Author’s response to reviews

Title: Biomechanical analyses of common suspension sutures in primary cleft lip rhinoplasty

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Version: 1 Date: 02 Feb 2019

Author’s response to reviews:

Reviewer #1:
Thank you so much for giving us that many precious suggestions, which indeed help improve our manuscript. We really appreciated that you liked our paper.

You refer to previous publications as for the cleft model. Since you cannot expect all readers to be familiar with this earlier article you should add some information in the present one.

Some questions arise:

1.: How are the cartilages prepared in this model? Are they still attached to the underlying and overlying skin?

Thanks for pointing this out. Micro-MRI was applied to provide high-quality tissue definition for the nasolabial sample scanned. The nasal cartilage framework included the alar cartilages, the upper lateral cartilages and the nasal septum, which could be differentiated from the surrounding tissue. As the muscles and skins of the nasal system were not specified in our model, in which the soft tissues were regarded as a whole, the boundary condition between the cartilages and soft tissues were set as attached. We have added this part in the Methods section.
2. Is there any separate preparation of the transversal nasal and the upper part of the orbicularis oris muscle simulated?

This is indeed one of our study’s limitation. Although micro-MRI could help define the locations of the cartilages, it cannot reveal different muscles in this case. The specimen was too small to distinguish the muscles. Micro-CT with iodine staining could be the potential method for determination of the muscle structures [1]. Simulation of the orbicularis oris muscle is one of our goals in the future study. We have added this part in the last paragraph of the Discussion section.

3. What kind of sutures have you incorporated in your simulation?

Thank you for pointing this out. We should present the suspension sutures in the introduction section for our readers, although we mentioned them in the discussion section. Four shared suspension sutures were recapitulated: 1. Millard’s method: Medially, anteriorly and cranially directed force on the tip of medial crus (F1) to simulate the suture fastening both medial crura together [2]; 2. Cutting’s method: Medially, posteriorly and cranially directed force on the medial crus (F2) to simulate the suture which sewed both medial crura and the non-cleft-side upper lateral cartilage together [3]; 3. McComb’s method: Force directed to the nasal radix and paralleled to the dorsum on the intermediate crus (F3) to simulate the suture elevating the alar cartilage cranially [4]; 4. Noordhoff’s Method: Anteriorly directed force on the intermediate crus (F4) to simulate the suture elevating the alar cartilage superiorly [5]. We have revised the last paragraph of the Introduction to state that these four common sutures were included in our simulation, and in the Methods and Discussion section, we restate the FEM definitions of different sutures.

4. You have not mentioned the nasal septum which may not always be put into the right position by just suspension sutures.

We totally agree with you. The nasal septum may not be easy to be put into the right position. When compared to the alar cartilages, the nasal septum could have less impact on the shape of the nose. The nasal septum would influence the upper airway more. Thus, we simplified the nasal septum by put it in the right position, because we concentrated on the shape in this study. However, the nasal septum could influence the nasal morphology more or less, because it belongs to the nasal system. We added the mention about the influence of the nasal septum in the last paragraph of Discussion section.

We also carefully did the English editing again. The revised parts were highlighted. Thank you again for considering our paper.
Reviewer #2:

Thank you for your recognition and giving us that many precious suggestions, which indeed help improve our manuscript. We really appreciated that you liked our paper.

1. It is advised that the authors mention the technique followed and simulated in FEM for repair of unilateral cleft lip.

Thank you for pointing this out. We should present the suspension sutures in the introduction section for our readers, although we mentioned them in the discussion section. Four shared suspension sutures were recapitulated: 1. Millard’s method: Medially, anteriorly and cranially directed force on the tip of medial crus (F1) to simulate the suture fastening both medial crura together [2]; 2. Cutting’s method: Medially, posteriorly and cranially directed force on the medial crus (F2) to simulate the suture which sewed both medial crura and the non-cleft-side upper lateral cartilage together [3]; 3. McComb’s method: Force directed to the nasal radix and paralleled to the dorsum on the intermediate crus (F3) to simulate the suture elevating the alar cartilage cranially [4]; 4. Noordhoff’s Method: Anteriorly directed force on the intermediate crus (F4) to simulate the suture elevating the alar cartilage superiorly [5]. We have revised the last paragraph of the Introduction to state that these four common sutures were included in our simulation, and in the Methods and Discussion section, we restate the FEM definitions of different sutures.

2. Also the factor which influences the tension forces on skin is, the extent and the technique of sub-cutaneous dissection and periosteal scoring which the authors have not mentioned.

Thank you for this suggestion. Multiple features which influenced the long-term stability of rhinoplasty were not fully recapitulated in this model due to technical limitations. First, the tension forces on the skin, which could be generated mostly by the scar contracture after surgery, was impossible to mimic due to the lack of information about the magnitude or direction of the contractile forces. Second, we simplified the model with no consideration for the subcutaneous dissection and periosteal scoring, which could make the model too complex for accurate calculation. These were the limitations of our study. We added this part into the last paragraph of the Discussion section.

3. This study only serves the purpose in simulated assessment of possible surface stress and possible relapse as a result of it with minimum clinical significance. It is advised that the authors use these suspension techniques in real patients in systematic randomized study and compare the results with this FEM study on a long term followup.
Thanks for this suggestion. We have already started this trial in our clinical work, and we believed this work would be published in the future. We have mentioned this part in the second paragraph from the bottom in the Discussion section.

We also carefully did the English editing again. The revised parts were highlighted. Thank you again for considering our paper.

Reviewer #3:

Thank you for your recognition and giving us that many precious suggestions, which indeed help improve our manuscript. We really appreciated that you liked our paper.

1. In the discussion, the authors initially discuss the effects of the different sutures, then, however, they state that surgeons would apply all because all would have some effects. Here some more clinical implications could be added, as well as the authors could compare common surgical procedures with their findings (not only a short mentioning of Millard). Also they should point if and then how their findings could be transferred into real world as otherwise they would have no meaning for the surgical community.

Thank you for making our paper more meaningful. The suspension maneuver proposed by Millard [2] could be the most positive to the primary unilateral cleft lip rhinoplasty, because it can generate less stress with more significant morphology restoration. Meanwhile, the other three maneuvers also have their own features. For example, when facing collapsed nasal tip, the suspension maneuvers proposed by McComb and Noordhoff should be considered [4, 5]. Different direction of the nasal tip addition can be realized by these two methods respectively. Although we found that a high level of stress can be generated by these two methods, overcorrection should be the solution. For significant asymmetry of the nose, the Cutting’s method could restore it easily without high stress remained in the nasal system, which could reduce the possibility of relapse [3]. We added this part in the second paragraph from the bottom in the Discussion section.

2. This also applies to the very short Conclusion chapter, which could benefit from information of the impact of their findings, the potential future (e.g. which surgical procedure to choose, maybe correlations with clinical results etc.), and the next steps undertaken in their investigations on cleft surgery.

Thank you for this suggestion. Each suspension suture had its characteristics respectively. The simulation suggested that the suture proposed by Millard which sewed both medial crura could be the most potential maneuver for cleft lip rhinoplasty, because it can symmetrically restore the shape of the nose without incurring a significant increase in stress. Meanwhile, the sutures of
McComb and Noordhoff could be chosen according to the needed direction of nasal tip restoration with overcorrection for avoiding relapse. For asymmetry nose without any significant nasal tip problem, Cutting’s method could be applied. The future study will concentrate on the clinical outcomes comparison among those four common sutures based on the finite element simulations. We revised our Conclusion section according to your suggestion.

We also carefully did the English editing again. The revised parts were highlighted. Thank you again for considering our paper.

References:


