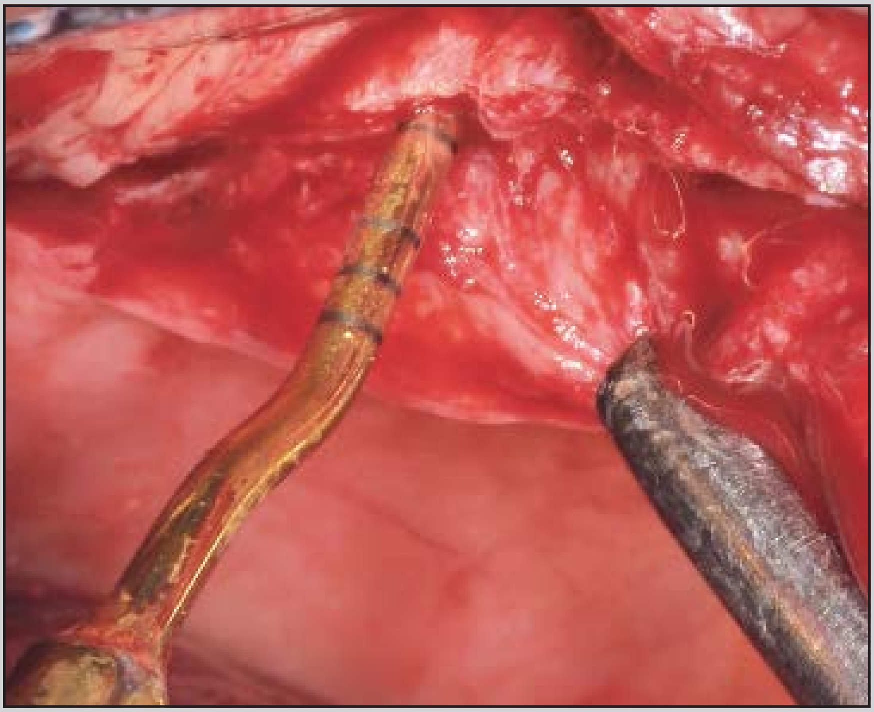
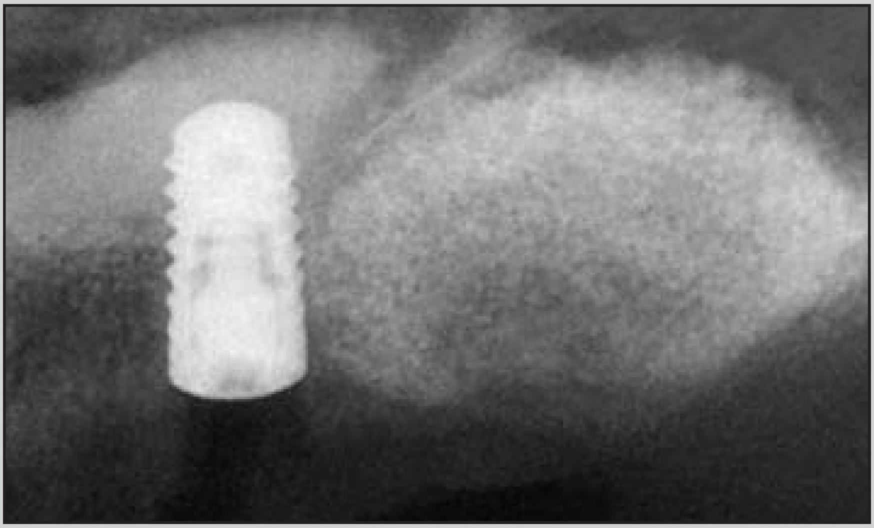
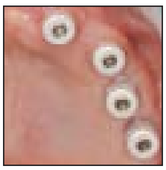




Nasal Floor Elevation with Transcrestal Hydrodynamic Approach Combined with Dental Implant Placement: A Case Report



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Severe atrophy of the anterior maxilla represents a major challenge for the clinician when planning an implant-supported rehabilitation. Several surgical options are available for augmenting bone volume in this area, including onlay or interpositional bone grafts, guided bone regeneration, distraction osteogenesis, and nasal floor augmentation. This case report describes a novel approach to nasal floor elevation using ultrasonic instruments to prepare the implant sites followed by transcrestal hydrodynamic nasal mucosa elevation and grafting with a collagenized xenogeneic biomaterial. This minimally invasive technique allowed for vertical augmentation of the atrophic anterior maxilla together with implant placement in a single-stage surgery. Int J Periodontics Restorative Dent 2016;36:357–361. doi: 10.11607/prd.2540

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The objective of preimplant surgery is the creation of a soft- and hard-tissue architecture that is favorable to the function and long-term survival of endosseous dental implants. One of the essential requisites is the presence of sufficient bone volume where the implants are to be placed.

In the edentulous posterior maxilla, sinus floor elevation is generally recognized as a predictable technique for increasing available bone height prior to implant placement. In the anterior maxilla, implant placement is limited by the nasal cavity and atrophic ridge volume can be augmented by onlay or interpositional bone grafting, guided bone regeneration (GBR) procedures, distraction osteogenesis, or nasal floor elevation.

Nasal floor elevation for vertical bone augmentation was first described in 1985 by Adell et al,[1] but scientific production regarding this procedure and the predictability of dental implants inserted in association with this technique are still limited. The classical surgical protocol consists in a full-thickness trapezoidal crestal incision followed by full exposure of the nasal spine and the inferior and lateral piriform rim. Elevation of the nasal mucosa is carefully performed with manual instruments, avoiding tears or perforations that could jeopardize the success of the procedure. The

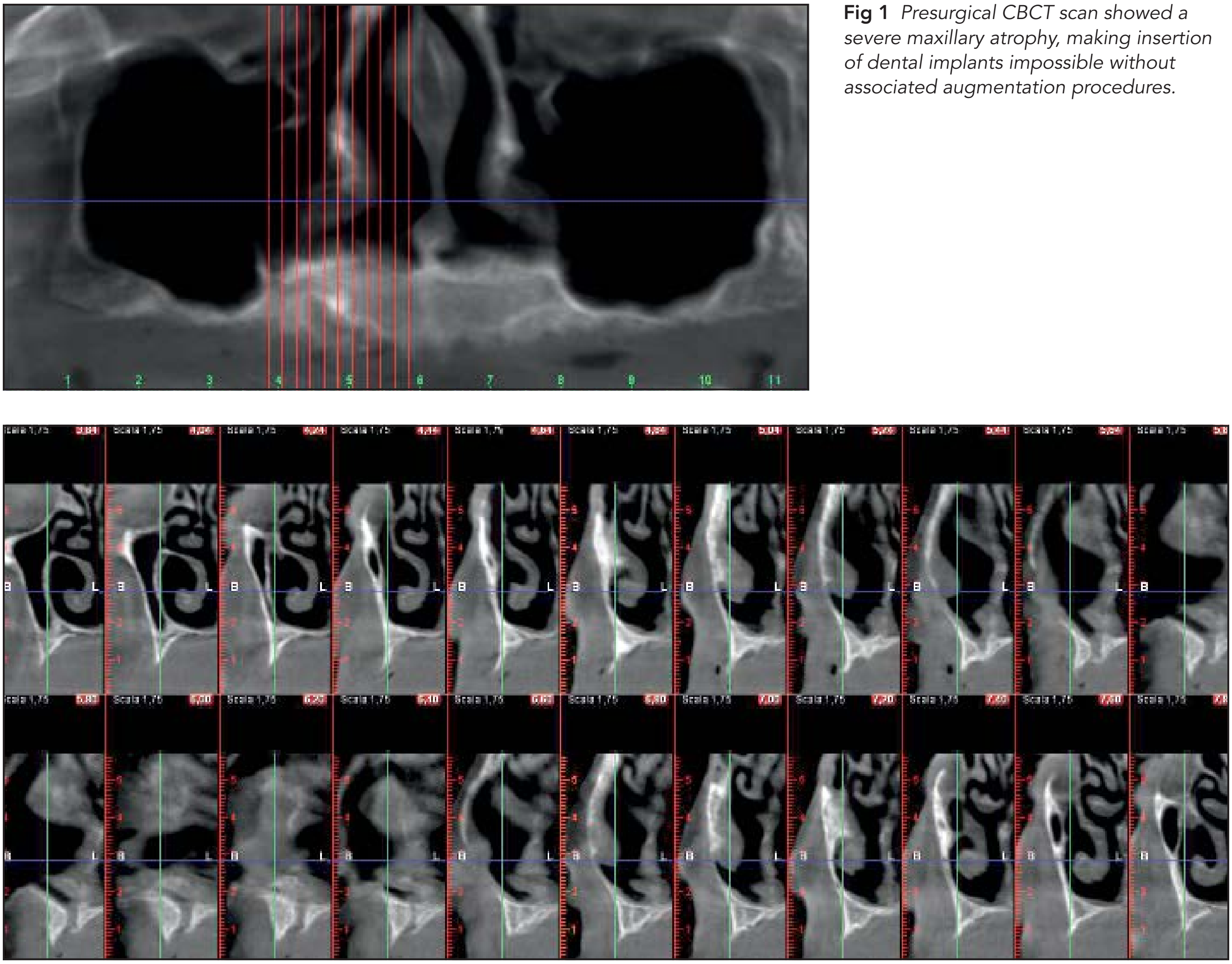


Fig 1 *Presurgical CBCT scan showed a severe maxillary atrophy, making insertion of dental implants impossible without associated augmentation procedures.*

space under the elevated mucosa is then filled by autogenous bone,[2–4] a mixture of autogenous bone and xenograft,[5] or other osteoconductive materials alone.[6–8] Implants are inserted simultaneously and demonstrate a high survival rate (90 to 100%).[3,6–8]

The aim of the present report is to introduce a novel, minimally invasive technique for nasal floor elevation using a transcrestal hydrodynamic approach and a graft of osteoconductive biomaterial with simultaneous insertion of the implants.

