Assessment of idiopathic scoliosis

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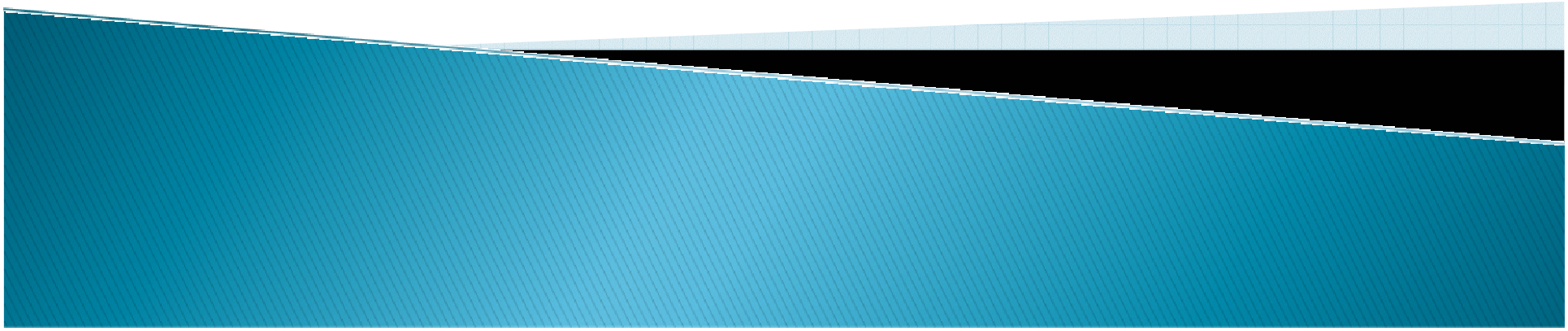


Aims of this lecture

- Deliver core knowledge on idiopathic scoliosis
- Describe the methods available for the assessment of idiopathic scoliosis
- Outline the treatment options for idiopathic scoliosis

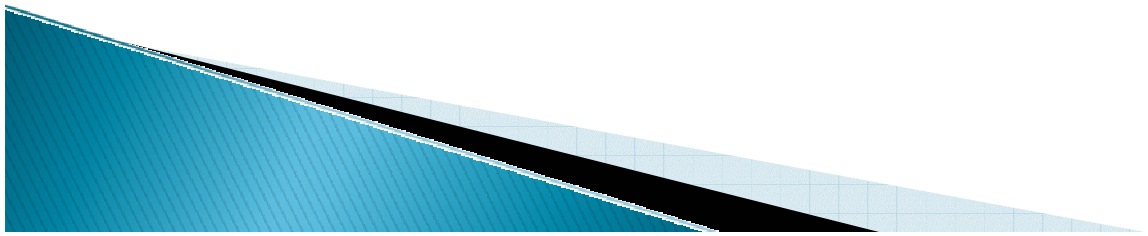
Scoliosis

- Definition
  A coronal curvature of the spine with apical rotation and a Cobb angle >10 degrees

- Prevalence
  0.5-3% for curves >10 degrees
  0.2-3 per 1000 for curves >30 degrees

Classification

- Congenital
- Neuromuscular
- Idiopathic
- Adult



Idiopathic scoliosis

- As the name implies, the cause of idiopathic scoliosis is not known
- It is a disorder of growth causing a scoliosis before skeletal maturity
- Note when curves are large they can progress past skeletal maturity
- Idiopathic curves tends to present during fast phases of growth
- Therefore the two commonest ages to present are the first few years and during the adolescent growth spurt

Early classification (James)

- Infantile (0–3 years)
- Juvenile (4–9 years)
- Adolescent (>10 years)

- As growth is fairly steady during the juvenile years presentation at this age is rare
- Early juvenile treatment similar to infantile and late juvenile similar to adolescent
- Therefore juvenile category of little practical use

Current classification Early(<7yrs) and Late(>7 yrs)

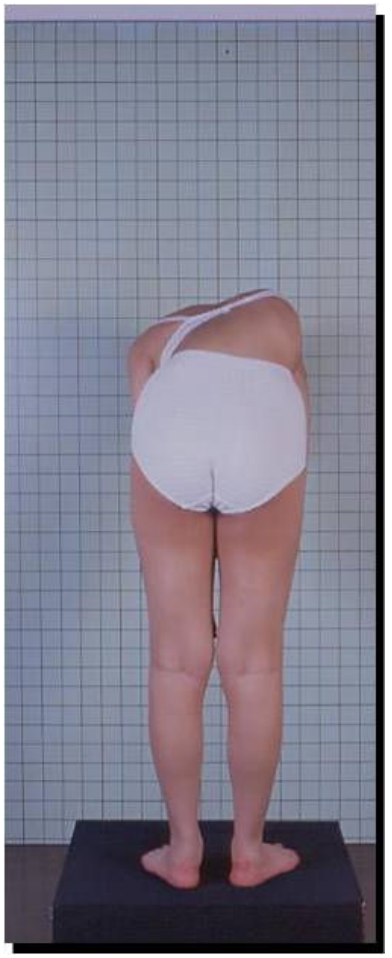
- Classification devised because the main period of development of the lung is up to 6 years of age
- If significant chest deformity occurs during these first six years lung development will be retarded (decreased number of alveoli)
- As a result of this early onset scoliosis can cause significant cardiopulmonary problems and shorten life expectancy
- Late onset scoliosis occurs after lung development and is therefore mainly a problem of deformity and appearance

Early onset scoliosis

- Males predominate (3.5:1) incidence deceasing
- 70% single thoracic
- 75% of these curves left sided
- Associated with plagiocephaly, torticolis and plagiopelvy giving limited hip abduction

Late onset scoliosis

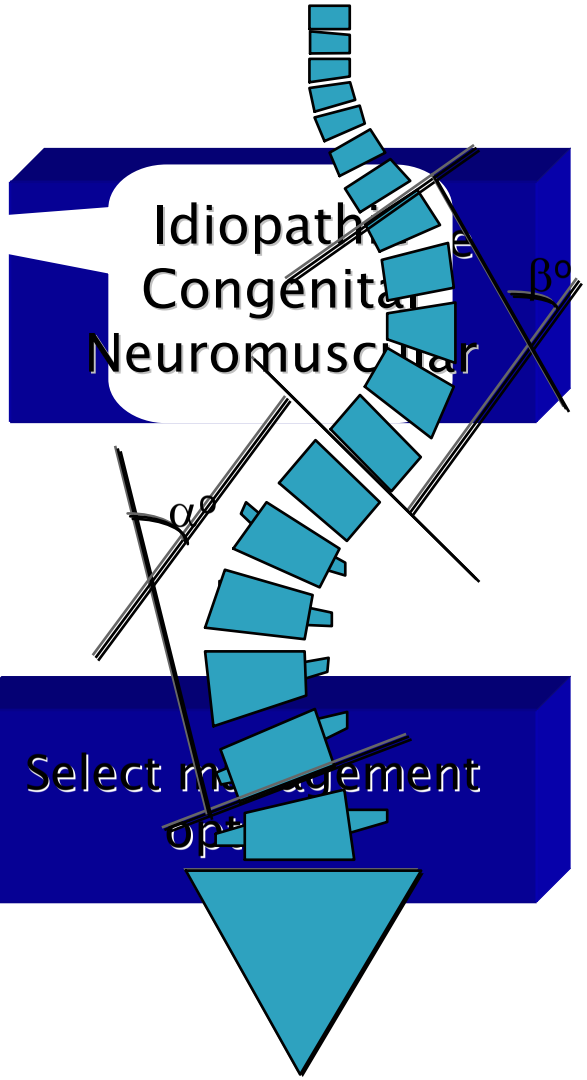
- 5.4 to 1 F:M
- Many different curve patterns
- Commonest right thoracic, left T/L and double major
- Classification Lenke most useful King historical



