# Metatropic dysplasia (MTD)

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# Disclosures

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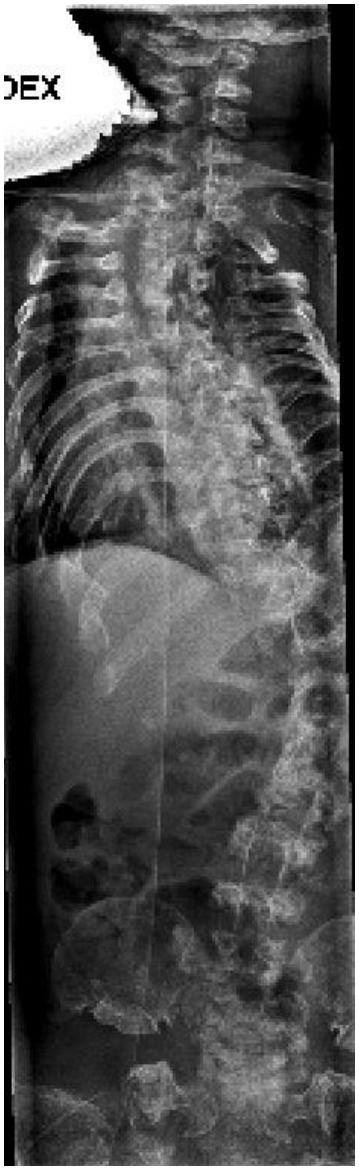
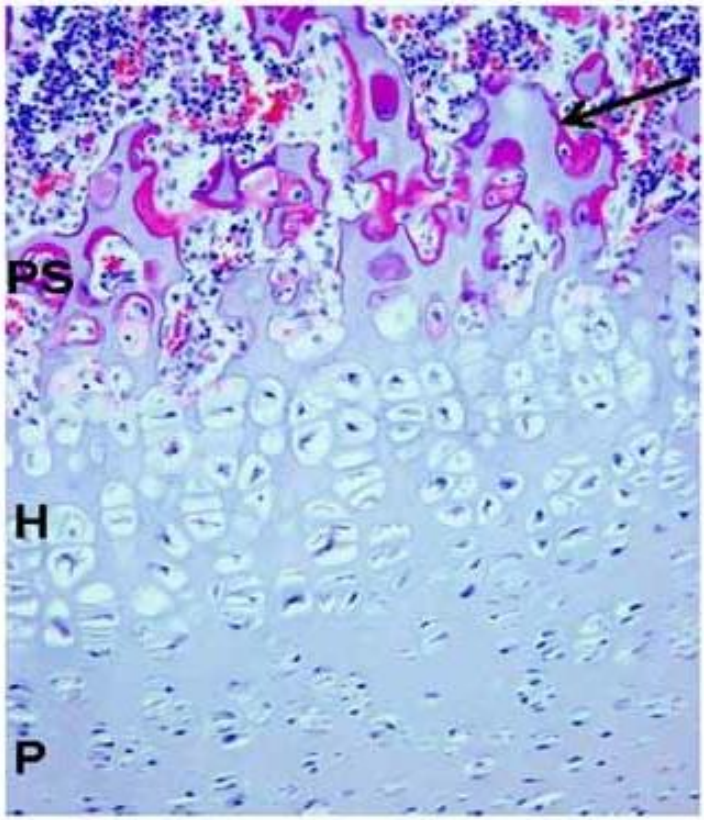
# Background



- Metatropic dysplasia (MTD) is a rare spondyloepimetaphyseal dysplasia characterized by a long trunk and short limbs in infancy followed by severe and progressive kyphoscoliosis causing a reversal in proportions during childhood (short trunk and long limbs) and a final short stature in adulthood (Leet et al. JPO 2006)
- Metatropic derived from the Greek word *metatropos*, meaning to change
- Prevalence < 1:1 000 000
- Autosomal dominant or DeNovo mutation
- 88 cases described in the literature (Orpha.net)