Case description and results

Presurgical evaluation

A systemically healthy 67-year-old female patient presented with a 30-year history of maxillary edentulism and use of a complete maxillary denture, asking for a fixed implant-supported rehabilitation. Presurgical evaluation was carried out and treatment plan options determined using panoramic radiographs, cone beam computed tomography (CBCT) scans, and study models (Fig 1). The patient presented with severe maxillary atrophy (Cawood and Howell Class VI)[9] and needed advanced regenerative procedures in the anterior and posterior maxilla to place dental implants. The interarch relationship analysis suggested an implant-supported hybrid prosthesis would be beneficial in achieving acceptable functional and esthetic results.

After thoroughly discussing with the patient the alternative options, it was decided to perform bilateral sinus floor elevation followed by nasal floor augmentation combined with implant placement to support a fixed hybrid prosthesis.

Surgical procedures

Bilateral sinus floor elevation with lateral approach was performed using ultrasonic instruments to insert a silicate-substituted calcium phosphate graft (Actifuse, Baxter). After 9 months of uneventful healing, five implants were inserted in the augmented sinuses (Bone Level SLActive, Straumann) and the anterior maxilla was treated with transcrestal nasal floor elevation and simultaneous placement of three implants.

After reflecting a full-thickness flap, implant site preparation was performed with piezoelectric inserts (Piezosurgery, Mectron) until a perforation of the cortical plate of the nasal floor was obtained (Fig 2). A hollow watertight screw was inserted into the osteotomy, and a progressive hydrodynamic elevation of the nasal mucosa was performed by injecting saline solution using a disposable syringe with micrometric pressure control (Physiolift, Mectron) (Fig 3). The hollow watertight screw was then sealed using a short closed pipe and the entire procedure was repeated for the other two implant sites until the nasal mucosa elevation was completed. The hollow screws were removed, and after implant site preparation with piezoelectric inserts was finalized, a collagenized porcine xenograft (OsteoBiol Putty, Tecnoss) was injected through the implant osteotomies to graft the submucosal space. Three implants (Bone Level SLActive) were inserted with high insertion torque (> 60 N/cm) and implant stability quotient values (> 65) due to the bicortical stabilization (Figs 4 and 5). All implants were submerged, and flap closure was performed with mattress and single sutures (PTFE, Omnia). The patient was prescribed an antibiotic for 6 days (amoxicillin 1 g twice a day) and a nonsteroidal anti-inflammatory drug (ibuprofen 600 mg) when needed. Sutures were removed after 10 days.

After 5 months of uneventful healing, second-stage surgery was performed (Fig 6) and prosthetic procedures were carried out following standard techniques. An implant-supported hybrid prosthesis was delivered 7 months after insertion

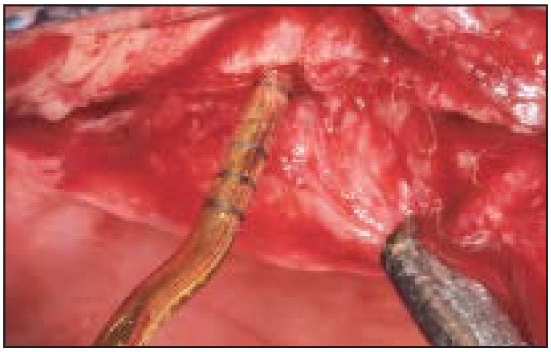


Fig 2 *Implant site preparation was performed with piezoelectric inserts to obtain a perforation of the cortical plate of the nasal floor.*

Fig 3 *Transcrestal hydrodynamic elevation of the nasal mucosa using saline solution injected through a hollow watertight screw.*

Fig 4 *Occlusal view of the three implants inserted immediately after the nasal floor elevation.*

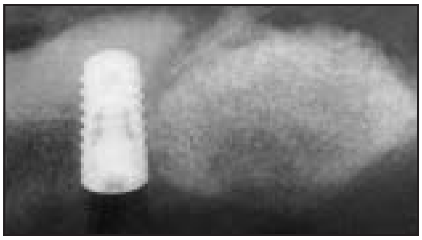
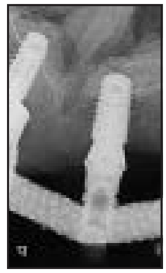


Fig 5 *Intraoperative periapical radiograph of the implant at site 23, showing both nasal and sinus floor elevations.*

