Al-Mustaqbal University

Collage of Engineering

Prosthetics and Orthotics Engineering

Third Stage

ORTHOTICS III

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Kyphosis and Scoliosis

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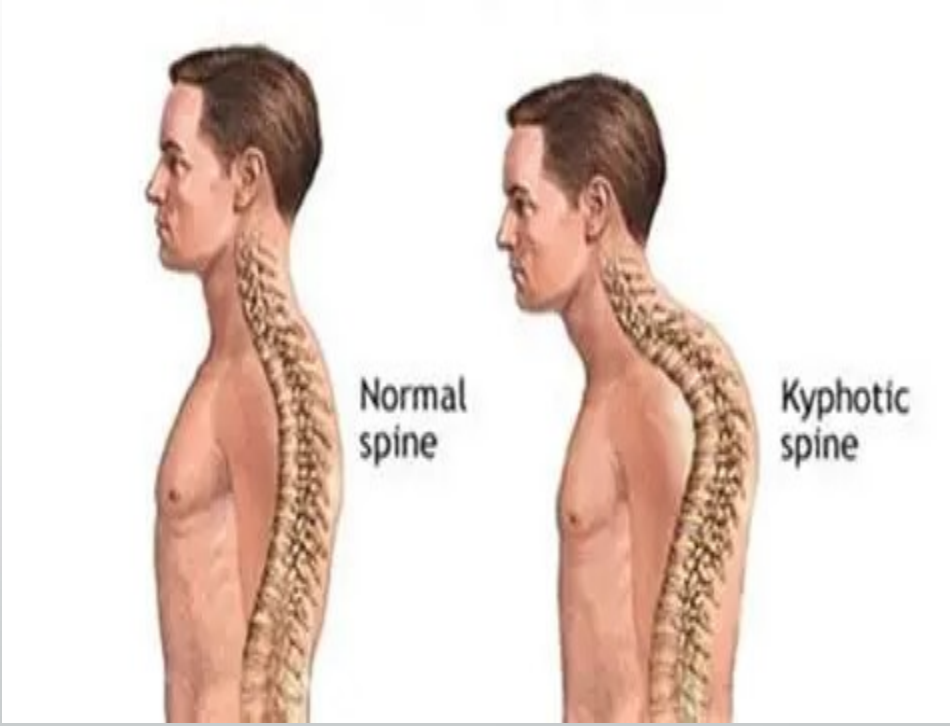
Kyphosis

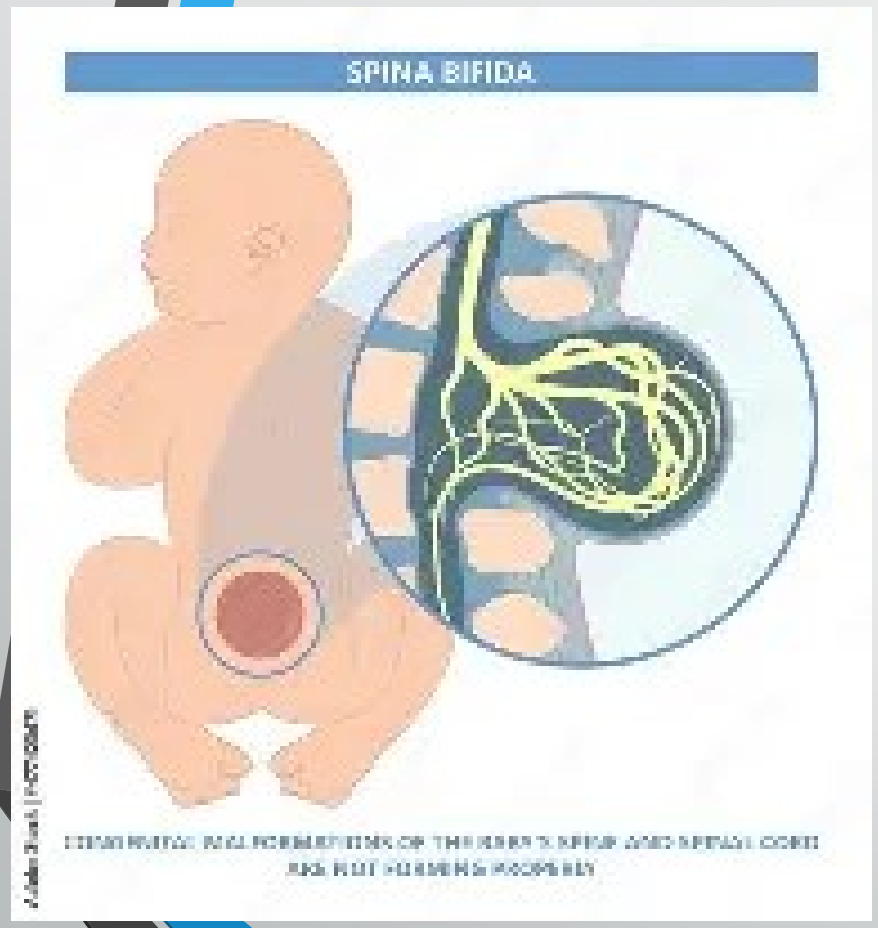
- refers to the normal outward (posteriorly convex) curvature of the thoracic spine when viewed from the side.
- This curve is essential for balanced posture, shock absorption, and efficient load transfer through the trunk during standing and walking.
- However, when the kyphotic curve becomes exaggerated beyond the normal range, it may be described as hyper kyphosis and can causes many complications.

