Author's response to reviews

Title: Real Time Noninvasive Assessment of External Trunk Geometry during Surgical Correction of Adolescent Idiopathic Scoliosis.

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Montreal, December 28, 2008

Dr Theodoros B Grivas
Editor-in-Chief Scoliosis
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Magula, Athens
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Re: Submission for the manuscript entitled "Real Time Noninvasive Assessment of External Trunk Geometry during Surgical Correction of Adolescent Idiopathic Scoliosis".

Dear Dr. Grivas,

The authors would like to thank the reviewers for providing relevant comments on the first version of our manuscript. Please find enclosed a revised version of this manuscript. The paper was revised according to the concerns raised by the reviewers and our point by point response is appended. All modifications made in response to the reviewer’s comments are underlined in this new version of the manuscript.

Thank you for considering our paper for publication in Scoliosis, which we hope will bring new knowledge on the population affected with Adolescent Idiopathic Scoliosis.

Sincerely yours,

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Reviewer #1

1. It seems difficult for the reader to tell which numbers represent improvement and which worsening.

We would like to thank reviewer #1 for his comment and we agree that the results are difficult to interpret. We provided a color coded table for each index, indicating where improvement can be observed.

2. Table 2 After displacement suggest adding units, presumably mm.

The displacement units (in mm) were added in the header of Table 2.

3. Reference points 4, 5, 6, and 7 do not seem to have been evaluated. Wouldn't it be helpful to know the angular change in the transverse plane of points 4 and 5? I'd suggest a comment about the lack of analysis of these points. If you have already made it and I missed it I apologize.

The reference points 6-7 were used solely for visualization purposes of the trunk, and were not considered for clinical analysis in this study. We agree with the reviewer that it is possible to consider it in future studies. We are currently investigating means of improving repeatability and reliability of identification of those landmarks, since those landmarks are not based on a single anatomical landmark, but on an approximate location on the trunk.

In this study, landmarks 4-5 were helpful to assess which data frame are synchronized with the breathing of the patient. Substantial motion can be attributed to the respiratory function and data collection has to be gated accordingly, to ensure proper comparison. In a longer term, these landmarks (4-7) will be used for quantifying the thoracic and lumbar level change.

4. The numbering of the reference posts in Figure 6 seems to be different here than in Figure 1.

The numbering of the reference posts in Figure 6 was modified accordingly.

5. The caption for Figure 7 says intraoperative difference between stage 1 and 2. The labelling in Figure 7 says Difference of intraoperative trunk clinical indices during and after. Suggest the wording be the same; e.g. between and during seem different.

The caption of Figure 7 was modified accordingly.
1. To prove the clinical relevance, it is necessary to indicate how their measurements during surgery can accurately predict postoperative residual deformity or imbalance such as rib hump, shoulder imbalance, coronal and sagittal trunk imbalance in the standing (or sitting) position. For this purpose, comparisons between the measurements during surgery and postoperative measurements are necessary. I think this is a preliminary study and such validations may be the next step for the authors. Could the authors add this point to the discussion?

We agree with the reviewer that pre-, per- and postoperative validations are important, and such validations are the next step for this study. This important point was added in the discussion and will be addressed in the future.

2. Please keep style as shown on the website, "Instruction for Scoliosis authors". Title page, abstract section, competing interests, authors’ contributions and figure legends are necessary.

We review the instruction for Scoliosis authors and re-structured the manuscript accordingly. Competing interests, authors’ contributions and figure legends were explicitly added to the manuscript.

3. Please address the following:
   Page 3, line 13 and 14: superior posterior iliac spine – iliac crest?
   Page 4, line 15: RMS – root mean square?
   Page 7, line 16: Table 2 – Table 1?
   Figure 6(B): What is the meaning of the numbers? Numbers in the figure 1 and figure 7 are not coincided.
   Table 2: Please add units. mm?
   Page 12, line 14: Eurospine – when and where?

We corrected the key points pointed by the reviewer in the revised version of the manuscript.

4. Table 1: For the double curve, Cobb angle of the both curves should be described. Moreover, from the clinical standpoint, level of the curve and area of instrumentation should be added.

The measurement for the second curve was added in Table 1. Moreover, to provide additional clinical background on the patients considered in this study, Figures 1-2 were merged into Figure 2 and Figure 1 was added with the pre- and post-operative radiographs of patients, illustrating the level of the curve and the instrumentation installed during the surgery.
Reviewer #3

One main question is that the 3D trunk positioning after anesthesia and placement on the surgical frame could be quite different from the standing position pre-operatively. The tracking can only help in monitoring changes in the intraoperative position. Have the authors thought of doing the same tracking measurement pre-operatively and then compare with the changes made intraoperatively?

We would like to thank the reviewer for his comment. Indeed, we are convinced that the standing pre-operative position is quite different from the positioning measured during the surgery, since the trunk is under gravitational effect. A workflow involving pre- intra and post-operative measurements should be optimal in understanding the relationship between the external trunk changes and the spinal correction performed during instrumentation. In a previous study, we focused on quantifying those changes using a magnetic tracking device with essentially the same landmarks. This point is added in the discussion section, to reflect furthermore the importance of these measurements in the overall understanding of intra-operative cosmetic changes of the trunk.