SCOLIOSIS

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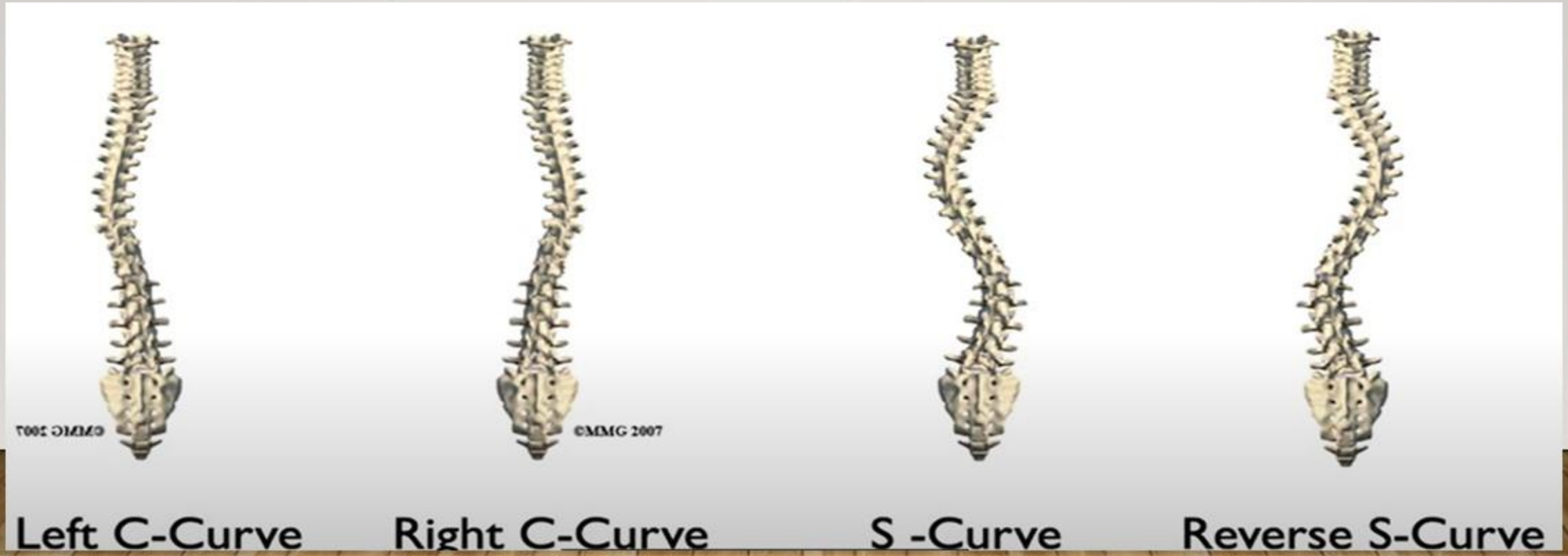
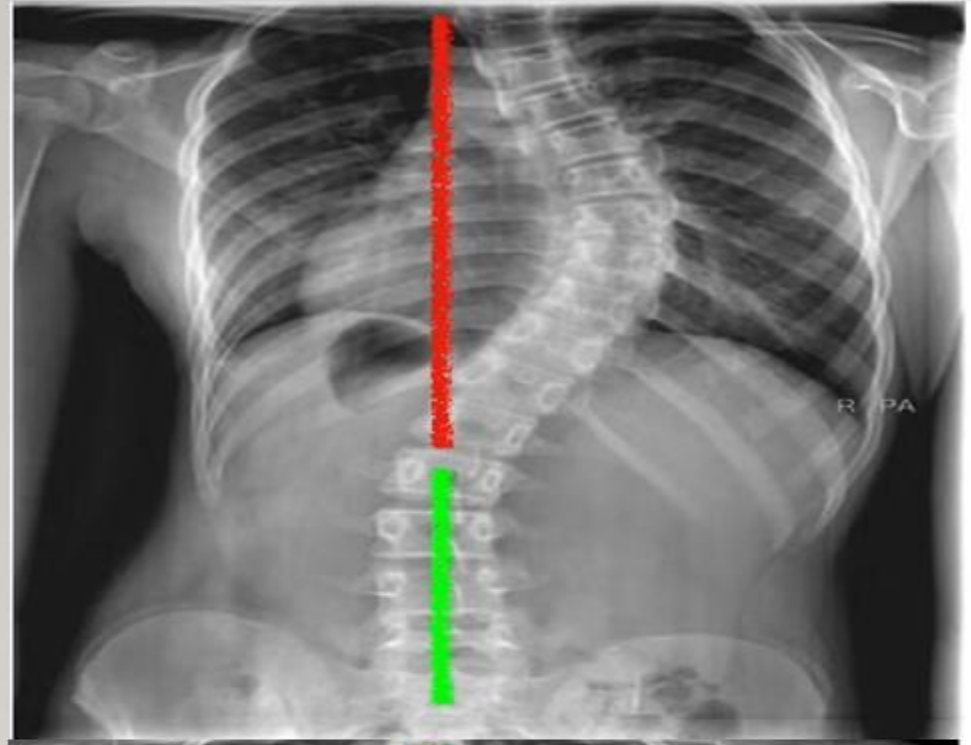
Scoliosis is a three-dimensional deformity of the spine and rib cage. It may develop as a single primary curve (resembling the letter C) or as two curves (a primary curve along with a compensating secondary curve that forms an S shape). Scoliosis may occur only in the upper back (the thoracic area) or lower back (lumbar), but most commonly develops in the area between the thoracic and lumbar area (thoracolumbar area). The physician attempts to define scoliosis by the shape of the curve, its location, direction and magnitude, and, if possible, its cause. The severity of scoliosis is determined by the extent of the spinal curvature and by the angle of the trunk rotation (ATR)

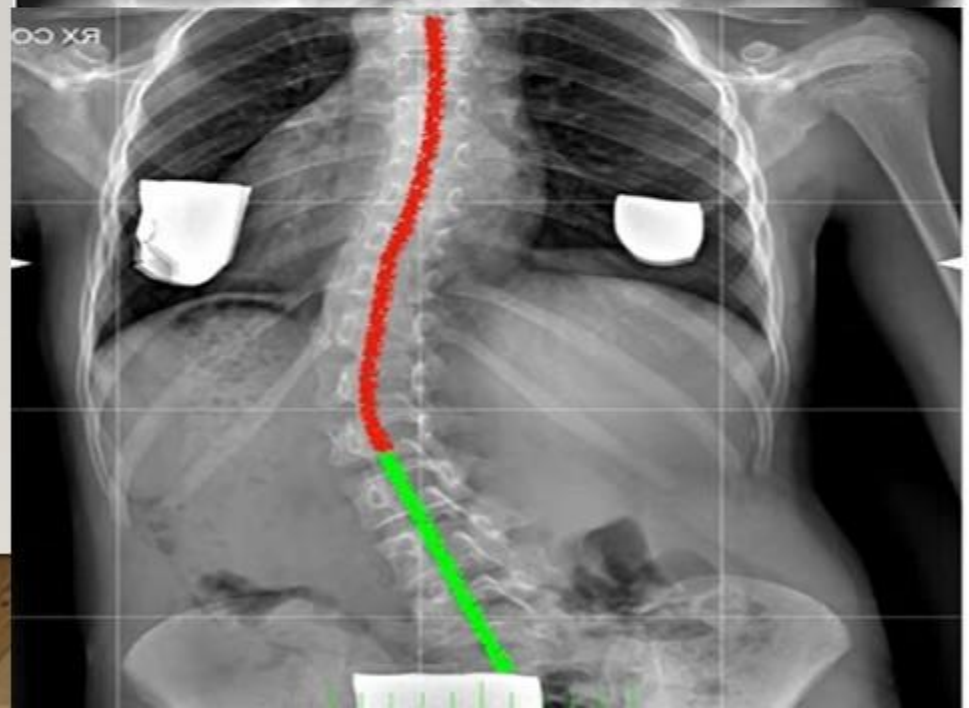




Single Curves
Thoracic Dextro Scoliosis

Right C-Curve Scoliosis

View is from the behind



Single Curves
Thoracolumbar Levo Scoliosis

Left C-Shape Scoliosis

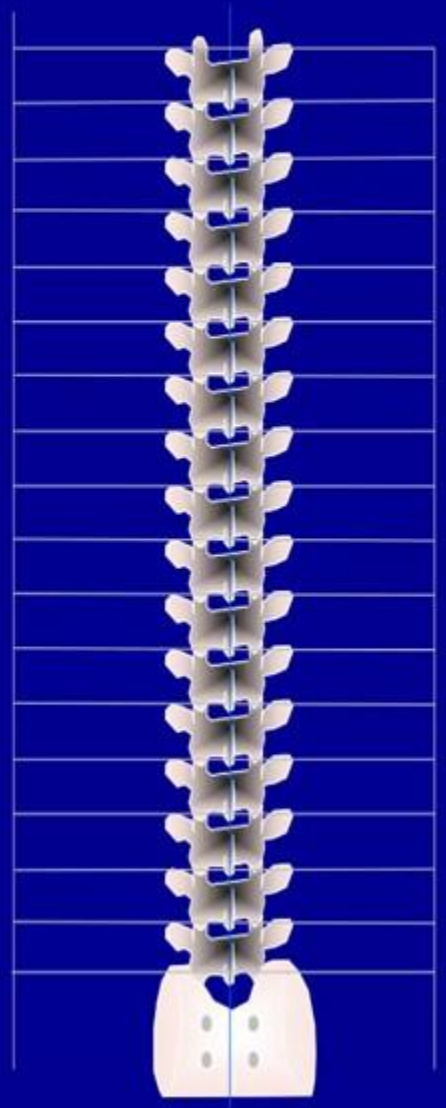
Spinal Biomechanics

"Normal" alignment

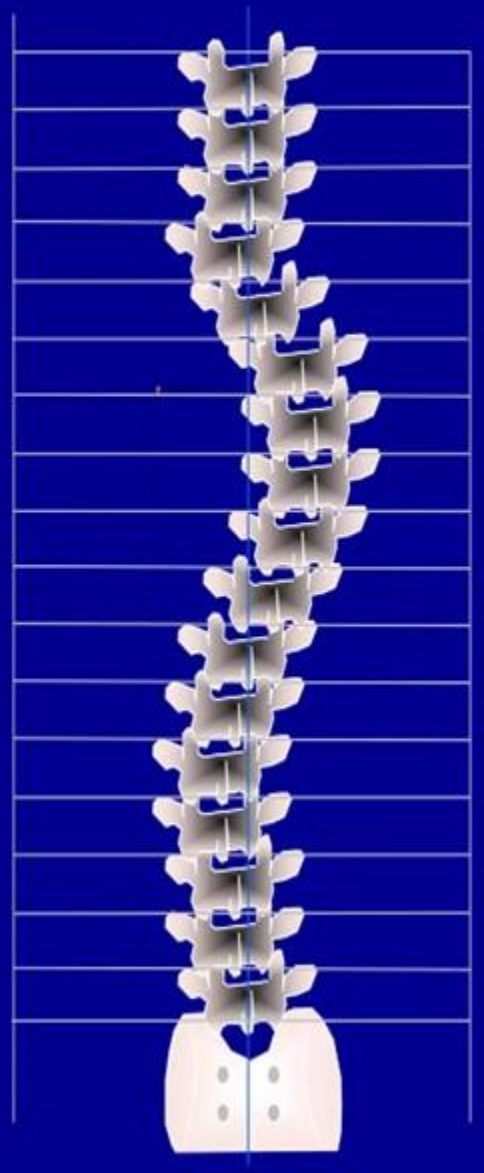
- Spinous processes all line up in a straight line over the sacrum

Scoliosis is a combination of

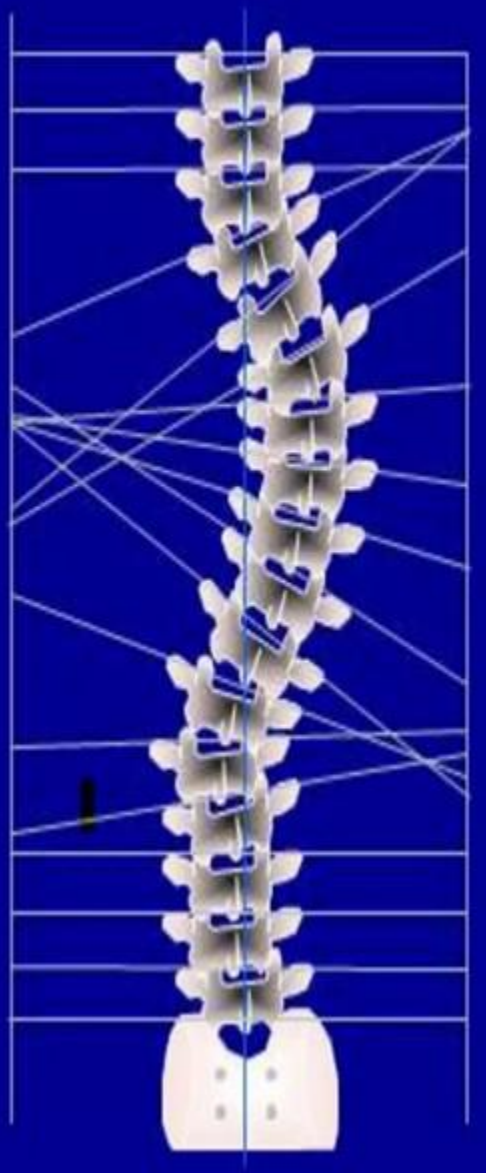
- Angular displacement
- Lateral displacement



Lateral displacement



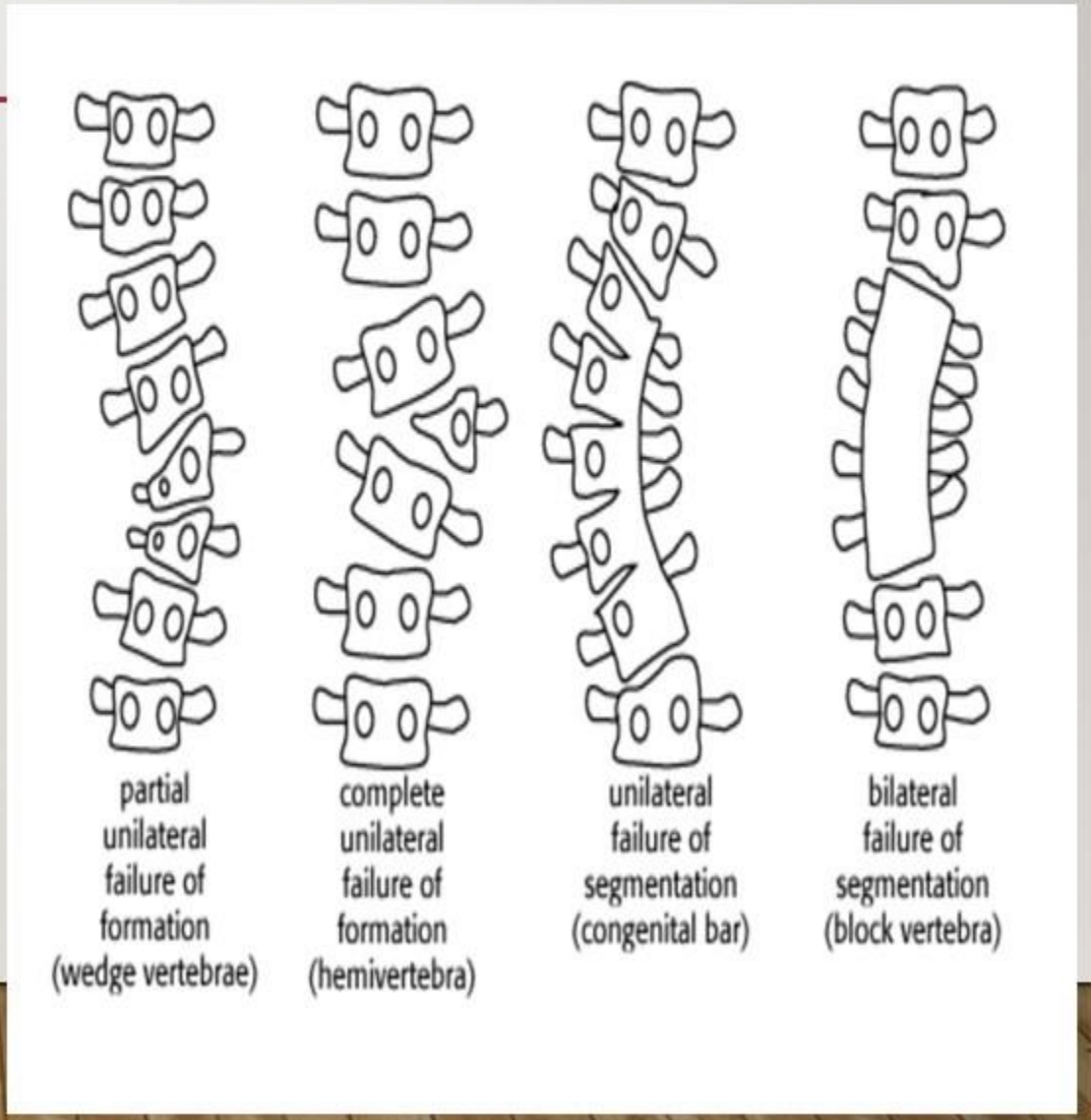
- Angular displacement



CLASSIFICATION OF SCOLIOSIS.

