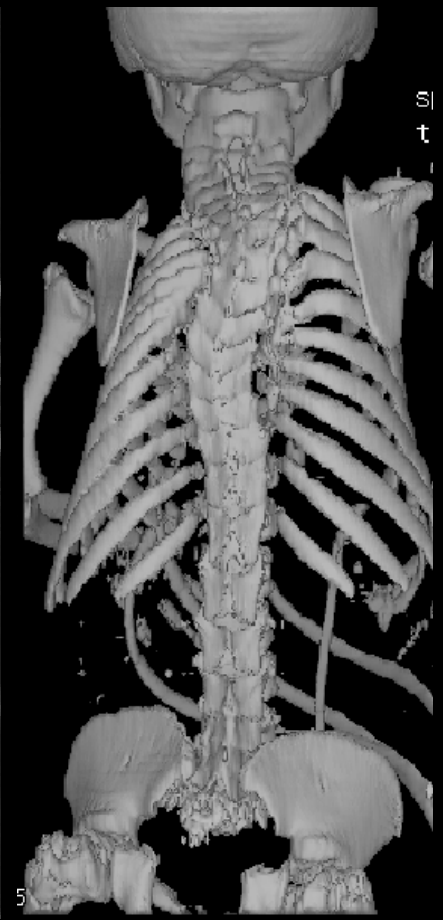
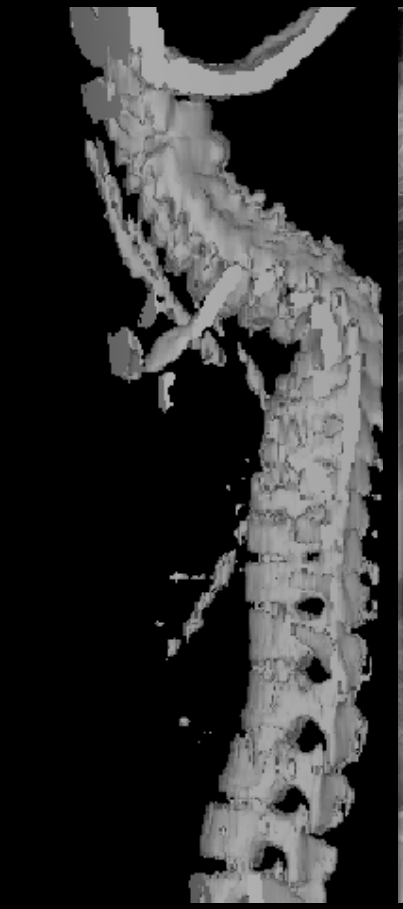
# Case Report 2

- FJL., 5 yrs, male.
- Goldenhar-sy
- One-stage posterior surgery, T4, T5 resection

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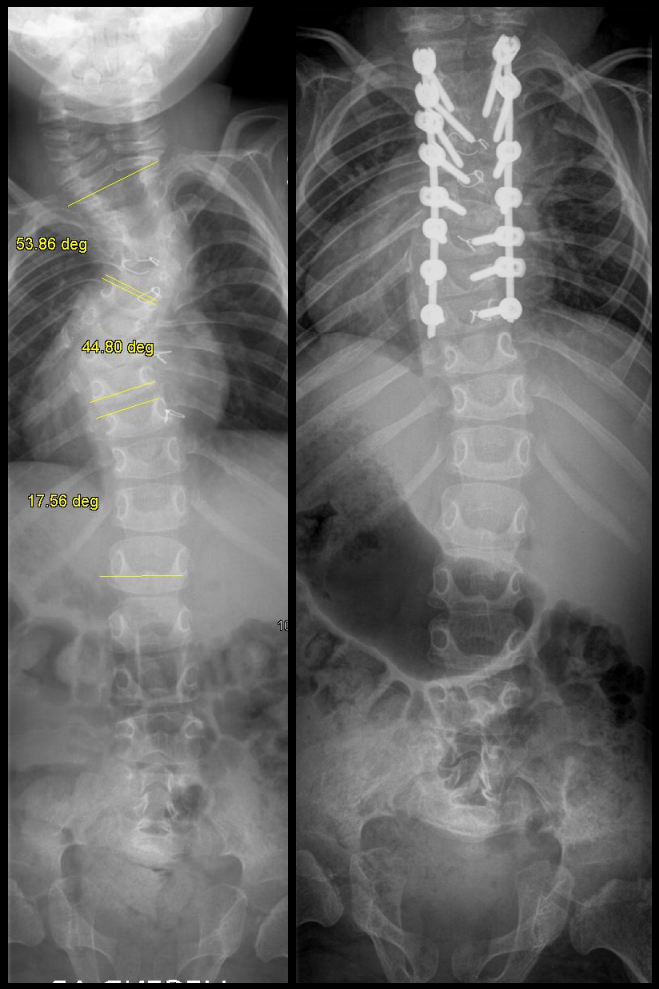
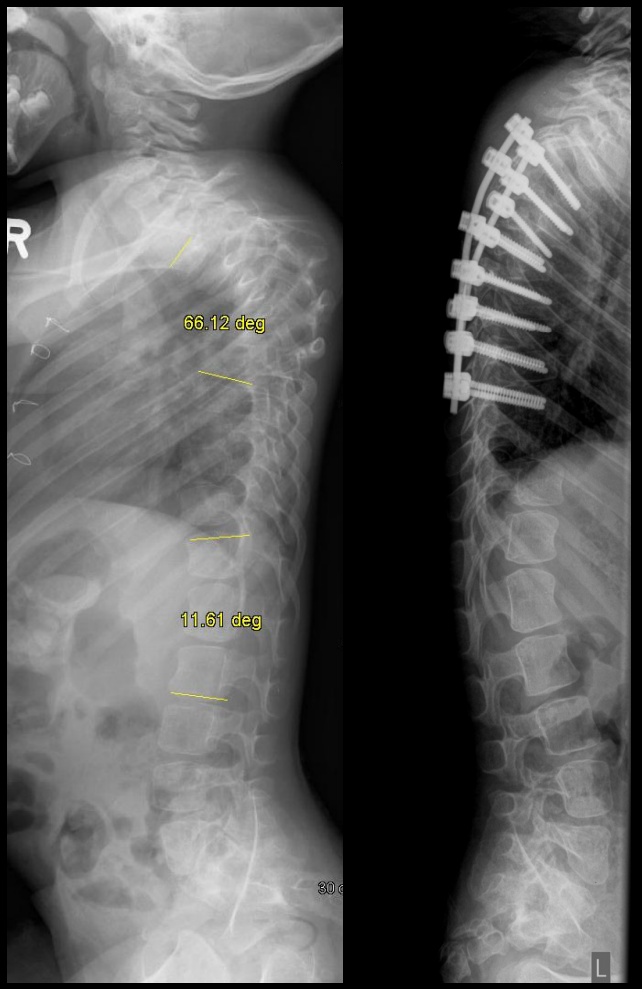
# Post op.