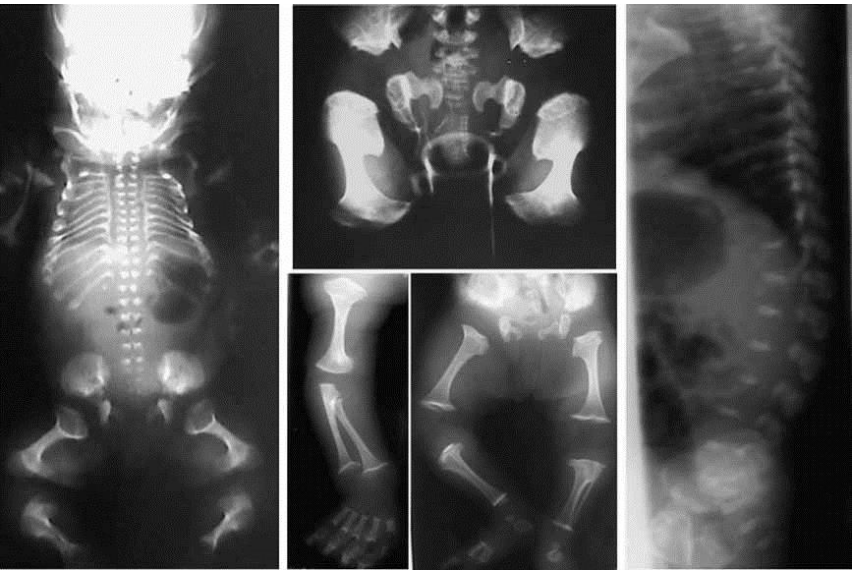
# Genetics & Pathophysiology




Camacho et al. Am J Med Gen 2010;152A:1169-1177

- Mutations in the transient receptor potential vanilloid 4 (TRPV4) gene (12q24.1) encoding a polymodal Ca2+ permeable ion channel
- Increase in Ca2+ in chondrocytes → Disrupted endochondral ossification (Camacho et al. AJMG 2010)
  - Reduced number of hypertrophic chondrocytes
  - Presence of islands of cartilage within the zone of primary mineralization
- Uncoupling of endochondral vs. perichondral (appositional) growth (Boden et al. JBJS 1987)
  - Vertebral body height reduced (Platyspondylia) while circumference maintained

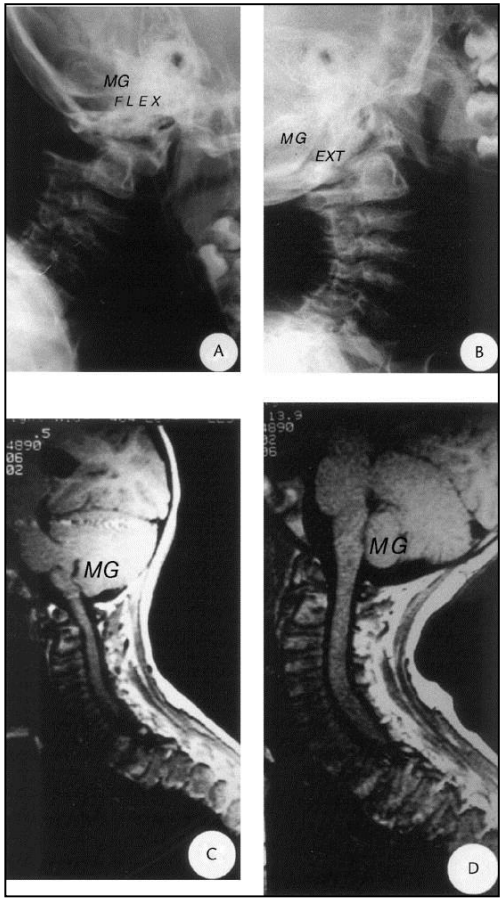
# Radiographic features as newborn



Genevieve et al. Am J Med Gen 2008;146A:992-6.

- Craniofacial abnormalities: Prominent forehead, midface hypoplasia.
- Short diaphyses with wide metaphyses
- Precocious calcification of hyoid and cricoid cartilage
- Platyspondyly
- Elongation of the coccyx
- Halberd shaped pelvis
- Severe hypoplasia of C1 and odontoid process

# Cervical instability (C1/C2)




- Hypoplasia and delayed ossification of C1 and odontoid: 71% (10/14) (Genevieve et al. Am J Med Gen 146A:992–996)
- Neurologic deficits reported in untreated cases after minor falls, with no improvement after surgical decompression and fusion (Beck et al. *Eur J Pediatr* 1983;140:231-237; Rimoin et al. *Clin Orthop* 1976;114:70-82)
- Occurrence of C1/C2 instability* in MTD: 42% (5/12) (Leet al. JPO 2006)

Leet et al. JPO 2006;26:347-52.
*AAD space > 4 mm (Locke, AJR 1966;97:135-40)

