Bicortical stability of implants placed in severely atrophic posterior maxilla; a novel technique

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February 2, 2023

Abstract

Simultaneous implant placement with sinus floor augmentations is possible when appropriate primary stability could be achieved. In current study, a novel technique is described to perform a single stage implant placement with bicortical stability in severe atrophic maxilla that can shorten the treatment time of an edentulous patient.

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Abstract

Maxillary sinus lift is a common procedure to achieve adequate alveolar bone height in patients with sinus hyper-pneumatization. Simultaneous implant placement with sinus floor augmentations is possible when appropriate primary stability could be achieved. In severe atrophic posterior maxillary ridge, vertical bone height is sometimes less than 4 mm, which may hinder simultaneous implant placements and necessitate two stage procedure. In current study, a novel technique is described to perform a single stage implant placement with bicortical stability in severe atrophic maxilla that can shorten the treatment time of an edentulous patient. During the procedure, to achieve an adequate access a conventional lateral window osteotomy is performed. After elevating the Schneiderian membrane using conventional instruments, an autologous ramus block is harvested from the mandible and then the block will be fixed in correct location in the sinus using screws with appropriate length to build sufficient stability as superior cortex for simultaneous implant insertion.

Introduction

Implant-supported prostheses have become one of the best treatments for edentulous patients. Significant vertical maxillary defects create a challenging situation to rehabilitate edentulous posterior maxilla, which is a consequence of maxillary sinus hyper-pneumatization and long-term alveolar ridge resorption. This situation indicates a necessity to restore the bone crest anatomy accompanying with sinus floor elevation (1, 2). There are many surgical options using different biomaterials of different components to reestablish an adequate bone volume for implant placement. Most of these surgical options require multi-staged procedures which might lead to patients' discomfort and long treatment time specially in severely atrophic posterior maxilla (less than 4mm residual bone)(1). In addition, the volume of the augmented space tends to decrease during healing, especially in delayed implant insertion. The amount of resorption also depends on types of grafting materials used for sinus augmentation(3). Nevertheless, intraoperative complications such as sinus membrane perforation tends to increase in two stage surgeries. This complication may lead to dislodgement of graft material into the sinus and graft failure (4, 5).

Today there are typically two sinus lift protocols: two-stage and one-stage techniques. Technique selection is based on the amount of residual bone height, which provides the initial implant stability. Clinical evidence suggests that the minimum bone height to provide simultaneous implant insertion is 4-5 mm (6, 7).

The aim of this study is to present a new technique that provides a good bicortical primary stability of implants in patients with limited residual bone height in posterior maxilla in a single stage surgery.

Surgical technique

In present study, we describe a new technique to achieve an acceptable bicortical stability during implant insertion in severely atrophic posterior maxillary ridge. This procedure can be performed in patients having residual bone height between 1 to 3 mm, which is approved with CBCT before the procedure. Patients should have no history of poor controlled systemic disease such as diabetes and no history of sinusitis (fig-1). During the procedure, a conventional lateral window osteotomy is performed and adequate access to sinus cavity is achieved. Then the Schneiderian membrane is elevated using conventional sinus lift instruments. Future location of implants is allocated on alveolar ridge according to the CBCT & the exact locations are measured using calibrated probe. After exposing the maxillary sinus, an autogenous block graft is harvested from lateral cortex of unilateral mandibular ramus. The block size should be compatible with the size of the bone window and the location of implants apexes are marked on the ramus block graft. Then the graft is placed inside the exposed sinus with its smallest dimension and is rotated in the sinus so that it is parallel to the alveolar bone and in the right position (fig-2). After that, the ramus blocks are fixed in correct location using screws with appropriate length. These screws are placed through the alveolar bone to the ramus graft in a location other than determined locations for implants and together with the block graft, they hold the sinus membrane elevated. In the following step, the implants are placed in both alveolar ridge and ramus block graft. The primary stability of implants is established by bicortical stability, one with alveolar ridge at the crestal level of implants and one with ramus graft at the level of implants apexes (fig-3). Finally, the space between the two cortexes is filled with biocompatible allograft bone materials and the lateral window is covered using a membrane. Then the mucoperiosteal flap is sutured. After follow up period of 30 months, all the implants are osteointegrated completely and no obvious bone loss is observed.

Discussion

The purpose of this study is to describe a new method to perform a single stage implant placement in atrophic posterior maxilla, with residual bone height between 1 to 3mm. Using this method, a bicortical primary implant stability is achieved despite the very limited amount of crestal bone. In previous studies, different methods for atrophic posterior maxilla reconstruction have been introduced. Allogenic cancellous bone blocks were used for maxillary sinus floor elevation in severely atrophic posterior maxilla but it impose a secondary stage surgery to the patient for implant placement (8). Simultaneous implant placement and sinus floor elevation have been performed using leukocyte-and platelet- rich fibrin as a sole graft material (9). Another reconstruction technique is simultaneous implant placement concomitant with maxillary sinus floor augmentation in posterior maxilla using mixture of bioactive glass granules and autogenous bone (10). In another study, simultaneous porcine bone layer insertion accompanied by graft less maxillary sinus floor augmentation has leaded to effective bone formation (11). In all mentioned techniques, implant placement cannot be implemented in residual bone height less than 3mm due to inadequate primary stability.

