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Maxillary sinus augmentation with bovine hydroxyapatite alone: A safe technique with predictable outcomes in patients with severe maxillary atrophy

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ABSTRACT

Sinus augmentation is a preprosthetic technique for rehabilitating posterior sector of the atrophied maxilla with implant-supported prosthesis. We retrospectively analyzed 34 consecutive sinus augmentations performed using only bovine hydroxyapatite.

The presurgical height in 92% of the cases was 4 mm or less.

The success rate of the maxillary sinus augmentation was 100% for this technique. 13.4% of the implants were placed immediately with a success rate of implants placement of 93.9%. The non-osseointegrated implants were all successfully replaced. Follow-up period was 1268 days.

The success rate obtained using bovine hydroxyapatite alone is similar to that using other types of materials, while avoids morbidity of the autologous bone donor area.

Elevación del seno maxilar con hidroxiapatita bovina sola: Una técnica segura con resultados predecibles en pacientes con atrofia maxilar grave

Palabras clave:
Elevación del seno maxilar
Atrofia grave
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RESUMEN

La elevación del seno es una técnica preprotésica para la rehabilitación del sector posterior atrofiado del maxilar con una prótesis de implantación. Analizamos retrospectivamente 34 casos consecutivos de elevación del seno maxilar con el empleo de tan solo hidroxiapatita bovina sola.

La altura prequirúrgica era de 4 mm o menos en el 92% de los casos.

El porcentaje de éxitos de la elevación del seno maxilar con esta técnica fue del 100%. Un 13,4% de los implantes se colocaron inmediatamente, con un porcentaje de éxitos de la

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implantación del 93,9%. Los implantes no osteointegrados se sustituyeron todos con éxito. El periodo de seguimiento fue de 1268 días.

El porcentaje de éxitos obtenido con el empleo de hidroxiapatita bovina sola es similar al de otros tipos de materiales, al tiempo que se evita la morbilidad en el área donante de hueso autólogo.

Introduction

Sinus augmentation was first reported by Tatum in 1976 and subsequently described by Boyne and James in 1980.[1,2] It is a preprosthetic technique to increase the height of the lateral and posterior sectors of atrophied maxillas for their rehabilitation with implant-supported prostheses. It is a predictable technique to restore sufficient bone volume for implant placement.[3]

The etiology of maxillary bone resorption is multifactorial and influenced by age, bone diseases, and tooth extractions. Thus, bone resorption continues after tooth extraction, producing a decrease in height and width. With the decrease in bone height, the remnant bone narrows and becomes closer to the nasal cavity, maxillary sinuses, and the group of nerves of the incisive canal.[4] Patients with severe maxillary atrophy are subject to changes in masticatory, swallowing and speech function, and these changes can often result in psychological problems.

During the maxillary sinus floor elevation procedure, the space created between the residual maxillary ridge and the elevated Schneiderian membrane is usually filled with grafting material. In this way, a bone fraction is created that may allow for reliable implant placement, either simultaneously with the elevation procedure when the residual ridge allows for primary implant stability or as a second stage after healing of the grafted site.[5]

The utilization of different filling materials has been reported after augmentation. The autologous graft is the gold standard, given its osteogenic, osteoinductive, and osteoconductive properties. It can be obtained from different areas, including retromolar trigone, chin, or iliac crest. Other options, such as allografts, xenografts, and alloplastic materials, have also been widely reported in the literature.

Recent studies analyzed maxillary sinus filling with periosteal cell grafts from the lateral jaw.[6] Some authors have also supported the non-utilization of cavity filling.[7]

Other available techniques to increase the maxillary height include bone splitting, bone sandwich graft after LeFort-type osteotomy, and onlay grafts.

The objective of this study was to retrospectively analyze sinus augmentations performed with biomaterial alone as well as the implants success rate. We also describe different complications that were observed during the procedure.

Materials and methods

This retrospective study included 34 consecutive sinus augmentations performed with biomaterial alone from 2008 through 2011.

All surgeries were performed by the same surgeon. Outcomes were evaluated by a maxillofacial surgeon not connected with the clinic, based on radiological images and clinical records. In all patients, the bone quality of the posterior maxilla was type 4 according to Misch's classification.[8]

Out of 95 sinus augmentations performed with autologous bone filling, a mixture of bone with hydroxyapatite, or bovine hydroxyapatite alone, we selected 34 augmentations that used bovine hydroxyapatite alone. 61 sinus augmentation were rejected due to the use of a mixture of materials. In these patients, we inserted 84 titanium implants with RBM-treated surface, external hexagon and standard platform.

Data were gathered on the sex, age, concomitant diseases, pre- and post-augmentation height, time interval between sinus augmentation and implant placement, timing of prosthetic loading, complications during surgery, and implant losses.

In all patients, an initial panoramic X-ray and CT scan were performed to yield the maximum possible information on the sinus anatomy and to rule out associated disease. All patients subsequently underwent another panoramic X-ray and/or CT scan.

Bone gain was measured manually in the panoramic X-ray at 180 days (the magnification was taken into account).

Surgical protocol

All procedures were conducted under local anesthesia (articaine with adrenalin).

The surgery consisted of a crestal incision with anterior and posterior release incisions. The mucoperiosteal flap was lifted and the Caldwell-Luc procedure was performed for lateral access (Fig. 1), preparing an oval osteotomy (Fig. 2) with a tungsten bur and irrigating with saline solution; perforation of Schneider's membrane was avoided by carefully detaching it from the sinus walls with membrane elevators.

A oxidized cellulose polymer layer was placed on the augmented sinus floor in order to isolate possible undetected microperforations (Fig. 3), and the cavity was then filled with two bovine hydroxyapatite vials and compacted (Fig. 4). A resorbable collagen membrane of equine origin was placed for the correct isolation of the area. No periodontal dressing material was used.

None of the patients had sinus pathology.

All patients were treated with amoxicillin–clavulanic acid (clindamycin for allergic patients) before and after the procedure.[9] They started the treatment an hour before the surgery with amoxicillin 875 mg-clavulanic acid 125 every 8 h and they completed 7 days of treatment. 0.12% chlorhexidine