

Nasal Floor Elevation Combined with Dental Implant Placement*

Ziv Mazor, DMD;* Adi Lorean, DMD;† Eitan Mijiritsky, DMD;‡ Liran Levin, DMD§

ABSTRACT

Objectives: The aim of the present study was to report on the survival of dental implants placed in conjunction with nasal floor elevation.

Methods: A retrospective cohort of 32 consecutive patients from two private practices was evaluated. All patients presented with alveolar bone height deficiency in the anterior region, which was not sufficient to place a dental implant according to a computed tomography (CT) scan preformed prior to implantation. Elevation and augmentation of the nasal mucosa was performed simultaneously with dental implant placement. Data collection included demographic information, as well as records of the pre-operative available bone height, implant dimensions, bone addition following nasal floor augmentation, and survival of the implants at last follow-up.

Results: Overall, 32 patients received 100 implants that were performed in conjunction with nasal floor elevation. The average pre-operative available bone height according to a CT scan that was preformed prior to implantation was 9.1 ± 0.9 mm and ranged from 7.3 to 11.2 mm. Bone addition following nasal floor augmentation was 3.4 ± 0.9 mm and ranged between 1.1 and 5.7 mm. The mean follow-up time was 27.8 ± 12.4 months, and during that follow-up period, no implant failure was recorded, resulting in 100% implant survival.

Conclusion: Nasal floor elevation might serve as a predictable procedure, which allows implant placement in areas with significant atrophy together with increased implant stability due to the bicortical support.

KEY WORDS: alveolar bone, anterior teeth, bone augmentation, dental implantation, maxilla, success, survival

INTRODUCTION

Over the past few decades, the use of osseointegrated implants as a foundation for prosthetic replacement of missing teeth has become highly predictable and successful.^{1–5} In the anterior region particularly, to replace a missing single maxillary tooth with a dental implant is a challenge because of the high aesthetic, functional, and biological demands.^{3,6,7} In the anterior

maxilla, the alveolar ridge dimensions influence implant location, position of the lip, and the architecture of the free gingival margin.^{8,9} Insertion of an endosseous implant requires sufficient bone volume for complete bone coverage around the implant. Additionally, the pattern of ridge resorption contributes to an unfavorable maxillo–mandibular relationship, requires angulations of the implants and/or angled abutments, and affects the proximity of adjacent facial concavities (maxillary sinus, nasal cavity) and vital structures (mandibular nerve).¹⁰ Bone resorption after tooth loss is usually dramatic and irreversible, and more prominent in the first year.^{11,12} Resorption can be vertical or horizontal, leaving the area without sufficient bone to place implants.¹³ In the anterior maxillary region, nasal floor elevation could serve as an option for bone augmentation to enable dental implant placement.¹⁴ The information on the literature regarding this procedure and the predictability of dental implants placed in conjunction with nasal floor elevation is rather scarce.

*Private practice, Ra'anana, Israel; †private practice, Tiberius, Israel; ‡private practice, Tel-Aviv, Israel; §Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel

Reprint requests: Dr. Liran Levin, Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel; e-mail: liranl@tx.technion.ac.il

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The aim of the present study was to report on the survival of dental implants placed in conjunction with nasal floor elevation and bone augmentation.

METHODS

A retrospective cohort of 32 consecutive patients from two private practices between the years 2006 and 2009 was evaluated. All patients presented with alveolar bone height deficiency in the anterior region, which was not sufficient to place a dental implant according to a Computed Tomography (CT) scan preformed prior to implantation. The treatment protocol included full thickness incision on the crest of the anterior maxillary ridge followed by full exposure of the nasal spine and the inferior and lateral pyriform rim (Figure 1). Elevation of the nasal mucosa was carefully performed via a lateral approach with the use of an angulated curette that mimicked the anatomical shape of the pyriform rim (Figure 2). The elevated nasal cavity was then filled with bovine bone material (Cerabone, Botiss, Berlin, Germany) (Figure 3). Care was taken not to exceed a height of 6 mm unless the inferior concha was removed. Implants (Adin Dental Implants, Alon Tavor, Israel) were inserted simultaneously during the same procedure (Figures 4 and 5). No membrane barrier was used unless there was a tear of the nasal membrane.

Data collection included demographic information, as well as records of the pre-operative available bone height, implant dimensions, bone addition following nasal floor augmentation, and survival of the implants at last follow-up. Data were evaluated using descriptive statistics.

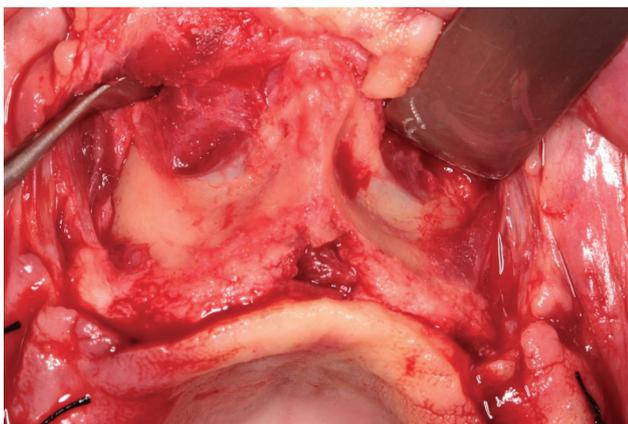


Figure 1 Full thickness incision on the crest of the anterior maxillary ridge followed by full exposure of the nasal spine and the inferior and lateral pyriform rim.

