

Scoliosis

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What is Scoliosis

- S shaped deformity of the spine on the coronal plane of the body (cobb angle $> 10^{\circ}$)
- Typically consists of
 - Proximal thoracic curve (down to T5)
 - Main thoracic curve
 - Thoraco- Lumbar/Lumbar curve

Location of Apex (SRS Definition)	
Curve	Apex
Thoracic	T2 to T11-12 Disc
Thoracolumbar	T12-L1
Lumbar	L1-2 Disc to L4

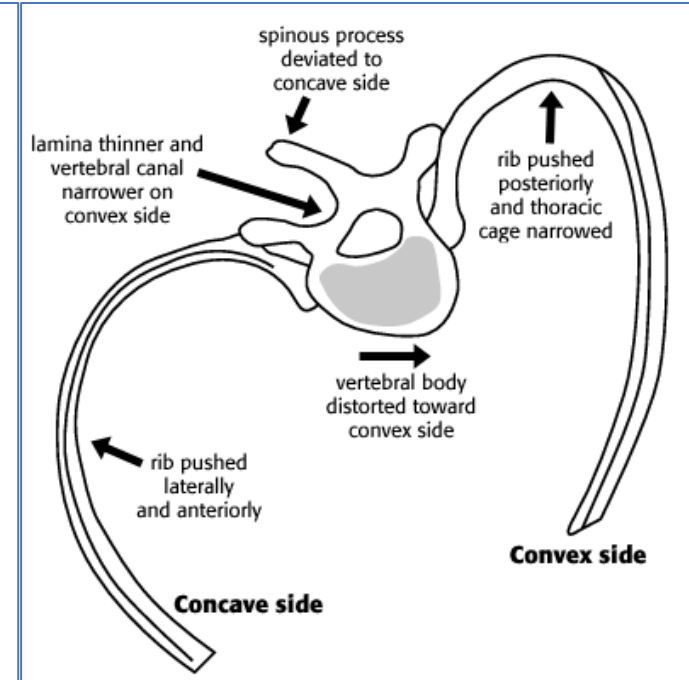
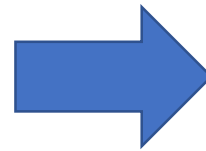
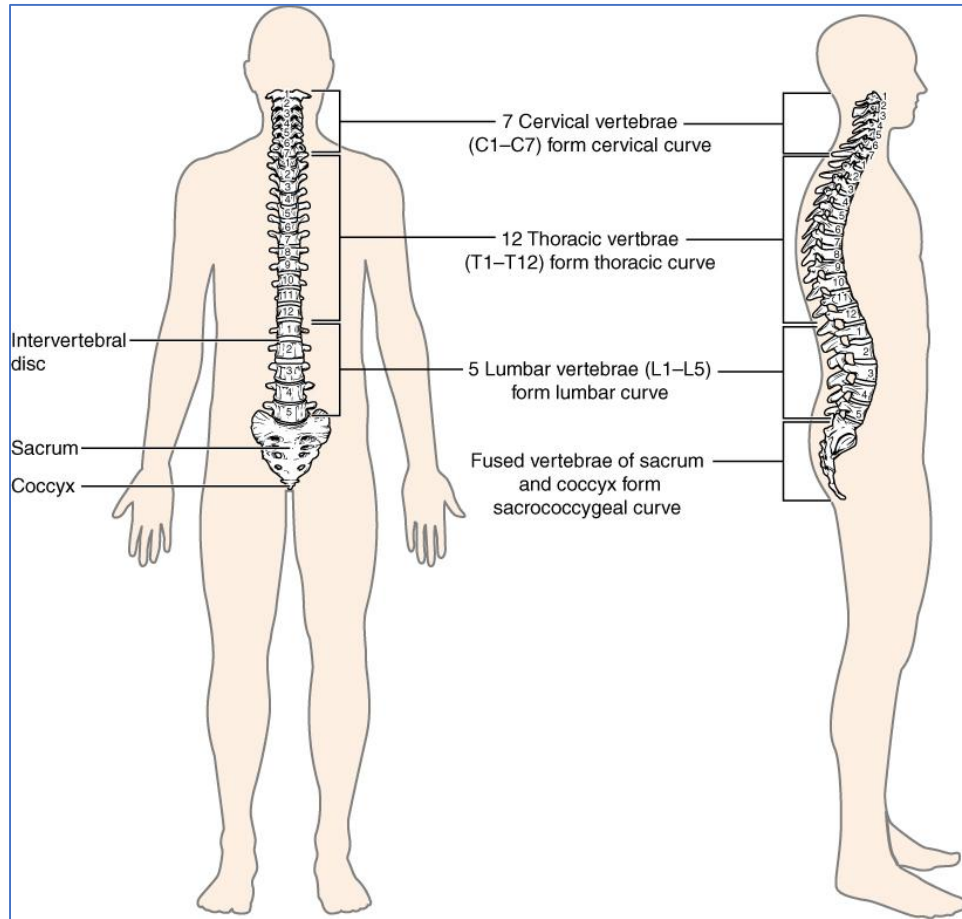


Statistics



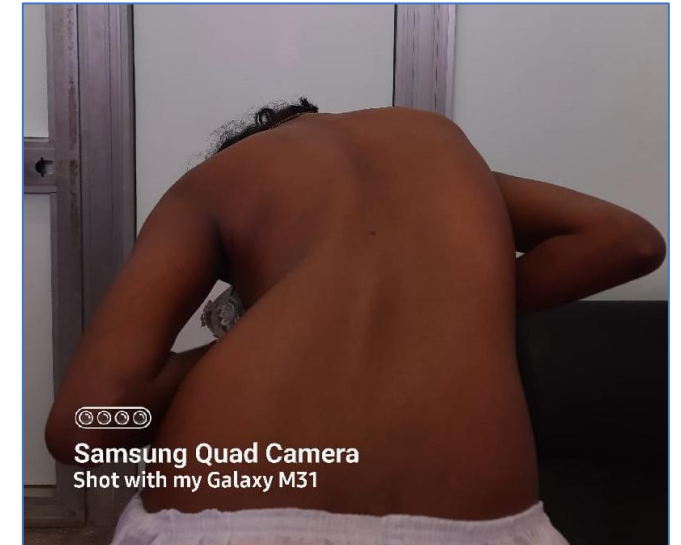
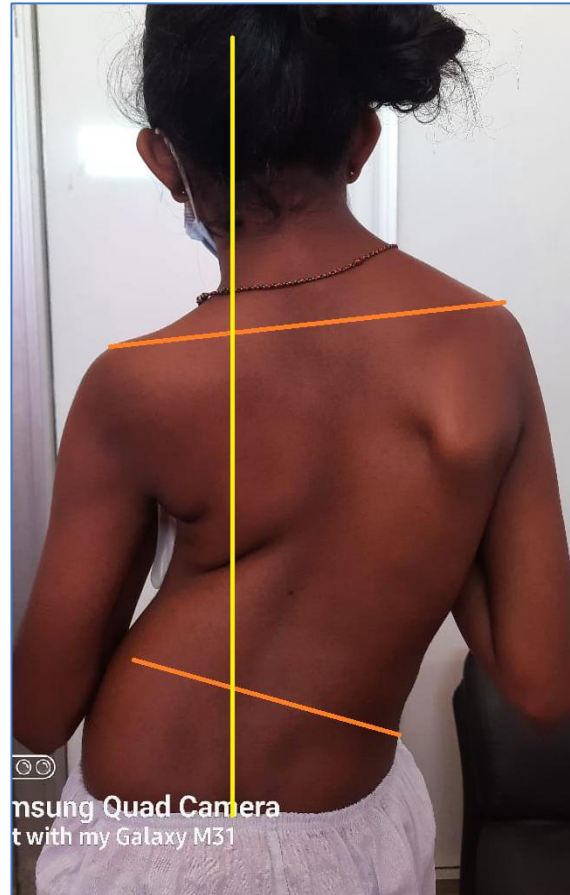
- ❧ ~2% of children affected at some stage of life
- ❧ ~10% of affected patients will require corrective surgery
- ❧ Occurs in 1-3% of population below the age of 16 years.
- ❧ 0.1% have a curve greater than 40 degrees.
- ❧ Girls are more affected than boys.
- ❧ Those with a curve of more than 30 degrees are generally girls, outnumbering boys by 10:1.

What is Scoliosis – 3D deformity



What is scoliosis – Clinical deformity

- Rib hump
- Shoulder imbalance
- Trunk Shift
- Pelvic tilt
- Kyphosis

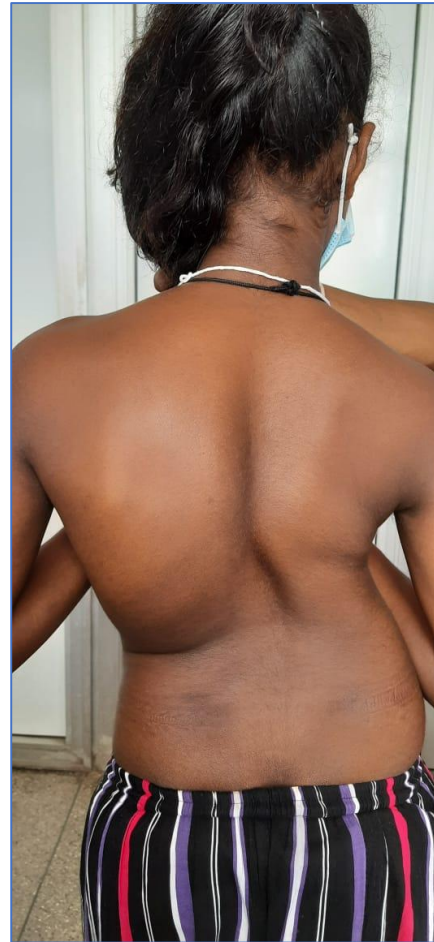


What is scoliosis – Clinical Assessment



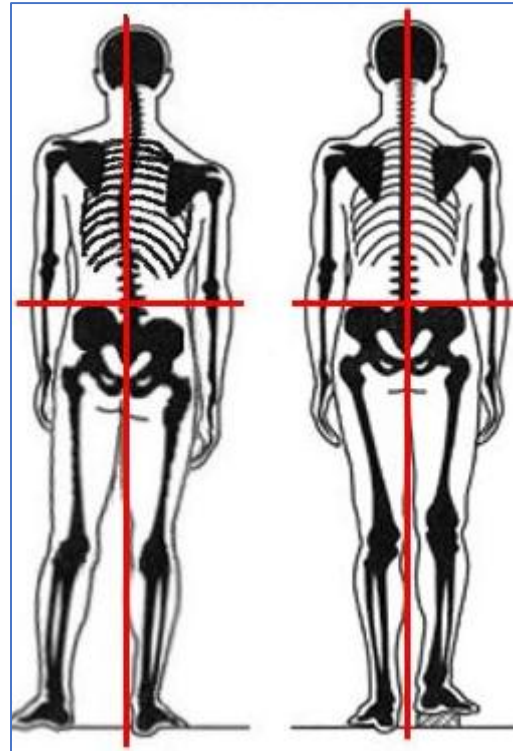
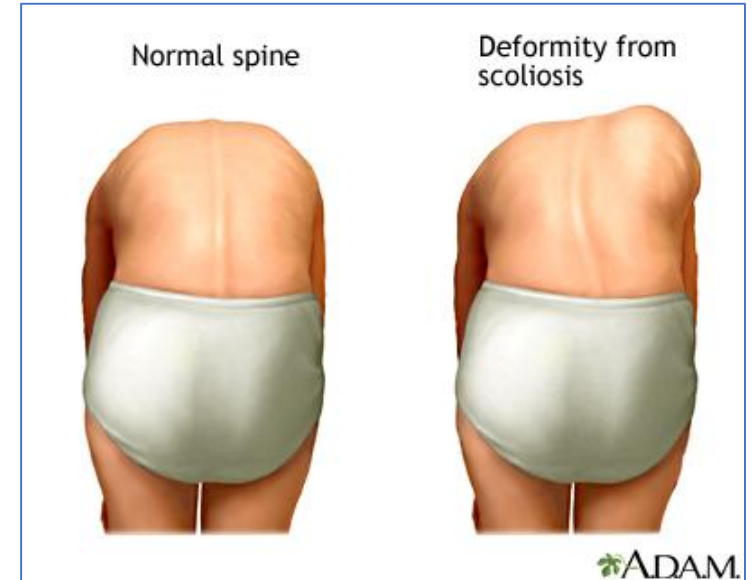
Red Flags