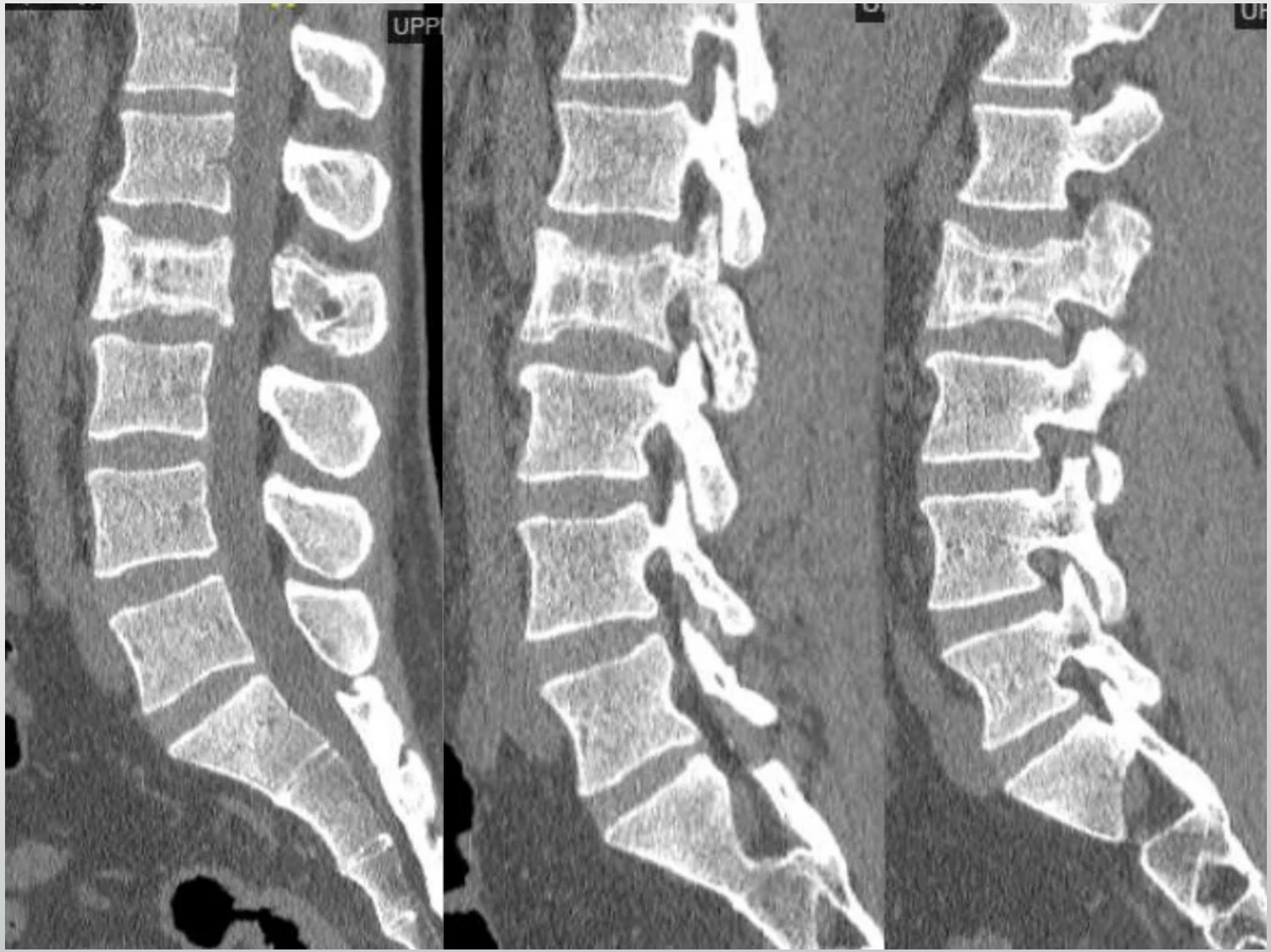


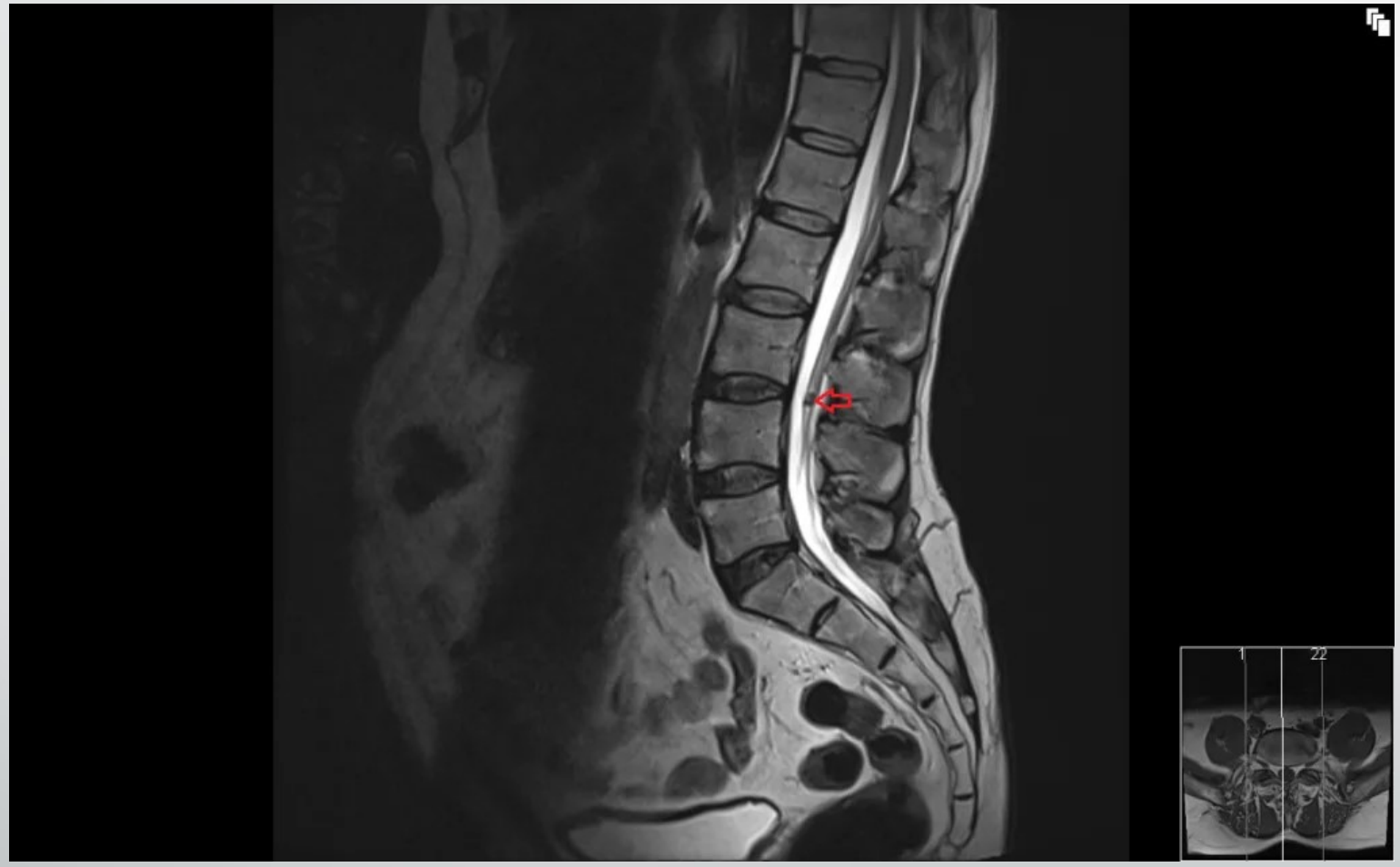
Conditions that cause kyphosis

- Osteoporosis.
- Spondylosis – a medical term used to describe the general 'wear and tear' that occurs in the bones, discs, and ligaments of the spine as a person gets older.
- Spina bifida – a birth condition where the spine has not formed properly
- Paget's disease – a condition in which the development of new bone cells is disrupted, leading to the weakening of the bones.
- Neurofibromatosis – a genetic disorder that affects the nervous system.
- muscular dystrophy – a genetic condition that causes progressive weakening of the muscles.
- Tuberculosis – a bacterial infection that mainly affects the lungs but can sometimes spread.
- Cancer that develops inside the spine or spreads to the spine from another part of the body.

