Reviewer’s report

Title: Three dimensional reconstructions of Lenke 1A Curves

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Reviewer: Jean Claude De Mauroy

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The concept of Berthonnaud is personal and interesting. The wired model has the advantage of being fast acquisition. However, it is much less accurate than 3D EOS reconstruction which provides the specific rotation for each vertebral segment.

The 3 initial regional plans are defined from the 3 physiological sagittal curves and their inflection point. In case of scoliosis these sagittal planes will rotate like the rudder of a submarine whose axis could tilt thus changing the trajectory in a horizontal plane but also in depth. The regional plane obtained from this wired representation depends on two arbitrary criteria: the proximity of the points with respect to the unknown plane and the continuity of projection of these points in this plane. Now we know by EOS 3D that each vertebral segment has a specific rotation. The image of the rotation of the plane is therefore an approximation which may be useful, but does not correspond to the reality. A 3-D shape of the vertebral body line, and even a part of it cannot be adequately represented by a 2-D plane.

"matching" could be better than "including"

A conclusion should demonstrate to the reader that you accomplished what you set out to do. You only demonstrate that using an arbitrary regional plane representation of a 3D shape you get 2 types of Lenke 1A scoliosis. In may 2010 you published in Scoliosis the Interest of the three dimensional analysis in brace treatment of idiopathic scoliosis. Prospective study. You wrote: "No significative difference was found between the two groups for the correction of frontal, sagittal plane, or for the plane of maximum deformation." In a later work it appears that a difference is noted in the thoracic kyphosis. Is there an international reference?

Please add: IN OUR MODELING, the 3D spinal curve is compound...

The geometric structure of a 3D spinal curve CAN BE characterized by the size and orientation of regional planes...

The heterogeneity of Lenke 1A has already been demonstrated by Atmaca: Spine J. 2014 Oct 1;14(10):2425-33. Axial plane analysis of Lenke 1A adolescent idiopathic scoliosis as an aid to identify curve characteristics. "Addition of axial plane analysis to conventional coronal and sagittal evaluations in patients with Lenke 1A curves may reveal inherent structural differences..."
that are not apparent in single planar radiographic assessments and may necessitate a different surgical strategy."

1 136-149 3D thoracic angulation integrates a part of the 45° of physiological kyphosis at the frontal Cobb angulation. What is pathological remains the frontal Cobb angulation which physiologically should be at 0°.

1 170-173 The arguments in favor of this clinical orientation are not obvious. FIG. 1 perfectly illustrates the ambiguity of the representation with a curvature of -54.4° at the lumbar level (plane 1) which results from the mix between the physiological lordosis of 50° and the frontal Cobb of 15°. A double curvature is usually more stable than a single curvature. In FIG 2 The cervical (plane 4) and cervico-thoracic (plane 3) rotation is identical and compensates the rotation of the thoracic plane 2. The plane 3 is in kyphosis, the plane 4 in lordosis, which explains the additional plane. The representation of the computer does not seem pathological.

1 177-179 EOS 3D shows that rotation and inflexion do not evolve in parallel and are opposed even in so-called paradoxal curvatures.

1 204-207 Taking into account the prospective study started more than 7 years ago, it should be possible to say whether "orthospine" is useful or not for bracing scoliosis. On the other hand, this work seems very useful for the classification of scoliosis.

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