

About the Correction of the Spinal Deformities

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EDITORIAL

No matter, neither the etiology neither the ways of treatment not surgical or surgical, the correction of the spinal deformities is appreciated mainly on radiological purely angular measurements as well as morphological as functional on SF36 or Oswestry or other scores.

The spinal community is quite addicted on these angular measurements coming from Cobb Angle AP and sagittal projections, ignoring most of the time the Horizontal plane (this one not considered as the shape given by one CT Scan cut, but by the piling up from head to feet of the successive masses of the human body.

The percentage of correction of the Cobb angle is still the “Gold standard” required for any modern publication on this topic. Sometimes this way of evaluating is acceptable and reliable but often this race to get the best Cobb angle is not the optimal one for the patient either immediately after the correction or most often with some more or less delayed follow up.

To address this problem, it is necessary to consider in the 3D (space) and even 4D (time), some basic concepts nowadays accepted by the entire community:

The successive masses of the various parts of the body realize from head to feet a piling up along the gravity line and subsequently a chain of balance with a particular importance of the pelvic vertebra (entire pelvis considered as a unique vertebra, intercalary bone adjusting the alignment between the lower limbs and trunk structures permanently as in standing or sitting position), as well as the cephalic vertebra (entire head considered as a unique vertebra).

Their relative position in space is able to regulate the alignment of the body working similar to a reverse pendulum with the weight located at the upper part ending with a harmonious distribution of the various parts of the body from head to feet immediately seen in a glance.

Do not confuse alignment, which is static and balance which is dynamically dependent mostly from neurological structures relative to neuromuscular behavior as well as cognition and central nervous system function. *The result of alignment and Balance is the Stability and finally we must consider Balance as the Stability within the movement, as global for the entire body as segmental for each spinal unit.

This drive to the concept of “Cone of Economy”. It is the status where these bone and joint axial structures with their surrounding masses of variable tissues or appendix (upper limbs, for example) during the erect posture remain inside a “small cone” area around the gravity line of this body using a minimum of muscle power to stand as they

use much more when they are outside the small cone during motion or exercises. This concept explains the phenomenon of Compensation or Adaptation of the posture (especially at the level of the lower limbs) in order to try to maintain the body within this “economical” small cone. In addition, we must remember the comment of Paul Bellugue (Professor of Anatomy at the School of Fine Arts in Paris): “Harmony is the sister of Economy”.

From this concept are coming the biomechanical explanations of the so frequent PJK observed on rigid fusion & instrumentation done more or less extensively along the spine in order to correct spinal deformities especially in adult spine surgery where compensation is often more difficult.

The consequences of this vision are (before any attempt to treat spinal pathologies by casting, bracing, or any surgery with or without instrumentation and fusion):

- To check the passive as well as the active capacities of the various segments of the spine to realign properly and able to compensate the residual deformity or stiffness within the cone of economy area. This can be done of course in the research labs of biomechanics, but more simply also during a regular clinic.

For checking pre-op or post op, functional conditions, or also at regular interval to measure, for example the consequences of ageing: with a simple chronometer check: a, the time necessary to walk frontward 5 m and come backward, b, climb 3 stairs and go down, c, to sit on the floor and get up (the more discriminant), d, walk in the room speaking on the telephone or counting reverse in a loud voice in order to explore the evolution of the cognition of the patient.

- To try to reduce the minimum as possible the extension of rigidity of the spine, leaving a maximum of mobility segments above and below the fusion mass in order to allow as much as possible compensation.
- To keep as harmonious as possible the junctional zones in between the segments of the chain of balance.
- To not be addicted for pre op planning to the formulas such as $PI=SS+PT$ almost always described from static measurements for normal adult people and mostly variable according age, height, weight, muscle and joint

function status, but be more confident in the clinical functional evaluation.

- Finally to not be glued on the unique Cobb angle to evaluate the status and the results of the correction of the spinal deformities, but think more about 3D for static, dynamic and functional evaluation.