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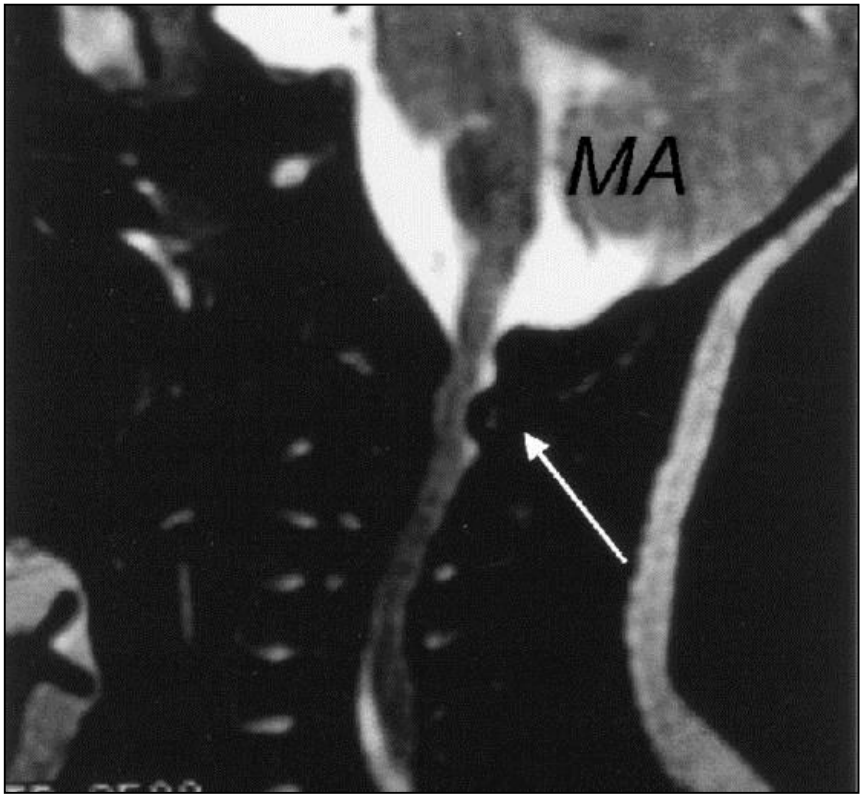
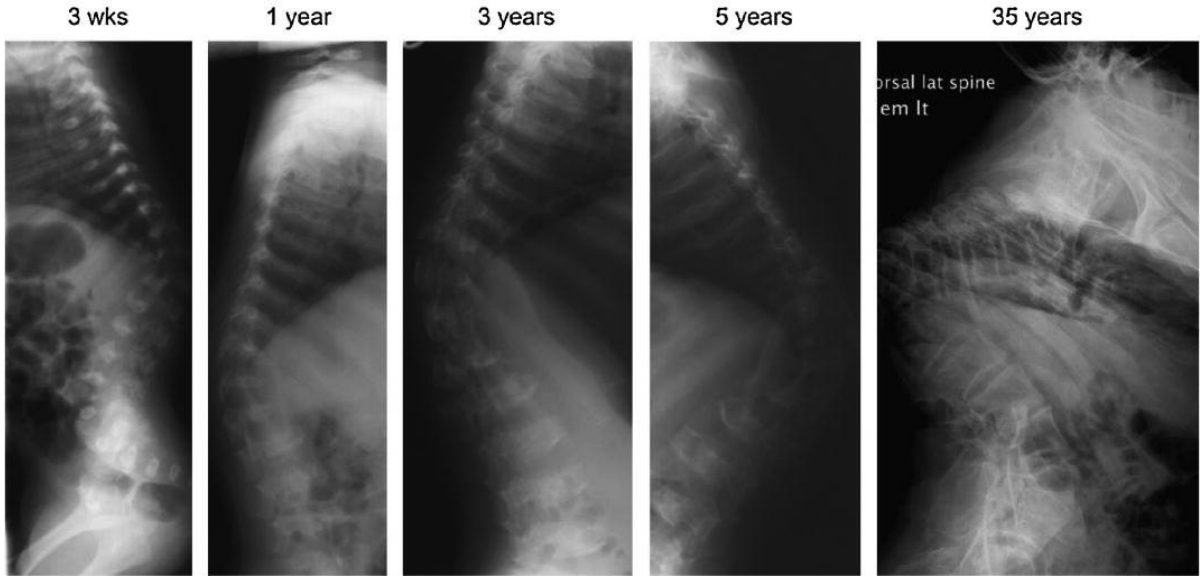
# Cervical stenosis




Leet et al. JPO 2006;26:347-52.
*Space available for cord (SAC) < 13 mm (Spiering and Braakman JBJS Br 1982)

