

# NEUROMUSCULAR SCOLIOSIS

**Ahmad Jaafar**

MD, FRCPC

Pediatric Complex Care

Clinician Educator Program

McMaster University

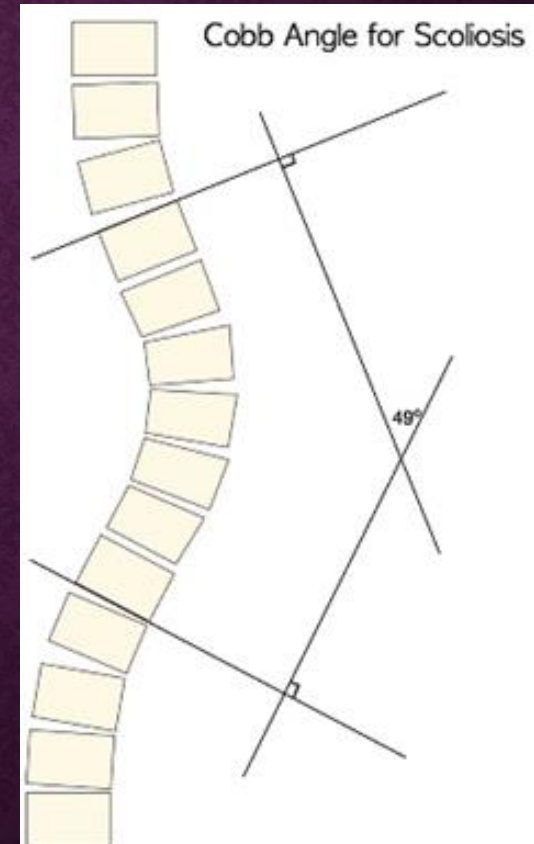
# OBJECTIVES

Understand the:

- Definition & types of scoliosis in children
- Differences between types of scoliosis
- Complications, associations & clinical features of scoliosis
- Investigations of scoliosis
- Red flags of scoliosis
- Treatment of scoliosis
- Complications & monitoring of spinal fusion

# DEFINITION

Curve on the coronal plane of at least **10 degrees**, measured by the Cobb method on AP X-ray



# TYPES OF SCOLIOSIS

- Idiopathic
- Congenital
- Neuromuscular

# IDIOPATHIC SCOLIOSIS

1. **Infantile scoliosis**, < 3 years, mostly spontaneously resolve
  - A/W ovarian abnormalities
2. **Juvenile scoliosis**, 3 – 10 years
3. **Adolescent idiopathic scoliosis**, age > 10 years, more common in females

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Often result from **muscular imbalance**

- Common causes: CP, MD, SMA & spinal cord injury

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**Risk in CP: 21-64%**

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## Patterns:

1. **Group-I curves: Double curves** (thoracic + lumbar), often in ambulatory patients, with minimal pelvic obliquity
2. **Group-II curves: Single curves** (thoracic or lumbar), often in quadriplegic patients, almost all display significant pelvic obliquity



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# NEUROMUSCULAR SCOLIOSIS

## Pelvic obliquity:

- **Definition:** Angulation of the pelvis to the horizontal plane
- **Causes:**
  1. Supra-pelvic (spinal deformity)
  2. Pelvic/infra-pelvic (lower limb contractures)
- **Complications:**
  - Pressure injury, impaired sitting balance, hip pathology

# DIFFERENCES BETWEEN NEUROMUSCULAR SCOLIOSIS & IDIOPATHIC SCOLIOSIS

## 1. Rate of progression

- Faster in children with neuromuscular scoliosis
- Continues past skeletal maturity with neuromuscular scoliosis

## 2. Age of development (earlier [ $<10$ Y/O] with neuromuscular scoliosis )

## 3. Risk of complications (more with neuromuscular scoliosis)

## 4. Management

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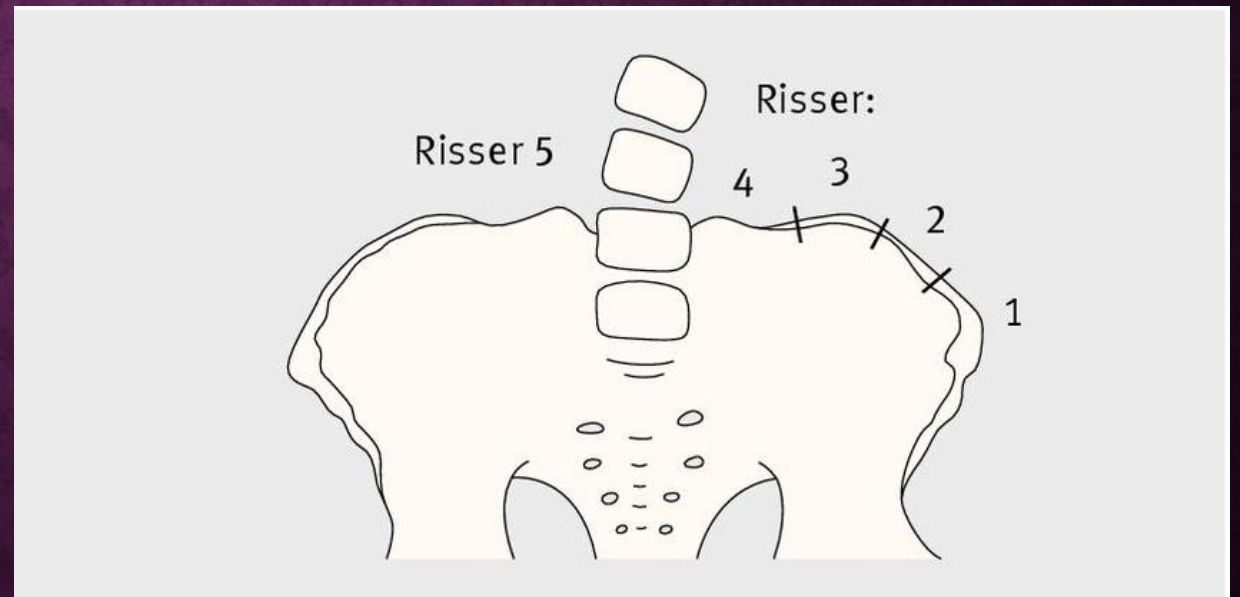
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# SKELETAL MATURITY & WORSENING OF SCOLIOSIS