Kyphosis can also develop because of an injury to the spine


SPINA BIFIDA

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Diagnosis of kyphosis:

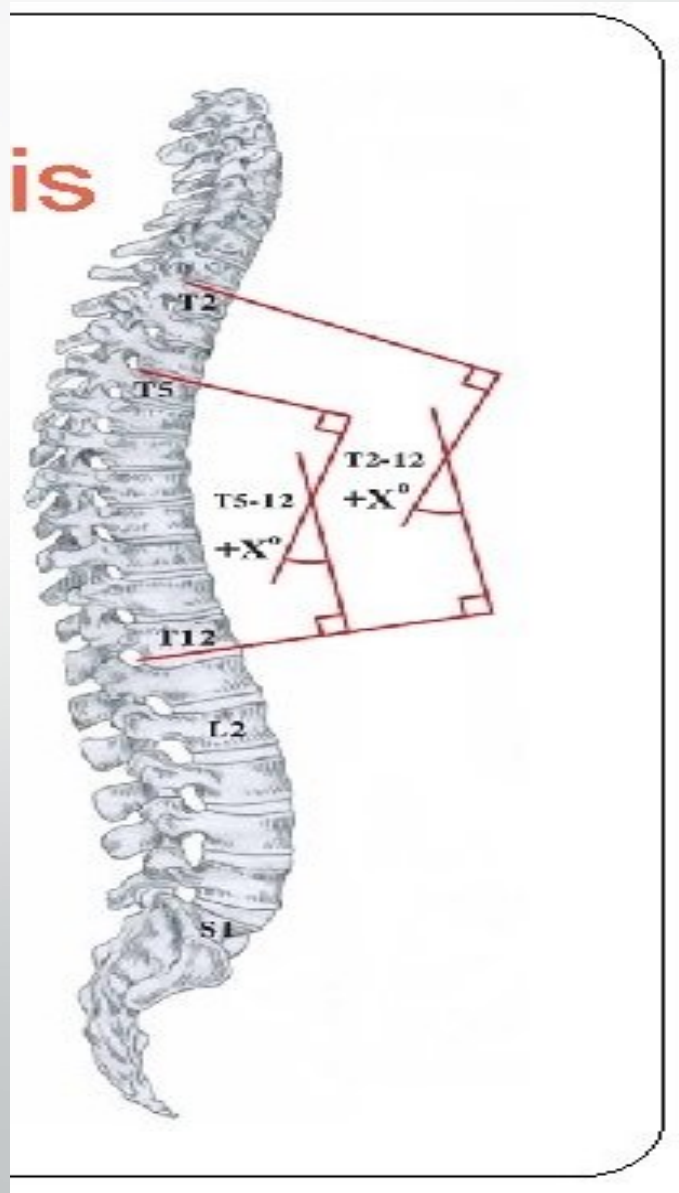
- To diagnose kyphosis, a physical exam will look at the spine, and an X-ray may be required to measure the curve of the spine. The natural curve of the spine is between 20 and 45 degrees.
- Kyphosis is diagnosed when the spine's curve goes beyond 50 degrees.

Physical examination

- Postural inspection (side view): rounded upper back, forward head posture, shoulder protraction.
- Flexibility assessment: If the curve improves when the patient lies down or actively corrects posture, it suggests postural (flexible) kyphosis.
- If the curve remains rigid, it suggests structural kyphosis (e.g., Scheuermann disease, vertebral deformity).
- Palpation: tenderness, muscle spasm, tight hamstrings.
- Neurological screening (if indicated): strength, sensation, reflexes, gait.

Imaging (Confirmation and measurement)

- Lateral spine X-ray is the key test to confirm kyphosis and measure the curve.
- Cobb angle is used between T2-5 AND T12
  - Identify the upper end vertebra and lower end vertebra of the kyphotic curve.
  - Draw lines along the endplates of those vertebrae.
  - Draw perpendiculars to those lines and measure the angle where they intersect