- High prevalence stenosis* in metatropic dysplasia 69% (9/13) already as a child (Leet et al. JPO 2006)
- Levels of stenosis
  - C1/C2: 5 children
  - C3/4: 2 children
  - Diffuse: 1 child
  - Cervical kyphosis: 1 child
- 8 children treated with uninstrumented fusion and 1 instrumented fusion + Halo traction / halo cast (age range 6 mths- 9 yrs)
  - Prolonged respirator: 3 pts
  - Loss of halo, abducens, pressure sore: 1 each

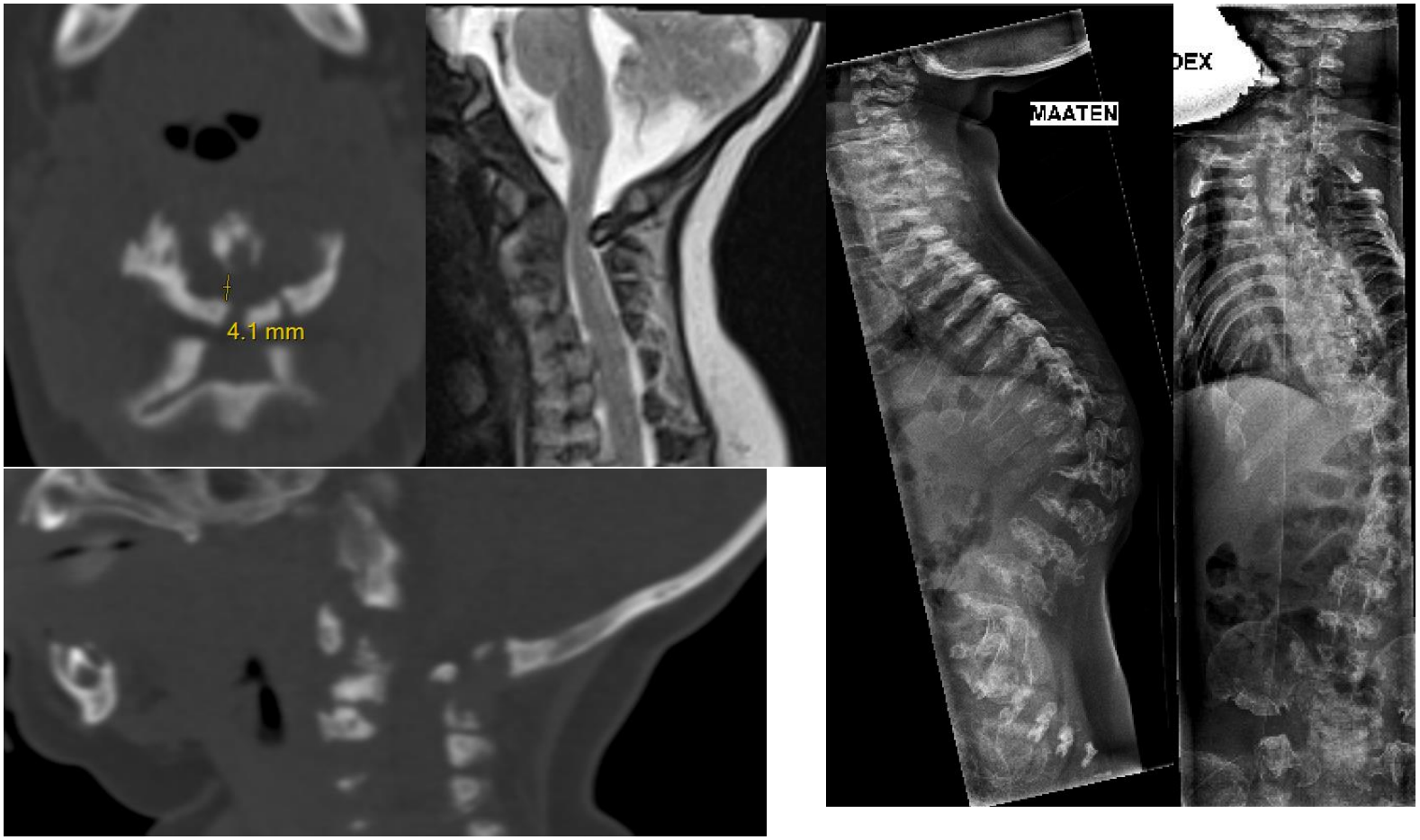
# Kyphoscoliosis




Kannu et al. Am J Med Gen 2007;143A:2512-22.