In our presented technique, we fix the cortical bone to make it stable enough. This way the graft can provide adequate retention and stability for implants. In addition, bicortical primary stability achieved by superior cortical layer eliminates the second stage of the surgery and accelerates the healing process of patients. In addition, there is no need to remove the bone retaining screws. Based on our experience, the morbidity of donor site was mild and none of the patients complained of any neurosensory changes and no significant complications such as infection was found. Another advantage of this study is being cost-effective by eliminating the second surgery stage.

In general, one stage implant placement at the time of sinus floor elevation in severely atrophic posterior maxilla using cortical ramus graft can provide a proper primary stability, which can decrease treatment time,

but a clinical trial is necessary to assess the efficacy of this new technique.

Acknowledgments

The authors reported no conflicts of interest to this study.

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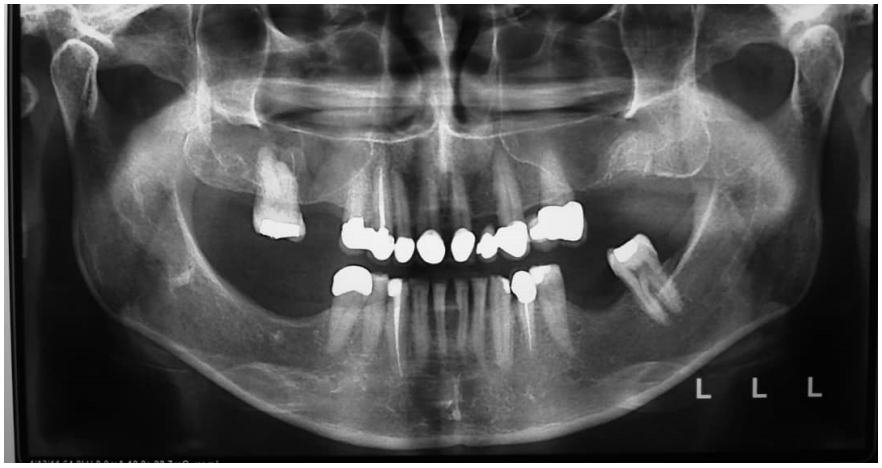

Figure-1. Preoperative Panoramic radiograph of a patient with severe bilateral atrophic posterior maxillary ridge.

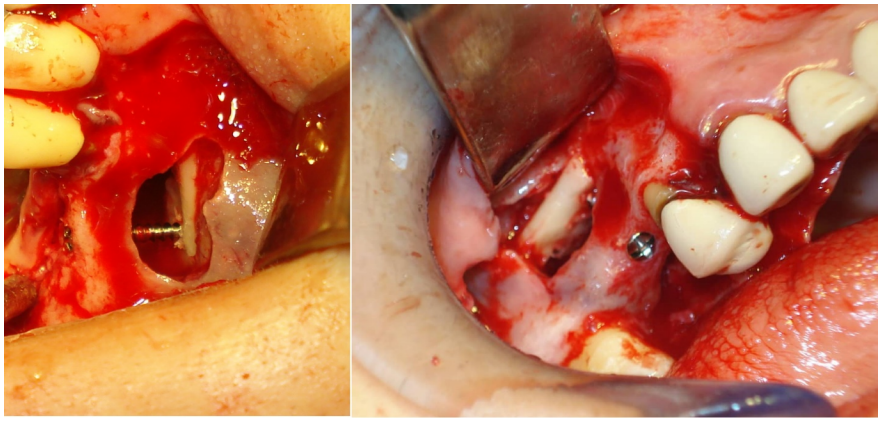

Figure-2. Ramus graft fixation in bilateral sinus lift procedure using bicortical screws

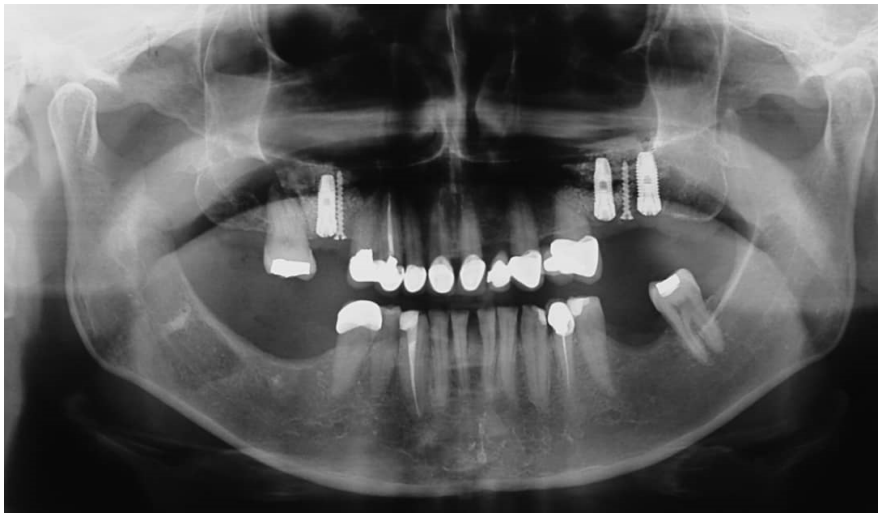

Figure-3. Post-operative Panoramic radiograph

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