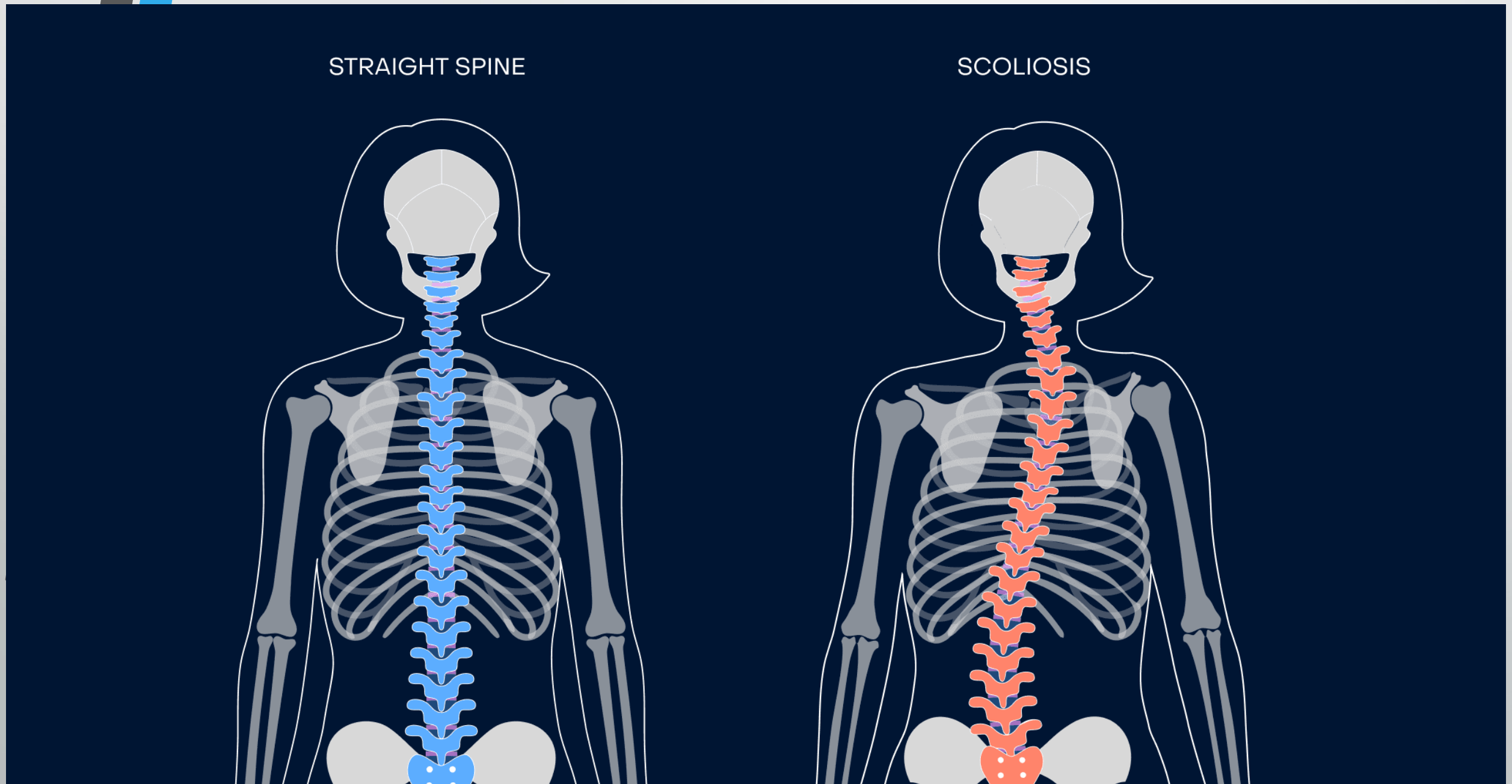


Treatment for a kyphosis

- Kyphosis that is caused by bad posture (postural kyphosis) can normally be corrected by improving posture, and kyphosis is caused by abnormally shaped vertebrae (Scheuermann's kyphosis) will usually improve once the individual is fully grown.

Scoliosis

- Scoliosis is a medical condition in which a person's spine has a sideways curve. The curve is usually "S" or "C" shaped. In some, the degree of curve is stable, while in others it increases over time.
- Mild scoliosis does not typically cause problems, while severe cases can interfere with breathing. Pain is typically not present.
- Scoliosis is defined as a three-dimensional deviation in the axis of a person's spine.
- In the diagnostic sense, it is defined as a spinal curvature of more than 10 degrees to the right or left as the examiner faces the person.
- Scoliosis, a condition describing an abnormal curvature of the spine, may in certain cases be treated with spinal orthoses


STRAIGHT SPINE
SCOLIOSIS

Symptoms of scoliosis can include

- Constipation due to tightened organs from curvature.
- Pain in back, shoulders, and neck, and buttock pain nearest the bottom of the back.
- Nerve pinching of the leg may cause the legs to cut out.
- Limited mobility.
- Painful menstruation.

CONT.

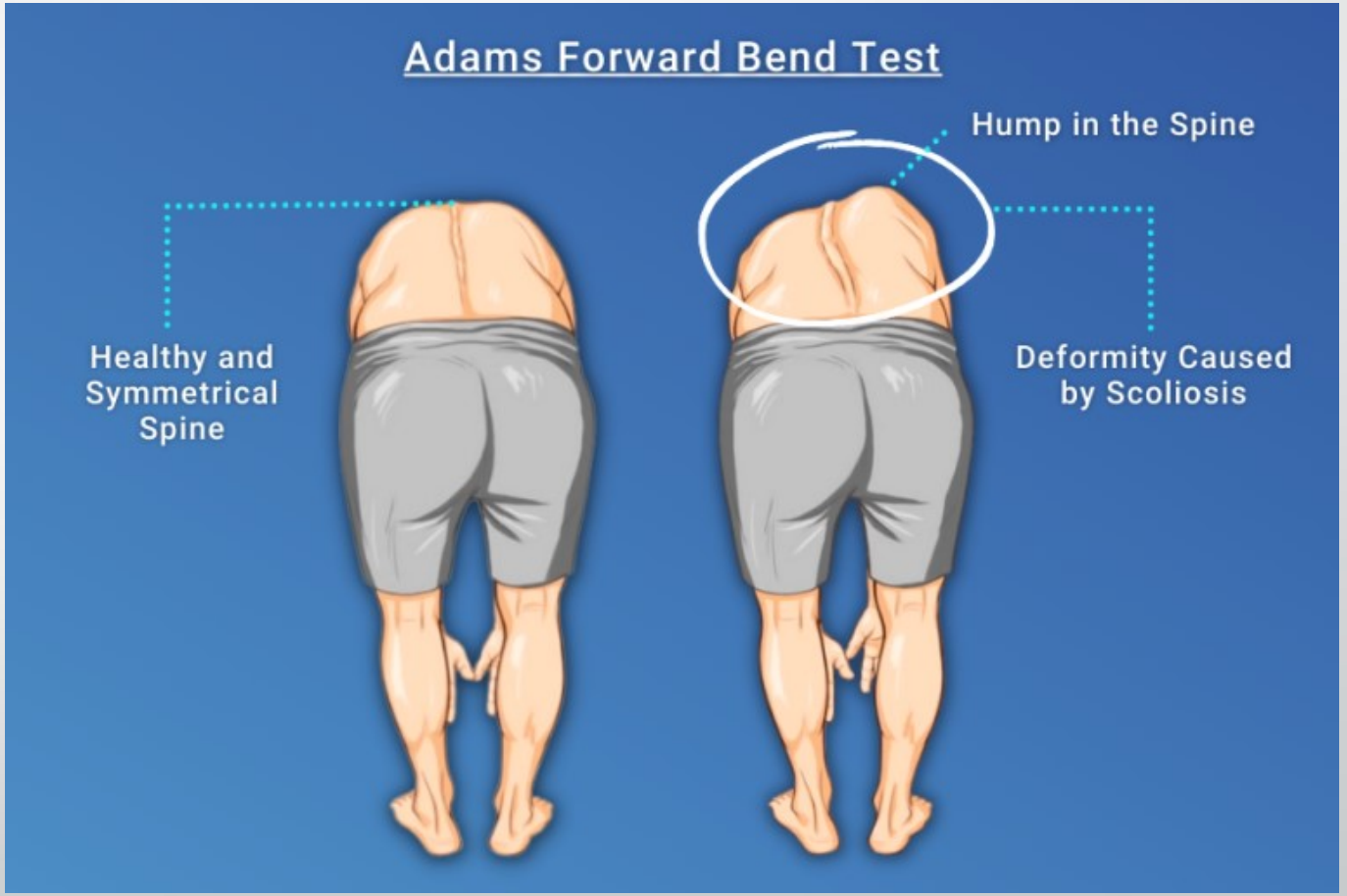
- Uneven musculature on one side of the spine.
- Rib prominence or a prominent shoulder blade, caused by rotation of the rib cage in thoracic scoliosis.
- Uneven hips, arms, or leg lengths.
- Slow nerve action.
- Heart and lung problems in severe cases

Causes

- There are many causes of scoliosis, including congenital spine deformities (those present at birth like cerebral palsy, spina bifida) and neuromuscular problems, inherited diseases or conditions caused by the environment, limb length inequality, and tumors.
- An estimated 65% of scoliosis cases are idiopathic, about 15% are congenital and about 10% are secondary to a neuromuscular disease.

Diagnosis

- Scoliosis diagnosis begins with clinical screening (posture asymmetry, Adam's forward bend, scoliometer) and is confirmed by standing full-spine X-ray, where scoliosis is defined as Cobb angle ≥ 10°.
- Severity and progression risk are assessed using curve pattern and skeletal maturity (e.g., Risser sign).