- Younger age
- Premenarchal status
- Tanner stage I or II
- Risser stage 0 or 1



# NEUROMUSCULAR SCOLIOSIS & LEVEL OF DISABILITY

**The more the disability** (e.g., GMFCS) → the less the ambulation → the more the risk of scoliosis & the more severe the scoliosis

# COMPLICATIONS OF SCOLIOSIS

1. Cosmetic and psychosomatic complications
2. Pain/irritability
3. Mobility/sitting/care provision issues
4. Restrictive lung disease (Cobb  $\geq 50^\circ$ )
5. Cor pulmonale (Cobb  $\geq 80^\circ$ )
6. SMA syndrome

# COMPLICATIONS OF SCOLIOSIS

## Complications of abnormal sitting:

1. Increased risk of reflux/sialorrhea/aspiration
2. Increased risk of pressure injury
3. Affects vision, communication & mobility
4. Compromises PO feeding





# ASSOCIATIONS WITH SCOLIOSIS

- **Intraspinal abnormality (20% of cases):**
  - Tethered cord or syringomyelia
- **Genetic disorders & syndromes:**
  - NF 1, OI, Marfan syndrome, Ehlers-Danlos syndrome, PWS

# CLINICAL FEATURES OF SCOLIOSIS

- Pain/irritability
- Spinal asymmetry → may interfere with functioning/care
- Adam's test
  - Most sensitive
  - Asymmetric rib prominence
- Neurological findings (if A/W spinal abnormalities)

# INVESTIGATIONS OF SCOLIOSIS

- **AP/lateral X-ray** (1<sup>st</sup> line)
- **MRI** (indications in idiopathic scoliosis):
  - Pain
  - Neurological symptoms
  - Boys
  - Age < 10 Y/O
  - Rapid progression
  - Side of curvature

# RED FLAGS OF IDIOPATHIC SCOLIOSIS

- Left-sided in adolescents and right-sided in infants
- Rapidly progressive
- Painful/abnormal neurological examination
- Cobb angle (immature)  $\geq 20^\circ$
- Cobb angle (mature)  $> 45^\circ$

# RED FLAGS OF NEUROMUSCULAR SCOLIOSIS

- Curvature impairs sitting ability
- Pain/irritability
- Pulmonary dysfunction
- Cardiac dysfunction
- Abdominal issues
- Spine bracing fails or is intolerable
- Cobb angle  $>40^\circ$  at a young age

# TREATMENT OF SCOLIOSIS

- 20-30° → F/U (with physiotherapy/seating/spasticity Tx)
- 30-40° → brace
- 40-50° → may consider surgery
- >50° → surgery

# TREATMENT OF SCOLIOSIS

Physiotherapy, seating, and bracing  
are **LESS effective** with scoliosis in  
children with NI

# SURGERY

Posterior spinal fusion with multisegmented fixation is the **MOST COMMON** procedure



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Posterior spinal fusion with multisegmented fixation is the **MOST COMMON** procedure

Significant **pelvic obliquity**/risk of developing pelvic obliquity → instrumentation should extend to the pelvis

# SURGERY

Indications → red flags

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# SPINAL FUSION COMPLICATIONS

1. Pulmonary complications (MOST COMMON)
2. Failed fusion (non-union, hardware breaking, loose hardware)
3. Worsening of back pain
4. Infection
5. Neurovascular injury/paralysis
6. Bleeding & PRBC transfusion → can be significant
7. SMA syndrome
8. Blindness

# PRE-OP MEETING

## Benefits:

1. Improves rate of success
2. Decreases risk of complications

## Who **attends** the meeting?

- Surgeon, PCC, PICU, PT, OT, RD, anesthesia, wound nurse

# FOLLOW-UP

## Pre-OP:

- Every 4 months without brace
- Every 6 months with a brace

# FOLLOW-UP

## Post-OP:

- 2 weeks post op
- 6 weeks post op
- 3 months post op
- 6 months post op
- 12 months post op
- Annually thereafter

**THANK YOU!**

**QUESTIONS?**