TERMINOLOGY OF IDIOPATHIC SCOLIOSIS

E. ALICI * R. H. BERK * M. ÖZKAN * K. YALDIZ *

Current knowledge on idiopathic scoliosis is an ever increasing matter. With the increasing literature obviously new terms are introduced. We aimed to collect, most if not all, the terminology appeared in idiopathic scoliosis literature.

1. Apical Vertebra : The most horizontal, the most rotated, the most deviated, and the most deformed vertebra in a curve.

2. Buckling : A structure is said to buckle under axial load if there is a sudden "give" or lateral deformation of the structure (3).

3. Clinical Stability : The ability of the spine under physiologic loads to limit patterns of displacement so as not to damage or irritate the spinal cord or nerve roots and in addition to prevent incapacitating deformity or pain due to structural changes (3).

4. Composite Measurement (CM) : Composite measurement combines sagittal plane deformity with the frontal plane deformity. In calculating CM, deviation from normal sagittal plane is added to frontal Cobb angle (14).

5. Coronal Balance : In a well balanced spine C7 is aligned over mid sacral line. Thus, by coronal balance a centrally located C7 over sacrum is ment in frontal plane.

6. Coupling : A phenomenon of consistent association of one motion (translation or rotation) about an axis with another motion about a second axis (3).

7. Crankshaft Phenomenon : This phenomenon results from tethering of the posterior aspect of the spine by the fusion mass in an immature, while the vertebral bodies continue to grow. Since the spine cannot lengthen in this situation, the vertebrae begin to rotate with the posterior elements and the fusion mass as the axis of the rotation, resulting in an apperent increase in the curve (6).

8. Creep : A viscoelastic material deforms with time when it is subjected to a constant, suddenly applied load. The deformation-time curve approaches a steady-state value asymptomatically. This phenomenon is called creep (3).

9. Decompensate : The meaning of compensate in Webster dictionary is : hence to balance; to counterbalance. Decompensate is the loss of counterbalance.

10. Deviation of the T1 Vertebra from the Midline : Horizontal distance from the center of the first thoracic vertebra to the vertical plumb line (9). (Increases in coronal decompensation)

11. Deviation of the Apical Vertebra : Lateral deviation of the apex from the midline (9)A.

12. Disc Index : Mean wedging of the dick spaces in the curve, expressed by the height in the convex side divided by the height in the concave side (17).

13. Elastic Stability : The ability of a loaded structure, given an arbitrary small elastic deformation to return to its original position (Euler's Law) (3)B.

14. End Vertebrae : The end vertebrae (EV) are usually the cephalad and caudad instrumented vertebrae. These EV, however, may coincide with the neutral vertebrae. EV are determined from standing AP, standing lateral and two side bending films. If standing film confirms, the discs that open in side films can be left outside the instrumentation area. However, caudad EV **must** be bisected by the mid sacral line. Finally, any sagittal plane abnormality must be included in the fusion area.

15. End Vertebra Angle : The angles between the lines through the end vertebrae and the horizonta'phale are called end vertebra angle (EVA) (2).

16. Flexibility Index : Flexibility index is calculated by subtracting the percentage of side bending thoracic curve correction from the percentage of side bending lumbar curve correction.

17. Frontal Translation : The center of the vertebral body is defined by the intersection between the anterior wall of the vertebral canal and the line of Aaro and Dahlborn (1). The distances between the outer wall of the rib cage and the center of the vertebral body are used to calculate frontal translation (8).

* Dokuz Eylül University, School of Medicine, Dept. of Orthopaedics and Traumatology, İzmir.

18. Harrington Stable Zone : Parallel lines are drawn through the lumbo sacral facets. The vertebral bodies within the lines are considered in the stable zone (7).

19. Harrington Factor : Cobb angle divided by the number of vertebrae in the curve (17).

20. Idiopathic Scoliosis : A structural spinal curvature for which no cause is established.

21. Junctional Kyphosis : Junctional kyphosis is the pathologic kyphotic segment at the transitional area. The sagittal curve from T12 to L2 should be in slight lordosis (approximately 3 degrees of lordosis). Therefore, kyphosis from T12 to L2 (especially greater than +10 by lateral Cobb measurement) is pathologic and should be considered in the instrumentation of type 2 curves. If junctional kyphosis is present at type 2 curves, modified hook pattern will be used at thoracolumbar zone as Shufflebarger mentioned.

22. Kyphosis Index : Kyphosis angle from T2 to T12 is measured by Cobb method. Then the width (W) of the curve is divided by the length (L) of the curve. KI = W/Lx100 (16).

23. Lordosis Index : Lordosis between L1 and S1 is measured and the witdh (W) of the curve is divided by the length (L) of the curve. LI = W / Lx100 (16).

24. Lumbar Distance : Measured from the center of the apical vertebra of the lumbar spine to perpendicular line in the sacral midline. If it's greater than 2 cm., decompansation will be expected postoperatively especially at type 2 curves (10).

25. Lumbosacral Angle : Mason et al. first describe this angle in order to distinguish the patients that have type 2 curves which have a risk of postoperative decompansation. An angle formed by the sacral center line and a line drawn from the intersection of the sacral center line at the iliac crest level through the center of the apical lumbar vertebra. If it's greater than 15 degrees, there will be a risk of decompansation postoperatively especially at type 2 curves (10).

26. Mid Sacral Line (MSL) : A single line drawn through the center of the sacrum perpendicular to the iliac crest. The vertebra that is most closely bisected by the line is the stable vertebra (7).

27. Neutral Vertebra : On the standing film neutral vertebrae are: the most tilted (they allow to measure the Cobb angle), the most neutrally rotated, very near to midsacral line.

28. Rib Vertebral Angle (RVA) : The intersection of a line perpendicular to the apical vertebral end plate with a line drawn from the midneck to the midhead of the corresponding rib is called rib vertebral angle (RVA) (11).

29. Rib Vertebral Angle Difference (RVAD) : The rib vertebral angle difference is the difference between the RVA of the concave and convex ribs of the apical vertebra. In a straight spine the RVAD is zero (11).

30. Risser's Expected Correction : (Standing angle-supine angle) X 3 (13).

31. Rotation : Motion of a rigid body in which a certain straight line of the body or its rigid extension remains motionless. This line is the axis of rotation. The unit of measure is radians or degrees (3).

32. Sagittal Balance : (C7 - S1 distance) This is determined by dropping a plumb line from the center of the body of the seventh cervical vertebrae and measuring the distance from the anterior aspect of the sacrum to this plumb line. In patients without scoliosis and those with idiopathic scoliosis who have had no surgery, the C7 plumb line falls within 2 cm. of the anterior aspect of the sacrum (9).

33. Sagittal Score : It's the product of rotation and wedging at each level and calculated so as to give a number that is positive if that level is lordotic and negative if kyphotic (Sagittal score : Rotation X Wedging.) (4).

34. Sagittal Translation : The measurement of translation in the plane of one CT slice evaluates the percentage of translation of the defined center of the vertebra in relation to the thoracic cage or to the lumbar and abdominal muscles (8).

35. Segmental Rotation : It is the difference between the cephalad and caudad vertebrae. There is only small amount of segmental rotation at the apical region however segmental rotation is maximal at the transitional zones of the curves (15).

36. Selected Plane (plan d'election) : True anteroposterior or posteroanterior view of a selected segment of the spine where the center of the beam is vertical to the selected vertebral segment. In most common use the apical vertebra is "selected" at it is "neutralized" by rotating the patient to the amount of apical vertebral rotation, which is previously calculated on the standard PA view (5).

37. Translation : Movements are such that all particls in the body at a given time have the same direction of motion relative to a fixed point (8).

38. Torsion : A type of load that is applied by a couple of forces (parallel and directed opposite each other) about the long axis of a structure. The load is called torque. It produces relative rotation of different axial sections of the structure with respect to each other. For a straight structure, all the sections are subjected to the same torque. However, in a curved structure, loaded by a torque on its ends, each cross-section is subjected not only to torque but also to bending. The magnitude of bending depends upon the orientation of the particular cross-section with respect to the torque axis (3).

39. Trunk Shift : In a normal spine mid sacral line intersects thorax. However, if the thorax is translated to one side due to the coronal plane deformity, it is no longer bisected. The difference between the rib cage to mid sacral line on both sides represents lateral trunk shift (12).

Appendix :

A. The two spinal curvatures (a & b) represented by this schematic drawing are obviously quite different in magnitude. However, using Cobb's method to measure the deformities, the degrees of curvature (C°) are identical. The differences in curves are more accurately reflected when the length of the curves (L) and their respective widths (W and W') are taken into consideration (15). Fig. 1

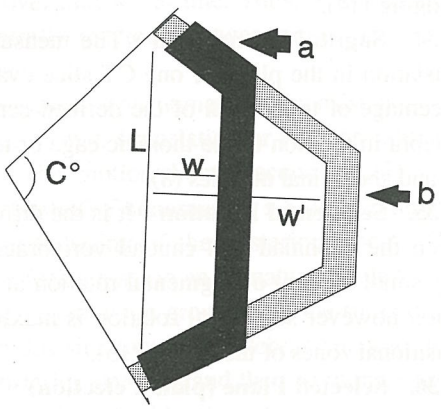

Figure 1. Although two curves a and b are identical in curve magnitude measured by Cobb's method, width of the curves and moment arms (W and W') are different. Thus, biomechanically clinical deformity is more severe on acute angle curve b (21).

B. Euler's law : The stability of an elastic structure is a function of the geometry of the structure and the quantitative and qualitative characteristics of the applied load. The classic example of elastic instability is the axially loaded columns that were studied by Euler in 18th century. Euler applied increasing loads on the column until the column is no longer able to maintain its straight vertical position. He called this final load the "critical load" (3).

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