Goals of scoliosis evaluation

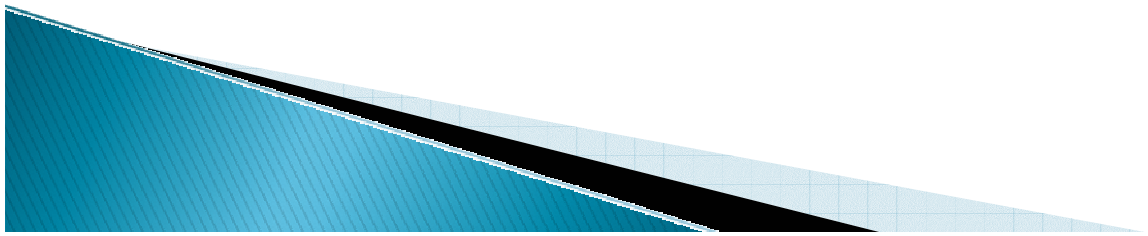
Establish Etiology

Determine Magnitude of Deformity



Evaluation Tools

- History
- Examination
- Radiological



History

- Family history
- Pregnancy and birth history – ?moulding defects
- Skeletal maturity – menarche, voice change
- Note many asymptomatic
- Deformity – ?progressive, body image perception
- Pain – red flags, effect on lifestyle
- PMH ability to tolerate treatments
- Career aspirations

General Examination

all patients examined barefoot/gowned

Each visit: weight height

Looking for causes of non idiopathic scoliosis

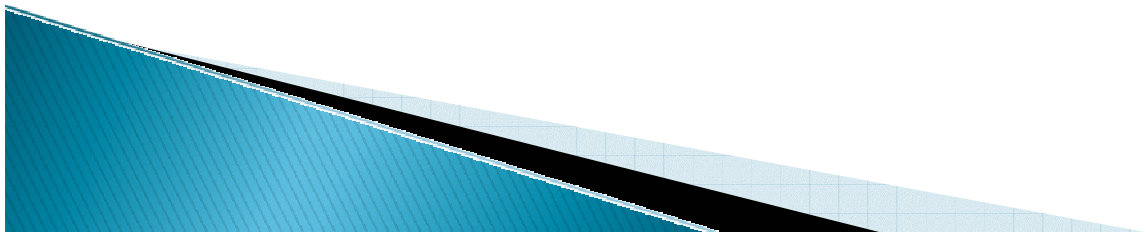
e.g leg length inequality

Skin:

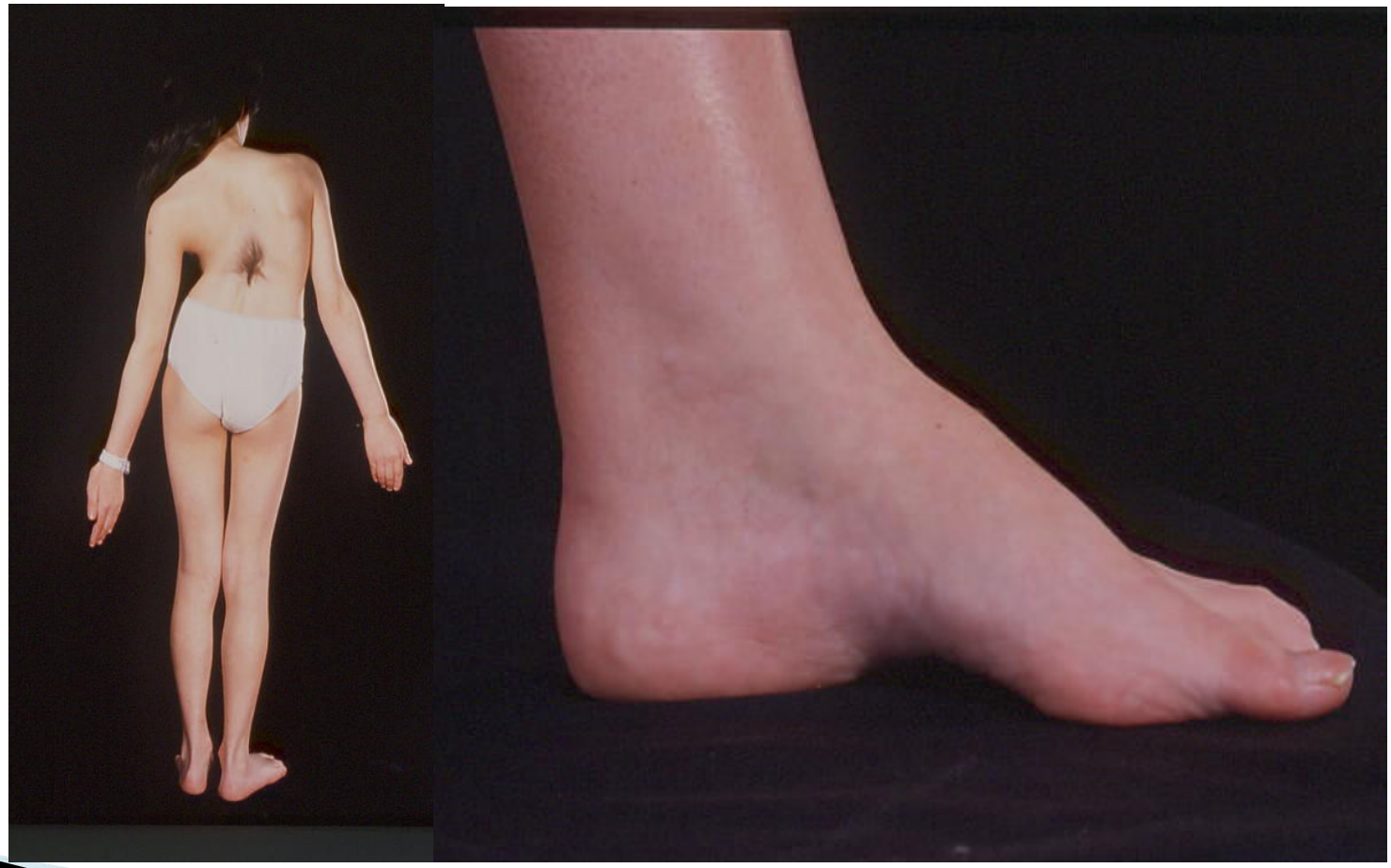
- café-au-lait spots
- hairy patches
- midline dimples
- hyperelasticity

Feet:

- High arch (CMT/Friedrich's)
- Clubfeet/CVT



General Examination



Scoliosis examination

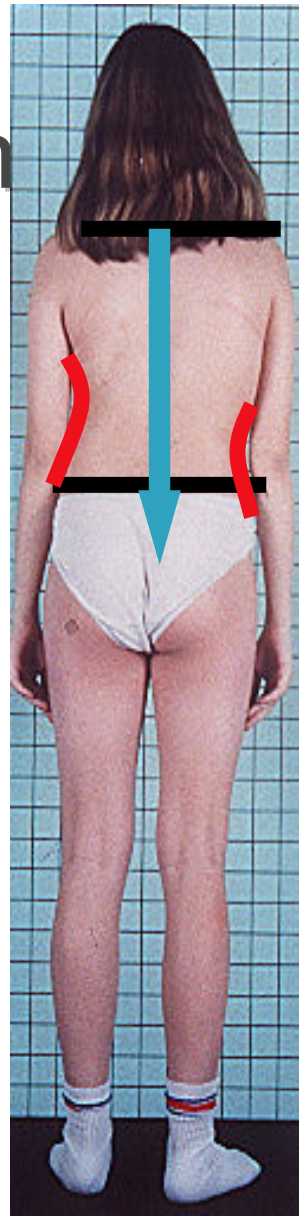
Observe standing posterior

Shoulder height

Pelvis height

Waist crease asymmetry

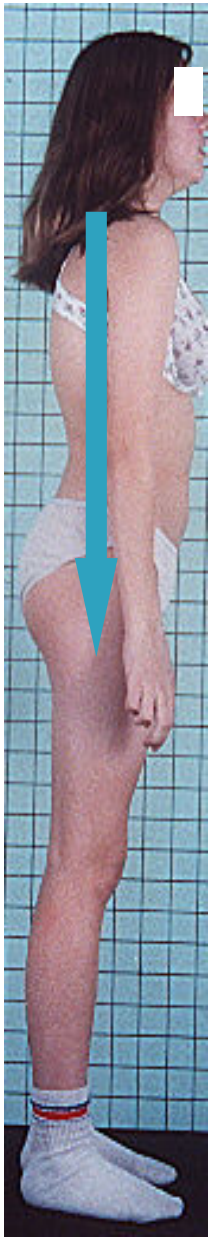
Trunk shift



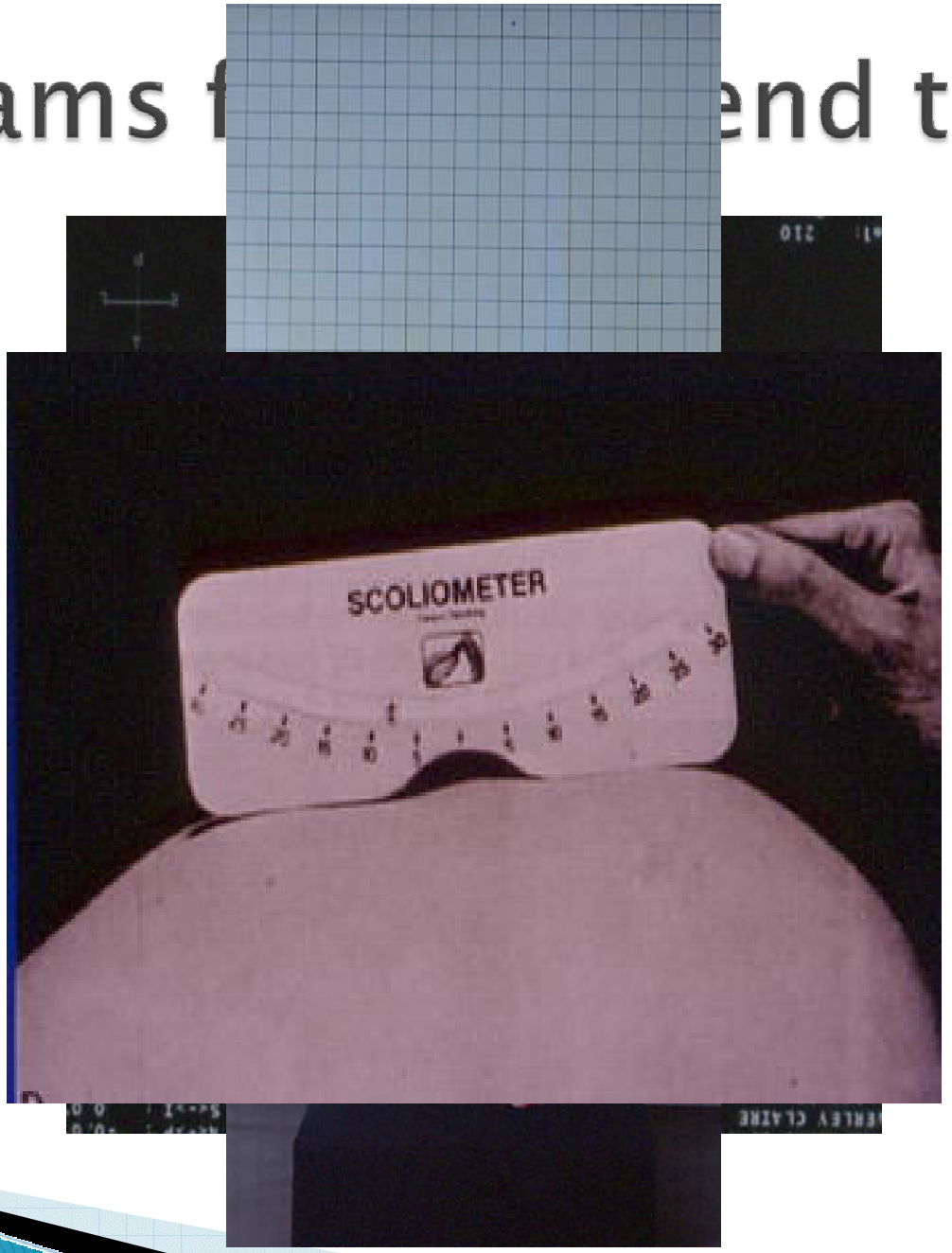
Scoliosis examination

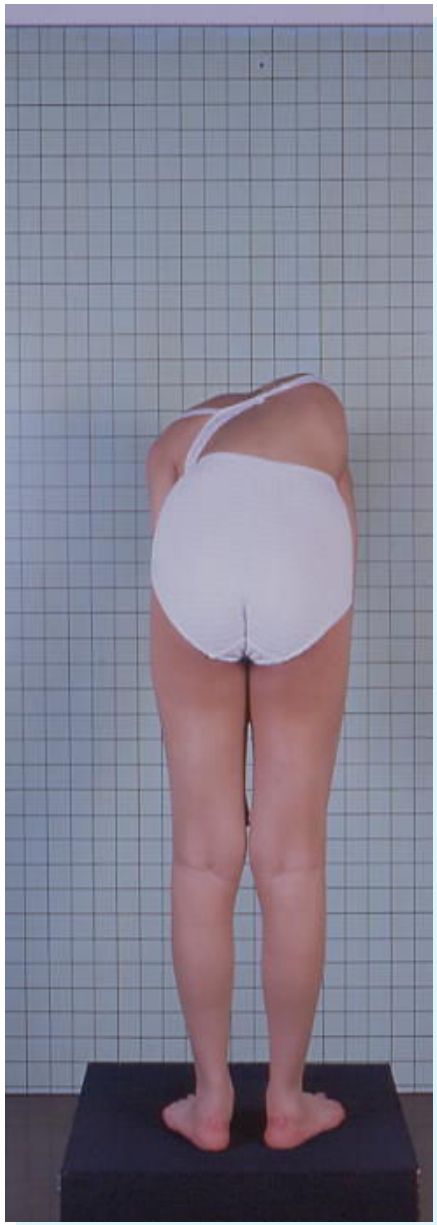
Lateral upright position

- Kyphotic deformity
- Sagittal balance