- Left Thoracic curve
 - (apex on left side)
- Pain
- Neurological deficit
- Family Hx of NF



What is scoliosis – Clinical Assessment

- Structural or Non structural
 - Adams forward bending test
- Leg length discrepancy



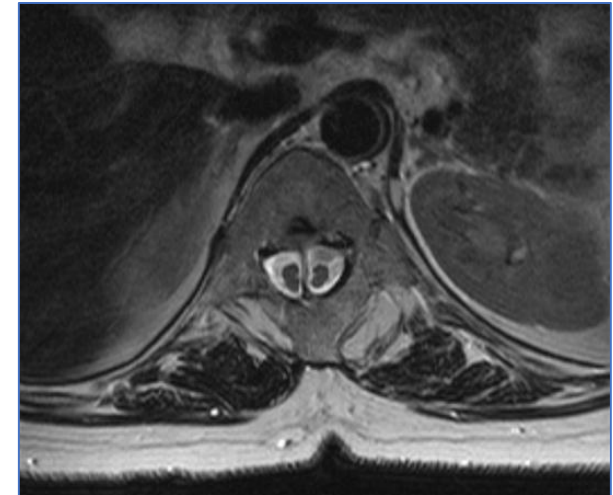
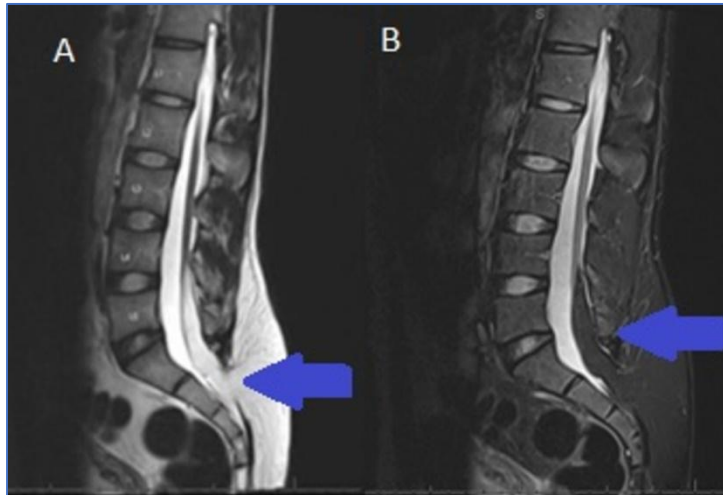
What is scoliosis – Radiological Assessment

- Standing full spine Orthogram (X Ray) – AP & Lateral
 - Assess severity
 - Measure angles
 - Follow up
- Bending films
- Bone age determination
- CT – Assess bony abnormality
 - Formation segmentation defects
 - Pedicle sizes



What is scoliosis – Radiological Assessment

- MRI – Assess spinal dysraphism
 - Cord tethering
 - Syringomyelia
 - diastematomyelia

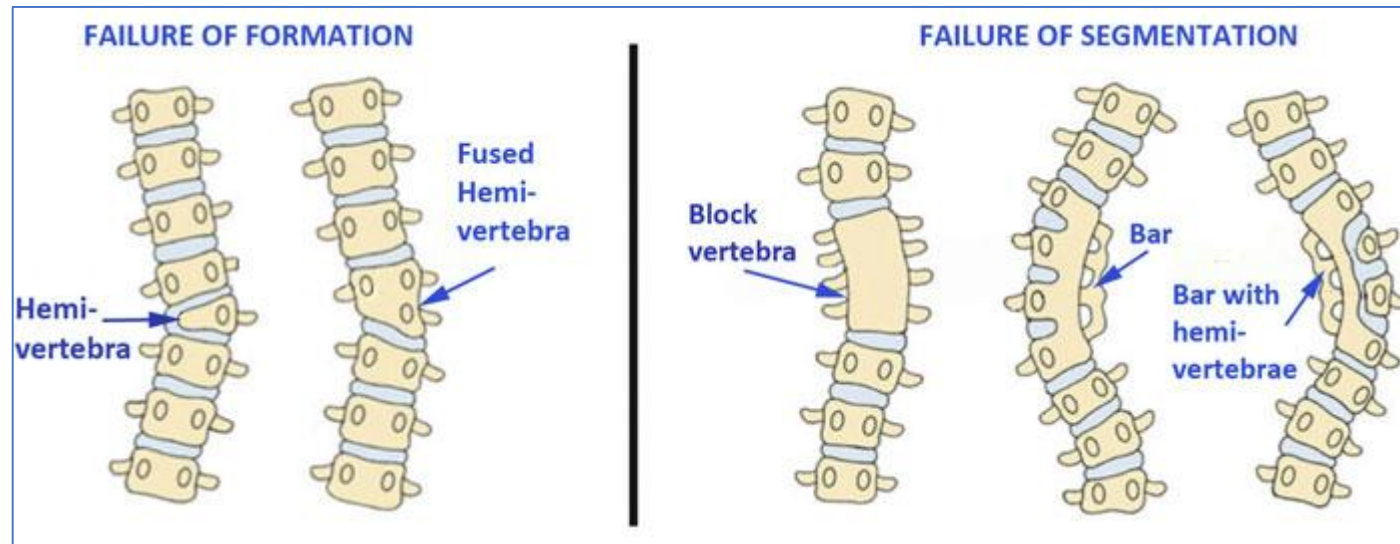


Types of Scoliosis

- Etiological
 - Congenital
 - Neurological
 - Idiopathic
 - Adult Degenerative

Congenital scoliosis

- Formation and segmentation defects
 - Hemivertebra
 - Butterfly vertebra
 - Unsegmented vertebrae
 - Bony bar/ Spodylocostal dysostosis
 - Congenital Spondylolisthesis