Fig 6 *Occlusal view after second-stage surgery, with healing abutments in place.*



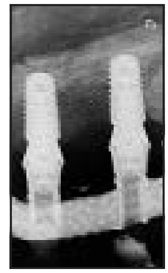


Fig 7 (left) *A full-arch implant-supported hybrid prosthesis was delivered 7 months after implant insertion.*

Fig 8 (center) *Radiographic follow-up at 18 months after placement of the implants at sites 12 and 21.*

Fig 9 (right) *Radiographic follow-up at 18 months after placement of the implants at sites 21 and 23.*

of the implants (Fig 7). At 18 months follow-up, both clinical and radiologic outcomes were satisfactory (Figs 8 and 9).

Discussion

Implant-supported rehabilitation of the edentulous patient with severely atrophic maxilla is always a complex problem for the clinician. Apart from solutions involving an extramaxillary anchorage (ie, zygomatic or pterygoid implants), several surgical approaches are available for sufficiently augmenting bone volume to place implants in a proper hard tissue envelope.

Autologous[10] or homologous[11] onlay bone grafting can be used to successfully reconstruct a deficient alveolar ridge. This procedure is validated in the literature, and the survival rate of implants inserted after using this technique is reported to be 79.5% (range: 60 to 100%, with a follow-up of 6 to 240 months).[12] Few case report studies describe the possibility of using GBR with resorbable or nonresorbable barriers in the treatment of these extreme cases, and it is unclear whether the results could be reproduced on a larger scale in a predictable way.[13,14] However, both GBR and bone grafting techniques have some disadvantages: soft tissue closure can limit the extent of regeneration, and the patient cannot wear any kind of removable prosthesis for the entire healing period.

Another possibility to correct alveolar bone deficiencies and intermaxillary discrepancies, described by Keller et al in 1987[15] and modified by Sailer in 1989,[16] consists of a LeFort I osteotomy combined with a sandwich autogenous bone graft. The survival rate of implants placed in conjunction with this surgical approach is acceptable (87.9%; range: 66.7 to 95.0%, with a follow-up of 6 to 144 months).[12] However, the high morbidity and elevated costs associated with this technique should be considered, along with the need for an extraoral donor site and hospitalization.

A more recently published alternative is horizontal distraction osteogenesis of the atrophic anterior maxilla in combination with bilateral sinus floor elevation.[17] Authors have presented encouraging results with a 1-year follow-up, but the main limitation of this approach is the need for enough bone to use as a base for regeneration and stable fixation of the distractor.

With the growing elderly population demanding a better quality of life and the search for minimally invasive, fast, and predictable techniques for dental implant placement, nasal floor elevation can be an interesting option for solving complicated situations in a simple way.

This surgical approach was first described in 1985[1] and consists of a full-thickness incision with an extended elevation of the flap until the nasal spine and the inferior and lateral piriform rim are exposed. Nasal mucosa is then carefully elevated with manual instruments to allow for the insertion of the grafting material. The graft should not exceed 6 or 7 mm in height to avoid interference with the inferior concha. Implants are then inserted with good stabilization as they cross the cortical bone of the alveolar crest and floor of the nose. Possible complications described for nasal floor elevation include bleeding, hematoma, swelling, graft infection, and rhinitis. This approach is not recommended in patients with chronic rhinitis, recurrent epistaxis, or previous septum correction.[7]

The transcrestal approach described in this report permits a further reduction in invasiveness and morbidity compared with conventional nasal floor augmentation, as follows:

- A minimal elevation of the flap is required, as when placing an implant with a standard technique, diminishing postoperative pain, swelling, and hematoma.
- Piezoelectric inserts are used to prepare the implant sites and to perforate the cortical plate of the nasal floor. Ultrasonic osteotomy has the advantage of selective cut[18] (diminishing the risk of nasal mucosa perforation) and seems to have the potential to modify biologic events during the osseointegration process, resulting in a limited decrease in implant stability in the early phase of healing when compared with the traditional drilling technique.[19]
- Hydrodynamic elevation of the nasal mucosa, as for the sinus membrane, is based on uniform distribution of the injected fluid, according to Pascal's principle.[20] Pressure is equally distributed in every direction, reducing the stress applied to the mucosa and facilitating its detachment with low risk of perforation.[21] Moreover, nasal mucosa is thicker than sinus membrane and more resistant to accidental tears or perforations.

Conclusions

Transcrestal hydrodynamic nasal floor elevation, as described in this report, could be an interesting, minimally invasive, alternative method for vertical bone augmentation of up to 6 mm in the anterior atrophic maxilla. However, properly designed case/control studies and randomized clinical trials are necessary to confirm and generalize these encouraging preliminary results.

Acknowledgments

The authors reported no conflicts of interest related to this study.

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