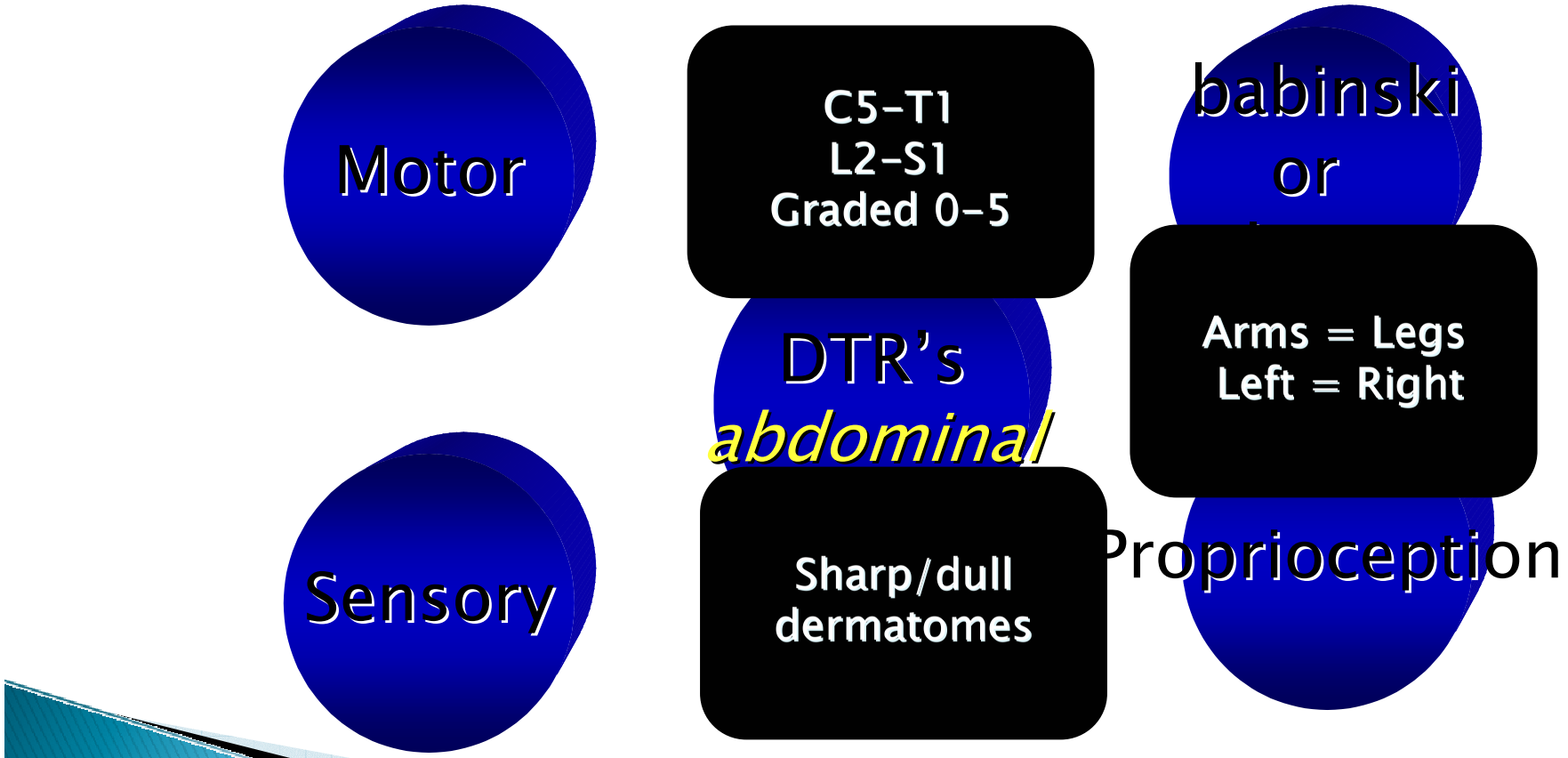


Adams f end test



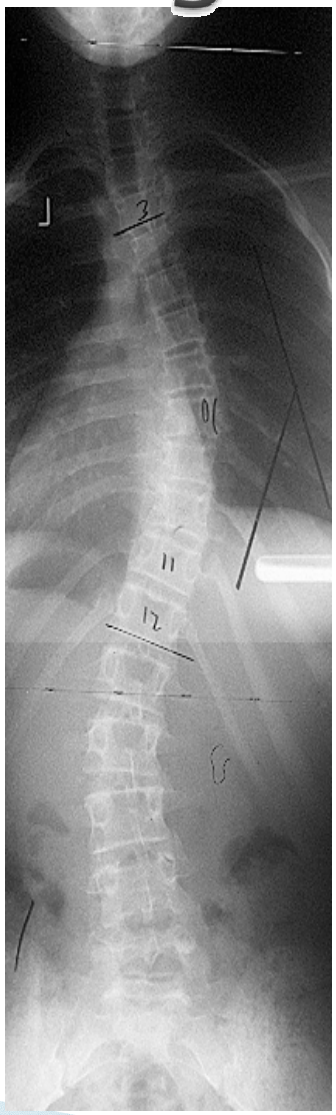


Neurologic Examination

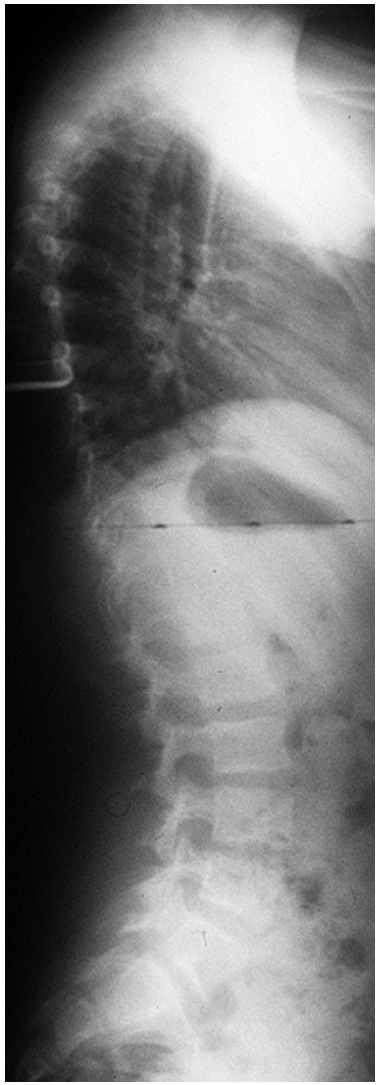


Standing long spine x-rays

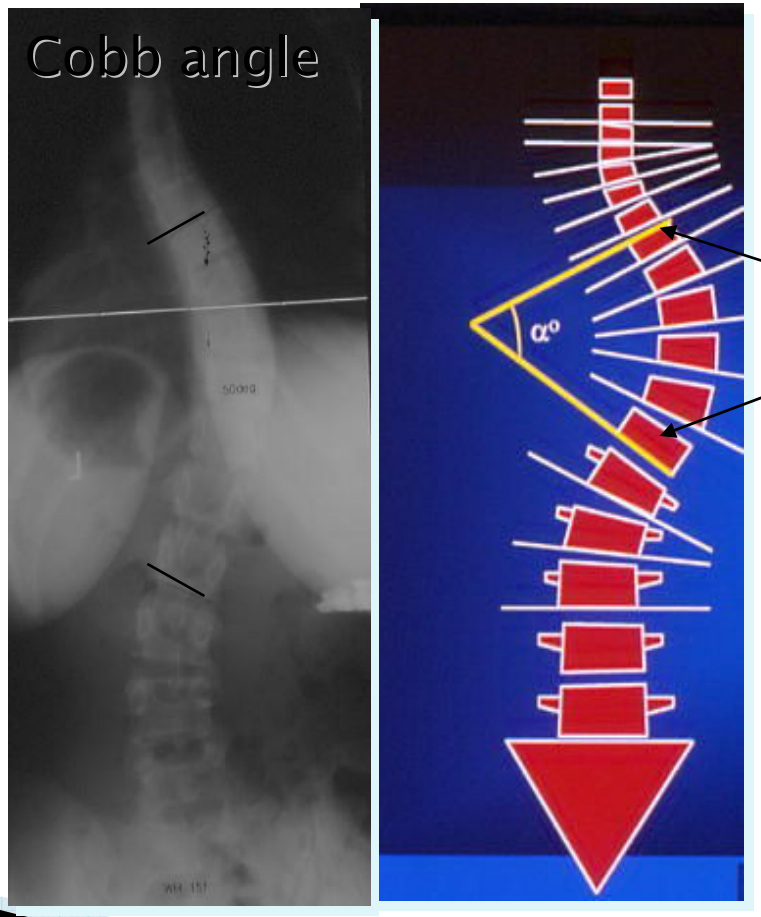
PA



Lateral



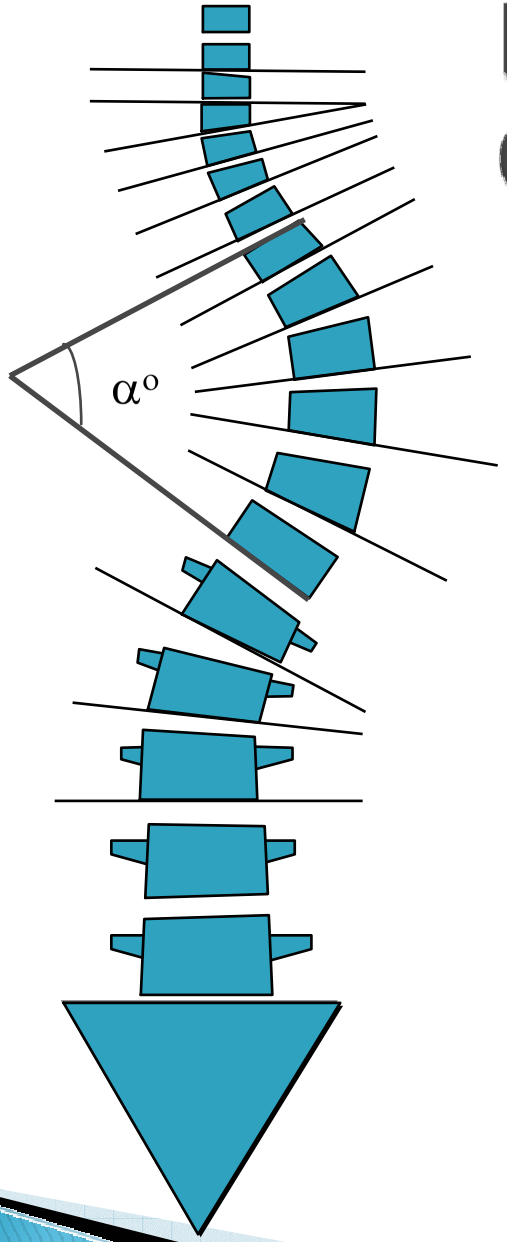
Cobb angle assessment



End vertebrae

Angle subtended
by respective superic
& inferior endplates

MEASUREMENT OF COBB ANGLES



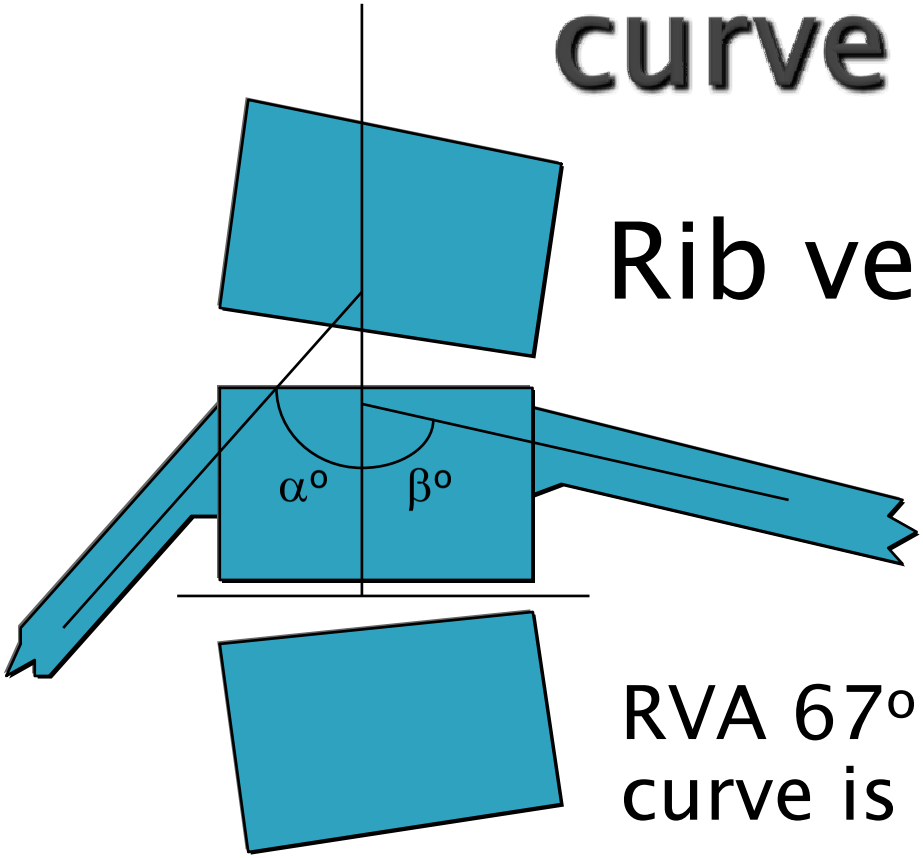