Types of congenital scoliosis



Congenital scoliosis

- Associations
 - VACTERL
 - Syndromes

- Marfan syndrome
- Ehlers-Danlos syndrome
- Other connective tissue disorders
- Muscular dystrophy
- Osteochondrodystrophy (dwarfism)
- Neurofibromatosis (NF)
- Noonan Syndrome
- VATER/VACTERL Syndrome
- Angelman Syndrome
- Rett
- Prader Willi
- Osteogenesis Imperfecta
- Trisomy 21 (Down's Syndrome)

Neurogenic scoliosis

- Causes
 - Cerebral Palsy
 - Meningomyelocoele
 - Following encephalopathy/ hemiplegia
 - Hereditary Sensory Motor Neurone disease
 - Seizure disorders
 - Muscular dystrophy (Duschenne)

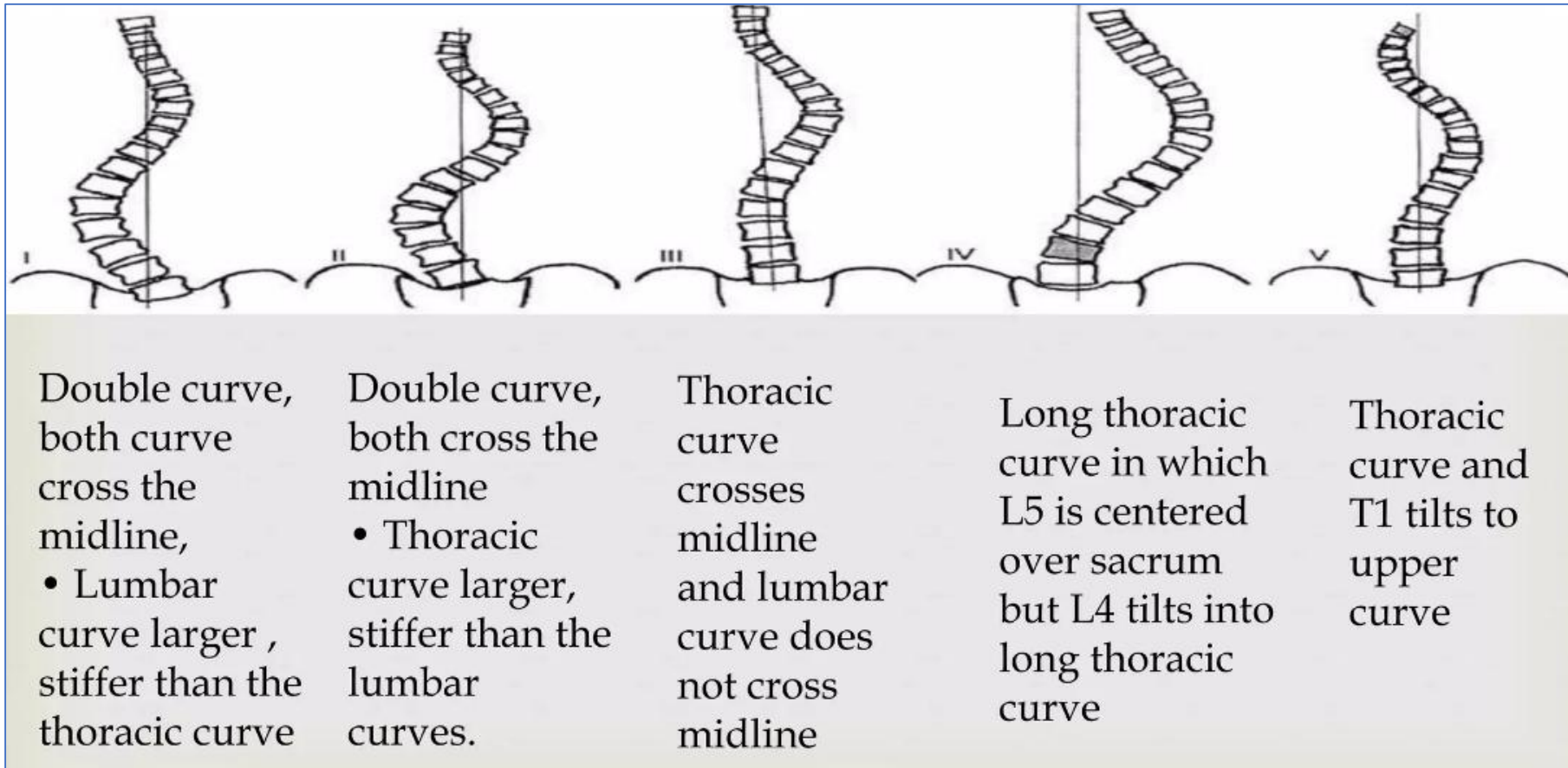


Idiopathic scoliosis

- Infantile - < 3years
 - Juvenile - < 10 years (Early onset)
 - Adolescent
-
- Probably multiple contributing factors
 - Some genetic predisposition (not consistent)
 - Discrepancy of Muscle excitatory potential on either side of the spine
 - 30% Vit D deficiency

Classification (idiopathic scoliosis)

- King Classification



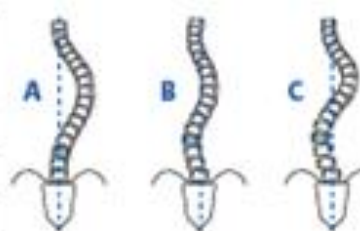
- Lenke

The Lenke classification system for AIS				
Curve type	Proximal Thoracic	Main Thoracic	Thoracolumbar/Lumbar	Description
1	Nonstructural	Structural*	Nonstructural	Main Thoracic
2	Structural ^x	Structural*	Nonstructural	Double Thoracic
3	Nonstructural	Structural*	Structural ^x	Double Major
4	Structural ^x	Structural [§]	Structural [§]	Triple Major
5	Nonstructural	Nonstructural	Structural*	Thoracolumbar/Lumbar (TL/L)
6	Nonstructural	Structural ^x	Structural*	Thoracolumbar/Lumbar-Main Thoracic (TL/L-MT)

***Major curve:** largest Cobb measurement, always structural; **^xMinor curve:** remaining structural curves; **[§]Type4 – MT or TL/L can be the major curve**

Structural Criteria (Minor curves)	
Proximal Thoracic	• Side Bending Cobb $\geq 25^\circ$ • T2-T5 Kyphosis $\geq +20^\circ$
Main Thoracic	• Side Bending Cobb $\geq 25^\circ$ • T10-L2 Kyphosis $\geq +20^\circ$
Thoracolumbar/Lumbar	• Side Bending Cobb $\geq 25^\circ$ • T10-L2 Kyphosis $\geq +20^\circ$

Location of Apex (SRS Definition)	
Curve	Apex
Thoracic	T2 to T11-12 Disc
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Modifiers		
Lumbar Spine Modifier	Center Sacral Vertical Line to Lumbar Apex	
A	Between pedicles	
B	Touches apical body(ies)	
C	Completely medial	

Thoracic Sagittal Profile T5-T12	
Modifier	Cobb Angle
- (Hypo)	$< 10^\circ$
N (Normal)	$10^\circ - 40^\circ$
+ (Hyper)	$> 40^\circ$

Curve Type (1-6) + Lumbar Spine Modifier (A, B, C) + Thoracic Sagittal Modifier (-, N, +) = Curve Classification (e.g. 1B+):

Progression

- Naturally curve progress as spine grows
- Some have rapid progression (?why)
- Management is a compromise between spinal growth and curve progression

Progression

- 30 – 50 degrees – progress 10 -15 degrees over life time
- > 50 degrees – 1 degree / year
- <30 degree at bone maturity – no progression
- >90 degrees increase risk of life threatening effects on pulmonary function

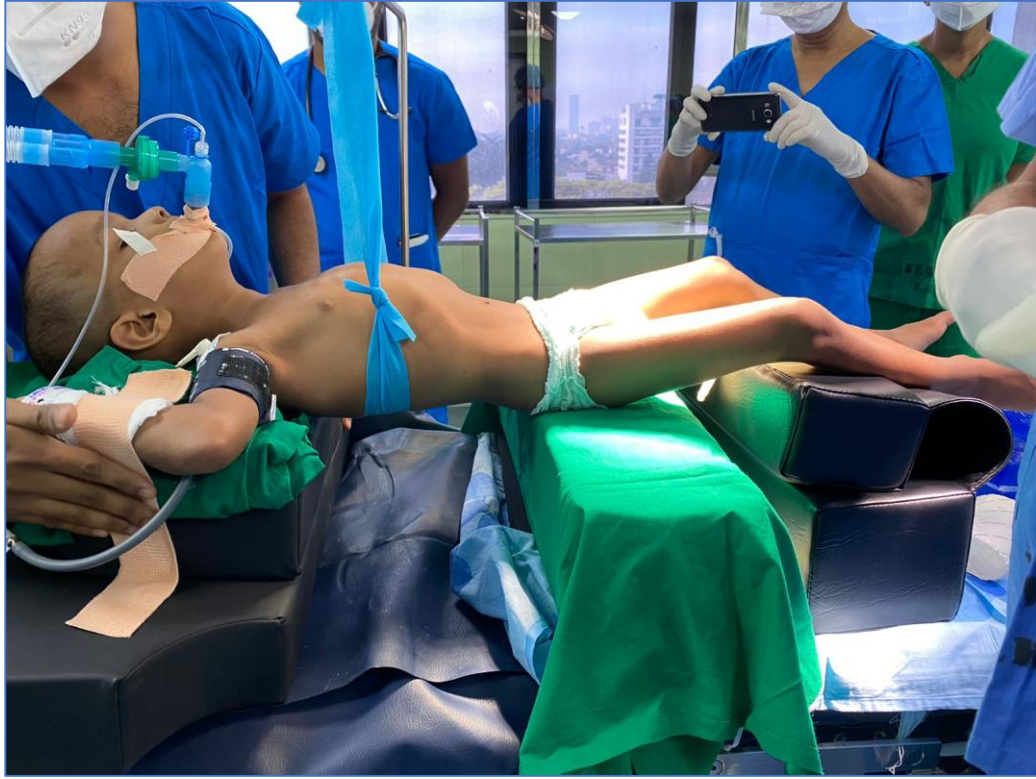
Non Surgical Management

- Smaller curves
- To buy time
- Not a candidate for surgery

Mehta casting (Traction and casting)

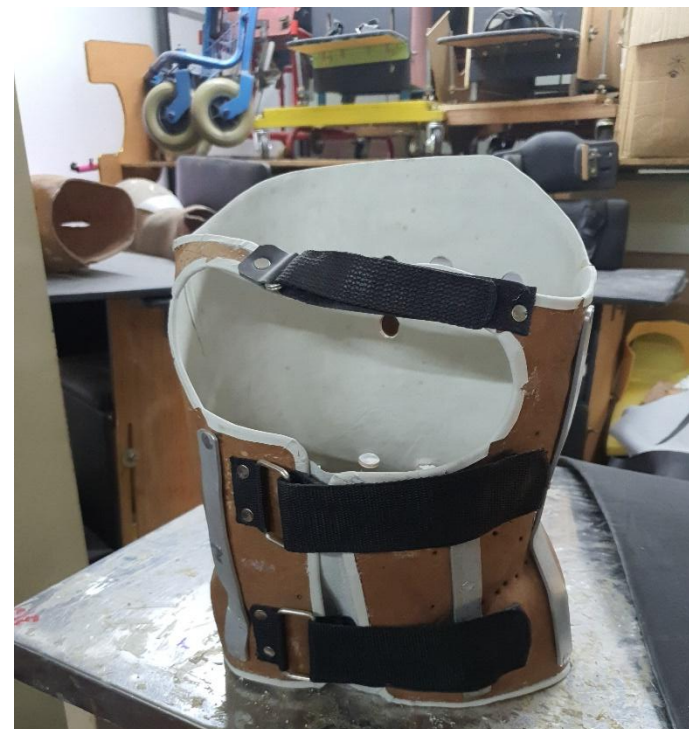
- < 5 years
- Serial Casting
- Every 3 months
- Complications
 - Skin abrasions
 - Dermatitis
 - Pressure sores
 - Breathing complications





Bracing

- To control curve progression
- Before skeletal maturity
- Cannot straighten the spine
- Definitive management or to buy time
- Brace efficacy
 - 60% - 80%
 - More with thoracic curves than lumbar curve
 - Less with obesity
 - 23 hrs /day - efficacy reduces with poor compliance



(A)



(B)



(C)

RISER	CURVE	Action
0 - 1 0 - 1	0 - 20 degrees 20 - 40 degrees	Observe Brace
2 - 3 2 - 3	0 - 30 degrees 30 - 40 degrees	Observe Brace
0 - 3 0 - 4	40 - 50 degrees 50 degrees and higher	Gray Surgery

Specialised wheelchair

- Severe Neurological deficiencies
- Not suitable for surgery



Role of physiotherapy

- Helps muscle strengthening gait and balanced.
- When coming off the brace
- Cannot straighten the spine
- Not a mode of scoliosis management
- Reduces compliance with the brace

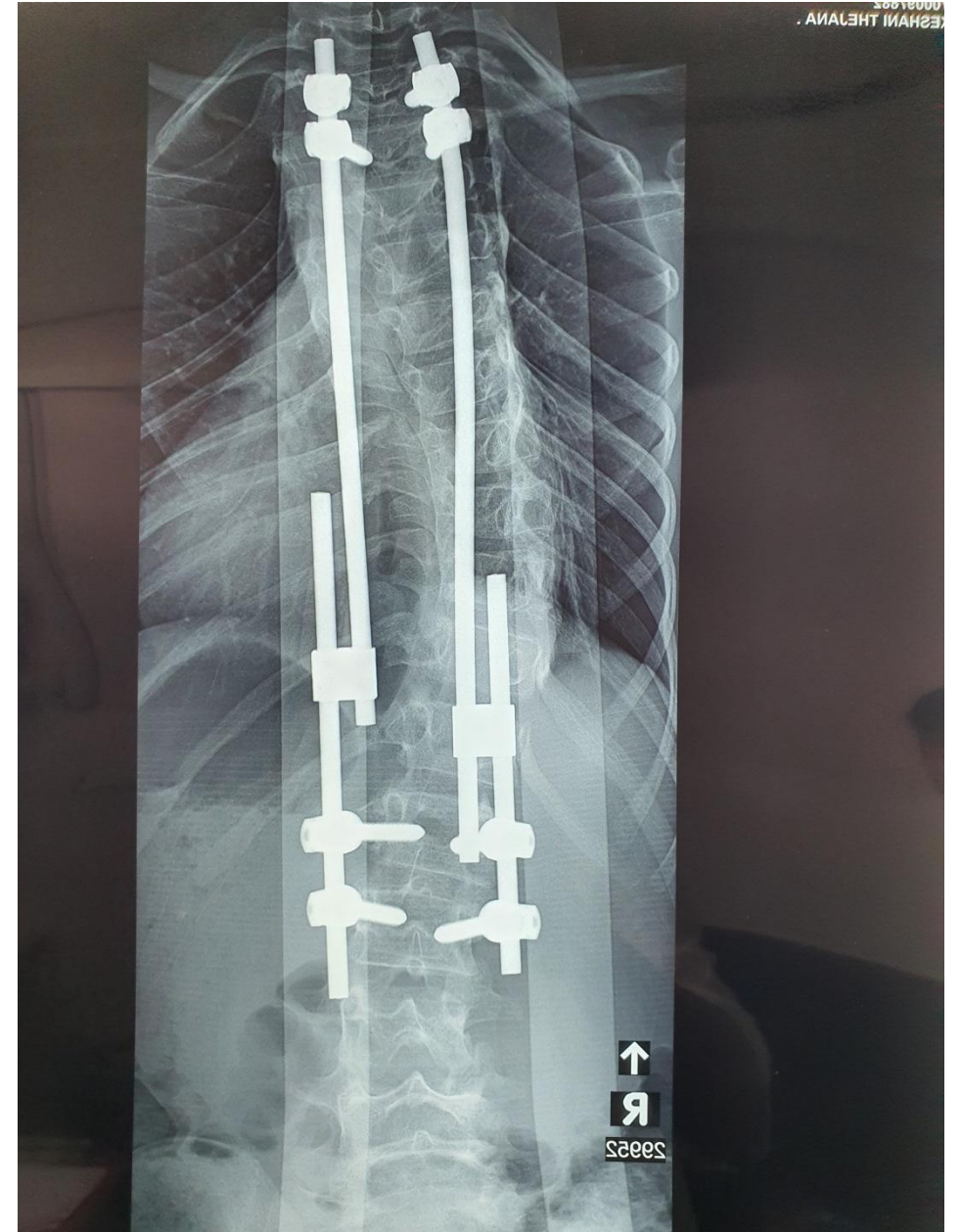
Surgical Management

- Hemivertebrectomy / insitu fusion
 - By 5 years
 - For single hemivertebra

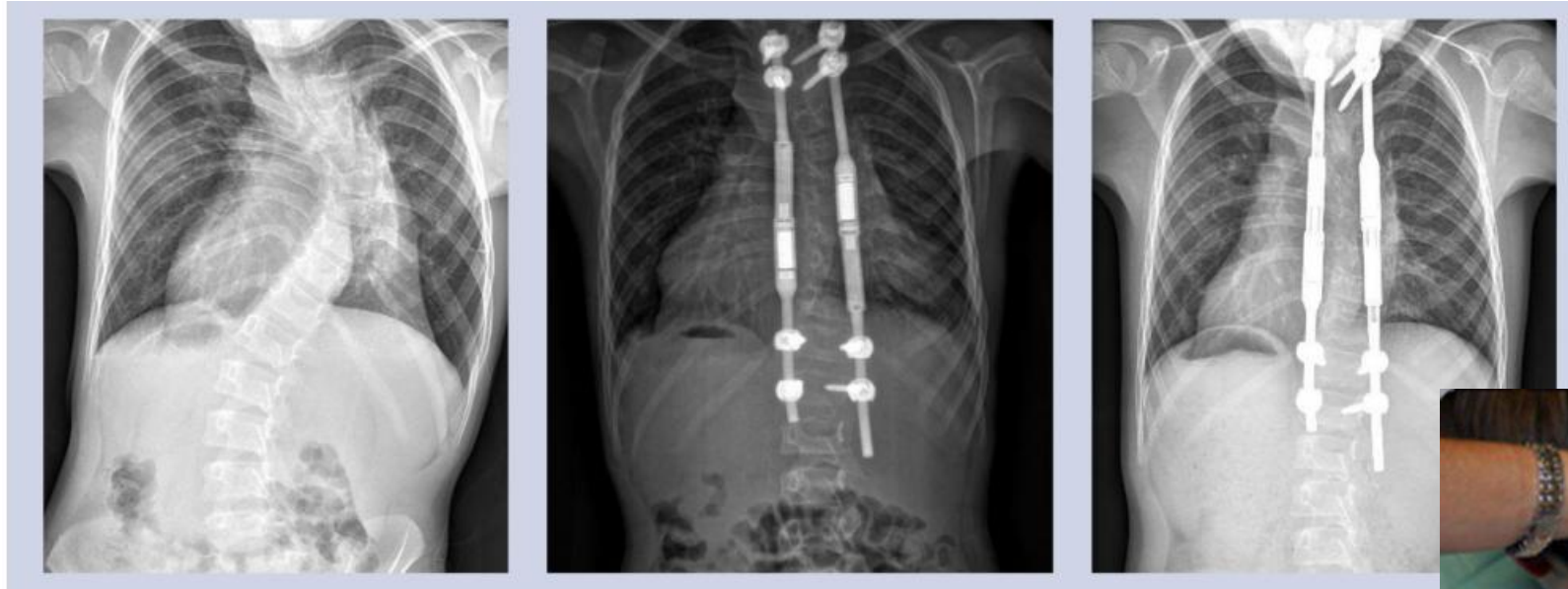


Growth Rods

- Prepubertal
- Around 10 years
- Distraction every 6 months
- Definitive surgery after adequate bone maturity