A. Nonstructural (postural)
B. Structural

- Congenital: Failure of formation, Failure of segmentation
- Neuromuscular: 1) Myopathic Arthrogryposis, Muscular dystrophy 2) Neuropathic Upper Motor Neurone, Lower Motor Neurone, Dysautonomia
- Idiopathic: Infatile (0-3 years), Juvenile (3-10 years), Adolescent (10+ years)
- Others: Neurofibromatosis, Traumatic, Tumors, Osteochondrodystrophies

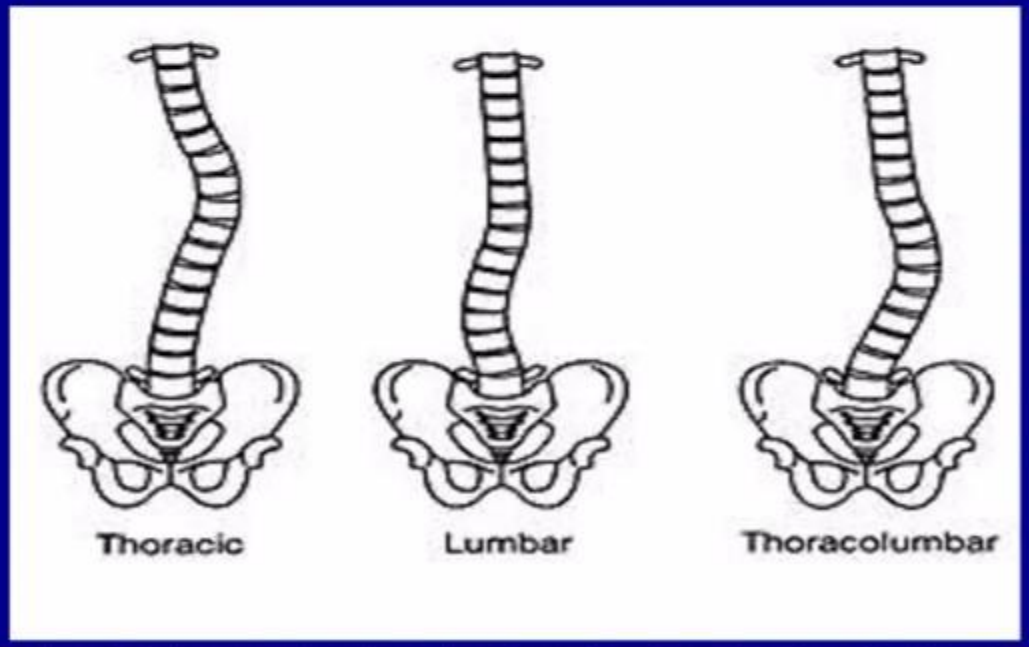



Hemivertebra

Descriptive terms

- The side towards which the convexity of the curve is directed is designated as Right or Left.
- The involved location of the curve is described as

1. **Cervial**
2. **Cervico thoracic**
3. **Thoracic**
4. **Thoracolumbar &**
5. **Lumbar**



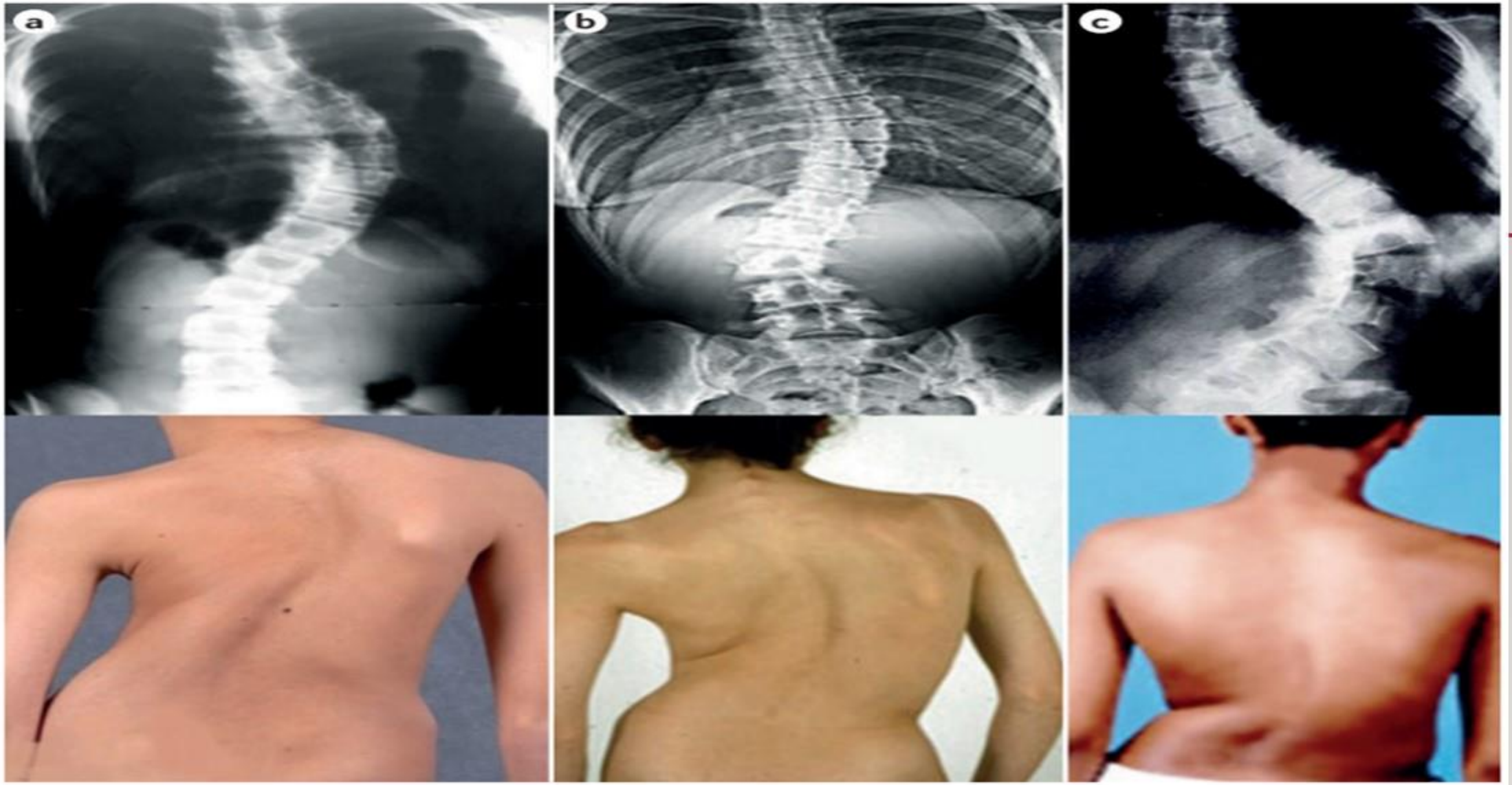
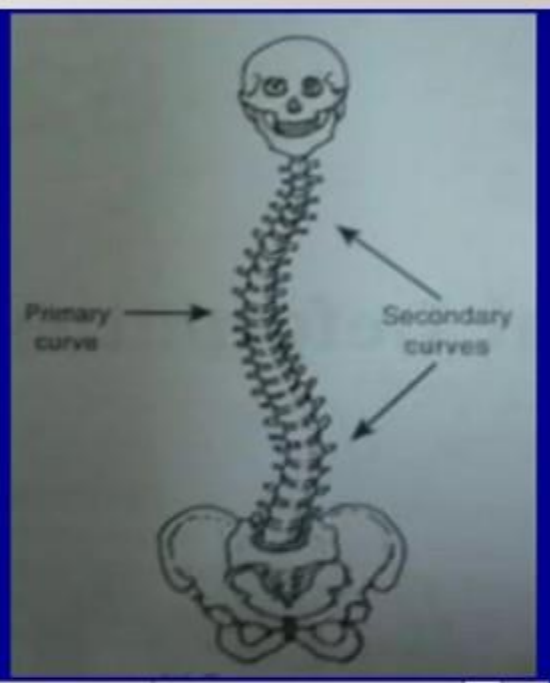


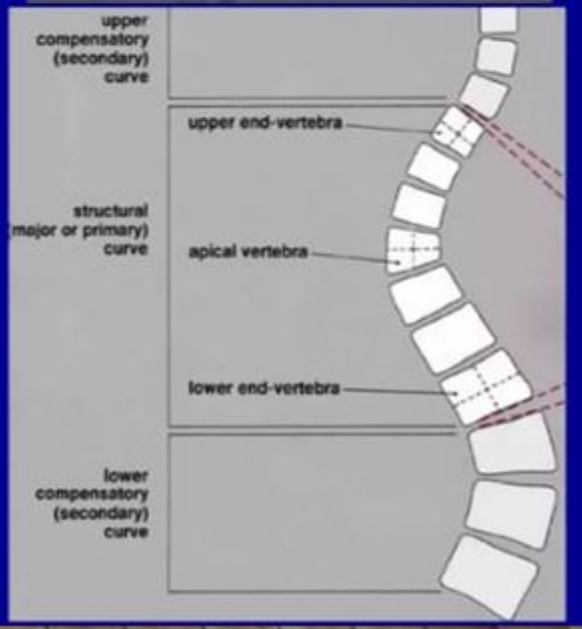
Figure 2 | **Classification of scoliosis on the basis of the location of the spinal curve.** Radiographs (top panels) and corresponding patient photographs (bottom panels) show three different types of scoliosis classified on the basis of the location and the apex of the major spinal curve: right thoracic (part **a**), thoracolumbar (part **b**) or lumbar (part **c**).

PHYSIOLOGICAL EFFECTS OF SCOLIOSIS

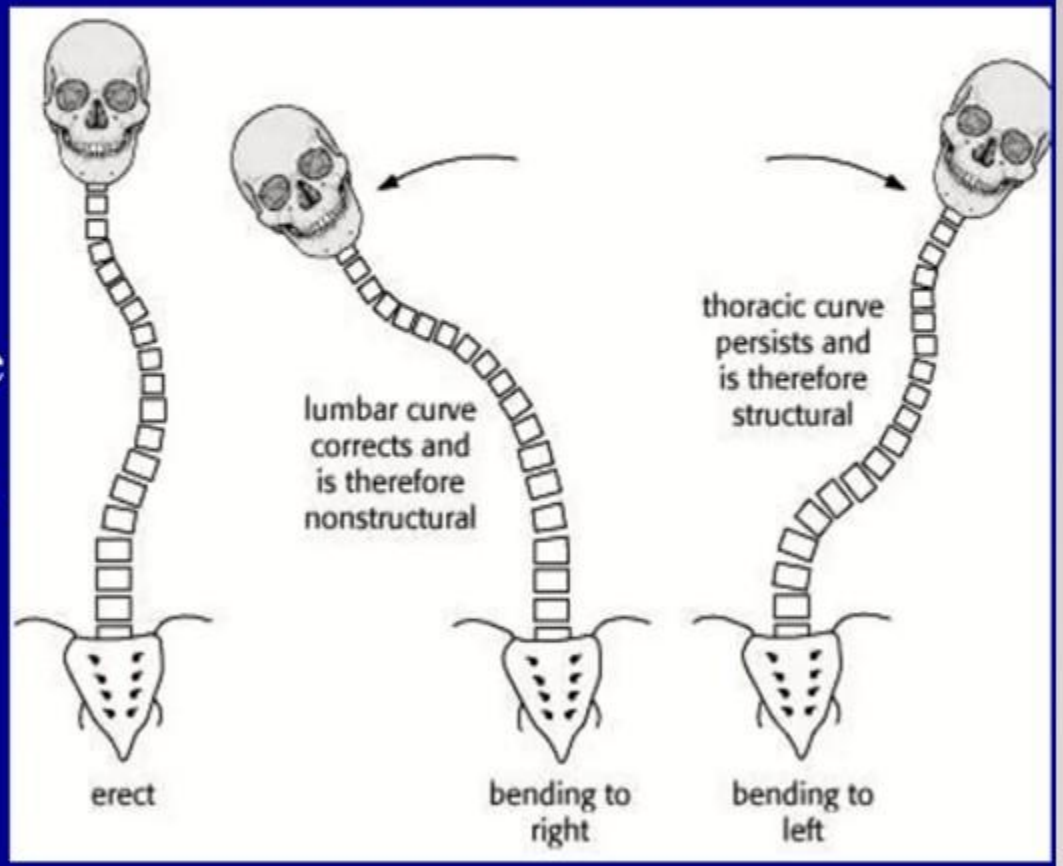
1. Mid back pain
2. Low back pain
3. Neck pain and headache
4. Decreased pulmonary function

- **Simple curve**-Single spinal deviation
- **Compound curve**-Displacements in Right & Left direction
- **Primary curve**- Curve that develops first
- **Secondary or Compensatory curve**-Develops as a balancing response to the primary curve





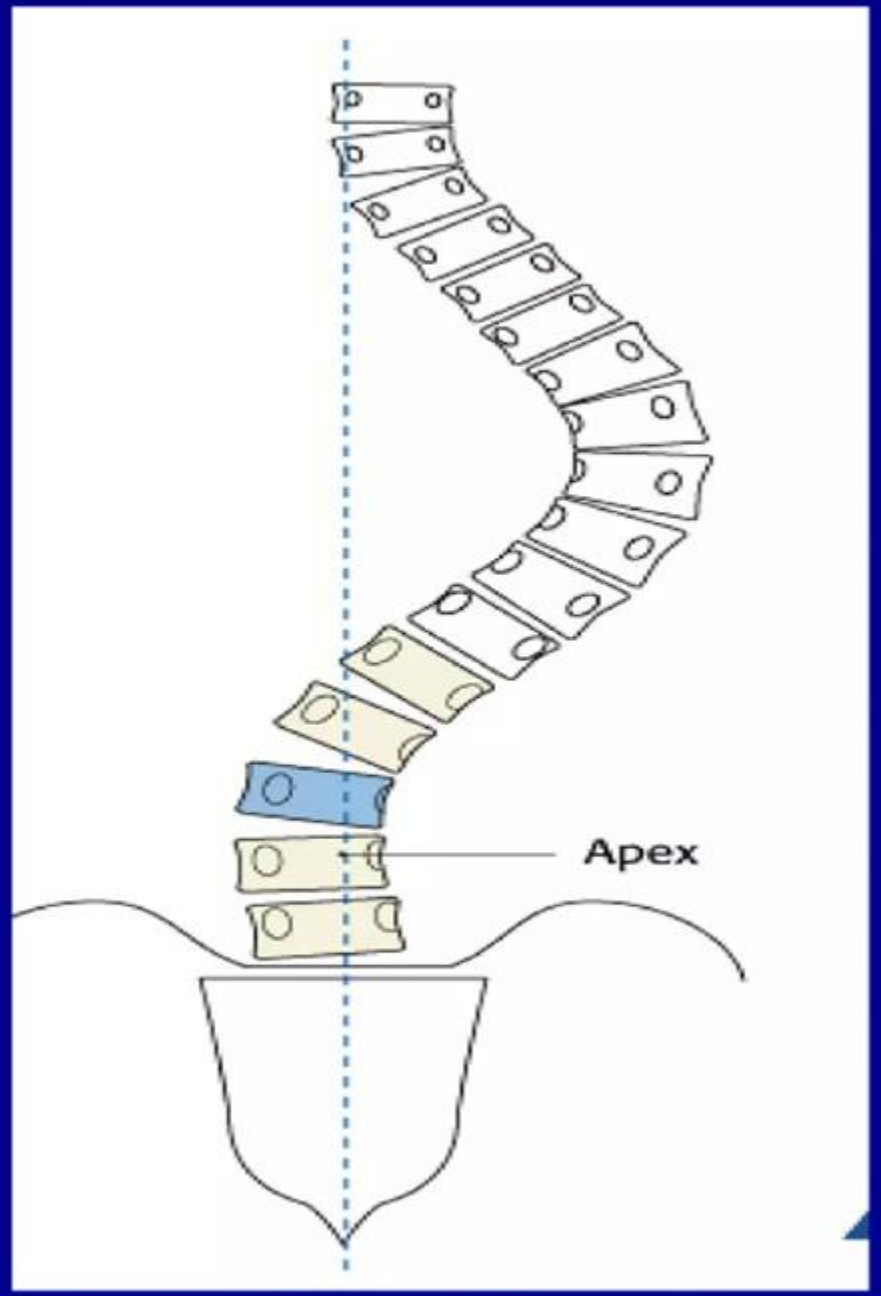
- **Non structural curve-** Curve is flexible and corrects by bending towards convex side
- **Structural curve-** Curve is not corrected on bending on convex side (vertebral and para-vertebral bodies and soft tissues are deformation developed)



- **Major curve**-Significant structural changes take place (the one of greatest degrees)

- **Minor curve**-Secondary or compensatory curve in the opposite direction above and below the major curve.
- Usually functional and nonstructural

- **Double major curve:** Two balancing curve of equal structural change and magnitude.
- Thoracic curve is major and the lumbar curve is structural.
- Because the main thoracic curve is always larger than the thoracolumbar/lumbar curve.



The five King's classifications of scoliotic curve

illustrated from T1 to L5.

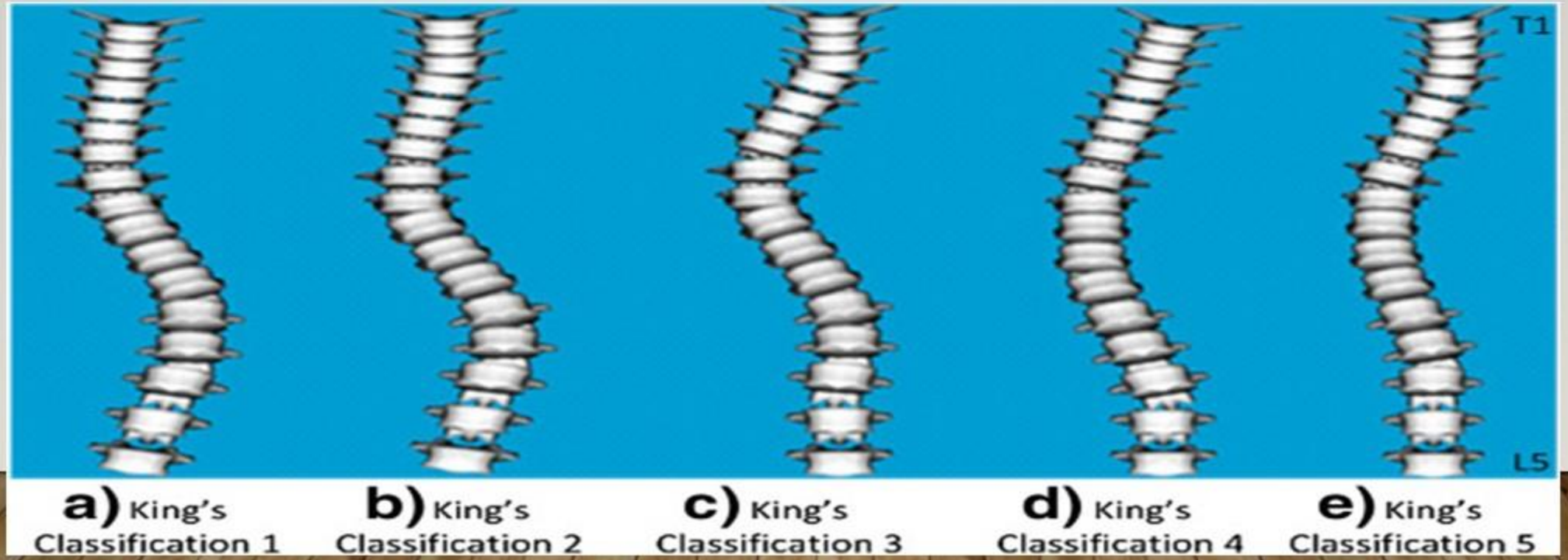
a) Classification 1: Double curve of the thoracic and lumbar spine.

b) Classification 2: Double curve of the thoracic and the lumbar spine with less prominent lumbar curvature.

c) Classification 3: Single primary thoracic curve.

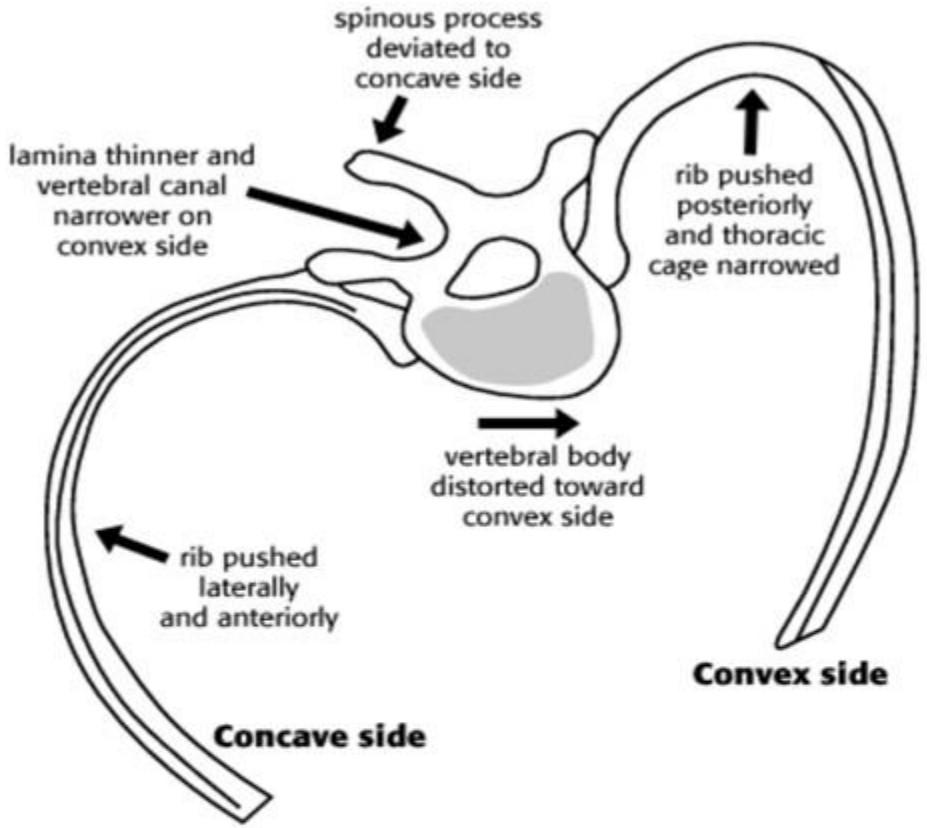
d) Classification 4: Long thoracic curve.