Scolisis Meter
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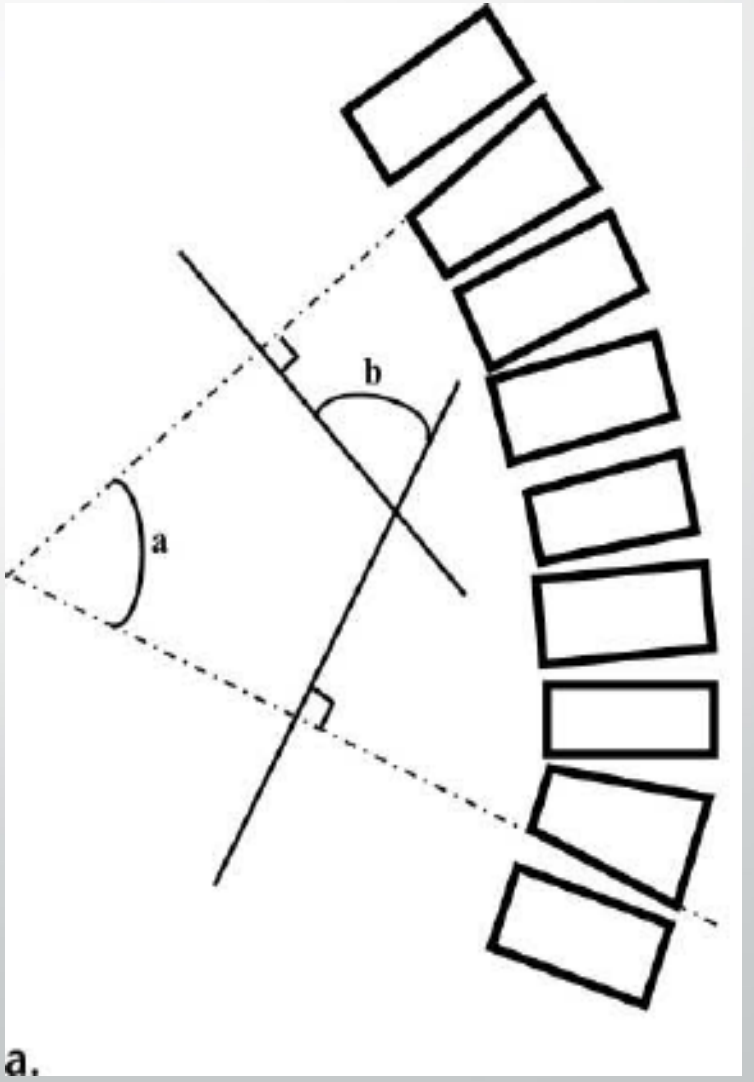
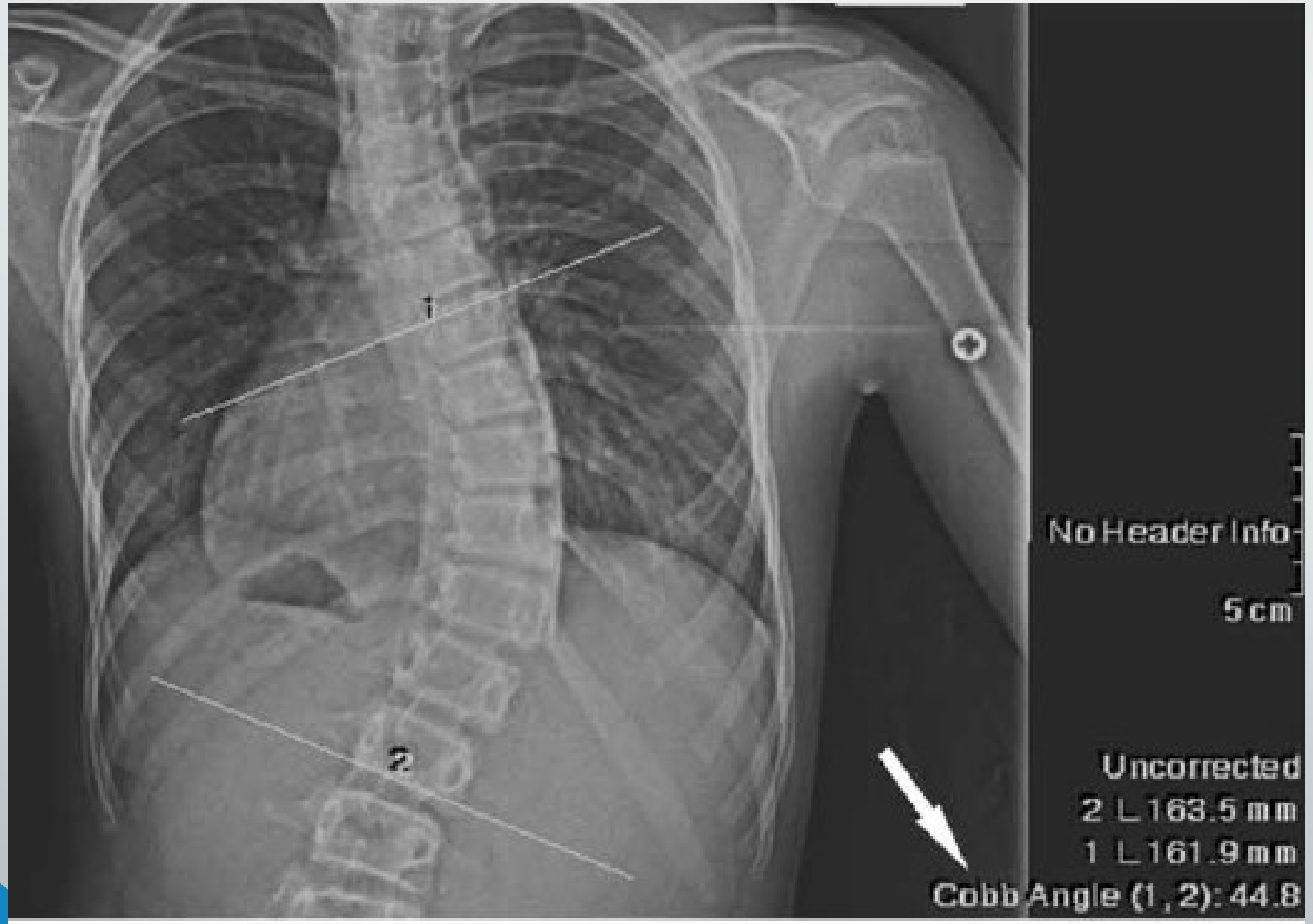
Cobb Angle