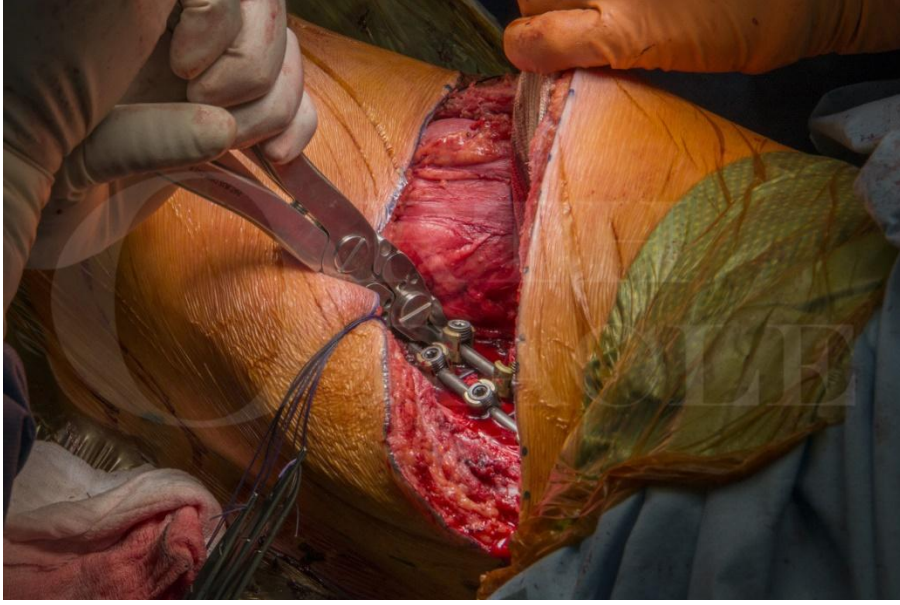


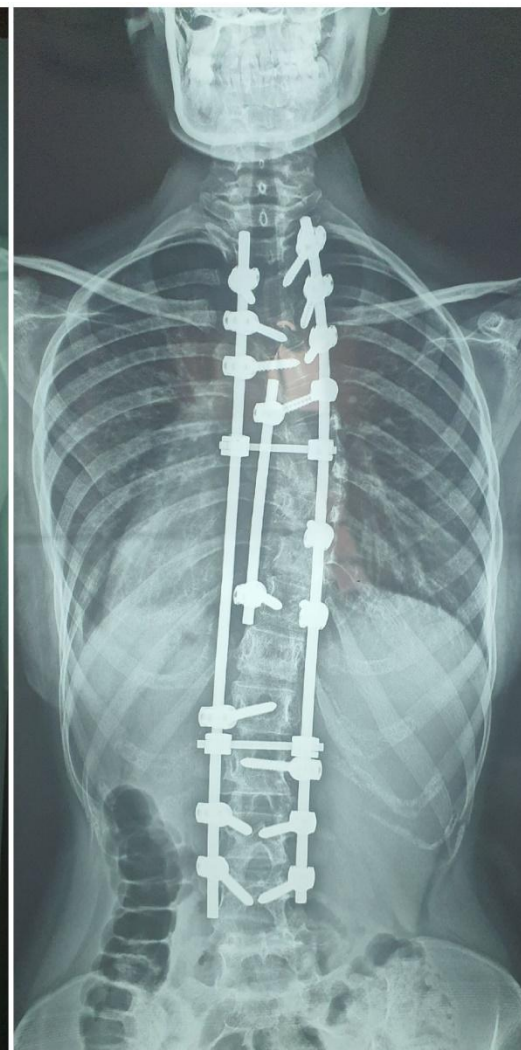
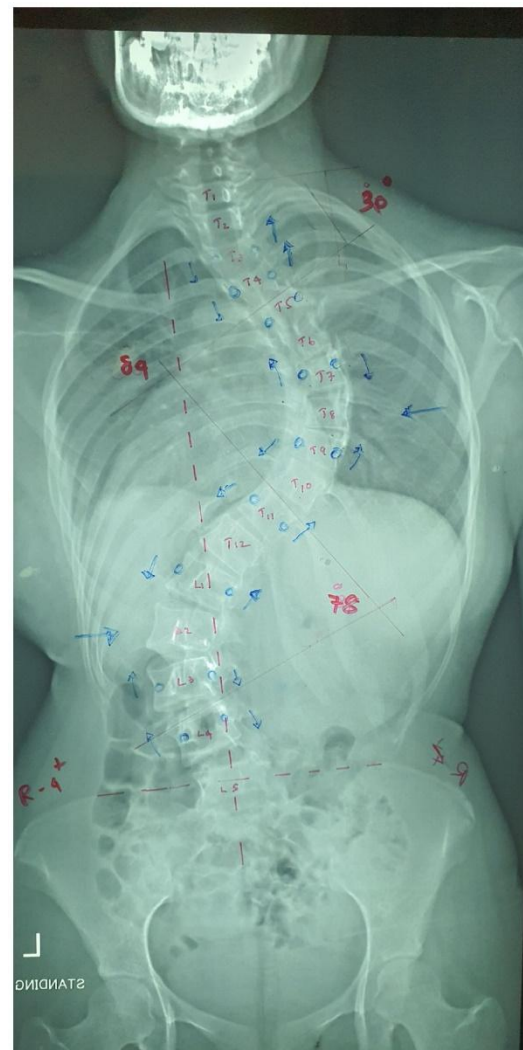
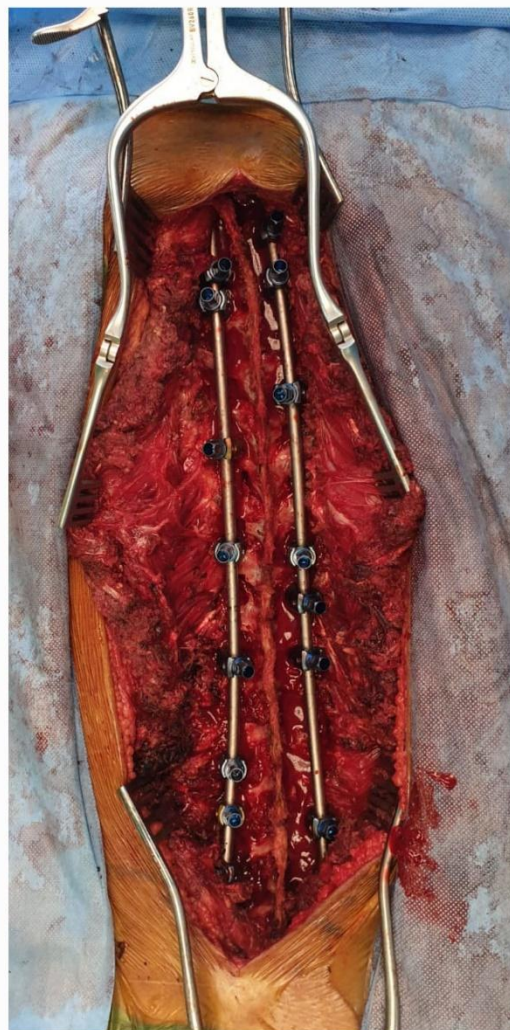
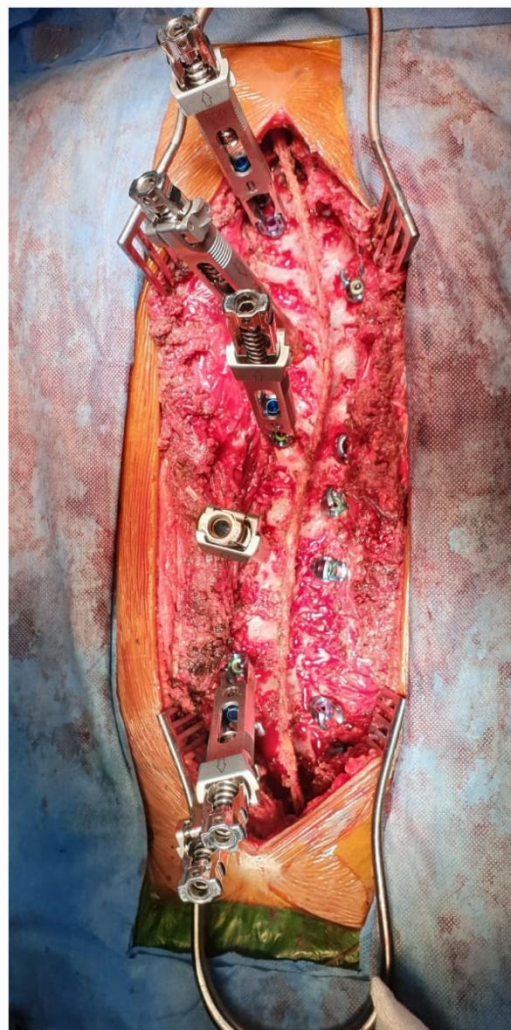
Magnetic growing device



Definitive Surgery

- Anterior
 - Posterior
 - Anterior and Posterior
-
- After adequate bone maturity
 - Post pubertal
 - Neurogenic scoliosis
 - > 50 degrees





Severe curves $> 90^{\circ}$

- Halo traction
- Anterior and posterior
- Vertebral osteotomy



Complications (Major)

- Paralysis – 1% (temporarily / permanent)
- Bleeding / massive transfusion/ DIC
- Blindness
- Death

General information

- Recovery 6 weeks
- Not advised for heavy weight lifting / contact sports
- Implants are for life
- Needs general anesthesia for future procedures
- < 30 degrees no surgery
- 30 – 50 degrees – only if patient insists considering the cosmetic and psychological derangement.
- > 50 degrees – best managed with surgery

@ LRH – Since 2021

- 230 Scoliosis Corrections
(6 -8 Cases / month)
- No permanent neurological deficits / deaths
- Average Age : 14 Y and 2 months
- 85% - female
- Average MTC – 68° (Max – 135°)
- Average TL/L – 51° (Max – 100°)
- Severe Scoliosis $>90^{\circ}$ – 16.2%



Myths

- School bag is not responsible
- Lifting weights , sports are not contributory factors
- Native treatment has no proven evidence.
- Do not have to sleep in flat surface (normal mattress is ok)
- Smaller stable curves could have normal life, normal work.

? Military Service

Thank you

