Author’s response to reviews

Title: Measurement Error and Reliability of three available 3D Superimposition Methods in Growing Patients

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Author’s response to reviews:

Reviewer #1: Language review - overall very good but there are two long 'sentences' that make no sense. Something is missing. They are Both Page 17

First para, lines 4-11

Last para, lines 54-59

Response from authors: Page 17 was the conclusion. We could not find lines 4-11 and 54-59. However, language was reviewed in the entire manuscript and edited as appropriate. Please lets us know if there are any other areas of concern. Thank you.

Reviewer #2: The study seems to be generally well conducted and described. However, some questions remain which should be addressed by the authors.

- The authors superimpose two data sets by registering at the cranial bases. It is not completely clear to me, whether this is done by a best fit algorithm or manually. Response form authors: Best fit

- If a best fit is used, does the software provide data about the remaining deviation as RSME? If this is the case, it would be a good estimator for the quality of the fit and should be provided. Response form authors: Best fit. Unfortunately, the software does not provide data about remaining deviation as RSME.
- One problem that should be discussed is the limited resolution of the CBCT data (0.3mm). Its effect cannot be quantified by the presented study design as all three methods use the same data set (at each point in time). It should therefore be clarified that the study provides an estimation of the precision limits due to the superimposition methods only and not of the overall precision. The additional error that would be observed if different CBCT scans were used for each method would probably extend the confidence intervals. This aspect should be discussed with a perspective to its practical consequences. Response form authors: Information added to the manuscript.

- An obvious limitation of the study is that it is based on the results of a single investigator. This limitation should be further discussed. The order in which the data was evaluated and the methods used should be described. Was there a learning curve? Response form authors: Yes, it was. Information added to the manuscript.

- The flowcharts (Figs. 1, 5 and 7) appear somewhat confusing. I would suggest to provide them in the usual syntax with standard graphical flowchart elements. Response form authors: Edited as suggested.

- Fig. 4: Instead of showing two views of the same situation, would it be possible to replace one of them with a false color image showing the remaining deviation at the cranial base after registration? Response form authors: Color-coded maps have some limitations and are used only for visual overall reference. Future developments may be able to improve software limitations.

- Fig. 9: ditto. Response form authors: Color-coded maps have some limitations and are used only for visual overall reference. Future developments may be able to improve software limitations.

- Fig.8 is quite dark and of low contrast. Response from authors: The image was taken directly from the software. It was reviewed and generated again and same results came out. Editing it would not show a real image. Thank you

Reviewer #3: Overall the article is interesting and of relevance. The study was well conducted within the limitations mentioned by the authors. Relevant literature is included. The abstract gives a concise description of the study.

It was, however, difficult to understand the underlying algorithms of the CmFreg/Slicer and dolphin method, which may be due to the manufacturer not disclosing details. Response from authors: In fact, it is a substantial limitation.

Statistical Analysis seems appropriate to us.

We would suggest perhaps to enhance the brightness/contrast of Fig. 8. Response from authors: The image was taken directly from the software. It was reviewed and generated again and same results came out. Editing it would not show a real image. Thank you