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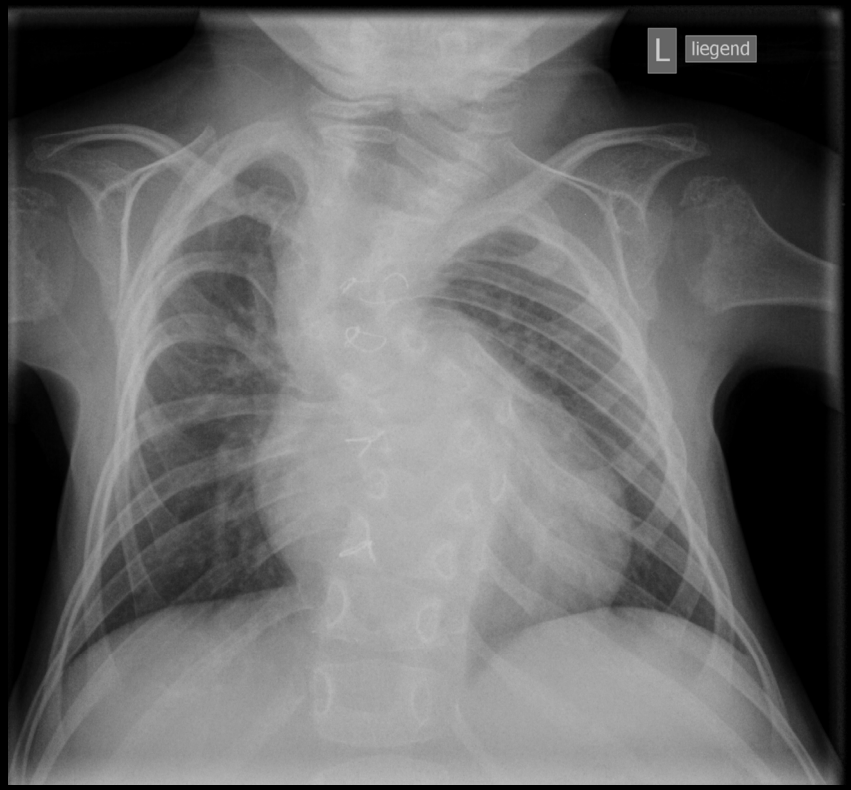
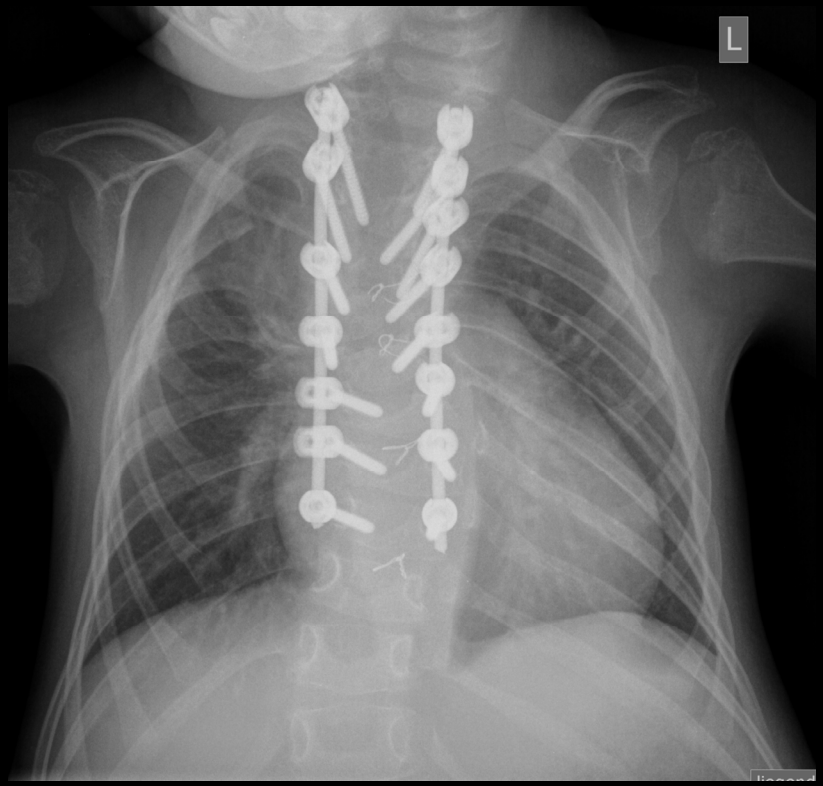
# Note the change in the chest wall