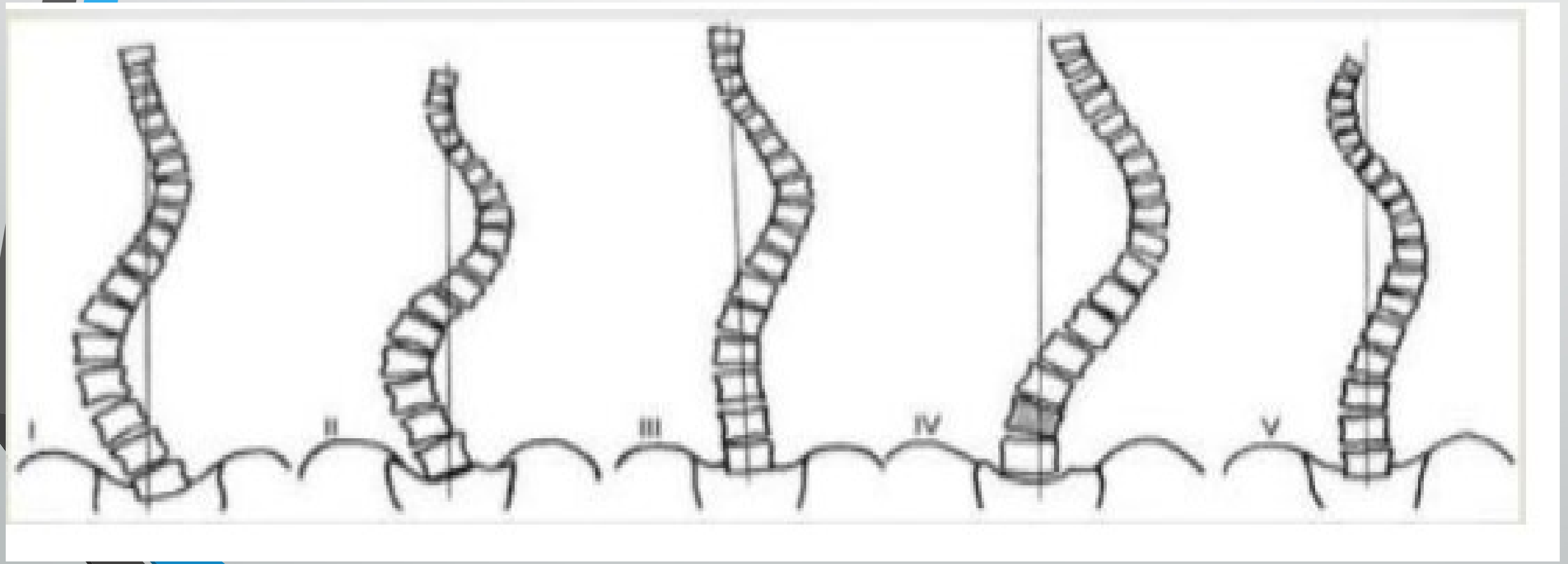
- Identify the curve you want to measure (e.g., main thoracic curve).
- Choose the end vertebrae.
- Upper end vertebra = the most tilted vertebra at the top of the curve.
- Lower end vertebra = the most tilted vertebra at the bottom of the curve.
- Draw Line A along the superior endplate of the upper end vertebra.
- Draw Line B along the inferior endplate of the lower end vertebra.
- Measure the angle where Line A and Line B intersect, OR
- Draw perpendiculars to Line A and Line B, then measure the angle where the perpendiculars intersect (same result)




1
2
No Header Info
5 cm
Uncorrected
2 ∟163.5 mm
1 ∟161.9 mm
Cobb Angle (1, 2): 44.8

King classification system

- The King classification system describes curve types in idiopathic scoliosis, and the system helps determine surgical treatment:
- Type I—primary lumbar and secondary thoracic curves
- Type II—primary thoracic and secondary lumbar curves
- Type III—thoracic curves only
- Type IV—large thoracic curves extending into the lumbar spine
- Type V—double thoracic curves


I
II
III
IV
V

Treatment options for scoliosis

- Treatment depends on numerous factors — the degree of spine curvature being a major one. The doctor will also take into consideration:
- The age.
- whether the curvature likely to continue growing.
- the amount and type of curvature.
- the type of scoliosis.

Cobb angle	Severity	Treatment
0-9	Spinal asymmetry	No treatment
10-24	Mild	Physiotherapy
25-40	Moderate	Bracing
More than 40	Severe	Surgery