

Sinus lift: a simulative model to surgical practice

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Abstract

Nowadays, there are several modifications of sinus lift procedures and the more complicated method is the lateral window approach. A number of maxillary models (animal and plastic) are used to educate the dentists and train their techniques. However it is difficult to prepare the animal maxillary model by dentist himself. When practicing sinus lifts in the plastic model, a jaw model with maxillary sinus and Schneiderian membrane is used. The plastic model is a single-use configuration and its plastic membrane is not similar to texture of sinus membrane. Therefore we develop an egg model with a simulative Schneiderian membrane. This model is an economical and realistic ways to practice the skills of sinus lift by dentists themselves.

Key words : sinus lift, animal model, plastic model, egg model

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Introduction :

To be eligible for the dental implant process, the patient must have enough bone in the maxillary and mandibular alveoli to support these implants. Sinus lift is a maxillary sinus floor augmentation procedure. It is a surgical procedure in the treatment of the atrophic posterior maxilla. It is preformed by the well-trained dentists to restore the bone volume for placement of dental implants. Bone graft material is positioned within the maxillary sinus for the purpose of increasing the width and height of the alveolus. Bone materials can be obtained from an autogenous bone or artificial bone.

In 1986, Tatum⁽¹⁾ performed the lateral window approach by opening a window in the anterolateral sinus wall. In this procedure, a crestal incision is created with vertical extensions. Then the lateral aspect of the maxilla is exposed and window osteotomy is created. The Schneiderian Membrane is detached from the bony walls of the inner sinus, using a variety of curettes. Once properly creating, lateral wall window with Schneiderian membrane could elevate from the floor of maxilla. Then bone grafting material could place below the floor of the maxillary sinus. There are a number of graft materials that can be used, and they can be used in combination as well. The graft material can be either or autograft, allograft, and xenograft.

The perforation of Schneiderian membrane is the most frequent complication during sinus elevation surgery, especially in the lateral wall window approach. In approximately 20-60% of sinus lift procedures, the Schneiderian membrane is ruptured.^(2,3,4) If this occurs, it should be repaired utilizing the proper methods. If this can't be done, the surgeon will have to stop the augmentation procedure and reschedule it for a later date, when regeneration has occurred. This could take as much as 3 months. After the operation, the patient should continue with proper antibiotic prophylaxis. A referral to a specialist is advised anytime sinusitis occurs.

The risk of Schneiderian membrane perforation can be minimized by the well-trained dentist. Therefore, it is the first step to master the sinus lift techniques by practicing the basic procedures extensively. Some sinus lift models are created with artificial materials that permit you to experience the sinus lift procedure. However, these models are expensive and used one time only. We invented an egg sinus lift model by using a student's dental model. Egg sinus lift model is more economical and realistic model.

Technique note :

The dental model is commonly used to introduce the dental student to the similar aspects of teeth morphology and surrounding anatomic structures. The practice in dental model is a major course in the dental school. Therefore dental model is familiar to the dentists. For this reason, we use a dental model and a bird egg to create a simulated model for sinus lift training (Figure 1). At first, we want to create an atrophy ridge with an enlarged maxillary sinus (Figure 2). The first step is to remove the maxillary and place the red self-curing resin into the socket. Then we trim the dental model to be a resorbed maxillary ridge and create a fossa like a maxillary cavity. Secondly, the bird egg was used to simulate maxillary sinus. After aspirating the substances of bird egg, it was sticking to the fossa by instant glue. Finally, a maxillary sinus lift prototype supporting by dental model was done. Subsequently, we can manipulate the maxillary sinus lift procedure by lateral window approach. You can create the bone window with No. 2 diamond bur to proceed to elevate the bone window and Schneiderian membrane with the surgical curettes (Figure 3). Then, you can put the bone grafting material into the maxillary sinus to increase the width and height of the alveolus.