Preoperative Chest X-ray




Postoperative Chest X-ray

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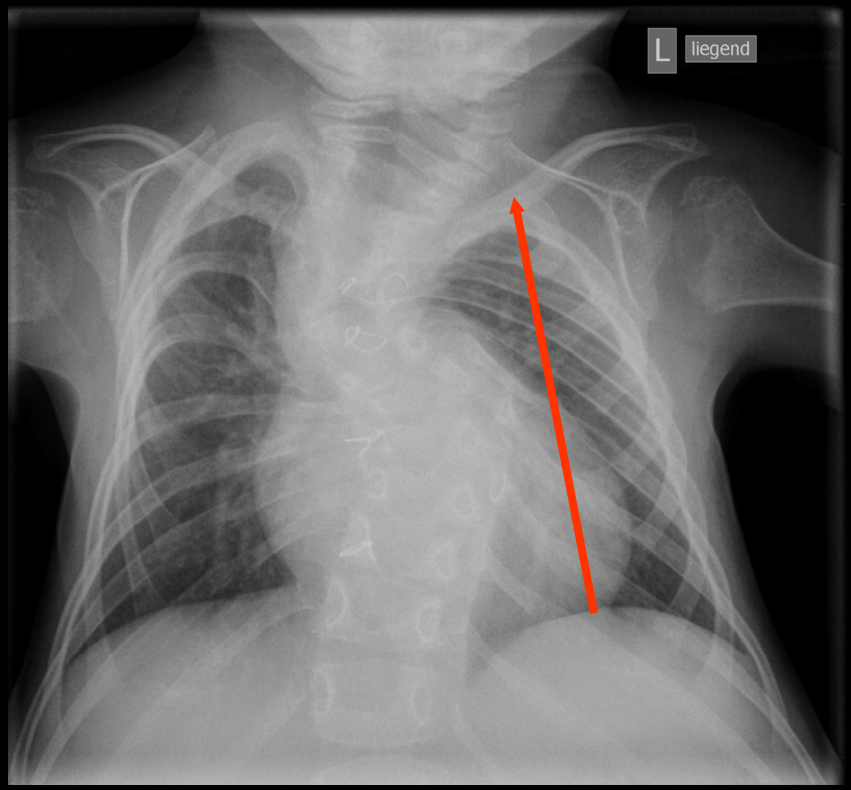
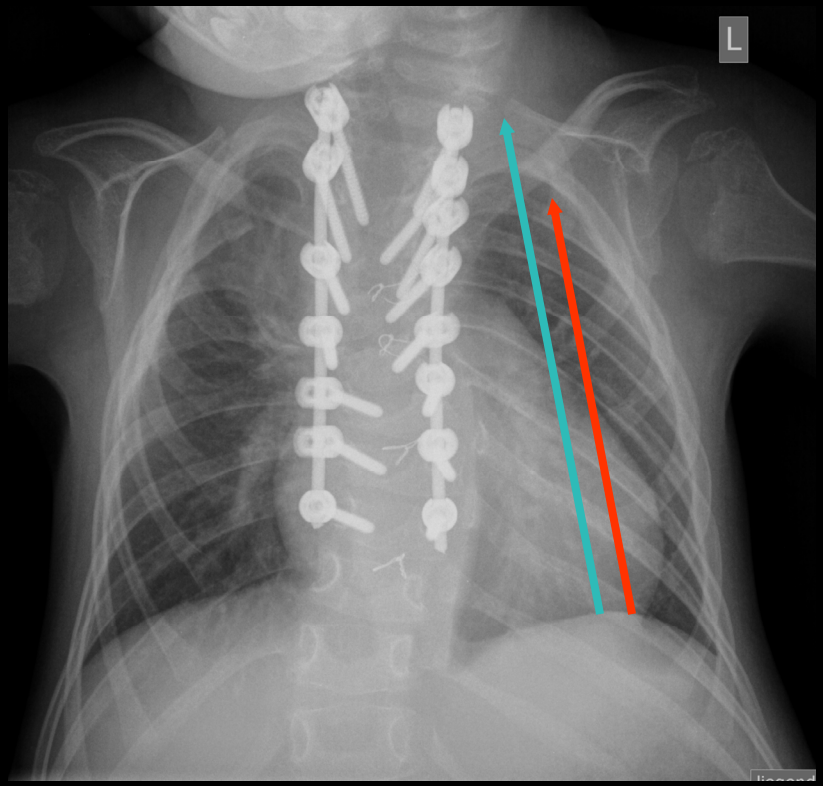
# Note the change in the chest wall




