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Pediatric/Craniofacial

A Practical Cleft Palate Training Model

Burak Ozkan, MD*
Harun Cologlu, MD†
Cagri A. Uysal, MD, PhD, FACS*
Nilgun M. Ertas MD, FACS*

Summary: Educational models are essential for training surgeons and making them familiar with experience- and skill-dependent operations such as cleft palate closure. The development of computer and 3D printer technology has allowed cleft lip and palate models to be produced and used for surgical training. However, these technology-dependent models are not affordable and reproducible for surgeons in developing countries where cleft cases are more commonly seen. Thus, we aimed to create a cleft palate educational model prepared with play-dough and latex. The play-dough is shaped in the form of a palate and the cleft is created by scissors. Then, a latex glove is cut and applied to the dough to mimic the mucosal layer. The combination of the latex glove and play-dough lets the trainee perform surgical markings, incisions, elevation of the flaps, and layer closure. We think this easily producible model might be beneficial for demonstrating cleft types, surgical techniques, and improving surgical skills, especially in developing countries. *(Plast Reconstr Surg Glob Open 2020;8:e2657; doi: 10.1097/GOX.0000000000002657; Published online 25 February 2020.)*

INTRODUCTION

Success in cleft palate surgery requires embryology-anatomy knowledge, technical skill, and experience. The surgeon has to be familiar with three-dimensional (3D) palatal anatomy and have the ability to operate under limited visualization in cleft closing. Although these challenges can be handled by maturation of the surgeon, practicing on educational models is needed to prepare inexperienced surgeons such as plastic surgery residents before handling real cases. For this purpose, various training models for cleft education have been described.[1] Previously reported training models are expensive and require technological background such as computer simulations or 3D models. More time is needed for these models to become cheaper and more widely available, especially in developing countries. Therefore, we wanted to prepare a cheap, easily made training model with play-dough. Play-dough is an inexpensive and unctuous instrument and it has been used as training models in medicine.[2]

THE CLEFT PALATE MODEL

The play-dough is formed into a palate shape, starting from the alveolus and ending at the uvula. An anatomy atlas or palatal anatomy images can be used for guidance. Once the boundaries of the palate is simply shaped by hand, molding the surface of the play-dough is started. It is important to form three-dimensional topography such as sulcus's and curves like humulus. After molding the play-dough palate, the framework is divided with scissors depending on which cleft type (incomplete or complete) is going to be practiced. A latex surgical examination hand glove is needed for demonstrating the mucosal coverage of the palate model. Thus, a latex hand glove is cut from the fourth and second web space to the palm. Then, the palatal model is rolled with that piece of glove circumferentially to simulate mucosal layers. The glove is applied to the play-dough with fingertip pressure and care is taken not to disform framework. At least half an hour is needed for the dough to begin to dry and to harden for better adaptation and integration. The oily surface of the play-dough holds and immobilizes the glove, so no adhesives such as glue or tapes are needed (Fig. 1). Surgical markings can be done on the latex glove to demonstrate where incisions should be. The integrity of the latex and play-dough permits continuous incisions, flap elevation, and holds sutures that allow oral/nasal mucosal closure demonstrations. True cleft palate surgical instruments can be preferred for improving handling skills (Fig. 2). The model can be placed in a deep mug or jug to imitate the oral cavity. Incisions are marked according to the surgery that is going to be demonstrated by surgical markers.

DISCUSSION

Training simulators and models are being widely used in paramedical and medical areas. With the developments in computer technology, 3D computer simulations are

*From the *Department of Plastic, Reconstructive and Aesthetic Surgery, Baskent University, Ankara, Turkey; and †Department of Plastic, Reconstructive and Aesthetic Surgery, Liv Hospital, Istanbul, Turkey.*

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Fig. 1. The play-dough is formed into the shaped of a palate and a latex surgical glove is applied over the palate.

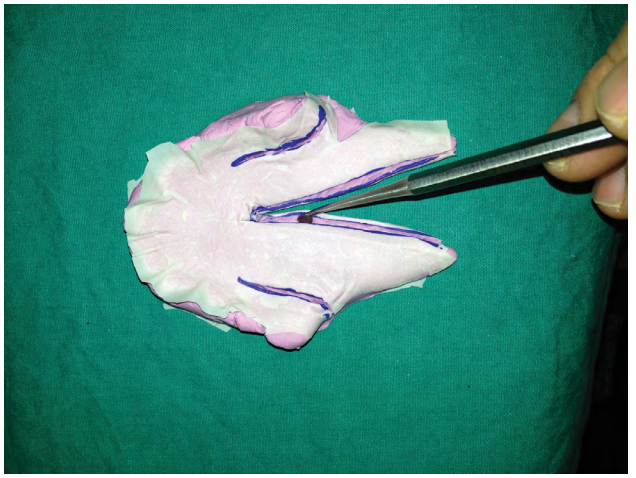

Fig. 2. Demonstration of the surgical markings, incisions, and nasal mucosal flap elevation with Mitchell Trimer instrument on the palate model.