Figure 1 : Bird egg sinus lift model



Figure 2 : Right: Chicken egg/Left: Bird egg

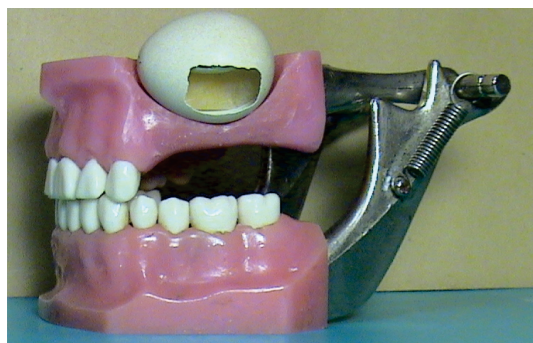


Figure 3 : Create a maxillary atrophy ridge

Discussion

Nowadays, dental implants are frequently the best treatment option for replacing missing teeth. There are many dental implant training courses which you can practice the implant placement in the plastic bone or animal bones. The sinus lift procedure is common treatment in the patient with an insufficient maxillary bone for dental implant. In order to familiar with structure of maxillary sinus, a sheep or pig models are commonly used as the hand-on training for sinus lift procedure. It is good for dentist to improve his (her) skill. However, the animal models are usually provided by the course of company of dental implant. It is difficult for dentist himself to prepare the animal model.

Many clinicians have developed a number of variations on the sinus lift procedure using lateral window openings and osteotome in an attempt to overcome the complications following sinus augmentation. Nowadays plastic maxilla with rubber membrane had been developed for sinus lift practice. However plastic model is inferior to animal model due to thickness of Schneiderian membrane. As known to all dentists, the Schneiderian membrane is a very thin apparatus of maxillary sinus. The plastic maxillary Schneiderian membrane is too thick to like an inflamed sinus membrane after chronic sinusitis. It is not enough train a tactile skill. The thickness of human maxillary Schneiderian membrane is proximity to the egg membrane of the hen. Therefore, the hen egg is frequently used as a training model to practice the maxillary sinus lift procedure. Nevertheless, investigating the surrounding structures of maxillary bone, we found that hen egg is too big to be a human maxillary sinus. The volume of hen egg is approximated to the hemi-maxilla. In the figure 3, we show the obvious differences among the human maxillary bone, hen egg and bird egg in size. Factually, the size of bird egg is similar to the volume of human maxillary sinus. The hen egg is four times larger than the bird egg in volume. Moreover hen egg model is not a simulated situation because without dental alveolar related structures (such as teeth, gingival, and alveolar process).

The student can practice in the dental model as in preparation for pre-clinic experience. Therefore, the dental model had been playing an important role in assistant for dental education and pre-clinic training. As known to all, if you want to improve the tactile ability to perform the technique of maxillary sinus lift, you must intensive the practice at privacy. In such a hand-on approach, our model provides a more realistic model to allow the visualization and demonstration of the sinus lift procedure. This will let you experience the feeling of maxillary Schneiderian membrane, as well as maxillary Schneiderian membrane perforation when you practice lateral window and osteotome methods. Moreover, this model is also easy and convenient to manipulate the simulative maxillary sinus in the dental office or at home. In a word, this model is more practical, available, repeatable and cost effective.

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上顎竇增高術：一個手術練習的擬真模型

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摘要

現今，上顎竇增高術已有一些的改良方法，而自上顎竇側壁開窗法是比較複雜的手術。目前有許多種上顎骨模型包括動物的上顎骨，以及塑膠模擬的上顎骨模型，來提供牙醫師技術的訓練與教育。然而，牙醫師要自行準備動物的上顎骨模型是一件困難的事。要在塑膠的上顎骨模型上練習，這個模型就必須有上顎竇及施奈德氏膜。然而，塑膠模型的上顎竇側壁開窗法只能操作一次，而且塑膠的上顎竇膜質地也不同於真正的施奈德氏膜。因此我們發展出一個質地相近於施奈德氏膜的蛋模型，而這個蛋模型在成本上是經濟的，而且也實際模擬上顎竇的狀況，因此有助於牙醫師對於上顎竇側壁開窗法的訓練。

關鍵詞：上顎竇增高術、動物模型、塑膠模型、蛋模型

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