Preoperative Chest X-ray




Postoperative Chest X-ray

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# Case Report 3
# Why bother to do early surgery?

- SM, 20 yrs old female
- Congenital Th-L kyphoscoliosis
- Myelopathy, bladder dysfunction
- 1 session surgery:
  - 1. posterior release & instrumentation
  - 2. anterior vertebrectomy
  - 3. simultaneous anterior & posterior
- Few years later pseudoarthrosis, rod breakage
- Revision: Posterior-anterior approach, refusion

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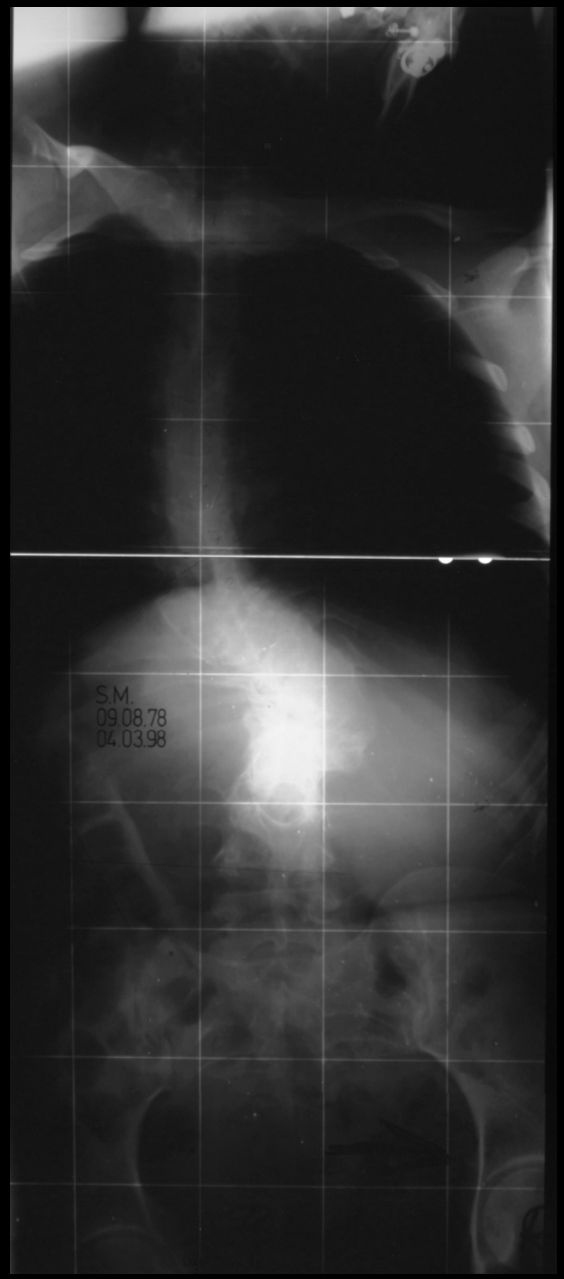


