

Simulation Training for Nasal Bridle Placement with Novel 3D Printed Nasopharyngeal Model

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Introduction

Nasal bridles help prevent dislodgement of nasoenteric feeding tubes. Placement involves inserting the bridle tubing through the nostril and around the vomer bone using a magnet retrieval device. If placed incorrectly, nasal bridles can cause unnecessary discomfort, epistaxis, skin ulceration or failure to prevent dislodgment. Procedural competence for placing nasal bridles is traditionally acquired through hands-on training in the clinical setting with patients. As a result, patients may be subjected to discomfort while trainees develop the necessary skillset. In an effort to improve training prior to placing nasal bridles in patients, we developed an anatomically accurate and easily accessible 3D printed nasopharyngeal model for nasal bridle training. We evaluated the feasibility and acceptability of using a 3D printed model to improve trainee proficiency and confidence for nasal bridle placement.

Methodology

The nasopharyngeal model was modified from a simulator designed for nasopharyngeal swab collection by Bone 3D. It was developed from human imaging data through segmentation, computer-aided design (CAD), and 3D printing. Eighteen first-year radiology residents and 3 fourth-year medical students prior to placing a nasal bridle in a real patient received a training session using the simulation model. After participation with the 3D printed nasopharyngeal simulation model, each participant provided feedback via a post-training survey using a 5-point Likert scale [from 1 (not beneficial/not confident) to 5 (extremely beneficial/extremely confident)] on the impact of training with the model on anatomical knowledge, hands-on skills, and confidence.

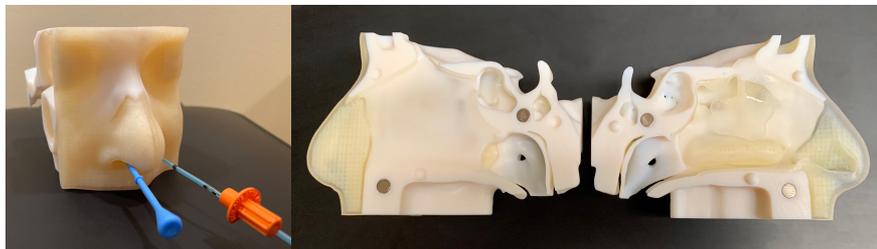
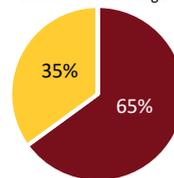


Fig. 1—3D printed nasopharyngeal model with nasal bridle in place (left) and open in the parasagittal plane (right).

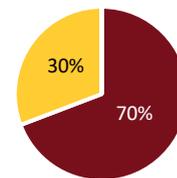
Results

There were 21 participants with an 95% response rate. 65% (n = 13) of participants rated the model as extremely beneficial (5/5) and 35% (n = 7) as very beneficial (4/5) for improving their anatomic knowledge. 70% (n = 14) of participants rated the training with the model as extremely beneficial (5/5) and 30% (n = 6) as very beneficial (4/5) for improving their hands-on skill. All participants' confidence level improved with simulation training by a mean of 2.5 out of 5 points. All the participants asked for the 3D printed nasopharyngeal model be offered as part of a formal simulation training.

How beneficial is the model for improving anatomical knowledge?



How beneficial is the model for improving hands-on skills?



- Extremely beneficial
- Very beneficial
- Somewhat beneficial
- A little beneficial
- Not beneficial at all

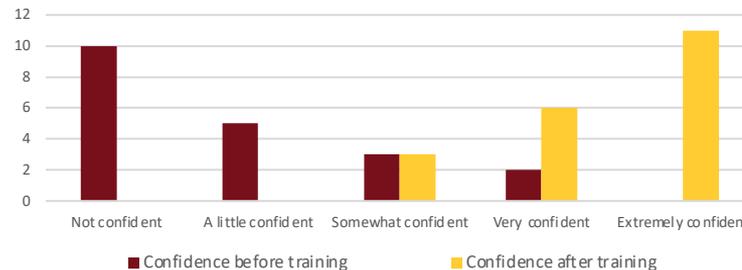


Fig. 2—65% of the participants rated the model as extremely beneficial and 35% as very beneficial for anatomical knowledge. 70% of the participants rated the model as extremely beneficial and 30% as very beneficial for improving hands-on skills. All participants' confidence level improved with simulation training by a mean of 2.5 out of 5 points.

Conclusion

An anatomically accurate 3D printed nasopharyngeal model is a feasible and acceptable training aid with the potential to facilitate novice knowledge, proficiency and confidence for nasal bridle placement.

Acknowledgement

The authors would like to thank Juliette Prebot, Pierre-Marc François, and the Bone 3D team for allowing us to modify their open-source nasopharyngeal simulator. The authors are grateful to Steve Morin and Minneapolis Adaptive Design & Engineering (MADE) Program at Minneapolis VA for enabling us to use the 3D lab to print the model.