Identification of "End Vertebrae"

- Last vertebrae tilted into the concavity of the curve
- Disc space next to the End Vertebrae is usually parallel

Measurement of Cobb Angle

- Line drawn at the superior end plate of the cranial end vertebra and the inferior end plate of the caudal end vertebra.

Early onset– Assessment of curve severity



Rib vertebral angle (RVA)

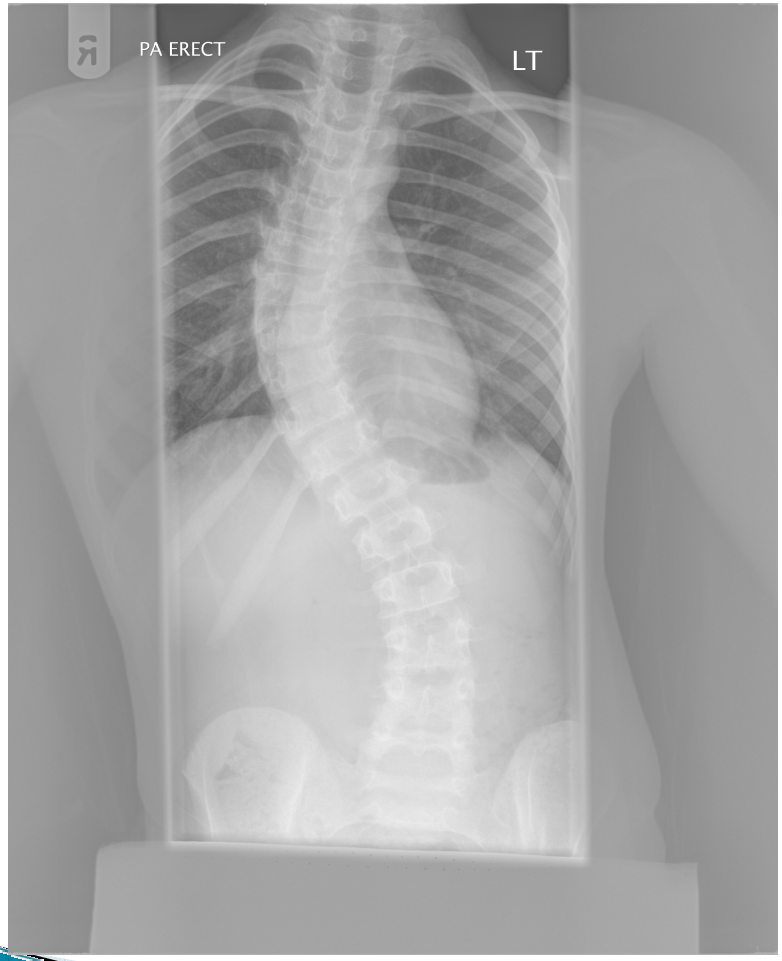
RVA 67º or RVA difference 20º curve is likely to progress