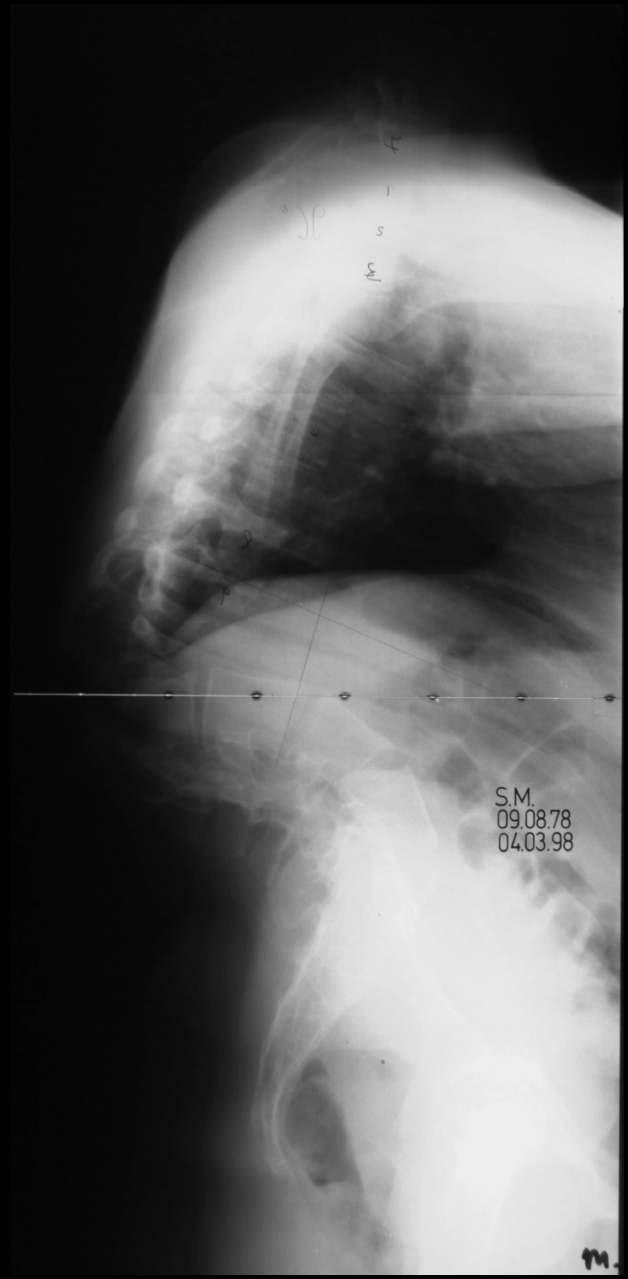


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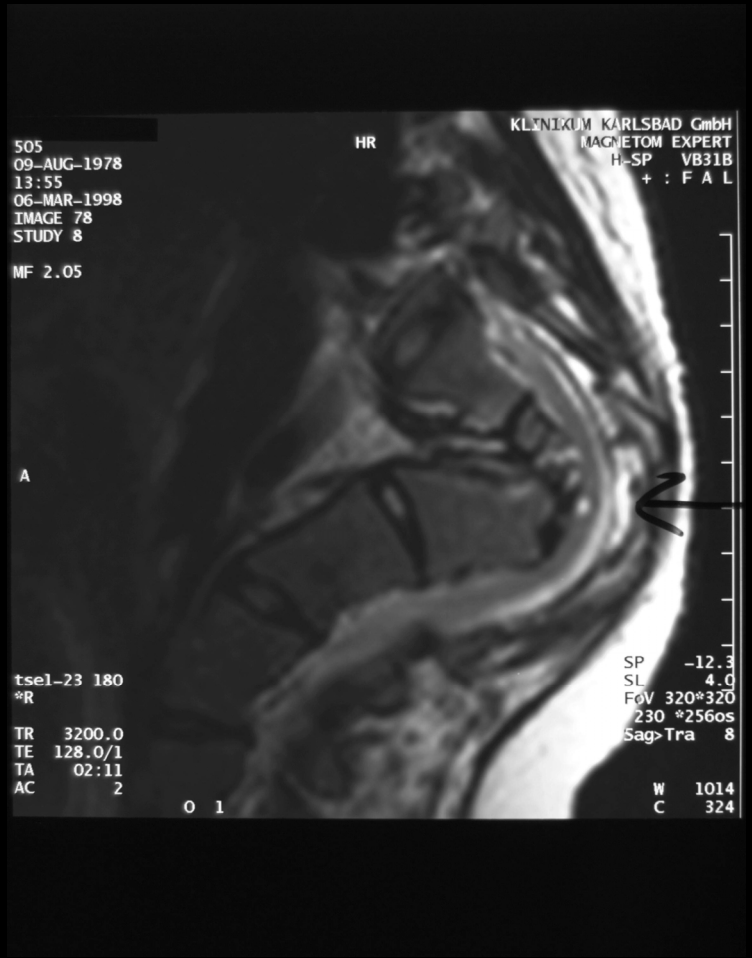


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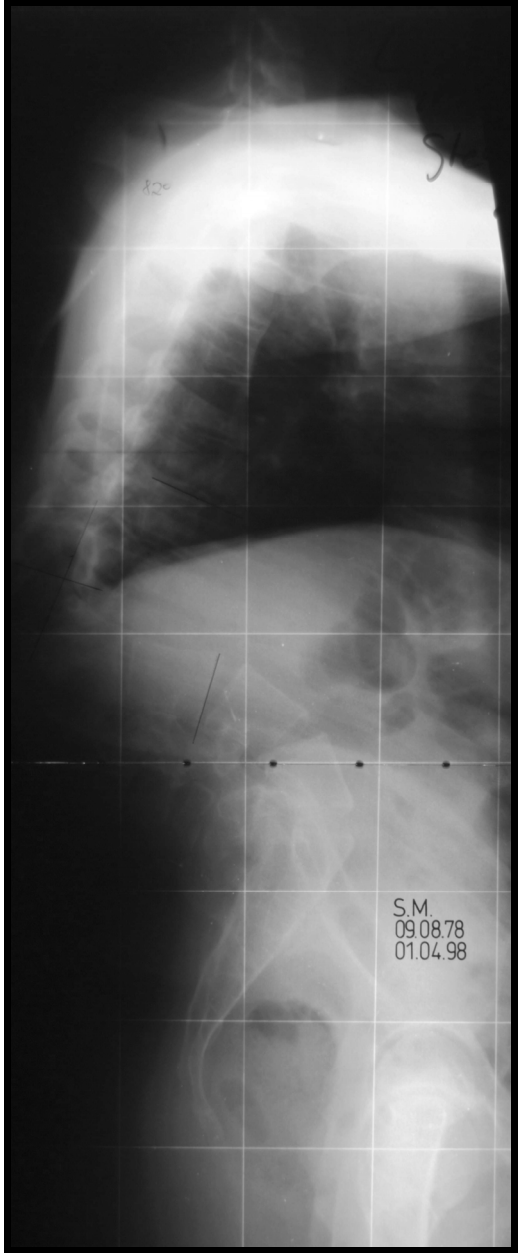