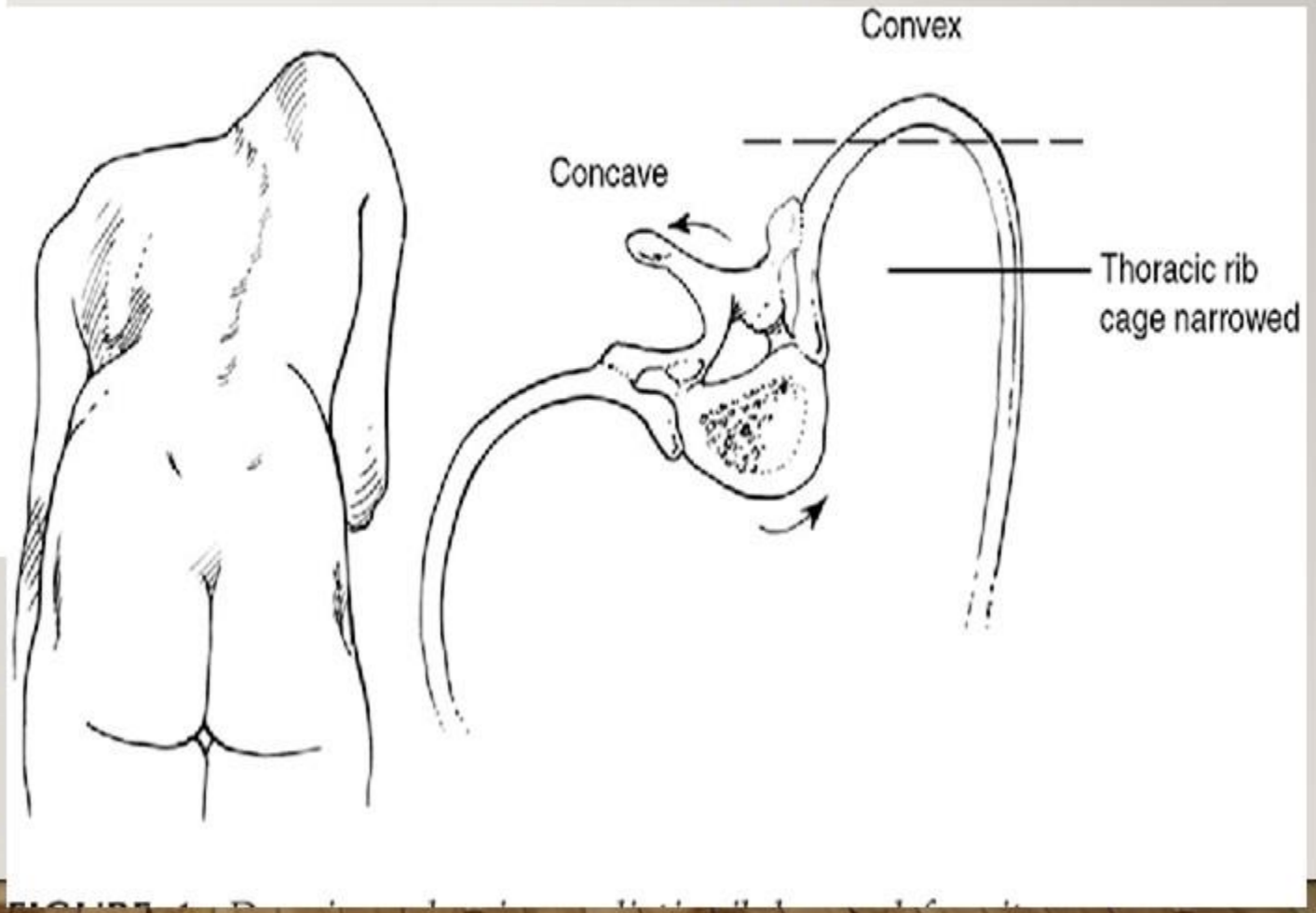
e) Classification 5: Double thoracic curve.



CLINICAL FEATURES

- Deformity is usually the presenting symptom
- Pain is rare complaint
- Rib hump or abnormal para spinal muscular prominence indicates spinal rotation
- **Rib hump leads to asymmetry of trunk called angle trunk rotation (ATR) .**


spinous process
deviated to
concave side
lamina thinner and
vertebral canal
narrower on
convex side
rib pushed
posteriorly
and thoracic
cage narrowed
vertebral body
distorted toward
convex side
rib pushed
laterally
and anteriorly
Convex side
Concave side

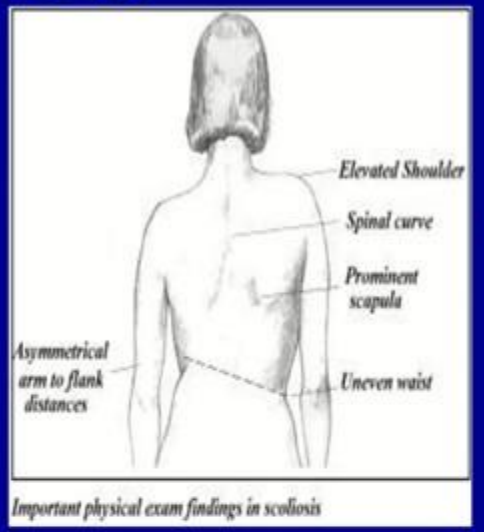

Convex
Concave
Thoracic rib
cage narrowed

CLINICAL EVALUATION

- **Trunk should be exposed completely & examined in front , back & side**

Trunk alignment

- Symmetry of shoulder girdles
- Scapula & ribcage observed for asymmetry
- Spinous process palpated to determine their alignment

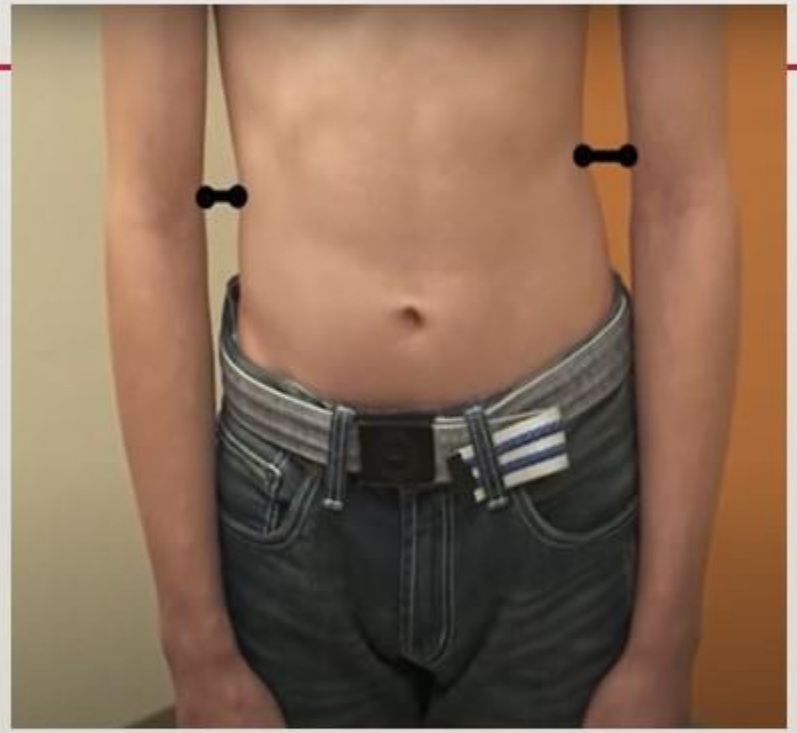


Important physical exam findings in scoliosis

POSTURAL SCREENING FOR SCOLIOSIS

Anterior view

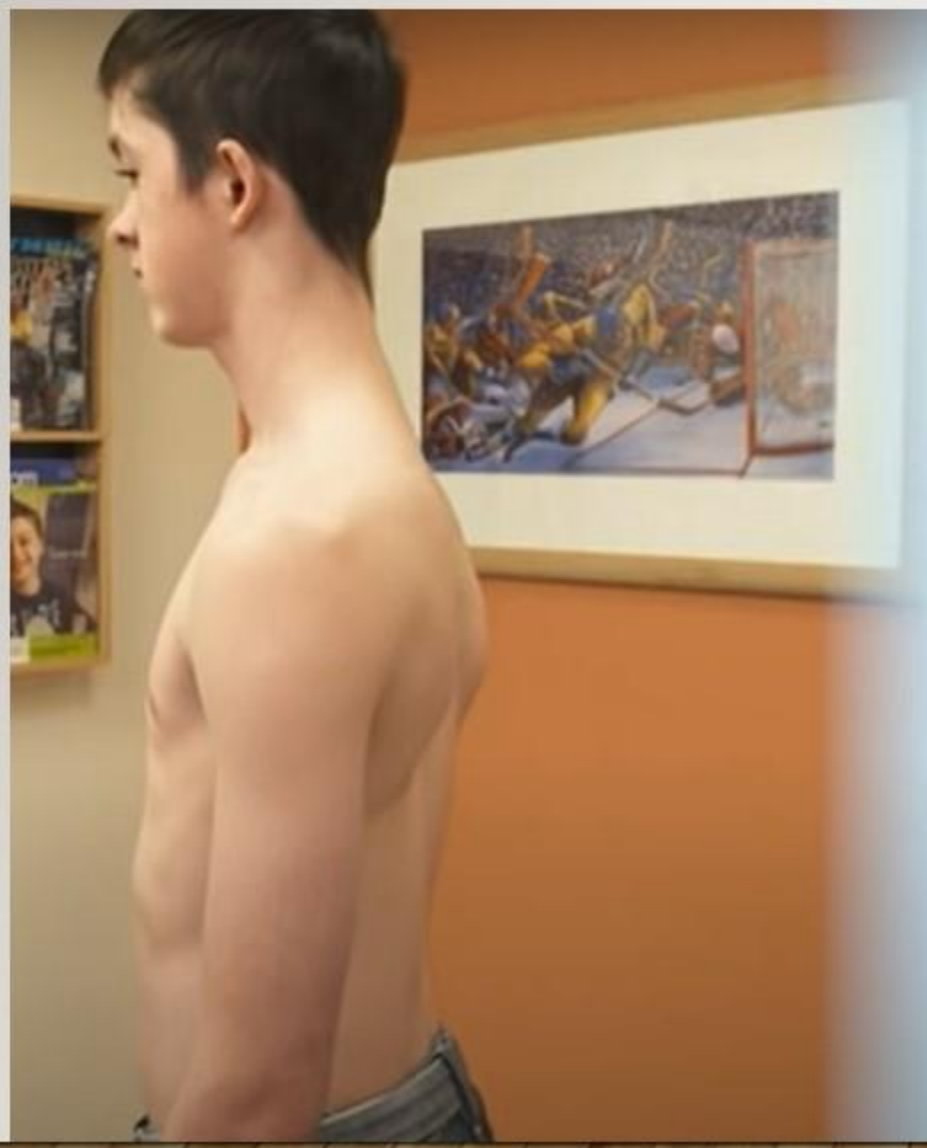
Shoulder level



Distance between arms and torso

Hips level or prominance

Posterior veiw



From the side view:

- Is there accentuated round-ness in the upper back?
- Is there an accentuated arch in the lower back?

The Adam forward bend test

can be used to make a distinction between structural scoliosis or non-structural scoliosis of the cervical to lumbar spine. Ask patient to bend forward with straight knees.

Scoliometer

- < 7 degrees is normal

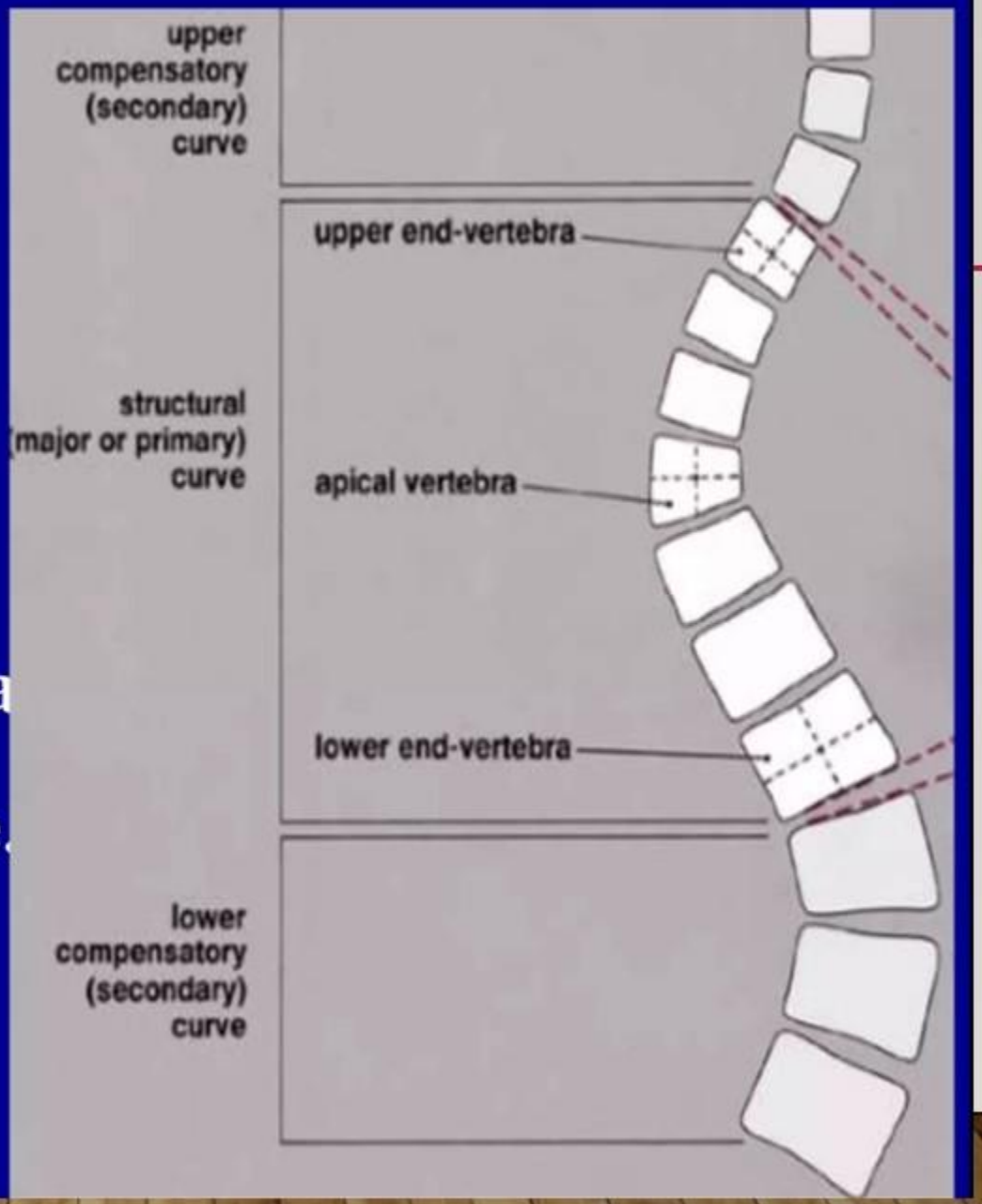
RADIOLOGY

- To determine the severity of the curve
- X-ray Antero Posterior, Lateral & Oblique view of spine
- Right & left bending view – determine the degree of flexibility of spine & to see how much curve can be passively corrected

X Ray Standing AP film of whole spine on one film.

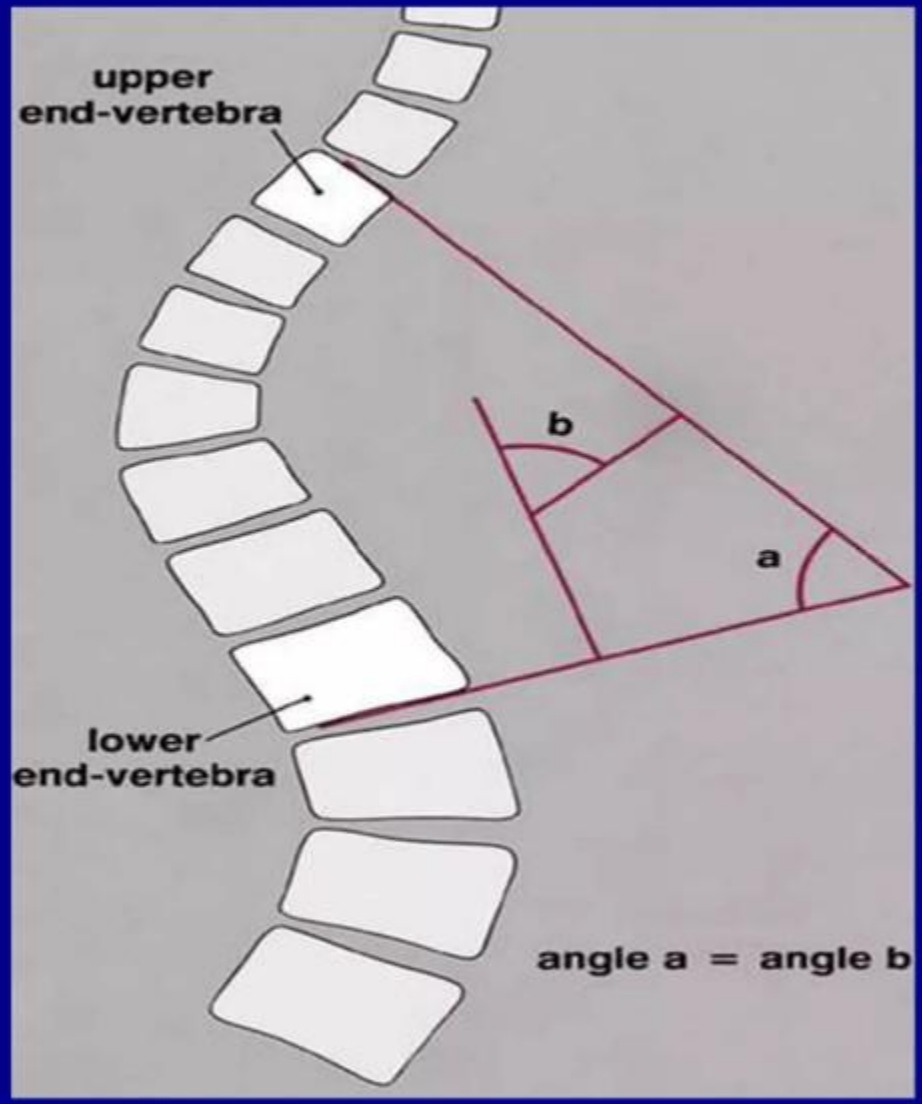
- The assessment of the x-ray images consists of measuring the degree of curvature using Cobb's method, measuring the rotation of the apical vertebra, and examining the osseous signs of maturity .
- Curvatures of less than 10° are not defined as scoliosis by Cobb

- **End-vertebrae** - maximum rotated vertebra (*most tilted* vertebrae)
- **Apical vertebra**-Vertebra at the centre of the curve.