Mehta, 1972

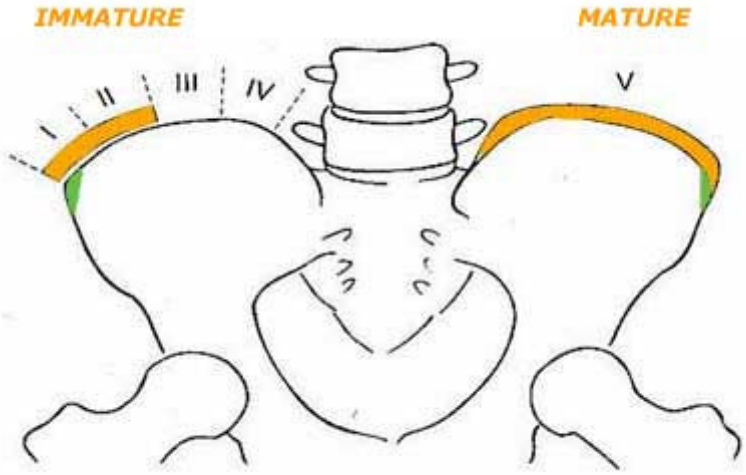
Flexibility Films

- Used pre-operatively to assess degree of correction likely to be achieved and help to decide fusion levels
- Bending films
- Supine fulcrum bending films
- Push pull radiographs
- GA traction films

Push pull radiograph



Risser's sign-1958



MRI

- 4% assumed idiopathic scoliosis patients have MRI abnormalities, commonest are:

Arnold Chiari Malformation

Syrinx

Diastomatomyelia

Tethered cord

- Thresholds for MRI vary from centre to centre
- High risk –patients with pain, left thoracic curves, abnormal neurological examination

Treatment early onset scoliosis

- Significant numbers resolve (50-90%)
- Curves that significantly progress need aggressive treatment to avoid affecting lung development

Treatments

- Need to control curve progression allowing lung development
- Ideally should also allow the spine to grow in order to avoid causing a short trunk and poor cosmetic results in adult life
- Casts and bracing
- One operation growing constructs-Luque trolley
- Sub-fascial rods that require 6 monthly surgery and manual expansion

Localiser casts

- Used to correct curves serially
- Placed under GA using a Risser table
- Window cut for abdomen to allow breathing and feeding
- Well tolerated in the young age group
- Some patients curves resolve
- Also useful to hold the very young until older and suitable for bracing or surgical intervention
- Proceed to surgery if not holding in brace

Risser Technique (manual technique)

- Standard method using Risser table
- Allows placement of custom braces whilst on traction

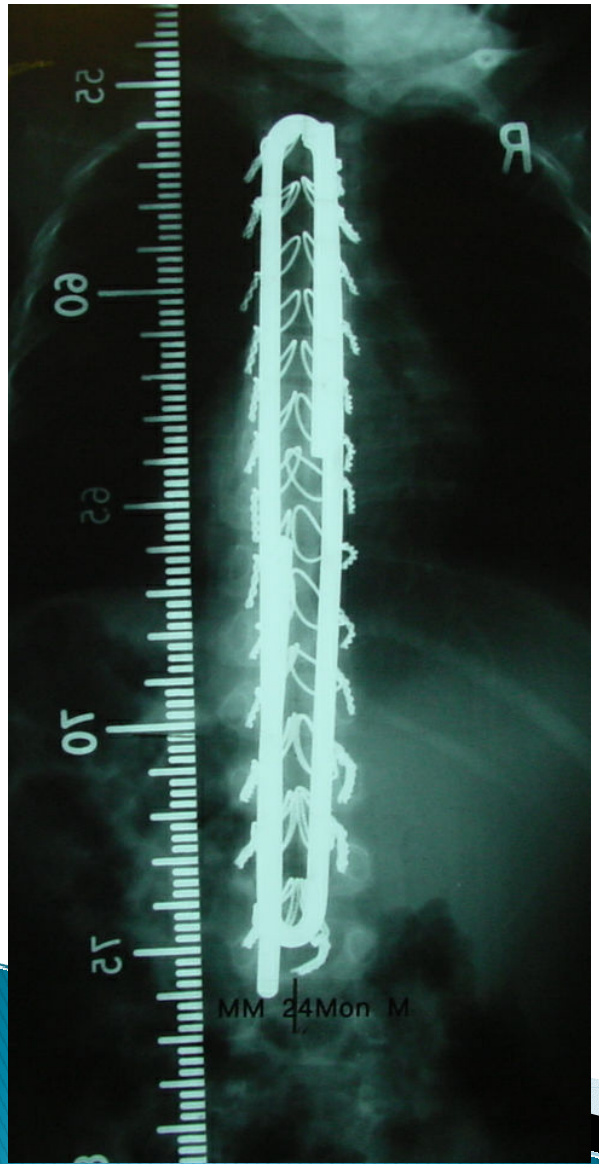
Risser Procedure (Manual Technique)

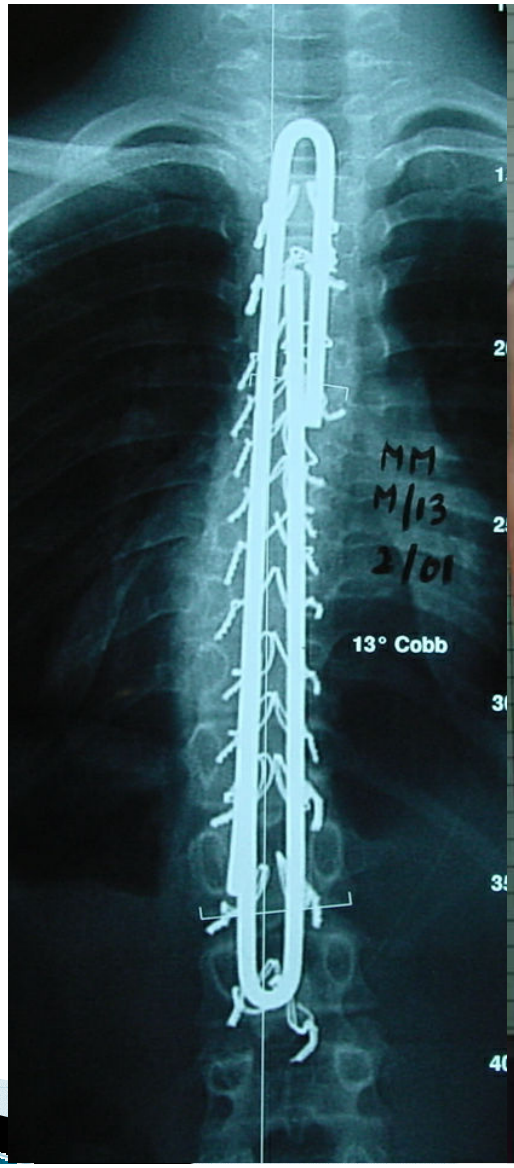
Patient positioned on table traction applied

