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Investigating the Efficacy of Anatomical Silicone Models Developed from a 3D Printed Mold for Perineal Repair Suturing Simulation

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Categories: Medical Education, Medical Simulation, Obstetrics/Gynecology
Keywords: medical simulation, 3d printing, obstetrics, gynaecology, postpartum, surgery, perineal repair, oasis

How to cite this poster
Goudie C, Shanahan J, Gill A, et al. (2017) Investigating the Efficacy of Anatomical Silicone Models Developed from a 3D Printed Mold for Perineal Repair Suturing Simulation. Cureus 9(8): e.

Abstract

There is a scarcity of affordable, validated, standardized and anatomically correct silicone perineum models for the rehearsal of postpartum laceration repair. The purpose of this technical report is to describe and validate evidence for a silicone, perineal repair model created from a 3D printed mold for medical resident training and clinical skills maintenance.

A pre-existing model from an open-source royalty-free website was purchased and converted using Fusion360^{TM} into a stereolithography (.stl) file and altered to produce a negative mold. Using a spatula, a fine silicone layer was first applied inside the mold, followed by a small piece of flesh-coloured mesh netting material within the perineal surface area, fitting the width of the mold. The mesh was pressed into the thin layer of silicone, which was meant to provide anatomical structure to prevent the sutures from tearing through the silicone. The remainder of the silicone mix was then poured into the mold, which required three hours to fully set before being removed from the mold. Twelve silicone models were produced and used during a one-hour workshop at the Rural and Remote Conference by 16 Obstetrics and Gynecology residents and practicing rural physicians, and four facilitators. At the end of the workshop, the participants were provided with a qualitative survey and asked to rate the perceived realism and educational effectiveness of the silicone perineum model as compared to pre-existing simulation models that they have used previously. The overall workshop participant feedback was positive, noting that the models provided more realistic visualization for the suturing simulation of 1st and 2nd degree perineal injuries.

The silicone models were considered to be useful in simulation training when attempting 1st and 2nd degree perineum suturing techniques within a confined space. The overall feedback was positive, noting that they provided more realistic visualization experience compared to pre-existing simulation models, such as beef tongues and synthetic sponges. The feedback from the participants and facilitators included thoughts about how to add additional mesh to the silicone model so the subcutaneous and vaginal plane sutures would hold, as well as increasing the size of the vaginal canal size to more accurately represent a postpartum repair. There were also suggestions to alter the colour of the model to be flesh-toned as opposed to pink, to more accurately simulate human tissue.

Open Access
Published 08/31/2017

Silicone perineum models, created from a 3D printed mold, are an economical training tool as compared to commercially available, cost prohibitive models. They also provide anatomically accurate simulation training opportunities for residents to learn and maintain clinical skills in perineal repair, as compared to beef tongues and synthetic sponges, which have previously been used in Obstetrics and Gynecology simulation-based medical education.