LIPPMAN-COBB METHOD

- Line drawn at end plate of upper end vertebra
- Another line at lower border of lower end vertebra
- Perpenidular lines are drawn from above two lines
- Angle formed between them measured

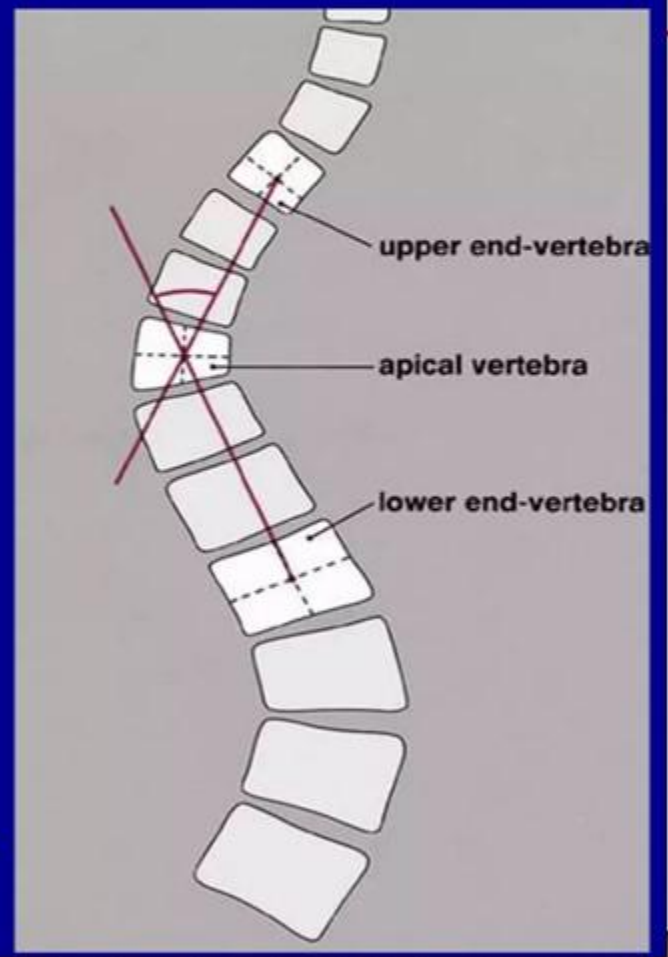


Double curve

- One vertebra is **upper end vertebra** for lower curve and **lower end vertebra** for upper curve (**transitional vertebra**).
- Only one line drawn on this vertebra.

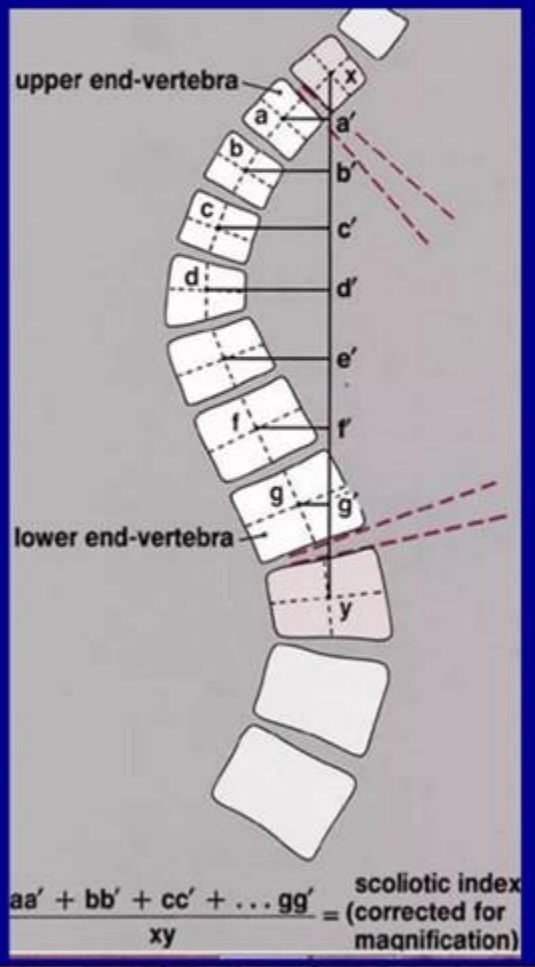
RISSER-FERGUSON METHOD

- First line originating at the centre of the upper end-vertebra
- Second line from the center of the lower end-vertebra.
- Angle formed by the intersection of two lines at the centre of the apical vertebra gives the degree of curvature

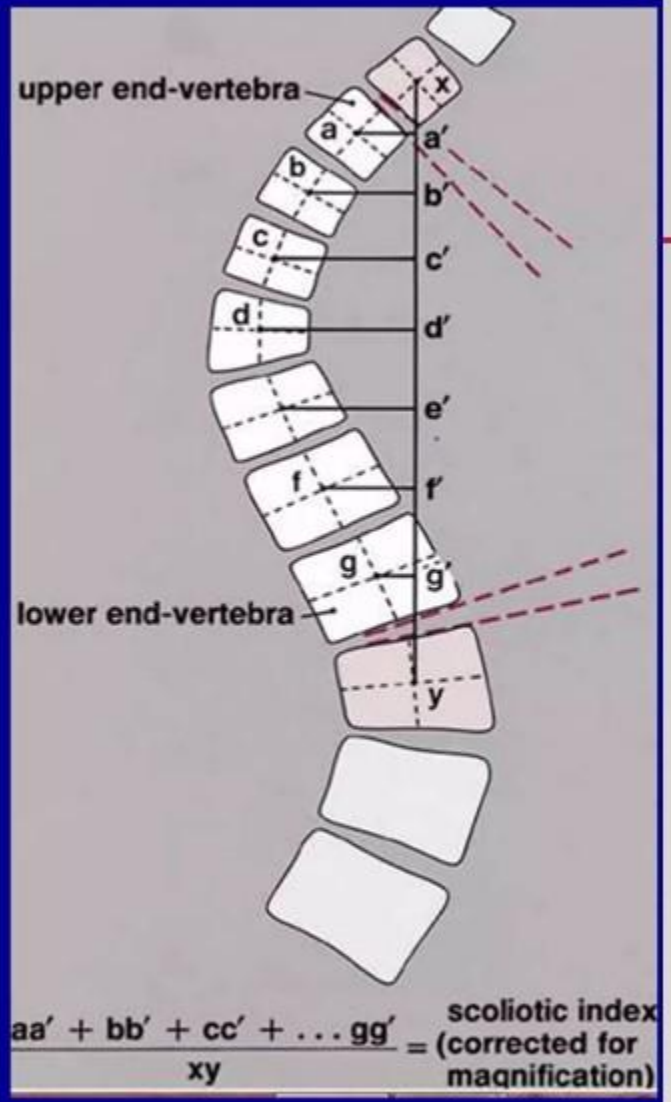


SCOLIOTIC INDEX

- Each vertebra *(a–g)* is considered an integral part of the curve.
- A vertical spinal line *(xy)* is first drawn whose endpoints are the centres of the upper and lower end-vertebrae of the curve.



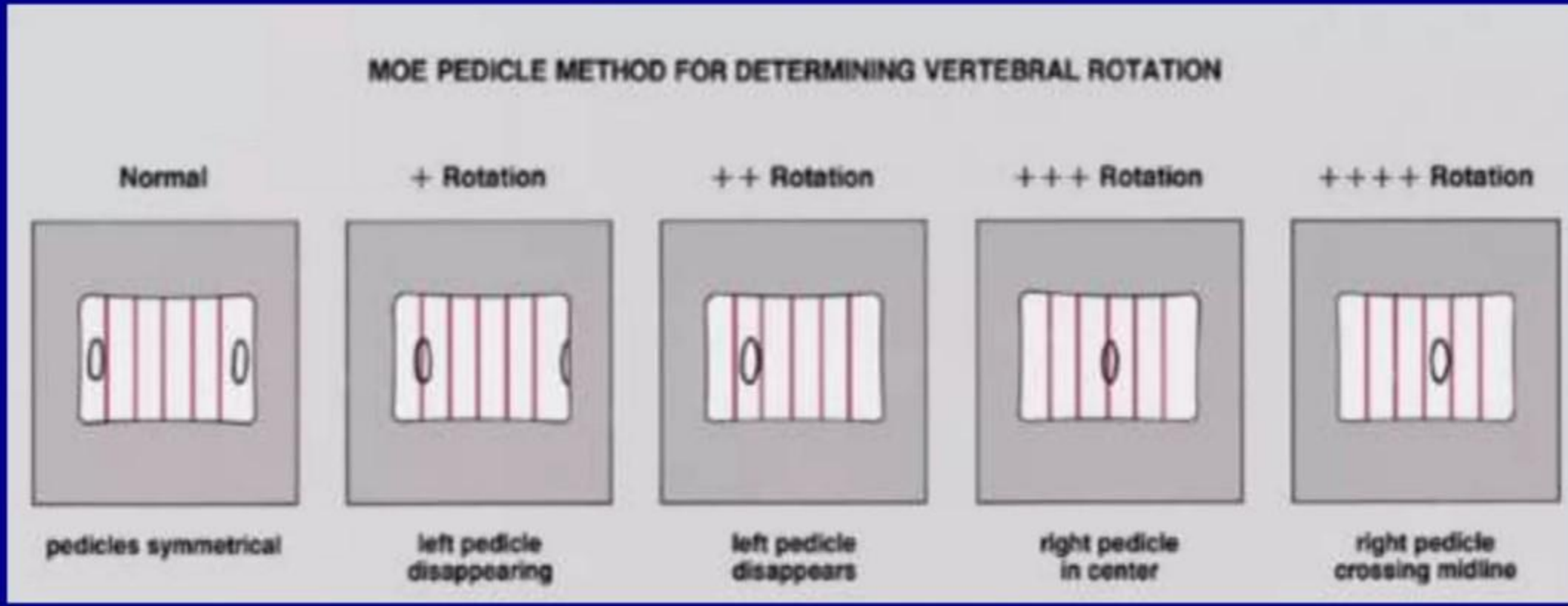
- Lines are then drawn from the centre of each vertebral body perpendicular to the vertical spinal line (aa', bb', … gg').
- The values yielded by these lines represent the linear deviation of each vertebra
- Sum of vertebral body lines, divided by the length of the vertical line *(xy)* gives the scoliotic index



DEGREE OF ROTATION

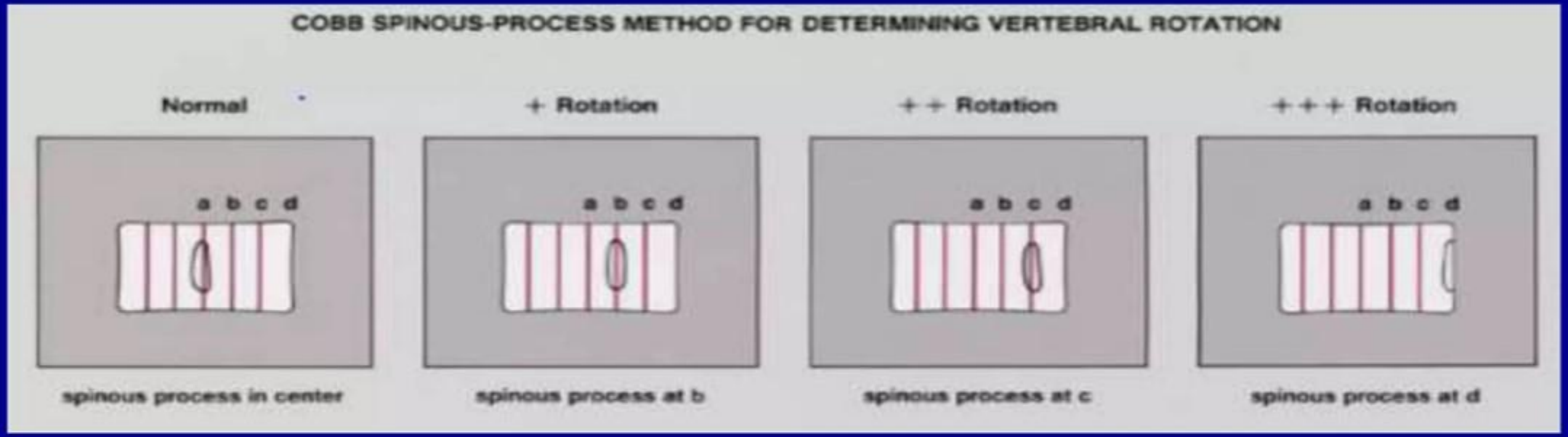
- Rotation – reflects the degree of structural change & resistance to correction of the scoliotic curve
- 2 methods are used.
- **Moe pedicle method**
- **Cobb spinous-process method.**

Moe pedicle method



- Divides the vertebra into six equal parts.
- Normally, the pedicles appear in the outer parts

COBB SPINOUS-PROCESS METHOD



- Vertebra is divided into six equal parts.
- Normally, the spinous process appears at the center.
- Its migration to certain points toward the convexity of the curve marks the degree of rotation.

Other Studies

- **Pulmonary function testing for patients with:**
  - Curves greater than 60 degrees
  - Respiratory complaints
  - Scoliosis resulting from a neuromuscular cause

The Society of Scoliosis Orthopedic Rehabilitation and Treatment (SOSORT)

The Society of Scoliosis Orthopedic Rehabilitation and Treatment (SOSORT) was founded in 2004 in reaction to growing awareness. SOSORT promotes and encourages conservative, evidence-based medicine regarding scoliosis and provides education, guidelines and consensus about treatment options to people with scoliosis

SOSORT uses the term Physiotherapy Scoliosis Specific Exercises (PSSE) in connection with all of the schools represented within the organization.

SCOLIOSIS SCHOOLS

1. Lyon approach from France
2. Katharina Schroth Asklepios approach from Germany
3. Scientific Exercise Approach to Scoliosis (SEAS) from Italy
4. Barcelona Scoliosis Physical Therapy School approach (BSPTS) from Spain
5. Dobomed approach from Poland
6. the Side Shift approach from the United Kingdom
7. the Functional Individual Therapy of Scoliosis approach (FITS) from Poland

THE LYON APPROACH (FRANCE)

Dr. Jean Claude de Mauroy, the head of the orthopedic medicine department at Clinique du Parc, Lyon, France

The Lyon method combined PSSE with bracing Lyon ARTbrace (Asymmetrical Rigid Torsion brace).

treatment includes 3D mobilization of the spine, mobilization of the ilio-lumbar angle (lumbar scoliosis), patient education, and activities of daily living, including correction of the sitting position.

Under the Lyon approach, the treatment is more specifically determined by the type of scoliosis; chaotic or linear

Under the Lyon approach, the treatment is determined by the type of scoliosis

Chaotic scoliosis

is a true 3D structural deformity of the spine, which occurs in approximately 2.5 % of adolescents with scoliosis curves <20° Cobb angle. This is a dynamic scoliosis, uncertainty of its progression

linear scoliosis

which occurs in approximately 0.25 % of adolescents with scoliosis curves >20°. A triggering event brings scoliosis into a vicious cycle, triggering event results in the formation of wedged vertebrae. What follows is continuous asymmetric loading on the spine, which can potentially promote asymmetric growth and advancement of the progression

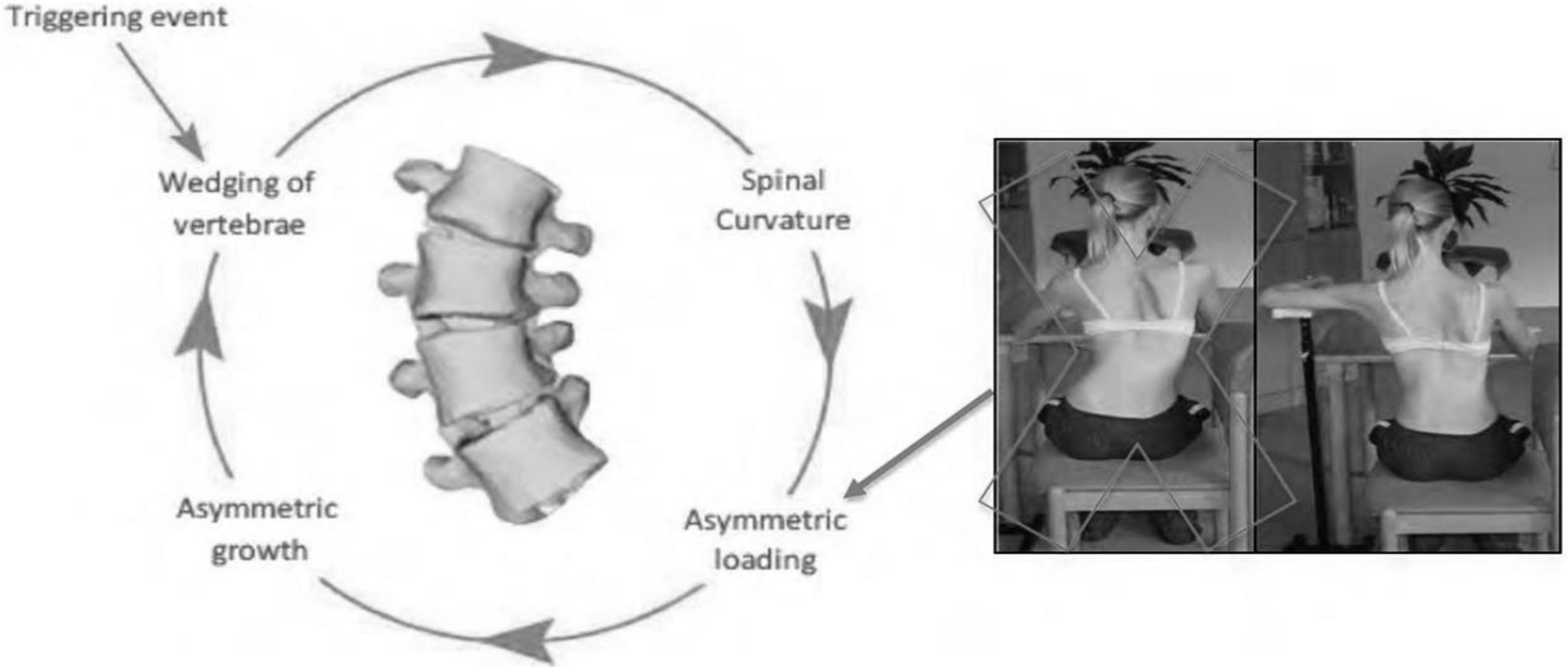


Fig. 2 Image on the left: The Vicious cycle. Dr. Stokes and Burwell hypothesized that the vicious cycle of scoliosis curve progression begins with a triggering event which leads to the formation of wedged vertebrae. Wedged vertebrae cause the spine to curve which results in continuous asymmetric loading on the spine. This in turn, can potentially promote asymmetric growth of the spine and progression of scoliosis curves as asymmetric growth increases the wedging of the vertebrae and perpetuates the cycle to continue. The image on the right shows a scoliosis patient sitting with increased asymmetric loading of the spine as described in Stokes' 'Vicious Cycle". The large red "X" on the image indicates that this is not the desired posture. The image on the right shows the same scoliosis patient sitting with improved asymmetric loading of the spine as she performs scoliosis specific physiotherapy exercises in accordance with the Lyon approach

The Lyon method of scoliosis treatment involves five stages:

Stage I: Lyon approach to assessment

The Lyon approach considers three factors in determining the regimen of therapy to pursue:

- the patient's age,
- postural imbalance
- the Cobb angle.

Stage II: Awareness of trunk deformity

The Lyon approach uses visualization with mirrors and video to help with curve correction.