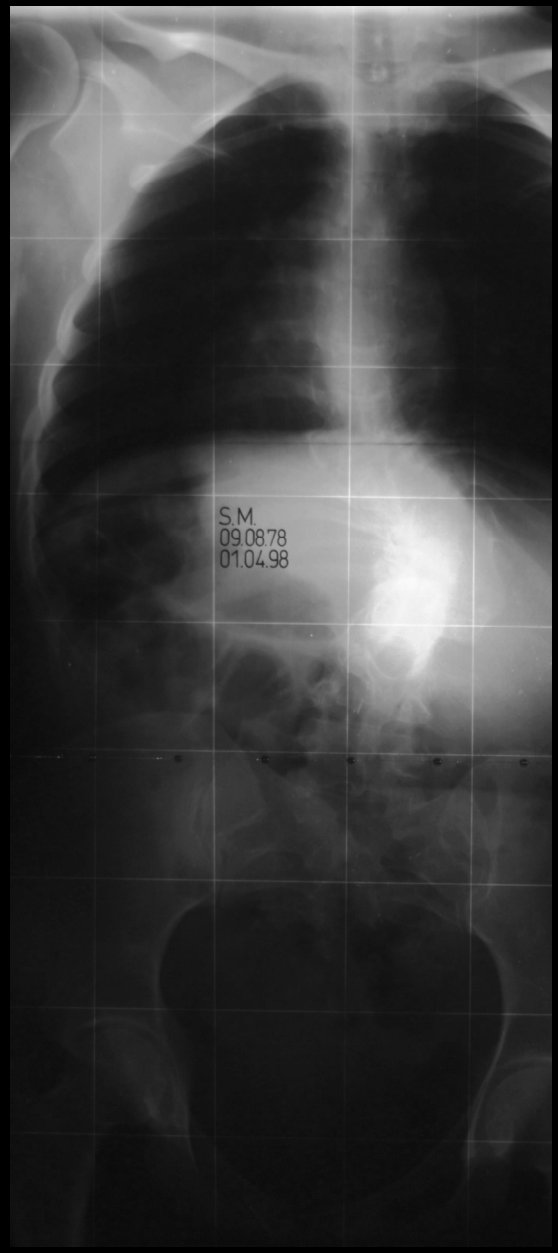


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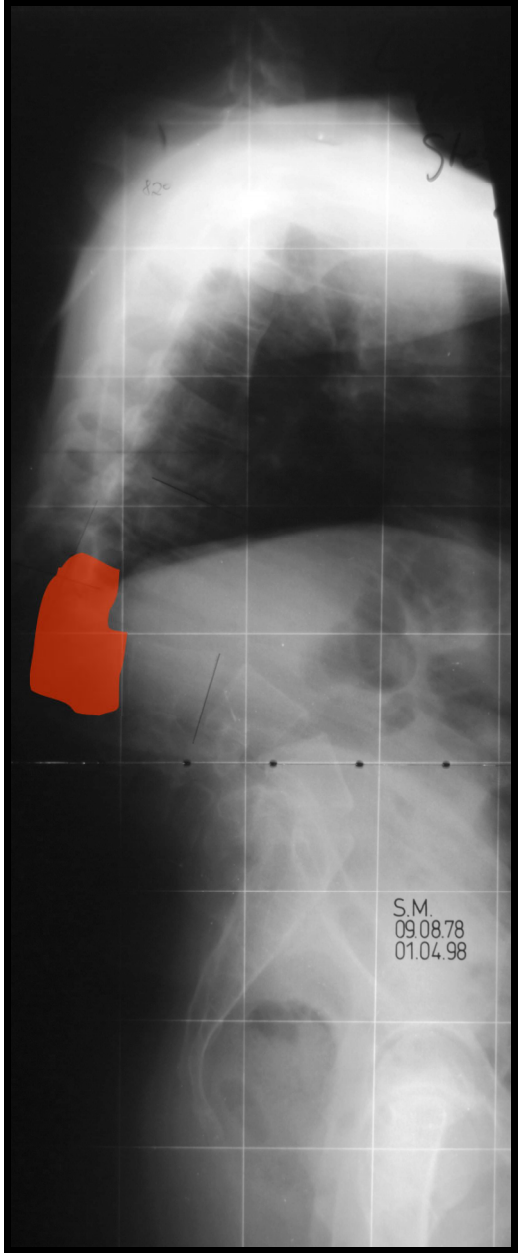