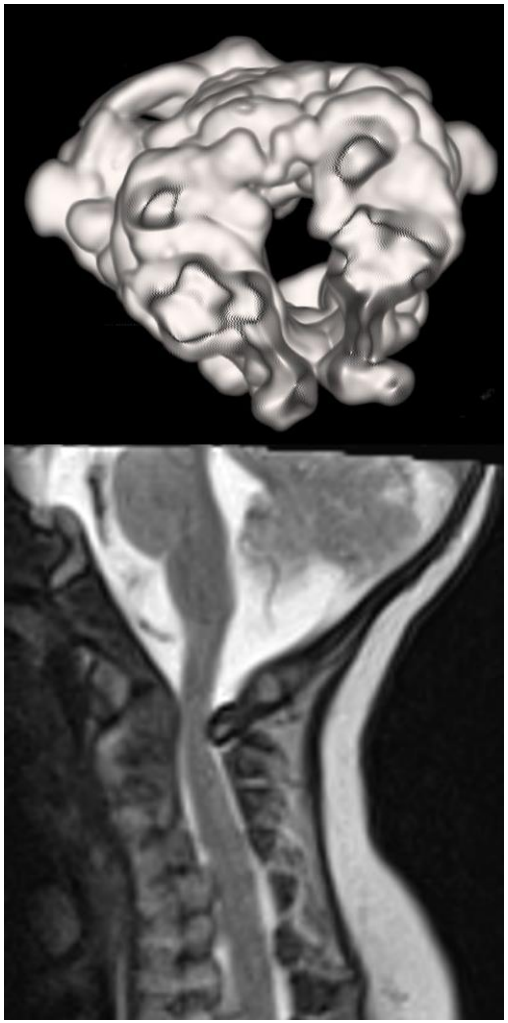
- Kyphoscoliosis often develops at early childhood resulting into progressive and severe deformity by the age of 18 years if left untreated
  - Prevalence: 55% (49/88) (Genevieve et al. Am J Med Gen 146A:992–996)
- Kyphoscoliosis reported as the main cause of death due to cardiopulmonary compromise (Genevieve et al. Am J Med Gen 146A:992–996)
  - Associated often with thoracic narrowing (49%, 43/88).
- Spinal stenosis and paraparesis as a result of deformity also reported in the literature (Rimoin et al. *Clin Orthop* 1976;114:70-82; Leet et al. JPO 2006)

# MTD Case #1 at 5 months of age




Courtesy of Prof Willy Serlo

# MTD Case #1 continued



Courtesy of Prof Willy Serlo

- Triangular chest wall with early onset scoliosis
- Neurologically intact, but breathing difficulties easily with respiratory infection
- Occipitocervical decompression and C0-C2 fusion with authologous ribs recommended by the author at the age of 6 months, thereafter trial of casting
- Family denied
- Child past away at 10 months for pneumonia

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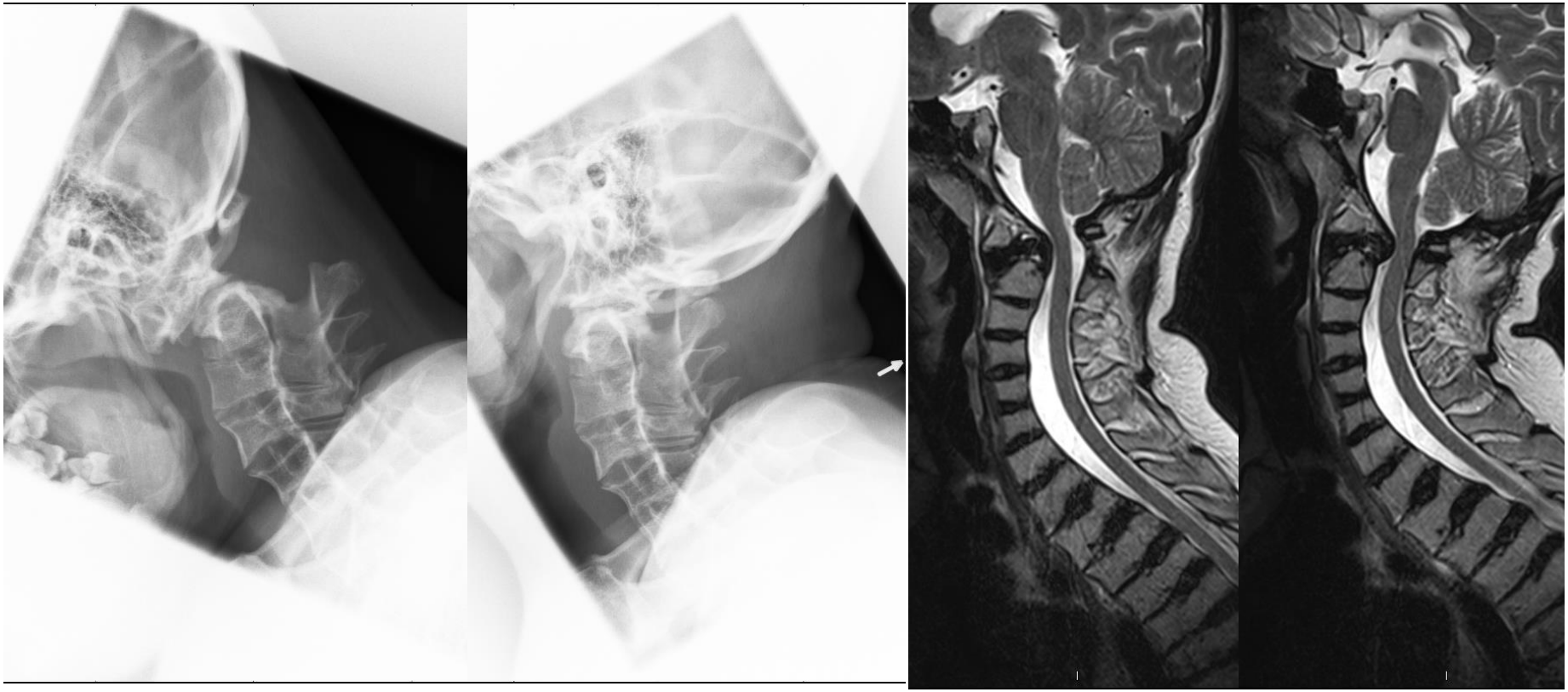
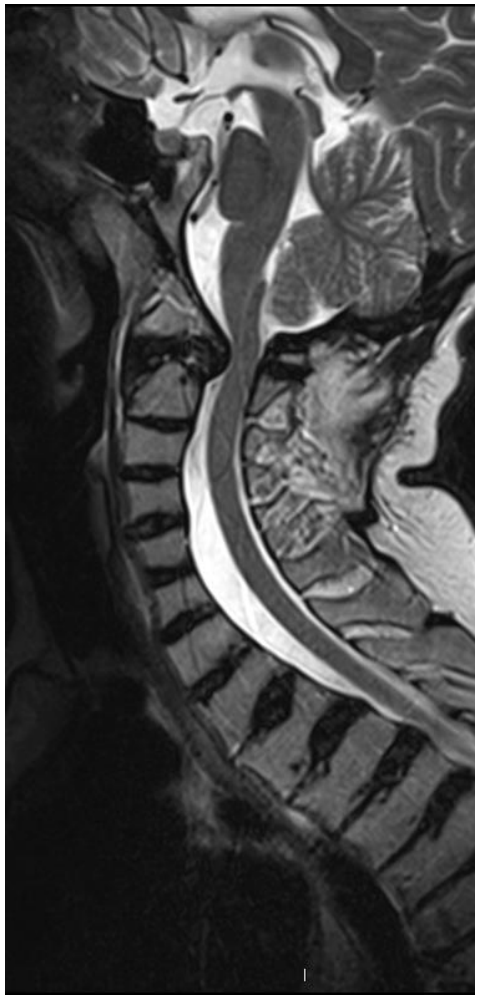