Fig. 3 Scoliosis patient developing self-awareness of postural defects with the help of a video recorder and real-time video feedback

Stage III: What to do: sample exercise

The basis of the Lyon method is to avoid spinal extension during exercise and enhance kyphosis of the thoracic region with lordosis of the lumbar spine as well as frontal plane correction, segmental mobilization, core stabilization, proprioception, balance and stabilization

Fig. 4 Active thoracic mobilization, promoting kyphosis, using the Lyon method

kyphotization with a cushion

ig. 5 Active lumbar correction, promoting lordosis, using the yon method

Fig. 6 (**a**, **b**): Active thoracic shift exercise with a dowel (**a**) and a Swiss-ball (**b**) using the Lyon method

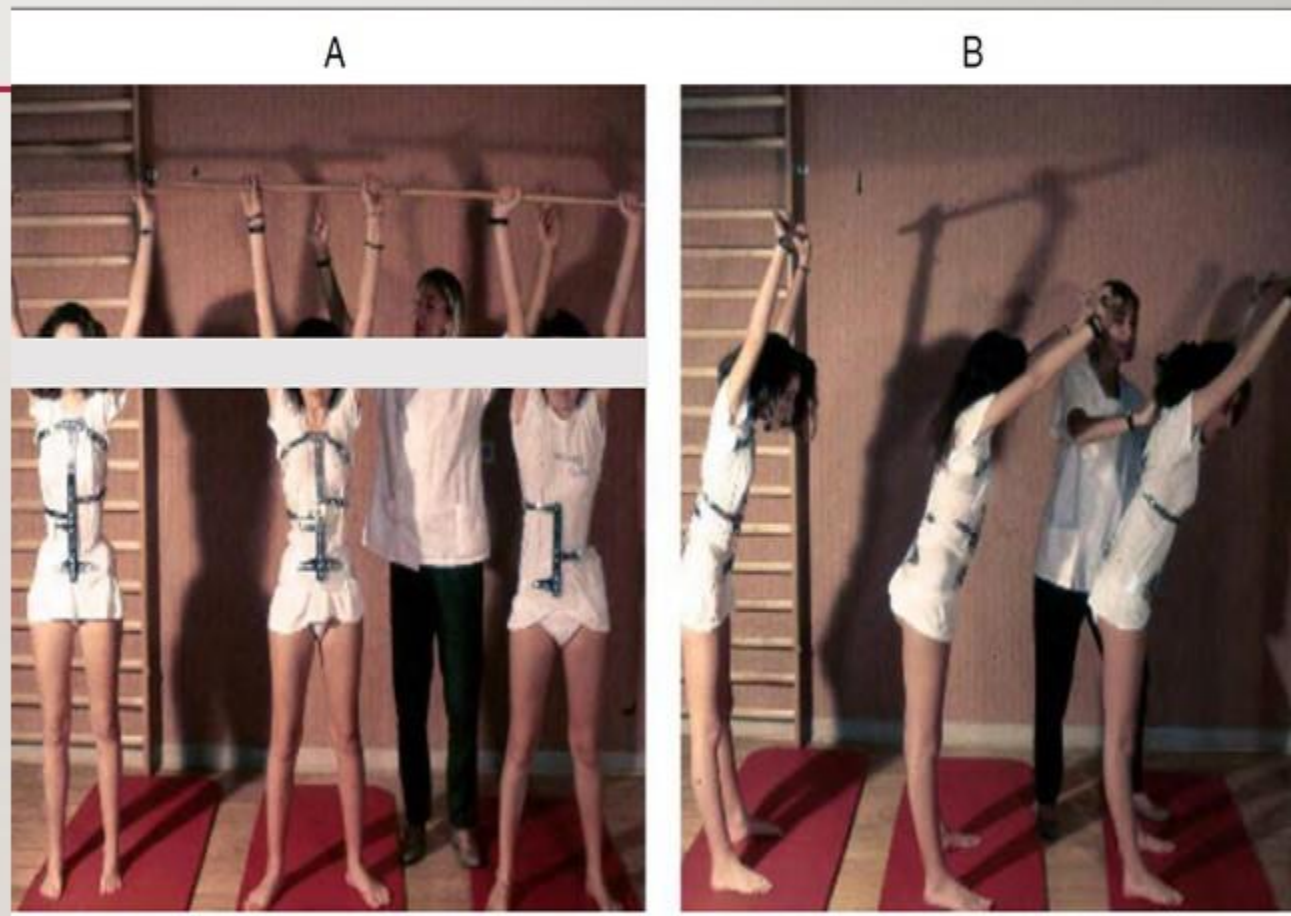
Fig. 7 Active thoracic shift and derotation exercise using the Lyon method. *Arrows* in the radiograph and the diagram show the direction of the thoracic shift and the derotation of the ribcage as the exercise is performed using the Lyon method

Fig. 8 (**a**, **b**): Balance and proprioception exercises on a Swiss-ball (**a**) and on a balance board (**b**) using the Lyon method

Fig. 9 Spinal stabilization exercises using the Lyon method

In the Lyon approach, a great emphasis is given to exercises done in the plaster cast prior to bracing and during bracing

Fig. 10 Several standard Lyon exercises in a Lyon plaster cast promoting core strength (top left), breathing and thoracic shift (bottom), and elongation



ig. 11 (a, b): Several standard Lyon exercises in a Lyon plaster cast promoting postural correction (a) and core strengthening (b)

LYON BRACE

Fig. 18 Anterior (*left*) and posterior (*right*) views of the new asymmetric rigid torsion brace (ARTbrace) made from 4 mm polycarbonate. The main biomechanical concepts are based on elongation along the vertical axis, lateral inflexion in the frontal plane, and derotation of the spine in order to obtain a correction of the scoliotic curve

Stage IV: What not to do and why

The Lyon method avoids sagittal plane extreme movements (flexion and extension) and exercises causing shortness of breath.

Stage V: Sport or only physiotherapy?

The Lyon method teaches patients how to play sports and the best and worst sports for scoliosis

Fig. 12 Activity level recommendations by age per the Lyon Schoo in accordance with the Lyon treatment principles

THE USE OF BREATHING MECHANICS, MUSCLE ACTIVATION, AND MOBILIZATION

The Lyon method uses rotational angular breathing with the diaphragm as well as a breathing machine to increase lung capacity. The Lyon method also improves the endurance of the deep paraspinal and core musculature and focuses on mobilization to improve correction

Fig. 13 Lyon method breathing exercises using a breathing machine, performed while wearing a Lyon plaster cast, increases lung capacity

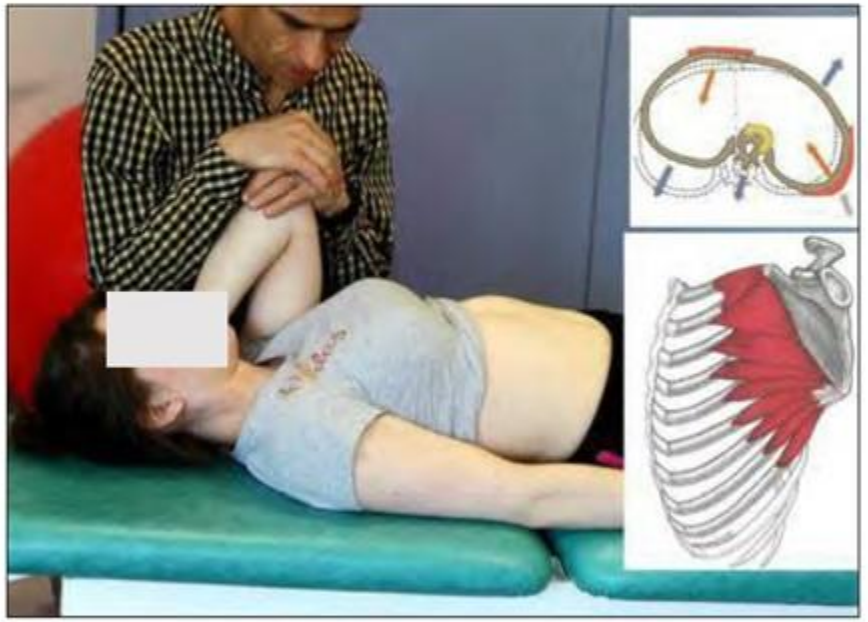


Fig. 14 Active thoracic mobilization using the Lyon method. *Arrows* in the diagram on the right show the direction of thoracic mobilization of the ribcage

Fig. 15 Active lumbar mobilization using the Lyon method. The diagram on the right shows lumbar scoliosis

Fig. 16 Mobilization of the costovertebral joints using the Lyon method

KATHARINA SCHROTH'S SCOLIOSIS TREATMENT METHOD

Katharina Schroth was born February 22, 1894, in Dresden, Germany. She suffered from moderate scoliosis and underwent treatment with a steel brace at the age of sixteen before she decided to develop a more functional treatment approach.

When she began her scoliosis program in Meissen, 1921, (Figs. 2.21 and 2.22) most patients she treated had curvatures exceeding 70° with large rib humps and stiff deformities as a result of scoliosis of varying origins.

it has been shown that by simply correcting a sagittal profile that has been inverted by the idiopathic scoliosis, a correction of the scoliosis in the frontal plane (Cobb angle) can be affected (Weiss 2004; 2005; Weiss et al. 2006; van Loon et al. 2008)

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the flattening or inverting of the sagittal profile must be seen as the starting point of idiopathic scoliosis

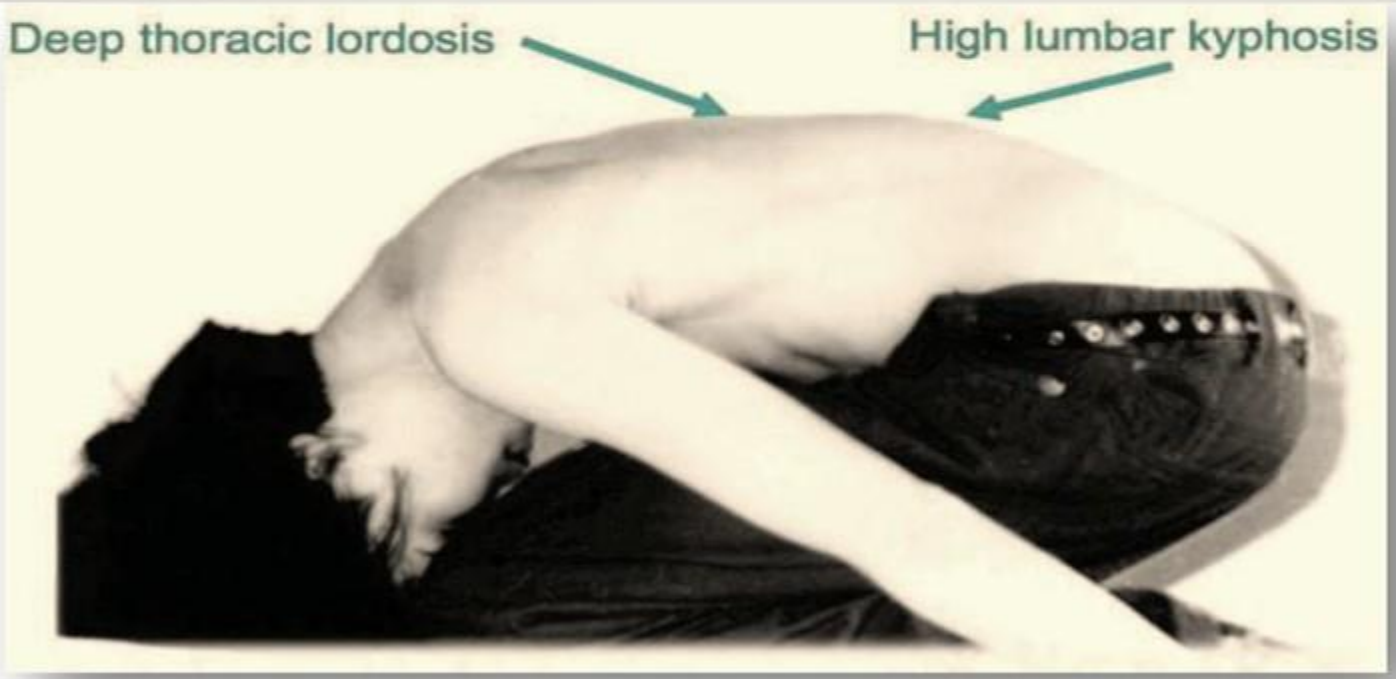


Fig. 6.1. *Patient with initial idiopathic scoliosis in Tomaschewski's "package sitting position." The deep thoracic flattening and the compensatory high lumbar kyphosis can be seen and are expressions of a structural inversion of the physiological sagittal profile.*

In the case of patients with idiopathic scoliosis and a thoracic pattern of curvature, a flattening of the thoracic sagittal profile into a thoracic lordosis is observed (Fig. 6.2); in the case of a lumbar curvature, a flattening of the lumbar lordosis into a lumbar kyphosis is seen.

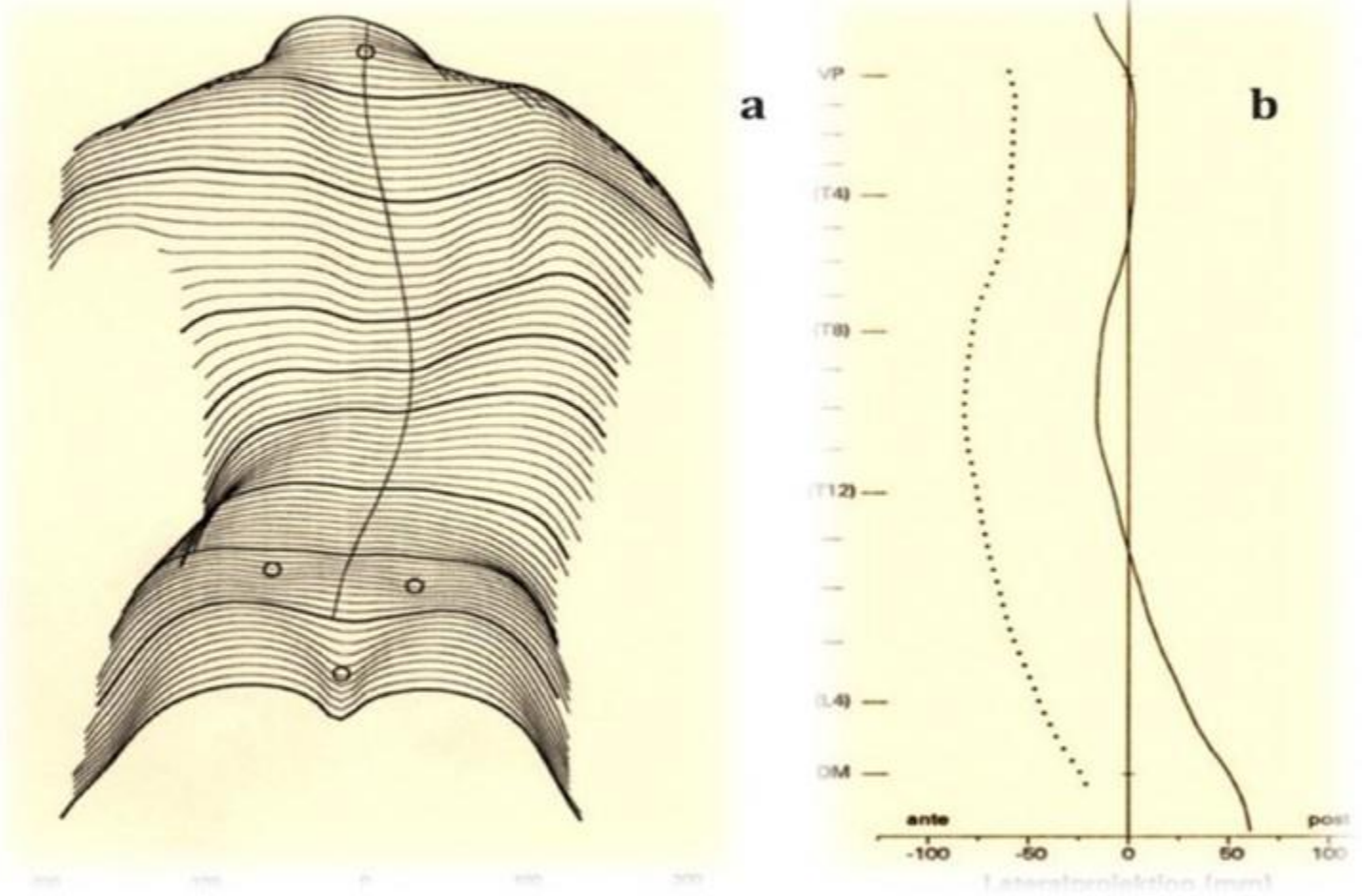
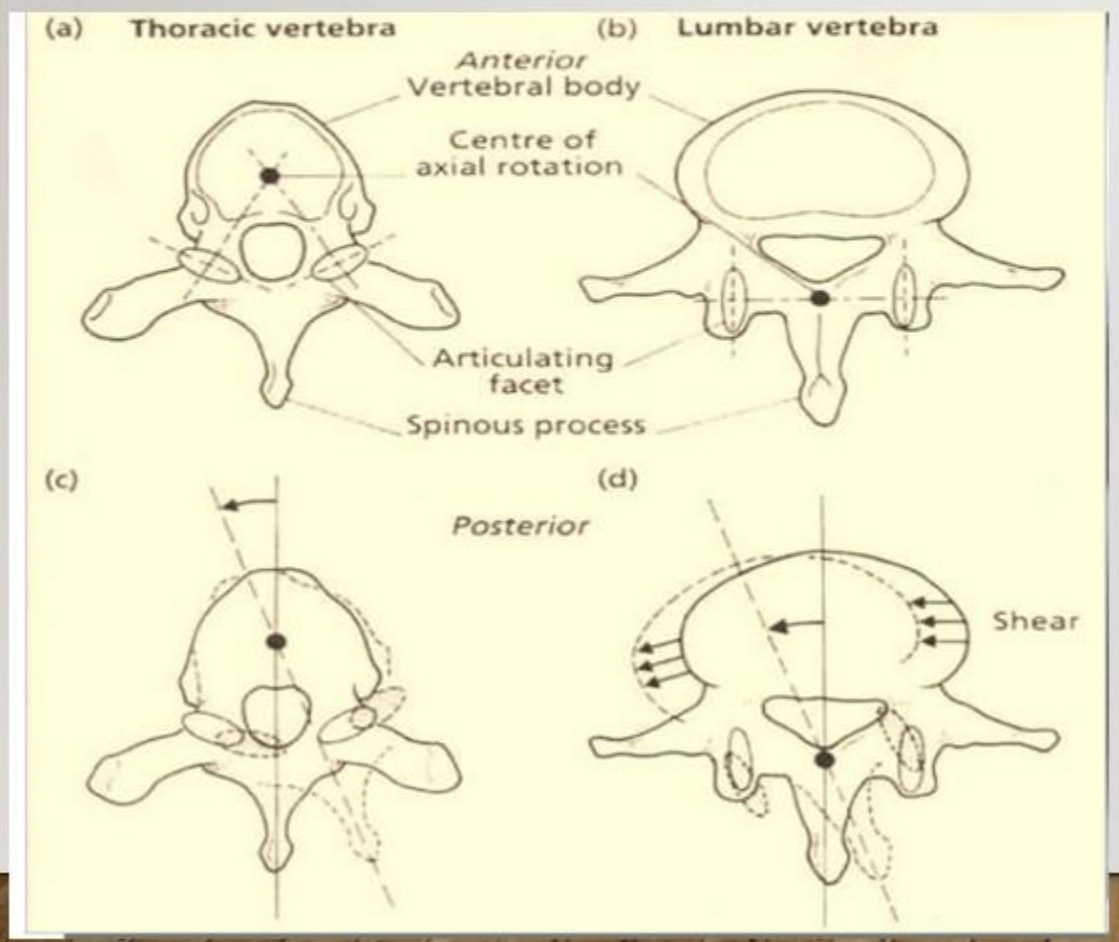
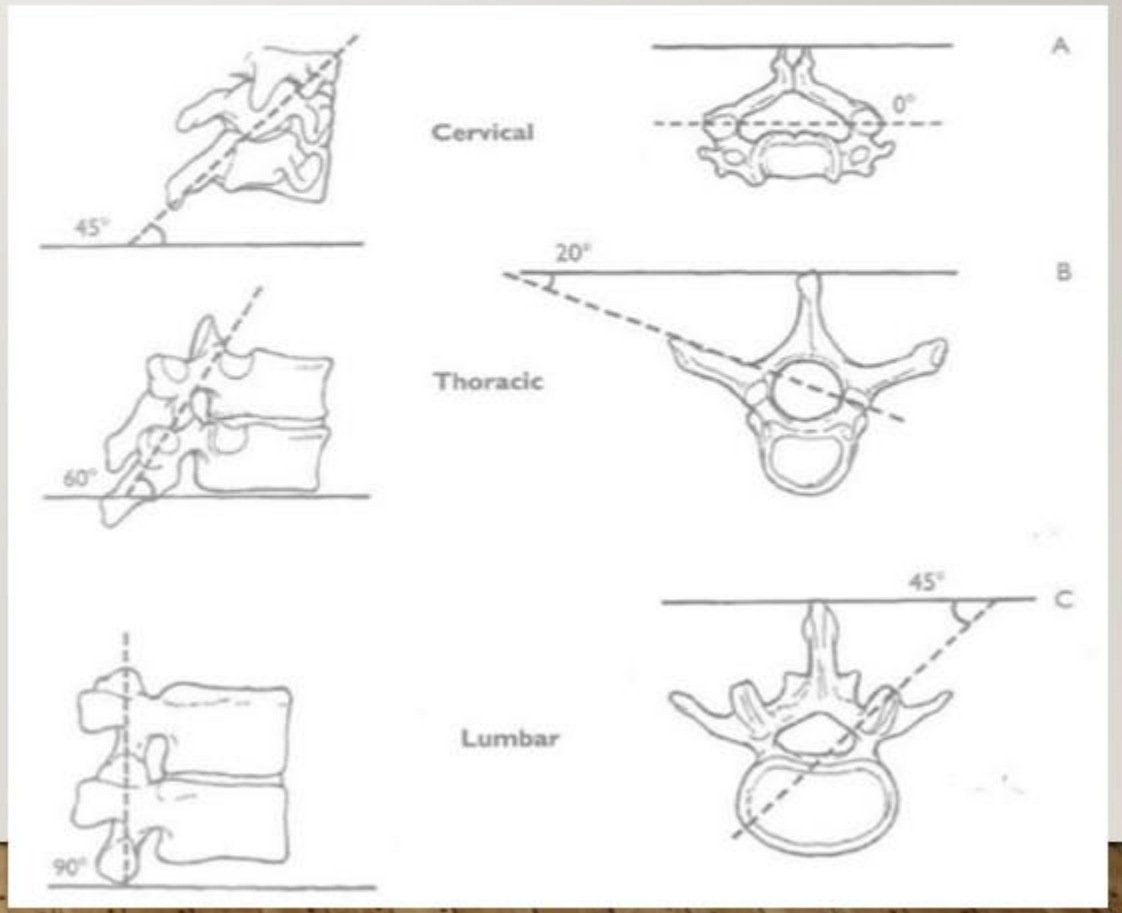
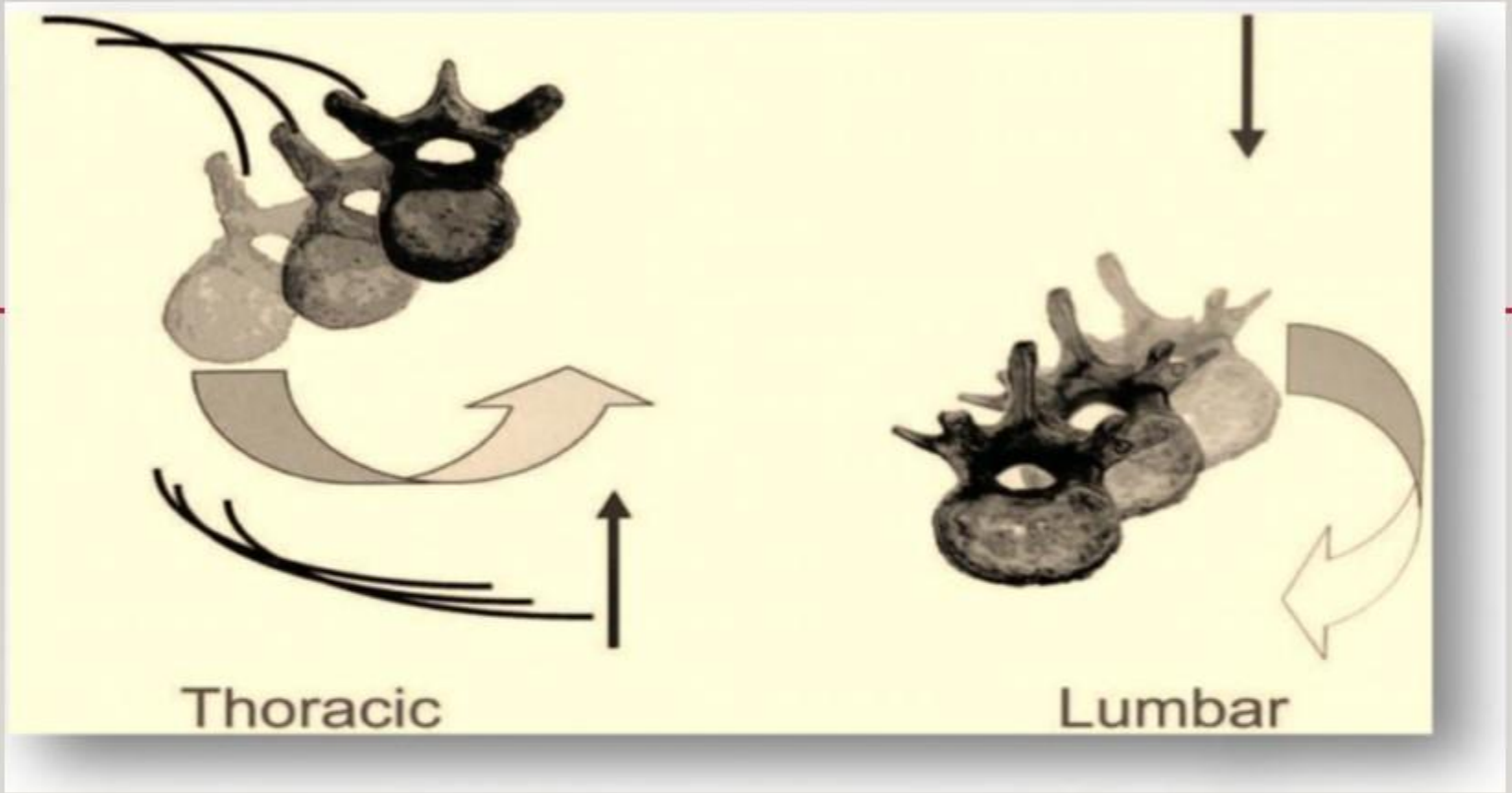


Fig 6.2. *(a) High-degree right thoracic idiopathic scoliosis with exaggerated ribhump as seen on a Formetric® scan. (b) A lordosis of the thoracic major curvature area can be seen in the lateral view.*

The orientation of the zygapophyseal joints in the thoracic region differs significantly from that in the lumbar region. Under physiological conditions, with a thoracic kyphosis and a lordosis of the entire lumbar region, the center of rotation is located in the thoracic spine, according to the joint orientation and the load-bearing relationships in the center of the vertebral body. While in the lumbar spine, due to the more dorsally situated axial load-bearing relationships, it is typically located at the base of the spinous process of the vertebral body.

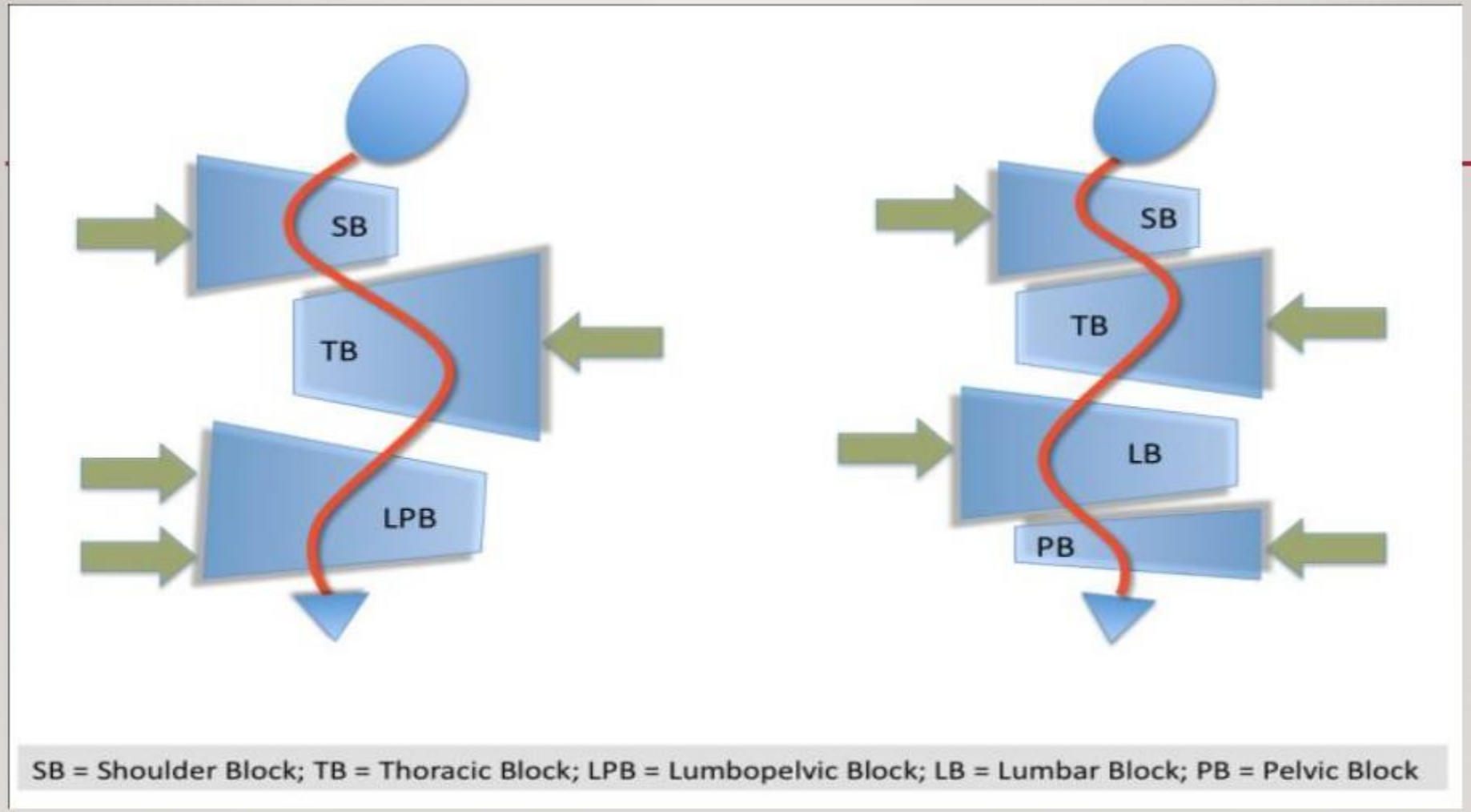






Left - With the evolution of an idiopathic scoliosis, the apical vertebra in a thoracoc curve slides initially in a ventral direction before the lateral deviation and the rotation appear. In the lumbar region, shown on the right, the apical vertebra slides more in a dorsal direction. Therefore, in the ribcage region, a clear correction force is required, from ventral to dorsal. Right - In the lumbar spinal region, a correction force from dorsal to ventral is necessary

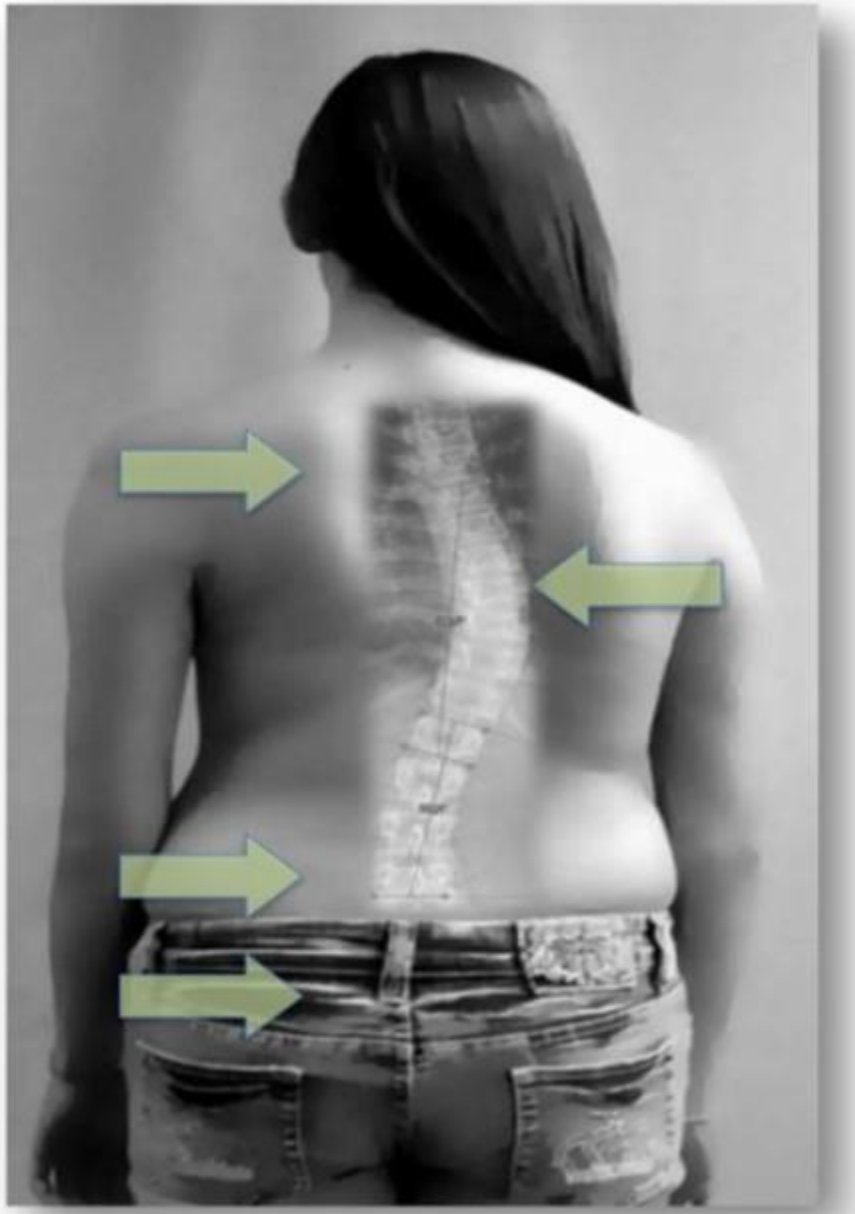
A SIMPLE SCOLIOSIS CLASSIFICATION - THE LS (LEHNERT-SCHROTH) CLASSIFICATION



The LS-Classification. On the left the typical 3C scoliosis with three blocks deviated and rotated against each other. On the right the typical 4C scoliosis (double major) with four blocks deviated and rotated against each other. The arrows indicate the frontal plane correction of the blocks against each other

TERMS

- The parcel side is the side on which the costal hump is found, the term parcel side always refers to the orientation of the thoracic curvature.
- The absolute decompensation is defined as the radiologically measureable deviation from the vertical line (plumb linee) from C7 - anal cleft.
- A relative decompensation is the clinical deviation of one of the trunk sections even when no plumbline deviation can be established radiologically.
- The weak side is the side on which the costal concavity is found. Accordingly, the term weak side always refers to the thoracic curvature. The weak side, therefore, is always on the opposite side of the parcel side.



3C Key Features

Radiologic features:

-Thoracic curve longer than lumbar.
-Thoracic Cobb angle > lumbar Cobb angle.
-Lumbar apex not crossing central sacral line (CSL).

Clinical features:

-Decompensation to thoracic convex side.
-Long thoracic curve no clear lumbar counter curve.
-Significant hip prominence on thoracic concave side.

4C Key Features

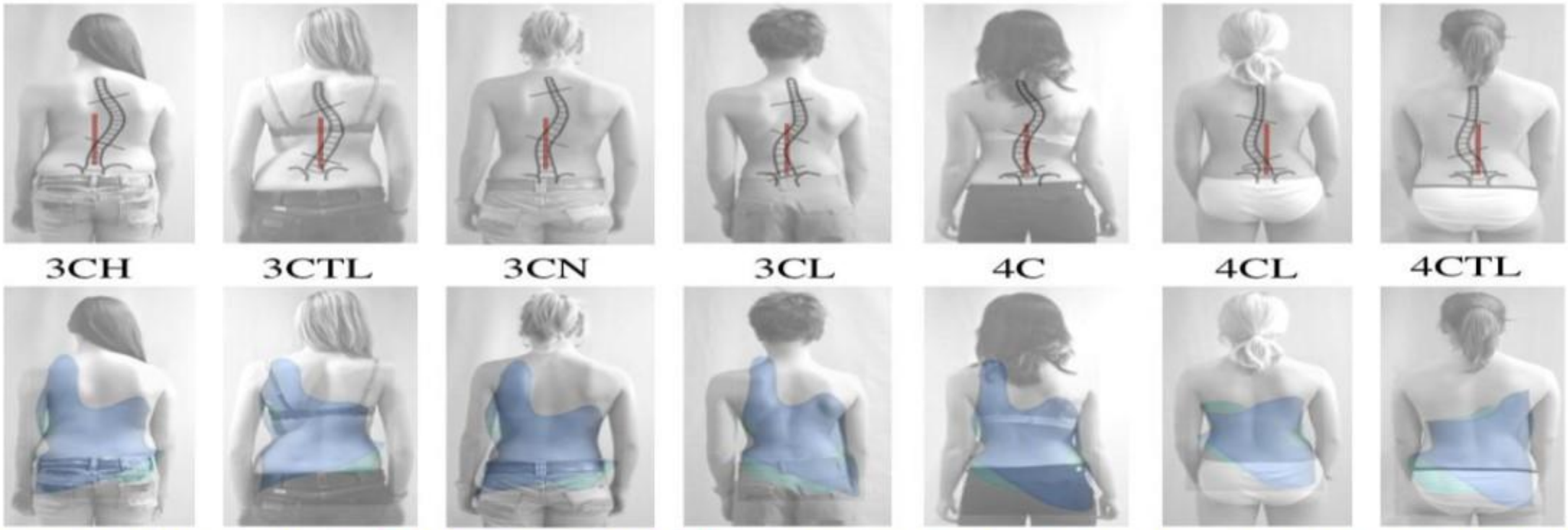
Radiologic features:

-Thoracic and lumbar curve about same length.
-Thoracic Cobb angle = lumbar Cobb angle.
-Lumbar apex is crossing the central sacral line (CSL).
-Wedging of the disc space L4/5/S1.