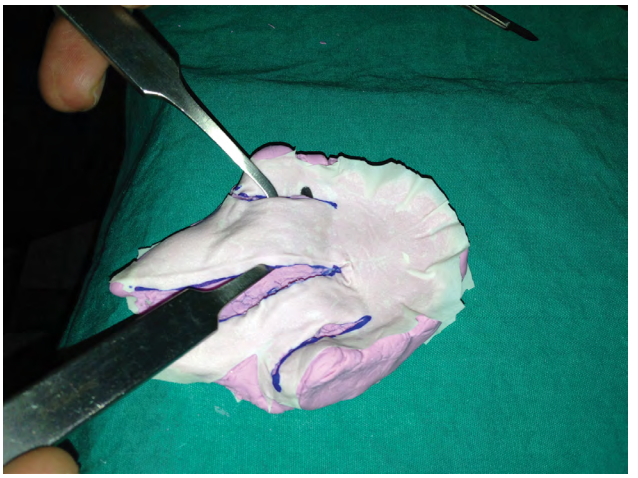

Fig. 3. Mucosal flap elevation with left-right Barsky instrument.

becoming more common in the medical era. Various cleft palate simulators were described in the literature. A computer simulator for cleft lip surgery training and its beneficial features on plastic surgery residents were reported by Schendel et al.[3] Vadodaria et al prepared a training model made with foam and latex placed in a plastic jug that provides palate anatomy and cleft palate surgery basic training.[4] Nagy et al demonstrated cleft closing techniques in a model made with alginate impression, latex, and plaster.[5] Another development in technology is 3D printers. AlAli et al[6] concluded that 3D printed models are more effective in learning than two-dimensional education materials on cleft lip and palate. Chou et al[7] also used 3D printed cleft models for parent education. However, all these models are technology dependent, hard to purchase, and reproduced especially for surgeons in developing countries. Although strategies for reducing the costs were suggested such as reusable and disposable model production, there is still time for wide-scale recognition of these models or softwares.[8] Thus, a model with negligible cost is still needed. Consequently, we described a practical cleft palate model made with play-dough and latex that can be prepared in a short time for understanding cleft types and practicing closure techniques.

Latex gloves and play-dough are the only requirements and can be prepared in every clinic. It is cheaper and not complicated compared with the previous reports. Topographic anatomy such as the great palatine artery localization can be taught in our model. A latex and play-dough union allows for surgical maneuvers such as mucosal flap elevations and mucosal relaxation incisions, cleft closing, and even inversion of the nasal mucosa by sutures. Mucosal flap elevations and mucosal relaxation incisions, cleft closing, even inversion of

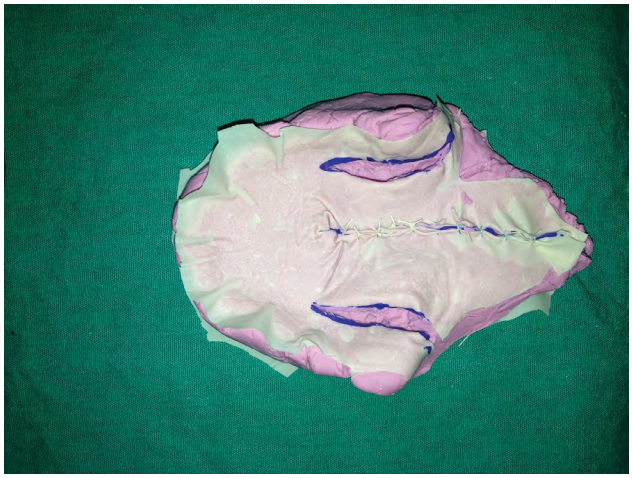

Fig. 4. View of the palate model after mucosal closure. The integrity of the play-dough and latex glove is intact despite the surgical knots in the latex mucosa.

the nasal mucosa by sutures can be demonstrated with this model (Figs. 3 and 4). Junior surgeons can feel and understand the fragility of the nasal mucosa and learn gentle handling of the instruments while suturing latex. The framework can be prepared in bigger sizes for beginners or in real-size for more experienced residents. True surgical equipment can be used, and the model can be placed in a jug for improving surgical skills.

Proper dissection and realignment of the palatal muscles are essential for preventing velopharyngeal insufficiency and soft palate fistulas. As with the other cleft palate training models in the literature, not demonstrating the muscle dissection is the main limitation of our model. However, mimicking muscle fibers in simulators is very difficult, and simulators cannot replace the sensations during surgery such as the tension of inadequate dissection or relaxation of detached muscles. Our model can be improved by adding another play-dough layer in a different color, such as red, for overcoming this handicap. Another limitation of our model is that it does not include bony structures. Therefore, mucoperiosteal flap elevation and its sensation cannot be achieved in this model. Adding a hard sheet such as plastic under the palate-shaped play-dough before latex application could be a solution for mucoperiosteal flap elevation simulation.

CONCLUSIONS

This model can be prepared easily in any plastic surgery clinic. We think this model can be used for educational purposes in developing countries or during voluntary overseas cleft missions where local authorities cannot afford current simulators. We believe that practicing on this model will improve the surgical skills of junior plastic surgery residents and improve outcomes in cleft palate surgery.

Burak Ozkan, MD
Department of Plastic, Reconstructive and Aesthetic Surgery
Baskent University, Ankara 06900, Turkey
E-mail: drburakozkan@gmail.com

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