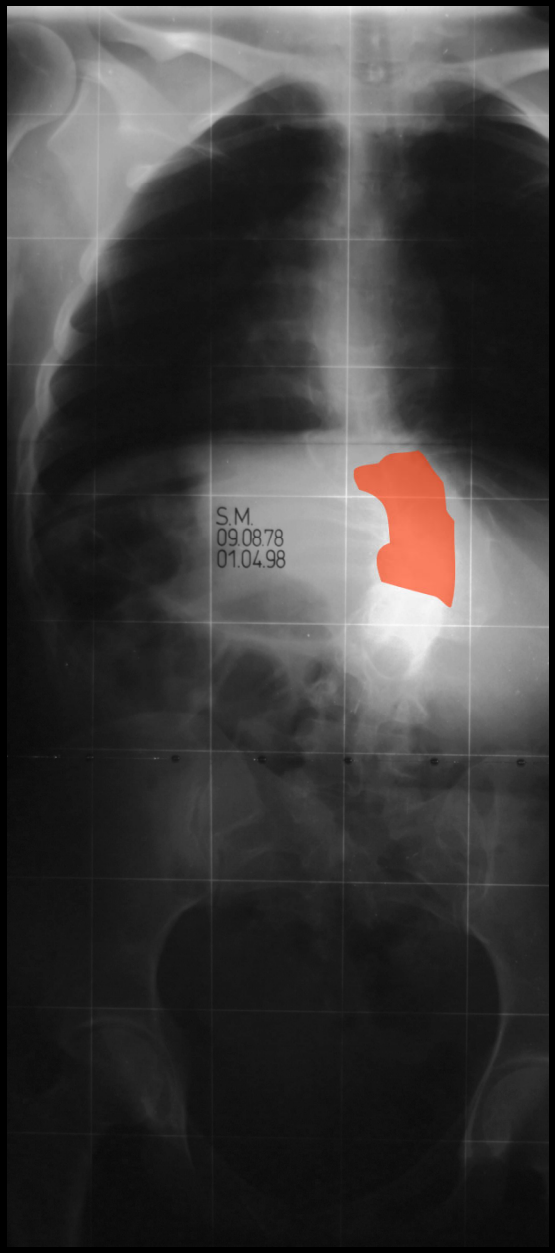


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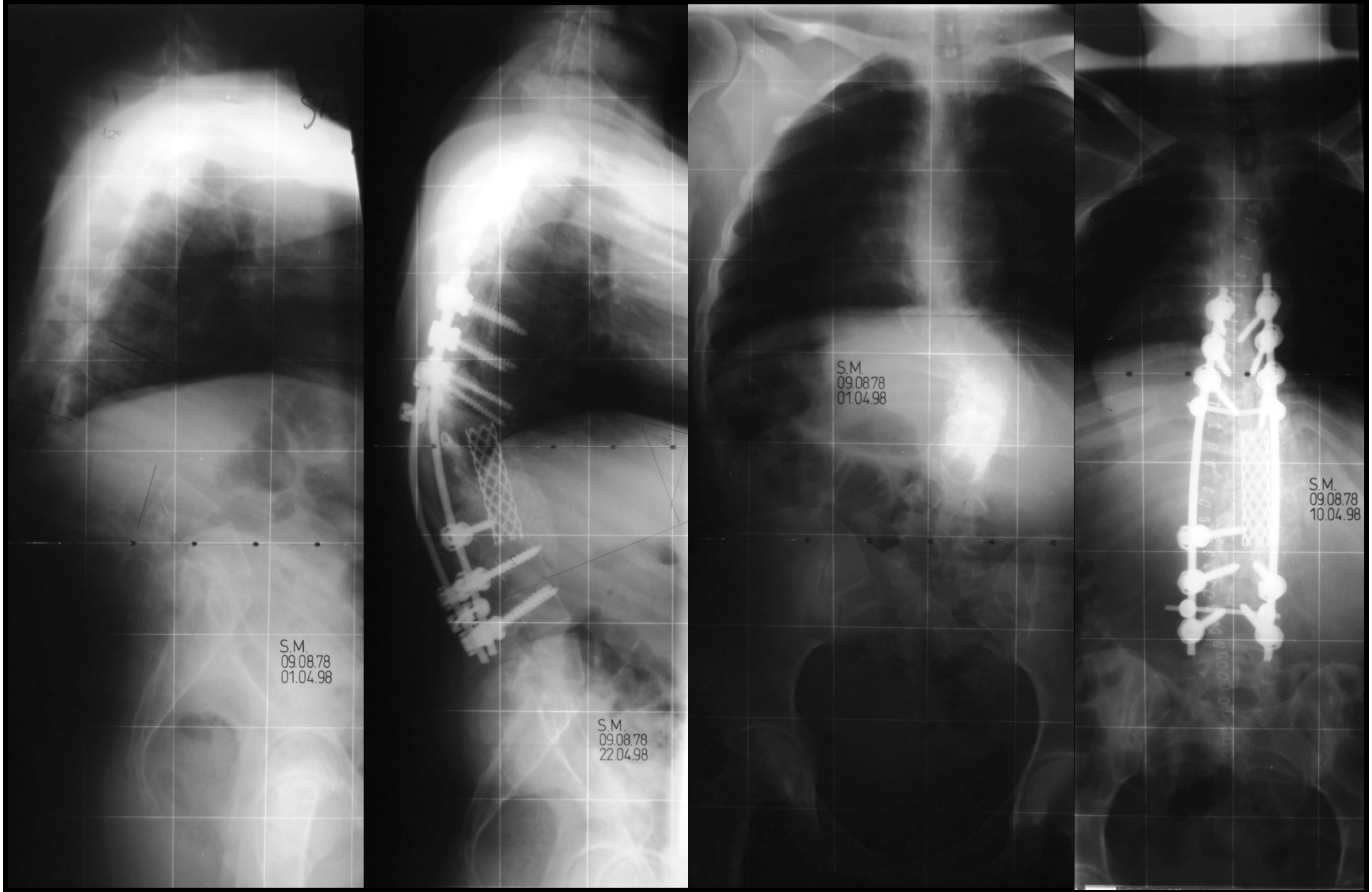


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# Postoperative course VCR

- No need for postoperative orthosis
- Physiotherapy for lung function improvement
- The patients should be followed with serial radiographs until fusion is consolidated and mature

# Discussion

- Careful consideration is needed in case of surgery for early onset scoliosis (EOS)
  - EOS itself means a shorter spine (bar, defect of formation, etc.)
  - Surgery (columnotomy/vertebrectomy) further shortenes the spine

  BUT
  - Columnotomy allows immediate huge correction resulting in improved development of the spine
  - Relatively short segment of spine needs to be fused
  - Better chance for growing rod instrumentation later, when necessary
  - Time is important!

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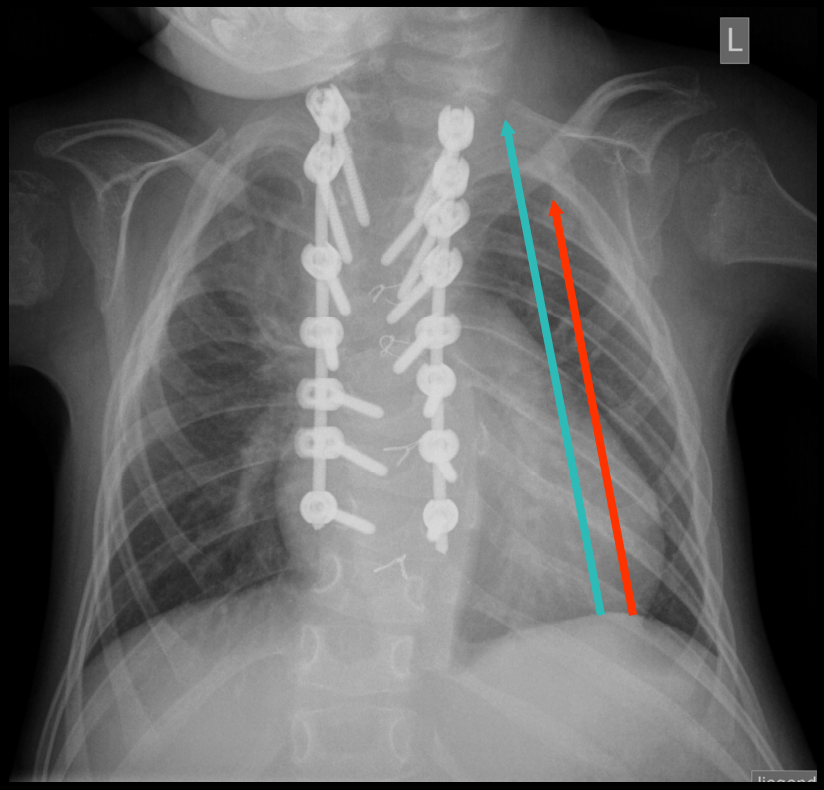
# Discussion

- Early radical intervention allows normal development of unaffected spinal regions - prevention of secondary deformities
- There is no time to waste in early childhood – progression may be very rapid at this age
- Perform posterior surgery alone whenever it is possible
- In case of anterior column insufficiency due to corrective resection you need to reconstruct the anterior column (cage and/or bone)

# Summary

- Severe, rigid three-dimensional deformities are perhaps the most challenging of the spinal deformities
- For adolescents and adults with fixed coronal and sagittal imbalance, we recommend vertebral column resection and arthrodesis
- In early onset deformities other growing surgical techniques have to be considered first
- This technique allows more satisfactory restoration of spinal balance than alternative techniques, because it avoids distraction and associated risk of neurologic injury
- Correction is achieved in shortest time!
- Low risk of major neurological complication when using IOM

# Thank you for your attention!

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