Patient s cast applied

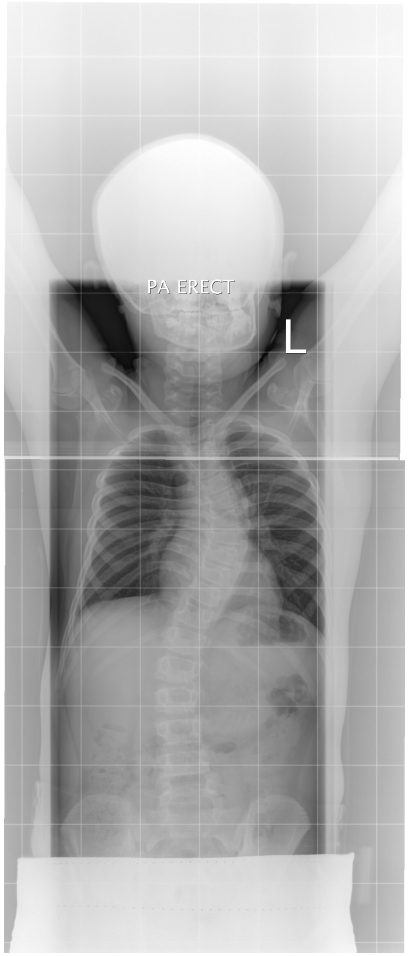
Later window cut for abdomen and cast trimmed and padded

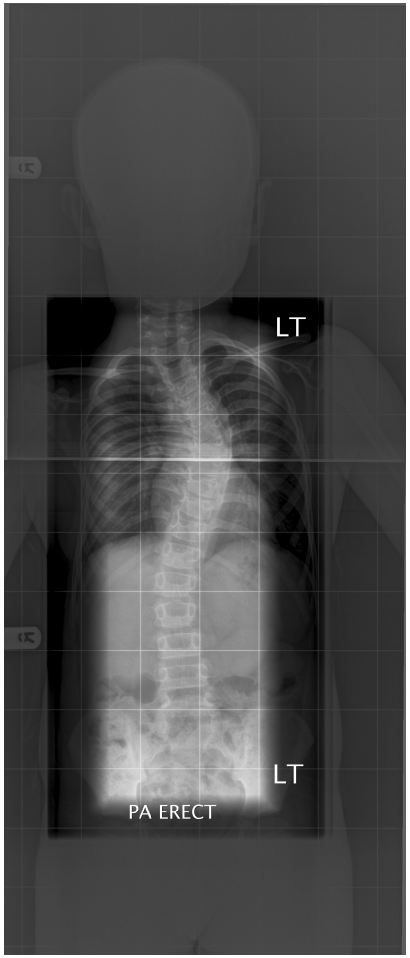
Luque trolley



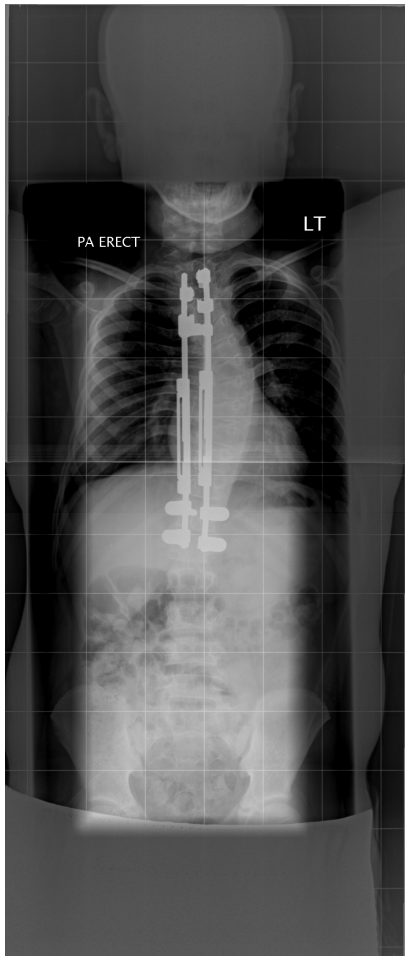


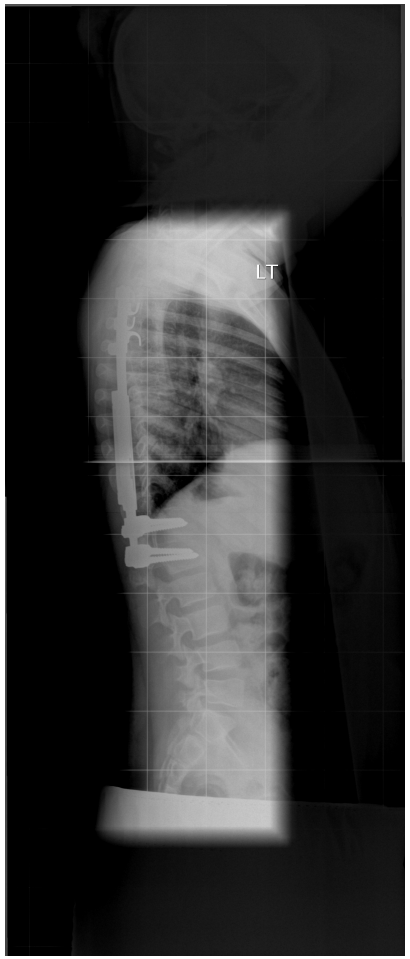
Sub fascial growing rods





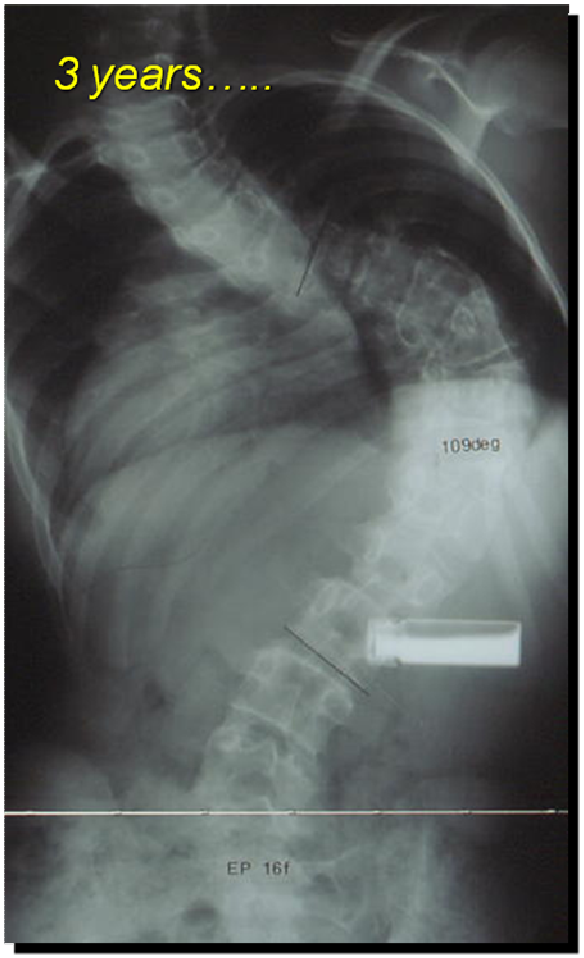
Sub fascial growing rods





Treatment-late onset

- Life expectancy not proven to be different from a normal population
- Lung function affected significantly in curves over 90-100 degrees
- Surgery mainly indicated for cosmesis and pain



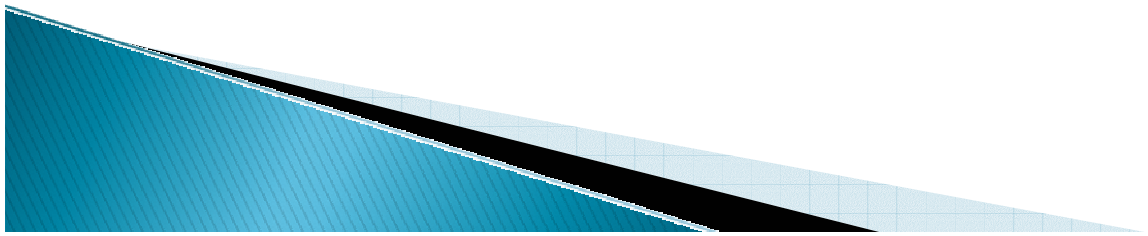
Treatment-natural Hx

- Risk of progression at presentation essential to know in order to give patients prognosis. High risk of progression if patient presents at:

- Low age (less than 12)
- Higher Cobb angle (>20 degrees)
- Skeletally immature – pre-menarchal, Risser 0-1 – increased growth potential⇨ greater deformity

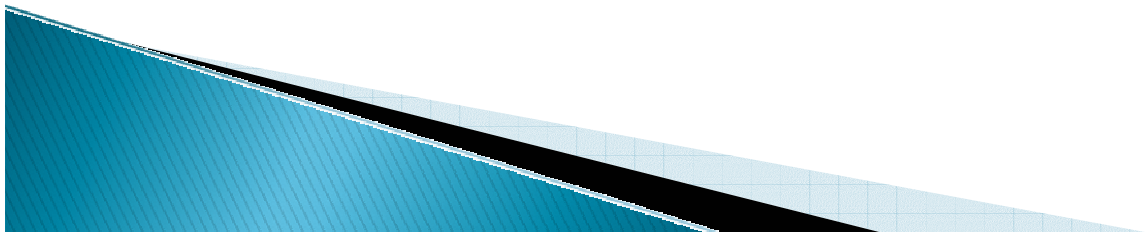
Curve progression post maturity

- Curves <30 degrees have no risk of progression into adult life
- Curves of 30-50 degrees may progress slightly but rarely clinically significant
- Curves >50 degrees progress 0.5-1 degree per year (probably not linear)



Treatment options–**Late Onset Idiopathic Scoliosis**

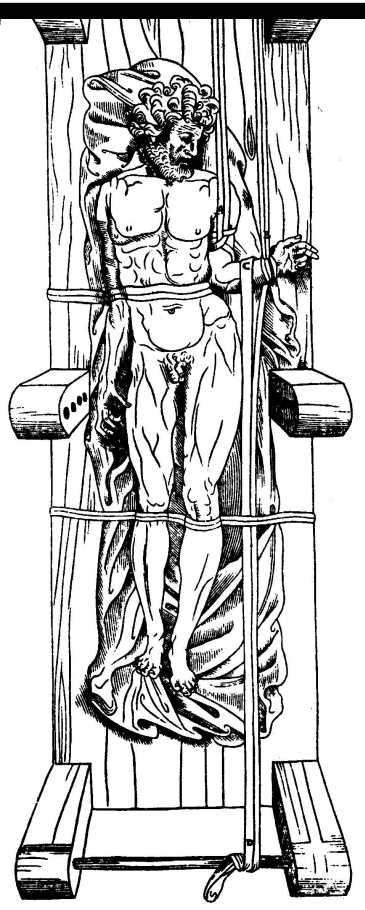
- Observation
- Brace treatment
- Surgery



BRACE TREATMENT

- Oldest orthopaedic treatment
- Hippocrates 400BC

- CTLSO-Milwaukee
- TLSO - Boston



present standards

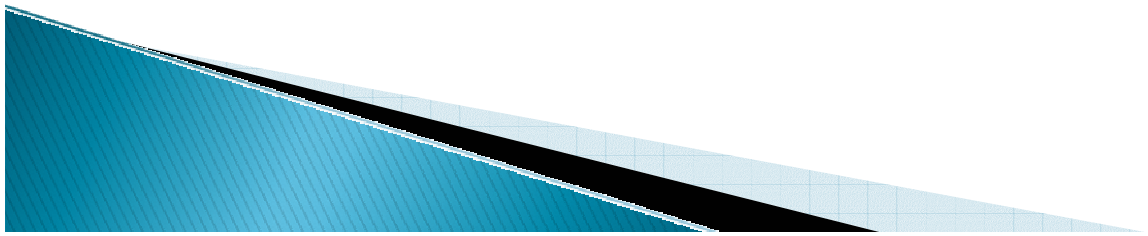
- prevention of progression
- but no reduction of curve
- for constraint not correction

contraindications

- skeletally mature = risser 4, 5
- curves < 25 - >40°
- progression < 5° within 6 mths

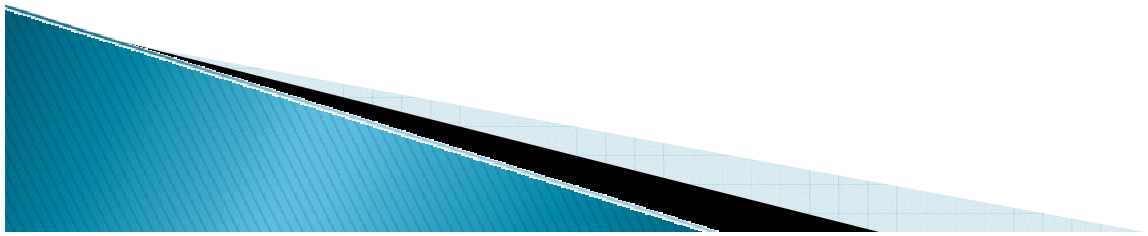
Bracing

- Evidence for using brace contradictory
- Some papers support ability to hold curve progression
- Others show no difference to controls
- Papers supporting use of brace show in order to be effective need to wear 23hrs/day
- Papers show poor compliance with brace use
- Uncomfortable and in general not liked by teenagers can have psychological effects



Role of Surgery

- Prevention of curve progression
- Avoidance of cardio-pulmonary complications
- Improve cosmesis
- Improve pain levels



Types of surgery

- Anterior correction (open and thoracoscopic)
- Anterior release (open and thoracoscopic) – prevents crankshaft in young patients, increases flexibility, increases fusion potential
- Posterior correction
- Costoplasty–as part of scoliosis correction or stand alone procedure NB recurrence if done too early

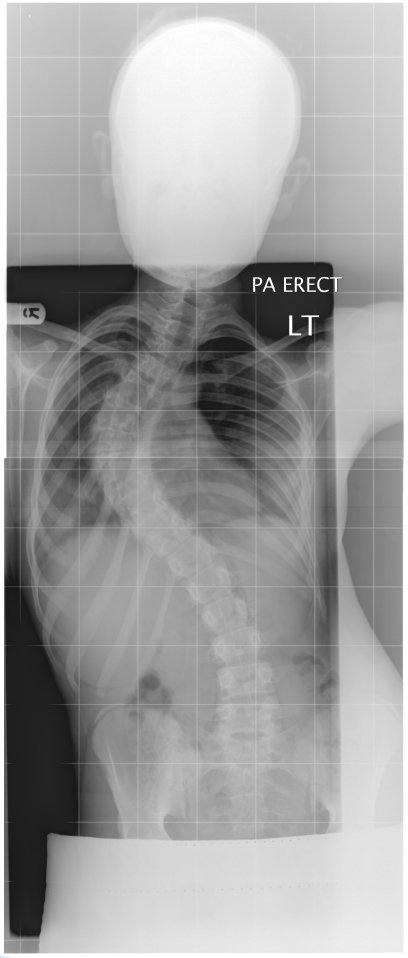
Complications and disadvantages of surgery

- Paralysis -Posterior 1in 600 to 1000 cases anterior probably less as shortening spine
- Infection 1-2% posterior anterior less common
- Pseudarthrosis
- Pain post surgery especially thoracotomy patients
- Major haemorrhage and vascular injury
- Long recovery period at important period of life

Surgical decision making

- Should be done over multiple visits
- In depth discussions need to be had with patients and relatives
- Only when they have all the information can patients make informed decisions
- Even though complications can be devastating in this surgical group the majority of patients are very happy with results and would go through procedure again

Example-13 year old girl late onset



Thoracoscopic anterior release and posterior instrumented fusion