



Fabrication of a Surgical Facemask Frame using Bellus3D Software to Improve Peripheral Seal: A Technique Report

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Introduction

Dental practitioners are at high risk of occupational exposure to respiratory droplets released from rotary drills and equipment used in the dental setting.¹ Gaps caused by improper fit of surgical masks may result in a drastic decline in filtration efficiency by over 60%.² Level 3 masks demonstrate 60-98% bacterial efficiency depending on intimacy of fit; while fitted and non-fitted N95 masks have demonstrated bacterial efficiency of 99% and 49% respectively.²

Objectives

This poster presentation will describe the utilization of facial scanning software, “Mask Fitter” (Bellus3D Inc. Campbell, CA) for fabrication of customized mask frames to improve peripheral seal.

Materials and Methods

1. A facial scan was made of the subject using Bellus3D FaceApp. (Fig 1)
2. A customized mask frame design was generated by the Bellus3D FaceApp. (Fig 2,3)
3. The STL file of the mask frame was exported and printed using SprintRay dental 3D printer gray die and model resin. (Los Angeles, CA) (Fig 4)
4. Elastic bands were inserted to the plastic attachments on the mask frame.
5. A level 3 procedural mask was donned by the subject followed by the digitally printed customized mask frame. (Fig 5,6)
6. Improvement in peripheral seal was determined visibly (Fig 6) and through fit testing procedures. Fit testing procedures were implemented according to OSHA accepted fit test protocol which includes normal breathing, deep breathing, turning head side to side and up and down, and talking.⁴