Clinical features:

-Decompensation to thoracic concavity or balanced.
-Thoracic and lumbar curve about same length.
-Hip prominence on thoracic convex side.

The Augmented Lehnert-Schroth (ALS) classification:



From left to right: 3CH (3-curve with Hip prominence), 3CTL (3-curve thoracolumbar with hip prominence), 3CN (3-curve Neutral with a more balanced pelvis), 3CL (3-curve with long Lumbar countercurve), 4C (4-curve double major), 4CL (4-curve single lumbar) and 4CTL (4-curve single thoracolumbar).

this classification is used for the application of Schroth Best Practice (SBP) exercises and for the application of the Gensingen brace (GBW) worldwide. For reasons of simplification we rely on the frontal plane pattern only because the sagittal plane deviations can simply be described additionally (eg. with thoracic kyphosis; with thoracic flatback).

DESCRIPTION OF THE CLASSIFICATION

3CH Key Features

Radiologic features:

-Thoracic curve longer than lumbar.
-Thoracic Cobb angle > lumbar Cobb angle.
-Lumbar apex not crossing central sacral line (CSL).

Clinical features:

-Decompensation to thoracic convex side.
-Long thoracic curve no clear lumbar counter curve.
-Significant hip prominence on thoracic concave side.

WITH A TYPICAL SCOLIOSIS INVOLVING A CONVEX THORACIC CURVATURE ON THE RIGHT SIDE OF PATTERN 3CH

- the lumbopelvic section is pushed laterally to the left, compressed in a wedge-shaped fashion on the right below the ribcage
- The thoracic section is pushed to the right, up against the lumbopelvic section, compressed in a wedge-shaped fashion on the left side
- The shoulder-neck section is pushed in a similar way to the lumbopelvic section
- The prominence of the hip on the thoracic concave side
- The weight appears to be predominatingly supported by the leg on the thoracic convex side.
- With a convex thoracic scoliosis on the right side, the thoracic section is rotated to the right, and, conversely, the lumbopelvic section and the shoulder-neck section are rotated to the left.

3CTL Key Features

Radiologic features:

-Thoracolumbar (TL) curve longer than lumbar.
-TL Cobb angle > lumbar Cobb angle.
-No lumbar countercurve.
-Apex at TH 12.

Clinical features:

-Decompensation to thoracolumbar (TL) convex side.
-Long TL curve no lumbar counter curve.
-Significant hip prominence on TL concave side.

3CN Key Features

Radiologic features:

-Thoracic curve longer than lumbar.
-Thoracic Cobb angle > lumbar Cobb angle.
-Lumbar apex is crossing the central sacral line (CSL).

Clinical features:

-Decompensation to thoracic convex side.
-Thoracic longer than lumbar counter curve.
-Hip prominence on thoracic concave side or centered.

3CL Key Features

Radiologic features:

-Thoracic and lumbar curve about same length.
-Thoracic Cobb angle > lumbar Cobb angle.
-Lumbar apex is crossing the central sacral line (CSL).
-No wedging of the disc space L4/5/S1.

Clinical features:

-Decompensation to thoracic convex side.
-Thoracic and lumbar curve about same length.
-Hip prominence on thoracic convex side.

4C Key Features

Radiologic features:

-Thoracic and lumbar curve about same length.
-Thoracic Cobb angle = lumbar Cobb angle.
-Lumbar apex is crossing the central sacral line (CSL).
-Wedging of the disc space L4/5/S1.

Clinical features:

-Decompensation to thoracic concavity or balanced.
-Thoracic and lumbar curve about same length.
-Hip prominence on thoracic convex side.

4CL Key Features

Radiologic features:

-Lumbar curve with short thoracic countercurve.
-Lumbar Cobb angle > thoracic Cobb angle.
-Main curve apex at L2 or below.
-Wedging of the disc space L5/S1.

Clinical features:

-Decompensation to thoracic concave side.
-Lumbar curve bigger than thoracic.
-Hip prominence on thoracic convex side.
-Ventral ribhump on the side of lumbar convexity.

4CTL Key Features

Radiologic features:

-Thoracolumbar (TL) curve, short thoracic countercurve.
-TL Cobb angle > thoracic Cobb angle.
-TL curve apex at L1.
-Wedging of the disc space L4/5/S1.

Clinical features:

-Decompensation to TL concave side.
-TL curve bigger and longer than thoracic.
-Hip prominence on thoracic convex side.
-Ventral ribhump on the side of TL concavity.

THE SCHROTH BEST PRACTICE PROGRAM

- The physio-logic program for correction of the sagittal profile
- Education related to everyday activities (ADLs)
- The program “3D made easy”
- The new “Power Schroth” program
- The rehabilitation of walk
- Neuromobilisation

THE PHYSIOLOGIC PROGRAM

- symmetric mobilization exercises for improving the lordosis with a target course of L1/2 and mobilizing the kyphosis of the lower thoracic spine
- education regarding the physio-logic® approach for everyday activities and
- training of these correcting movements also in locomotion.

Fig. 7.3. *When tensing the stomach muscles in an upright standing position, the upper trunk and shoulders automatically move forward (left). In order to remain upright, the shoulders must be held back actively (middle). This causes constant tightness, painful tension and decreased blood circulation. If one brings the front costal arches further forward (see Fig. 7.1; this figure on the right), the hollow curve in the upper lumbar region is increased, the upper body can balance itself better, the shoulders slide more loosely backwards, and the muscular tension needed to stand upright is barely noticeable.*

THE PHYSIO-LOGIC EVERYDAY TRAINING PROGRAM IS CARRIED OUT IN A STANDING POSITION WHILE SITTING AND
WHILE WALKING AS WELL

Everyday posture from the physio-logic® program in standing and seated positions

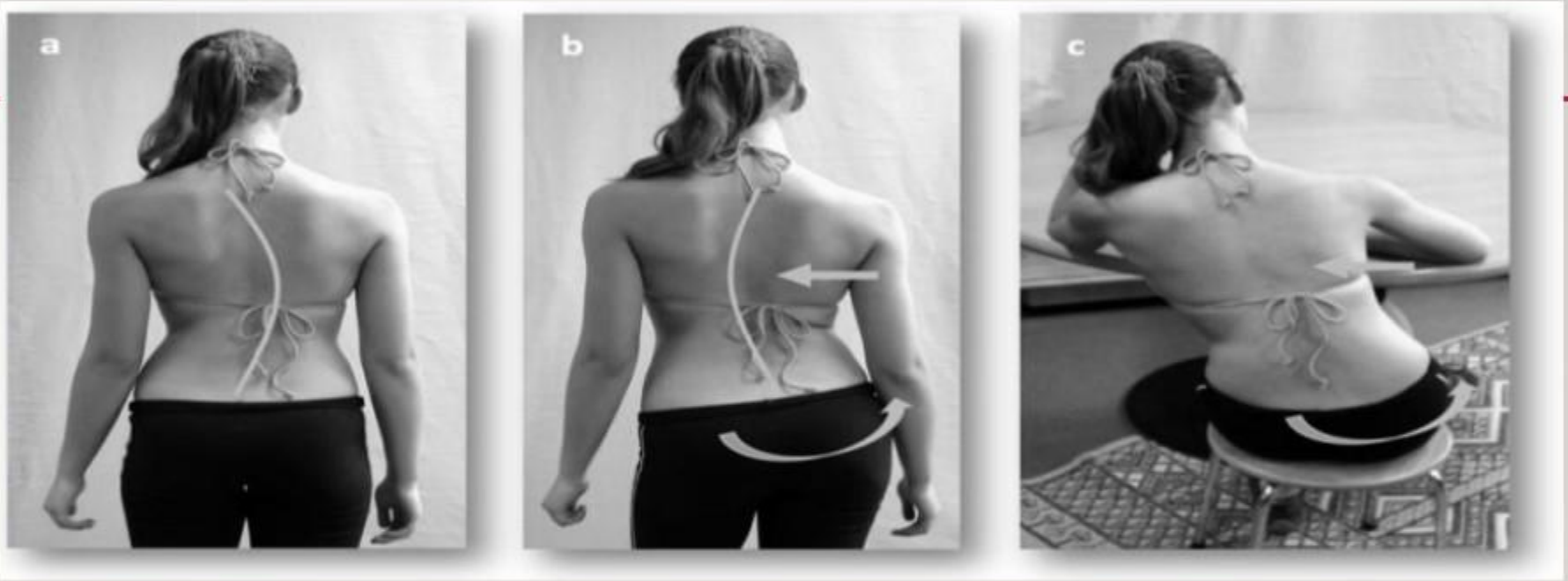
As part of the physio-logic® program, the catwalk leads to a re-lordosis of the upper lumbar spine and to a re-kyphosis in the chest region.

The catwalk physio-logic® has two phases: 1. The unrolling phase (placing of the heel to the placing of the sole). 2. The free leg phase (placing of the toes to the removal of the foot from the ground). With phase 1 (left), the lumbar hollow curve is maximized; with phase 2 (3rd image from the right) it is reduced.

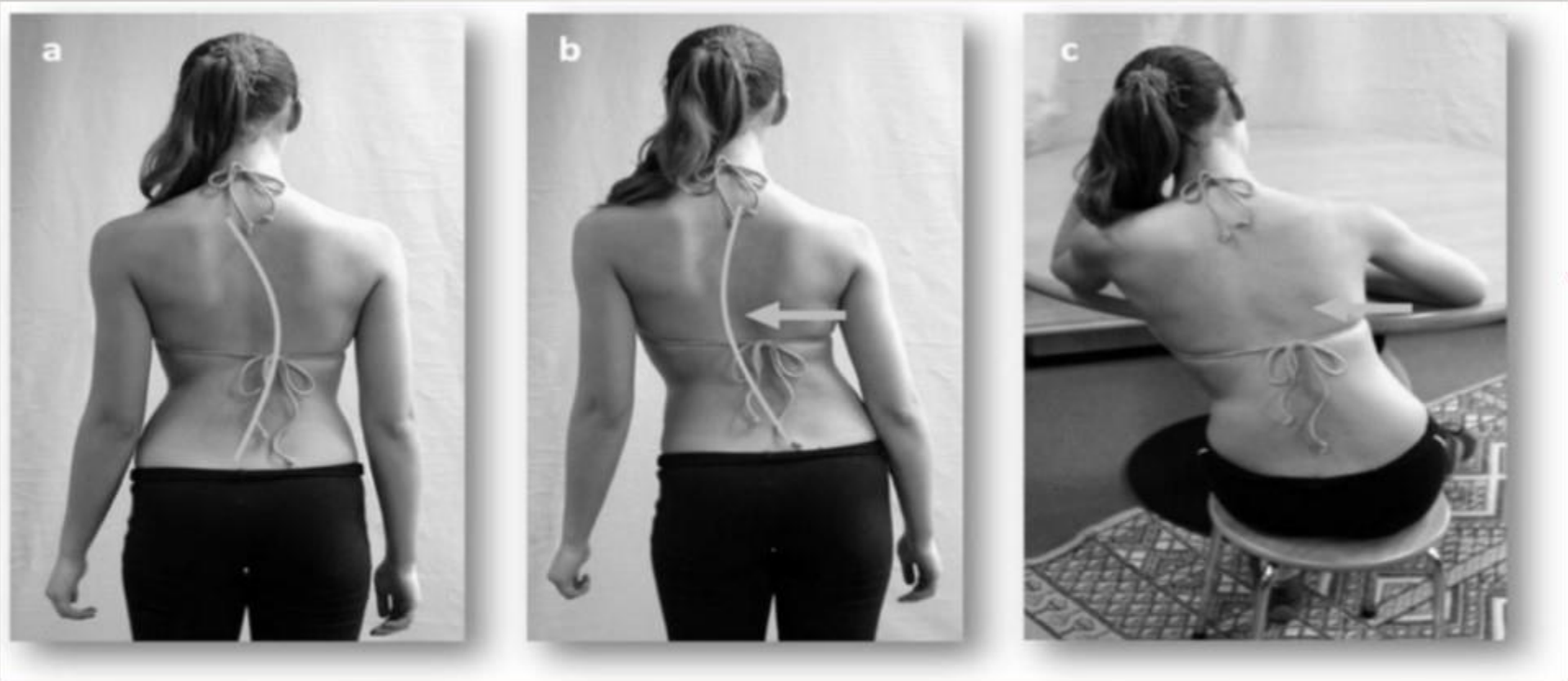
The exercise "snake on the ledge" can be carried out either standing (a, b) or sitting (below). With it we achieve passive counter-support of the lumbar lordosis and mobilize the thoracic spine by using kyphosisinducing synergy effects via pulling the arms downward against the resistance of an elastic band, going into inner rotation/abduction.

A passive counter-support of the lumbar spine while simultaneously mobilizing the thoracic spine into the kyphosis. In this exercise, the upper trunk should not be elevated to the extent that the full contact between the lumbar spine and the cushion lying underneath is separated.

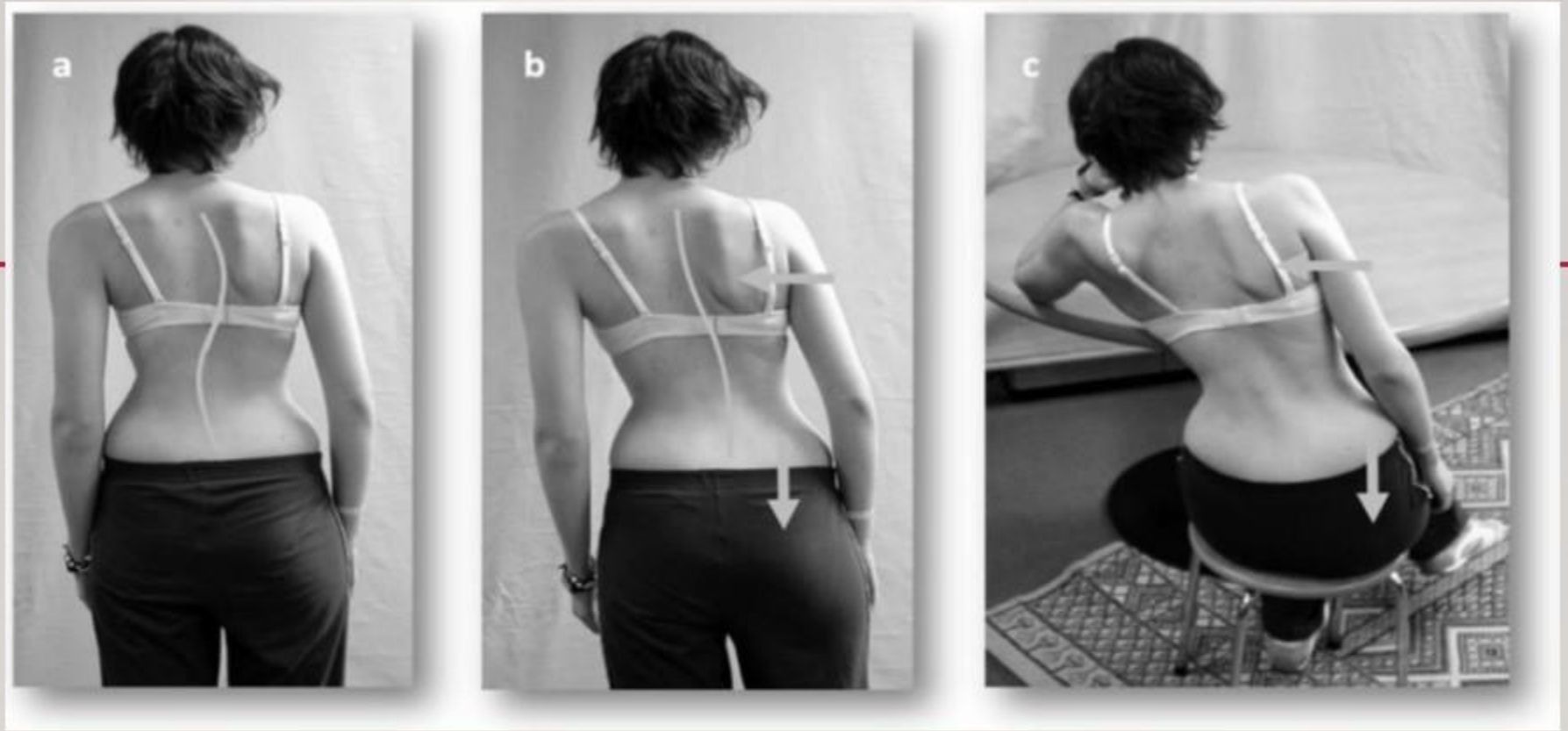
INSTRUCTION IN EVERYDAY ACTIVITIES (ADL)



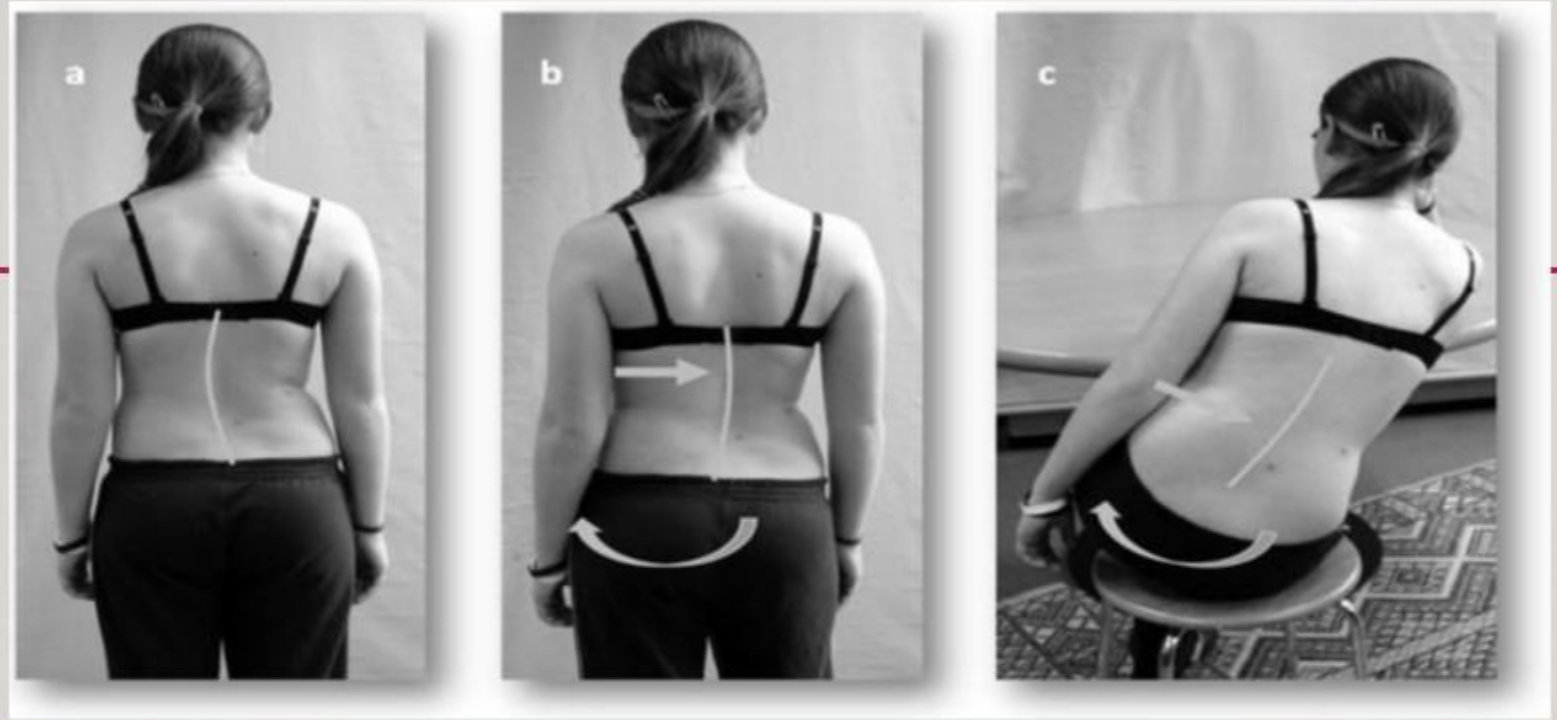
(a) Patient with scoliosis pattern 3C to the right uncorrected, (b) with load on the right leg tilting the pelvis underneath the ribhump. When sitting (c) the patient should try to support the frontal translation movement shifting the shoulder girdle to the left. In a 3CH pattern the right leg crosses over the left leg in order to reinforce the pelvic tilt.



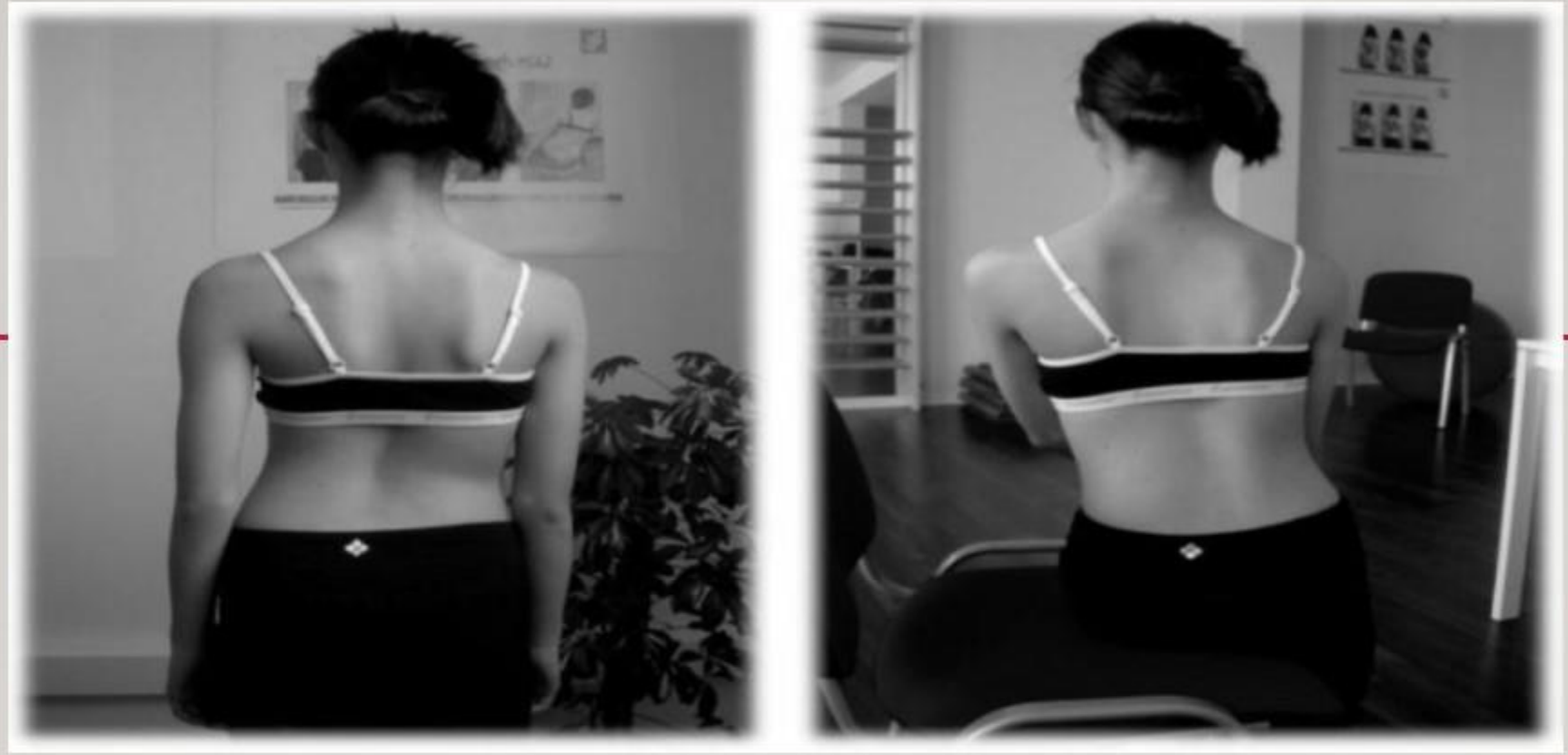
(a) Patient with scoliosis pattern 3C to the right uncorrected, (b) with load on the left leg shifting the pelvis underneath the ribhump. When sitting (c) the patient should try to support the frontal translation movement shifting the shoulder girdle to the left. In a 3CN pattern the left leg crosses over the right leg or both feet rest on the floor in order to reinforce the pelvic shift and prevent pelvic tilt.



(a) Patient with curvature pattern 4C right with a double major curve. During everyday activities one must take care to introduce a translation movement to the left (b) which is supported by the shoulder girdle shift to the left. Here, it is important that the right pelvis not be raised, in order to open the lumbar curvature. When seated, the left leg is crossed over to the right leg in order to keep the right pelvis down which keeps the lumbar concavity open (c).



(a) Patient with functional curvature pattern 4CL (4 curve single lumbar) with single lumbar curve. In this case, during everyday activity, focus does not need to be on the smaller secondary nonstructural thoracic curvature. The main visible feature is the hip protruding to the right, which can be centered with an appropriate loading on the left leg while standing (b). When sitting, the load should lie in the right lateral gluteal region, which automatically brings the pelvis to the left in the direction of correction, opposing gravity (c).



Sitting on a stool in a lop-sided fashion. The patient (pattern 3CH, still very flexible) cannot lean to the right into the costal hump without slipping from the stool. Therefore, an automatic correction of the posture is carried out in the frontal plane without previous skills or previous practice.

"Wipe your neighbor away from the table!" The patient (pattern 3CH, still very flexible) can completely correct her curvature using this exercise from the ADL program. The right hip can move upwards. The patient therefore crosses her right leg (the leg on the costal hump side) over the left leg. For pattern 4C, the left leg (the leg on the costal cavity side) must be crossed over the right leg in order to prevent the right hip from moving upward. In doing so, an increase of the lumbar countercurve can be prevented.

Leaning to the thoracic concave side using the wooden bars. The patient (pattern 3CH, still very flexible) can completely correct her curvature using this exercise from the ADL program. She is making a correction in the sagittal plane that improves the thoracic flat-back (chin out).

THE PROGRAM 3D MADE EASY

3D made easy for the treatment of curvatures of category 3C (with the exception of 3CL)

1. the hip is shifted under the costal hump by buckling the thoracic concave side leg
2. the shoulder girdle correction takes place with retroversion/adduction of the shoulder blade of the thoracic convex side; the sagittal profile is also corrected through this process
3. Through the opening up of the thoracic concave side, which has now been achieved, and through intentional guidance, the breath is directed into the concavity, correcting the ribs (that are rotated ventrally) in a dorsal direction
4. At the end of the correction, the trunk musculature should be tensed completely during the breathing-out phase in order for the tension pattern to be better perceived

3D made easy for the treatment of curvatures of category 3C (with the exception of 3CL). On the far left we see the clinical image; middle left is the schematic diagram with x-ray; middle right is the pelvis correction with the shifting of the hip under the costal hump and on the right is the pectoral girdle correction with retroversion/adduction of the shoulder blade, which also automatically corrects the sagittal profile. Finally, the patient breathes

3D made easy for the treatment of curvatures of category 4C (including 3CL

1. the hip is shifted under the lumbar bulge by buckling the thoracic convex side leg
2. the shoulder girdle correction takes place with retroversion/adduction of the shoulder blade of the thoracic convex side
3. Through the opening up of the thoracic concave side and through intentional guidance the breath is directed into the concavity, correcting the ribs (that are rotated ventrally) in a dorsal direction
4. At the end of the correction, the trunk musculature should be tensed in total during the breathing-out phase

3D made easy for the treatment of curvatures of category 4C (including 3CL). On the far left we see the clinical image; middle left is the schematic diagram with x-ray; middle right is the pelvis correction with the shifting of the hip under the lumbar bulge and on the right the pectoral girdle correction with retroversion/adduction of the shoulder blade, which also automatically corrects the sagittal profile. Finally, the patient breathes into the thoracic concavity and the correction result is stabilized with the muscles.

“POWER SCHROTH” - THE ADVANCED DEVELOPMENT OF THREE-DIMENSIONAL SCOLIOSIS TREATMENT ACCORDING TO KATHARINA SCHROTH’S METHOD

The Muscle-cylinder

Muscle cylinder being executed - functional 3-curve with pelvis position either straight or tilted underneath the parcel.

Muscle cylinder being executed - functional 4-curve with pelvis position either straight or tilted underneath the weak side.

The 50x Exercise

50x exercise being executed - functional 3-curve with pelvis position straight or tilted under to the parcel side. In the middle, the execution for an anti-kyphotic kyphoscoliosis; on the right, the execution for idiopathic scoliosis with thoracic flatback.

50x exercise being executed - functional 4-curve with pelvis position tilted under to the weak side. In the middle, the execution for an anti-kyphotic kyphoscoliosis; on the right, the execution for idiopathic scoliosis with thoracic flatback.

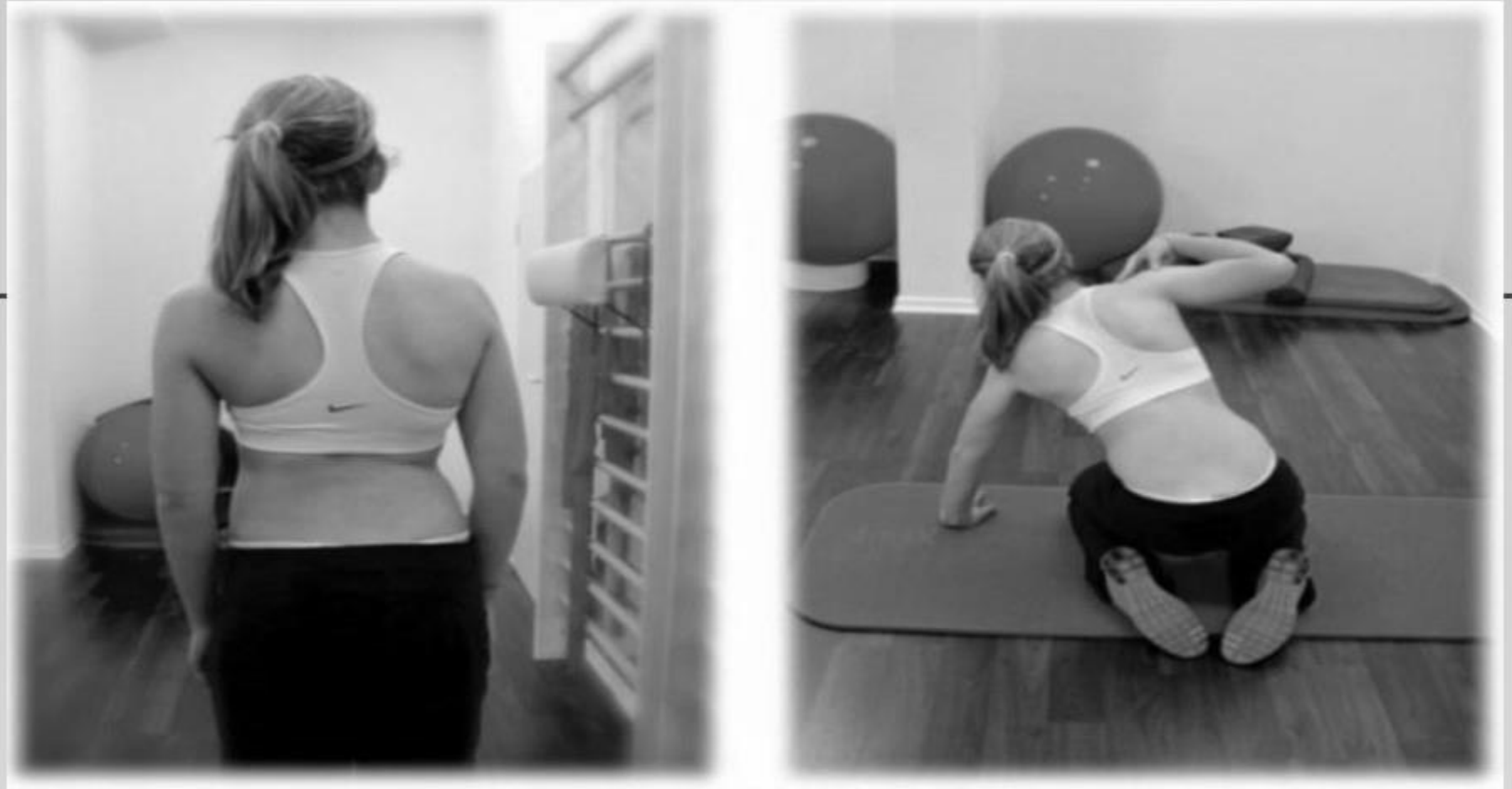
The door handle exercise

The new door handle exercise being executed - functional 3-curve with pelvis position straight or tilted under the parcel. In the middle, the execution for a kyphoscoliosis; on the right, the execution for idiopathic scoliosis with thoracic flatback.

The new door handle exercise being executed - functional 4-curve with pelvis position tilted under the weak side. This is achieved through caudalization of the thoracic convex side half of the pelvis. In the middle, the execution for a kyphoscoliosis; on the right, the execution for idiopathic scoliosis with thoracic flatback.

The frog at the pond

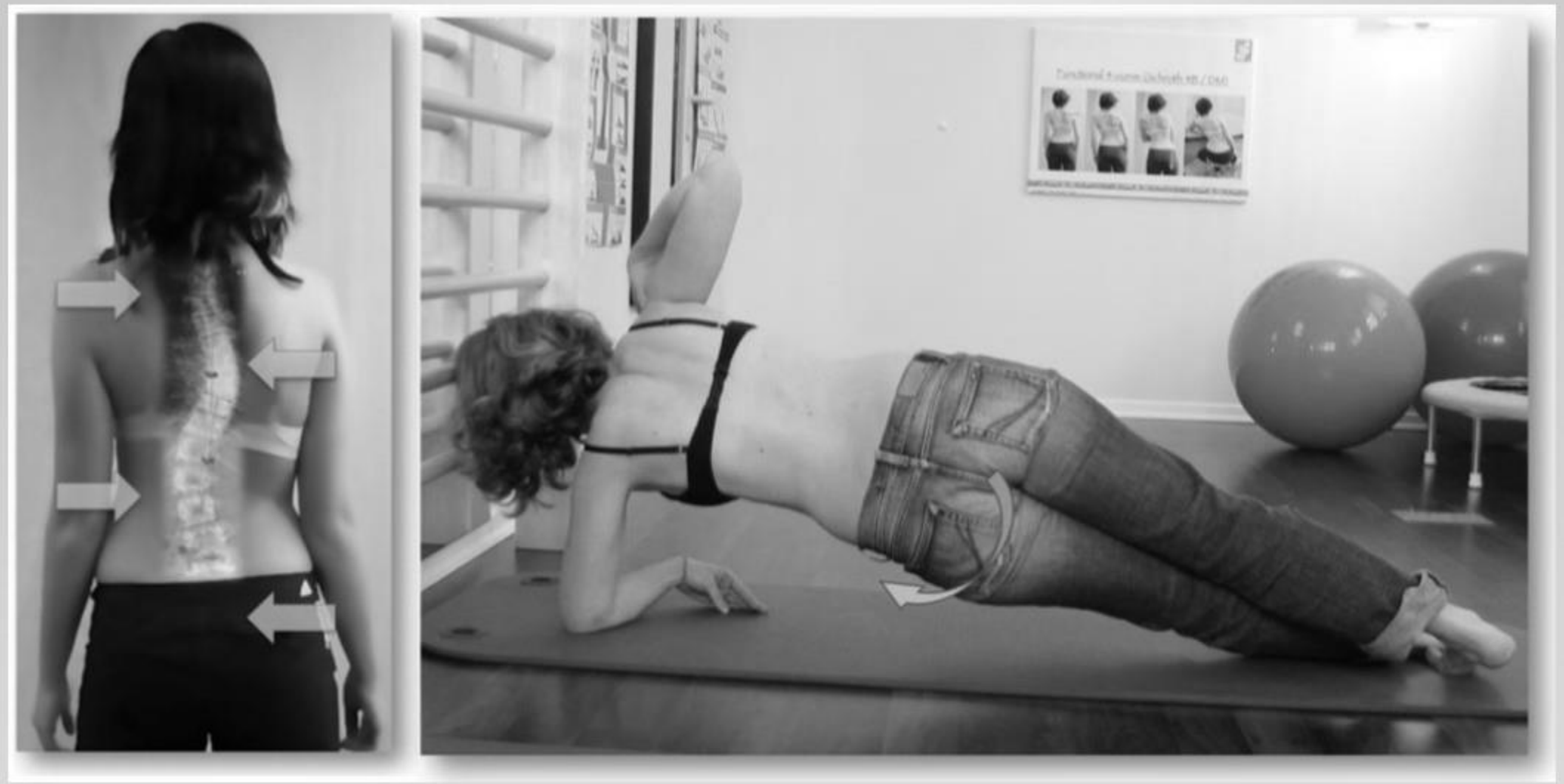
The "frog at the pond" exercise being executed - functional 3-curve with pelvis position tilted under the parcel (sitting, with legs folded back, heels folded back next to the body). The patient has a thoracic curvature of 43°, however, since she is only twelve years old, she is still very flexible. This exercise is for the patterns 3CH and 3CTL, only.



The "frog at the pond" exercise being executed - functional 4-curve with horizontally stabilized pelvis position (legs folded under the buttocks, sitting on the heels). In this way, the right half of the pelvis is prevented from coming free, which protects the lumbar correction. The nearly fifteen-year-old patient is classified as 3CL with a stiff thoracic curvature with a 50° Cobb angle.

Raising the Pelvis

Raising the pelvis exercise being executed - functional 3-curve. With the execution of this exercise, the leg lying on top is slightly bent and the pelvis is lifted over the abduction of the leg lying underneath.



Raising the pelvis exercise being executed - functional 4-curve. With the execution of this exercise, the leg lying on the bottom is slightly bent and the pelvis is lifted over the adduction of the leg lying above.

Correction strengtheners

Representation of the three most important correction boosters. Even after a brief period of learning, an engram for the correction value evolves and one only needs to remind the patient without any given resistance once that the appropriate resistances have been set priorily and a clear increase in correction will be observed. This effect is called the "virtual therapist." On the left, the correction booster at the elbow joint on the weak side for the correction of thoracic curvatures. In the middle, the correction booster at the shoulder blade of the parcel side for the correction of thoracic curvatures. On the right, the correction booster at the iliac crest on the weak side for the correction of lumbar curvature.

Rehabilitation of Walk

Correction on the treadmill using simultaneous 3D analysis with the Formetric® walking analysis. The patient has a left thoracic curvature of the 4C pattern (a) and, during the load-bearing phase on the leg on the parcel side shifts her pectoral girdle correspondingly in a rhythmic fashion over to the weak side, e.g. in this case to the right (b). In addition, the clear scapula adduction on the thoracic convex side (left side in this case) can be recognized as a visible feature of a (partial) three-dimensional correction of the main thoracic curvature.