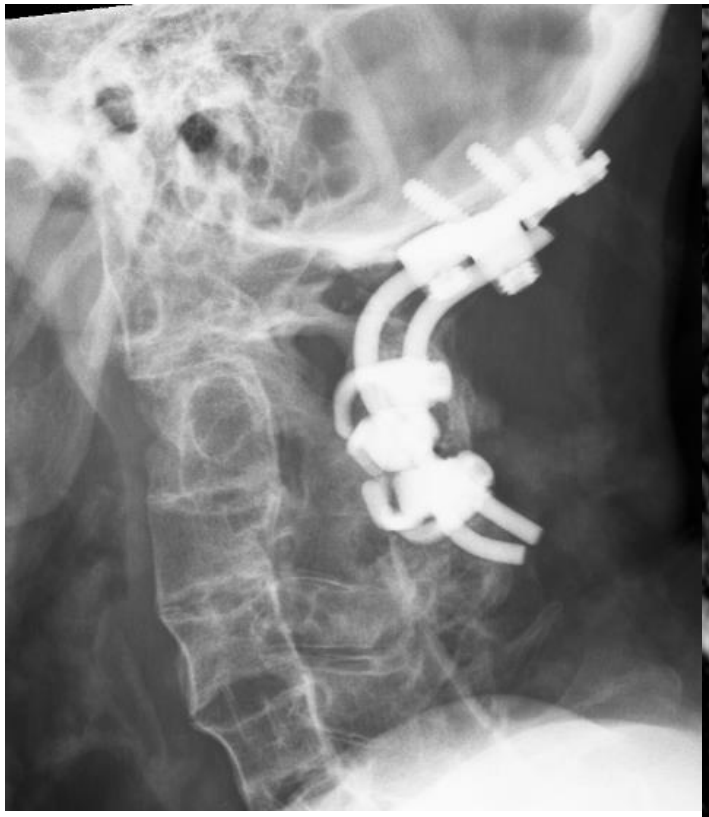
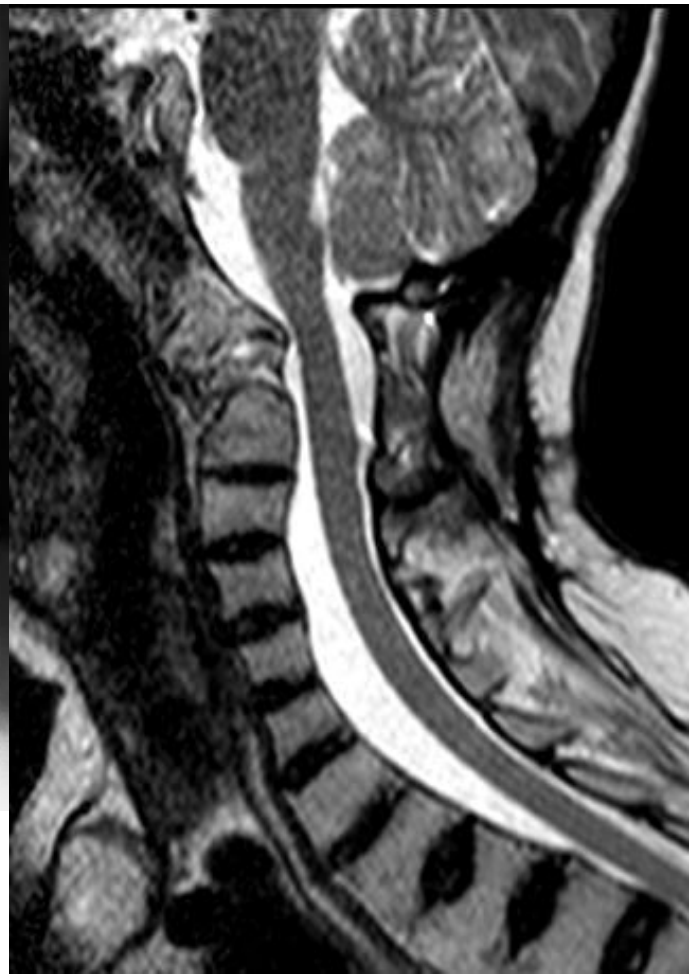
# Case #2: C1/C2 instability at 13 yrs



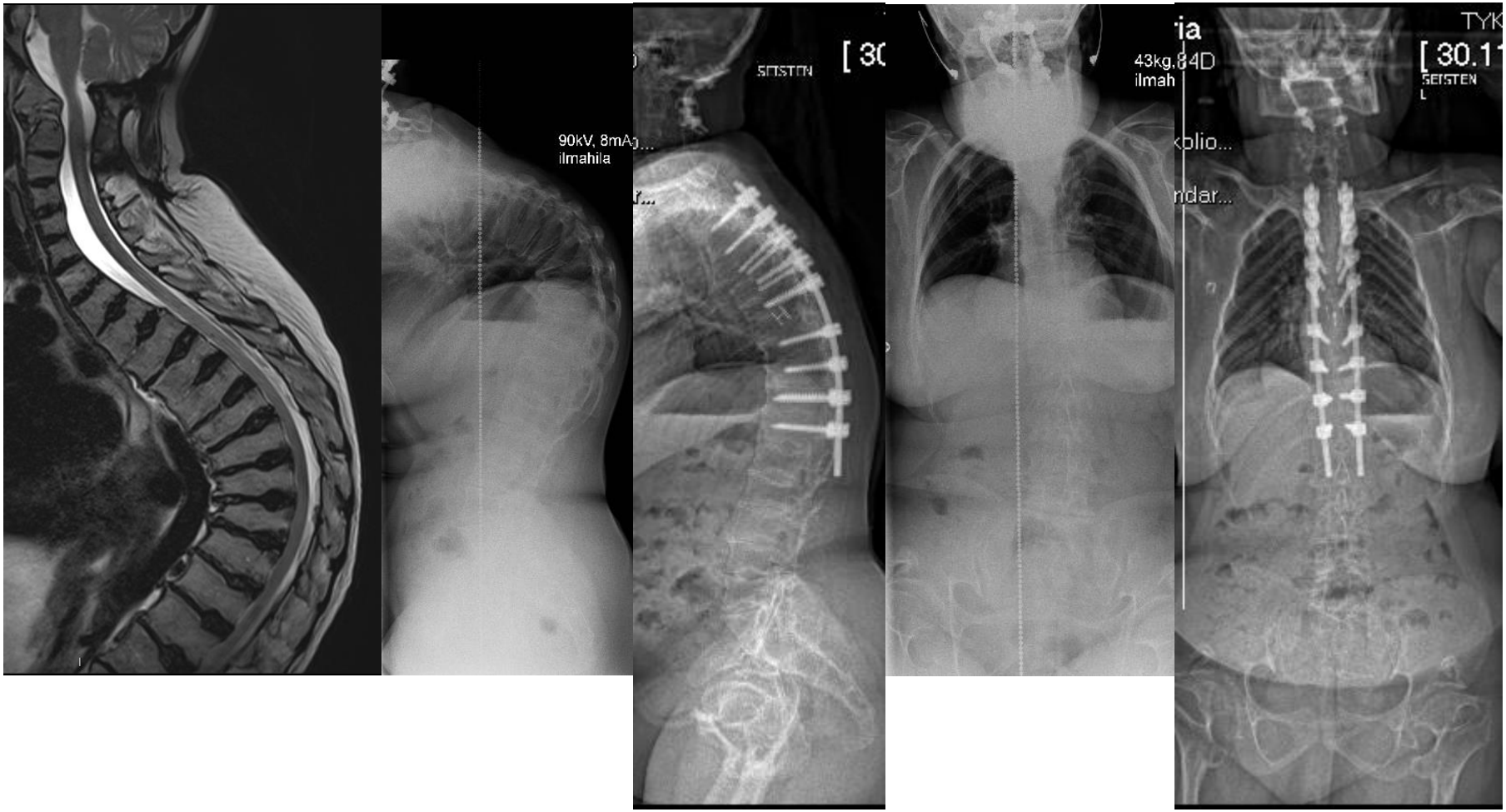
# C0-C2 fusion & C1 laminectomy





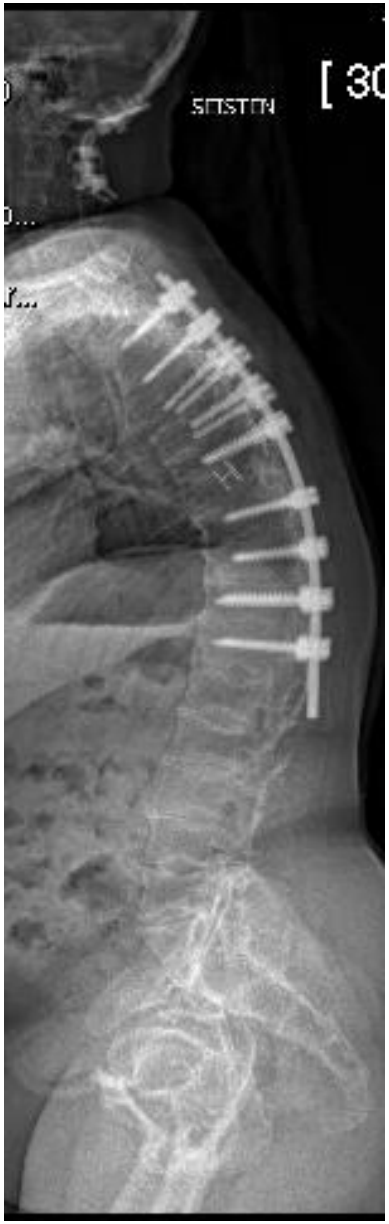


# Developed paraparesis 4 years later: Treated w T8 VCR




4-yr FU

# Conclusions



- Metatropic dysplasia a rare, but potentially lethal skeletal dysplasia
- Upper cervical instability associated with stenosis necessitates urgent decompression and spinal fusion even at young age.
- Platyspondylia often progress rapidly into kyphoscoliosis, which can result into spinal cord compression, spinal stenosis and if left untreated present the main cause death due cardiorespiratory compromise
- Results of treatment for spinal deformity unclear