Fig 1. Bellus3D App

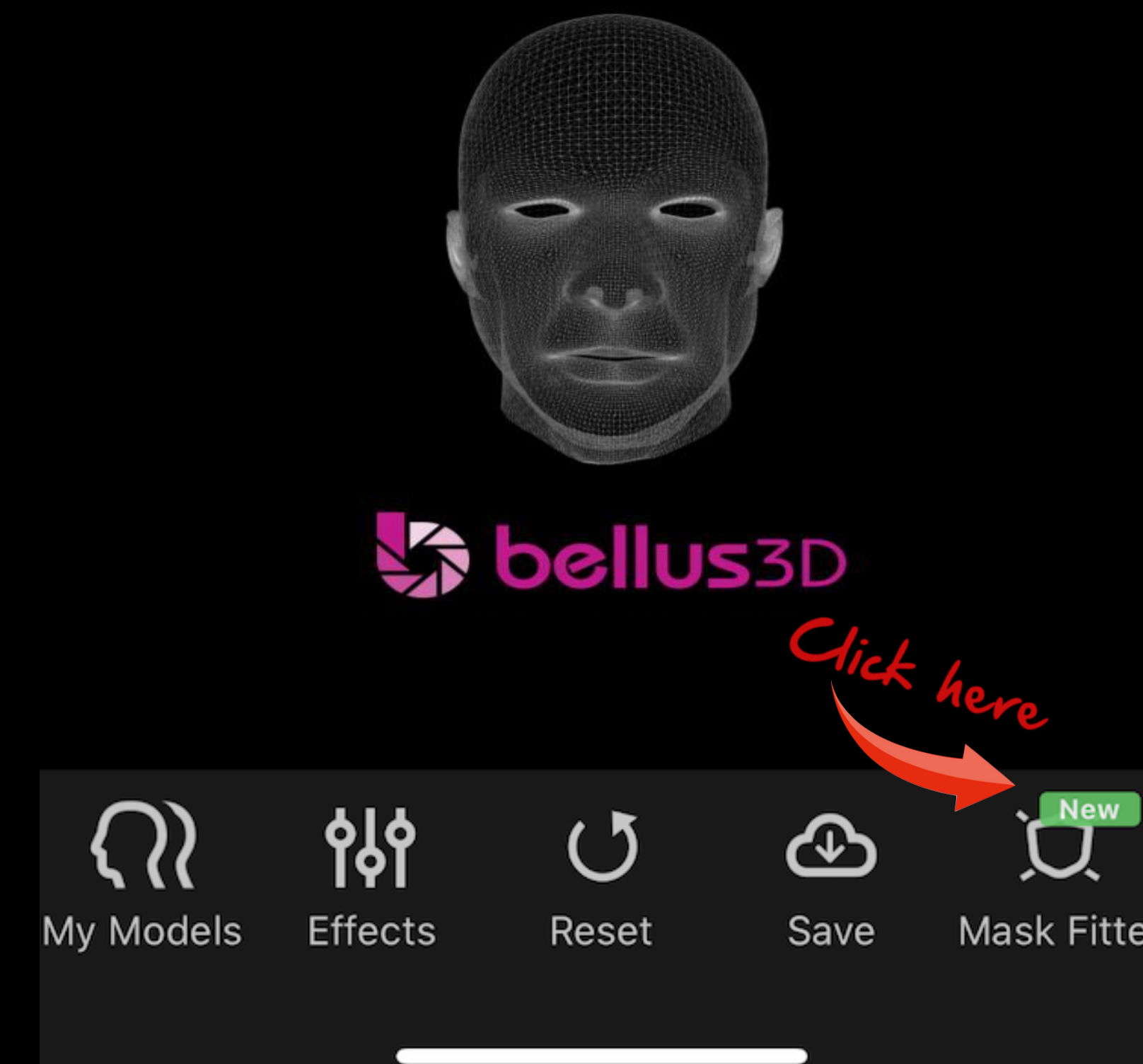


Fig 2. Selection on App



Fig 3. Generated Mask Frame Frontal View

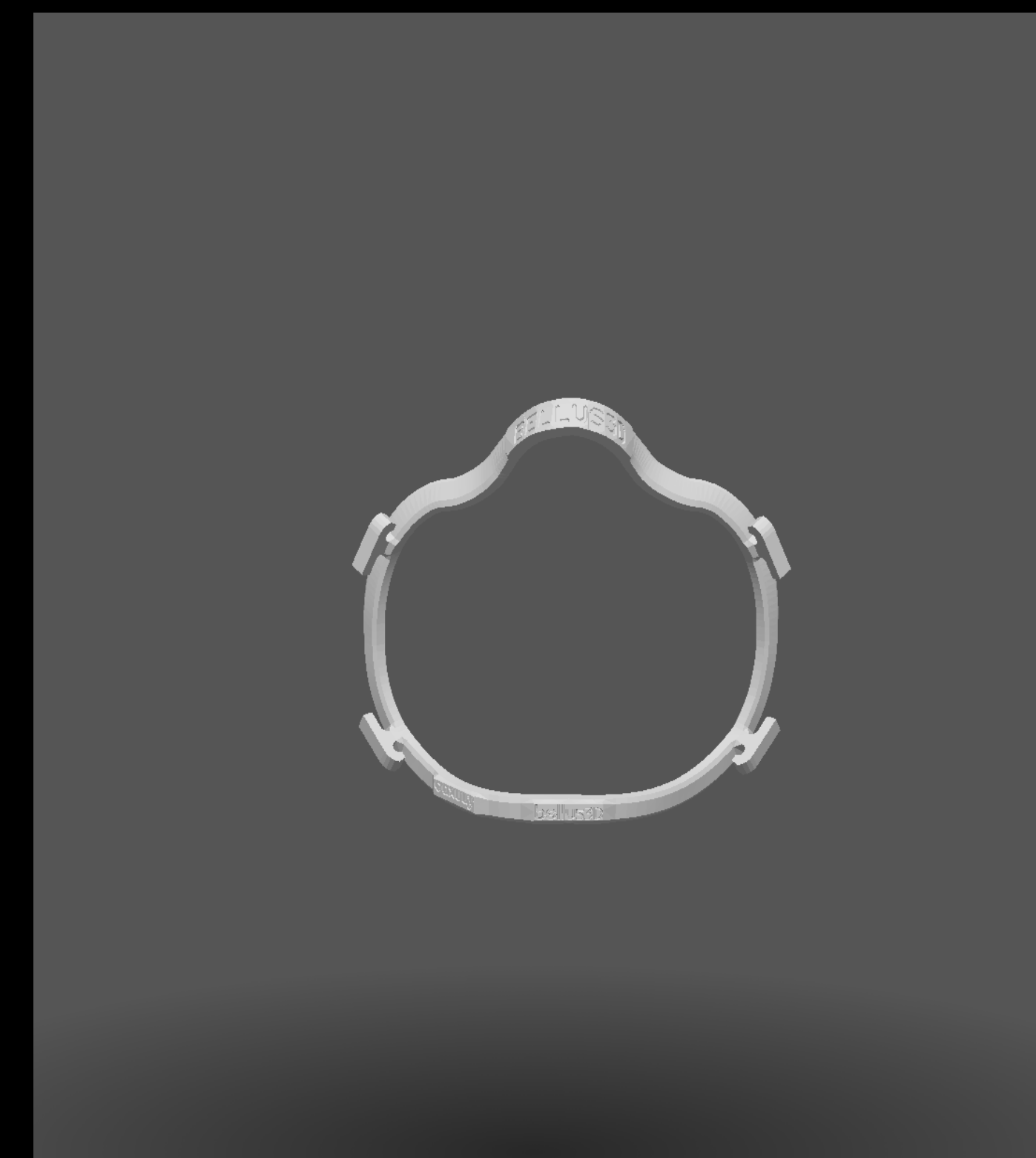


Fig 4. Generated Mask Frame



Fig 5. Fitted Mask Frame Frontal View



Fig 6. Fitted Mask Frame Profile View

Results

The mask frame showed improved lateral fit, diminishing gaps between mask and face. A limitation of this technique report includes lack of data regarding filtration efficiency of the level 3 procedural mask when used in conjunction with the customized mask frame.

Conclusion

Facial scanning for the purpose of developing a “Mask Fitter” as described can serve as a useful approach in improving peripheral seal of readily available low-grade masks. Although N95 masks remain the gold standard PPE for aerosol generating procedures,^{4,5} this technique provides a relatively simple method that can be used with conventional surgical masks which are readily available to dental staff. Results of this technique report suggest that filtration efficiency of level 3 masks when used with a customized mask frame may be more effective than non-fitted N95 masks. Further studies are needed to evaluate the effectiveness of this mask frame.

References

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