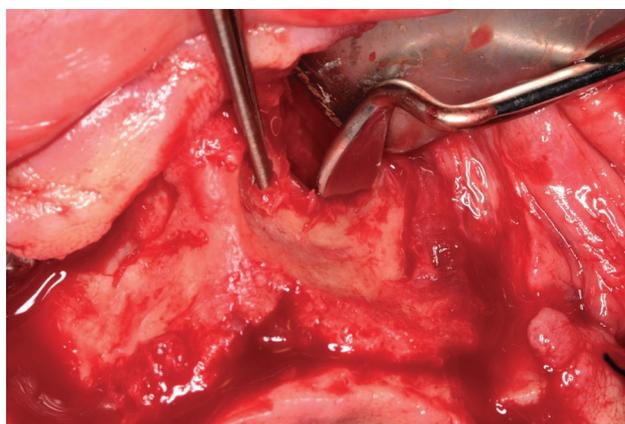


Figure 2 Elevation of the nasal mucosa carefully performed with the use of angulated curette, according to the anatomical shape of the pyriform rim.

RESULTS

Overall, 32 patients (18 males and 14 females) received 100 implants placed in conjunction with nasal floor elevation and bone augmentation. Patients' age ranged from 35 to 76 (average 56.4 ± 9.9). Thirteen patients reported smoking at the time the procedures were performed. The distribution of implants according to their position in the maxilla is presented in Figure 6. The average pre-operative available bone height according to a CT scan that was preformed prior to implantation was 9.1 ± 0.9 mm and ranged from 7.3 to 11.2 mm. The average implant length was 12.5 ± 0.9 mm (range 10 to 16 mm).

Bone addition following nasal floor augmentation was 3.4 ± 0.9 mm and ranged between 1.1 and 5.7 mm. The mean follow-up time was 27.8 ± 12.4 months, and



Figure 3 The elevated nasal cavity is filled with bovine bone material.

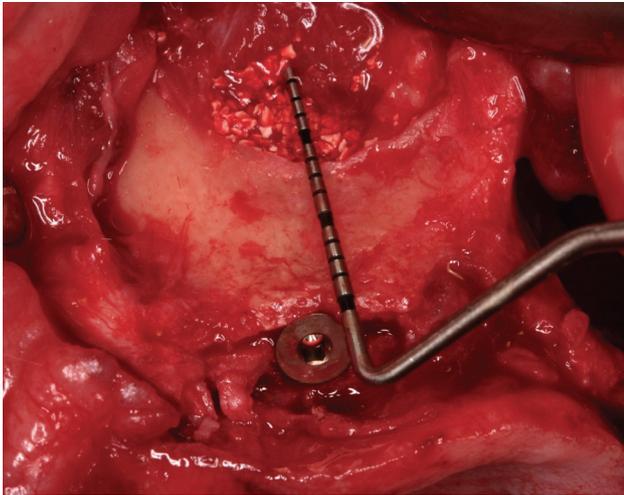


Figure 4 Implants were inserted simultaneously during the same procedure.

during that follow-up period, no dropout patients and no implant failure was recorded, resulting in 100% implant survival.

DISCUSSION

Placing implants in the anterior region represents a challenge for the clinician, mainly because of the high aes-

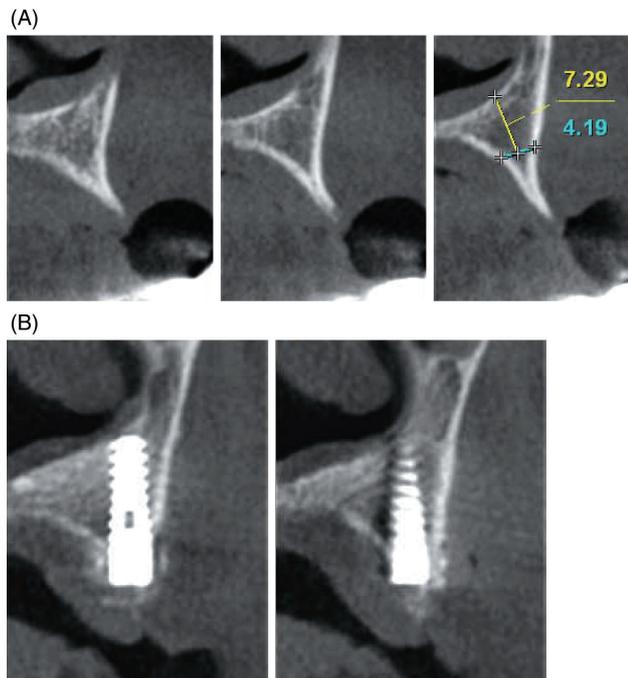


Figure 5 CT scan of the anterior maxillary area before (A) and following (B) nasal floor elevation combined with dental implant placement. In this case, nasal floor elevation and dental implant placement was performed together with ridge splitting.

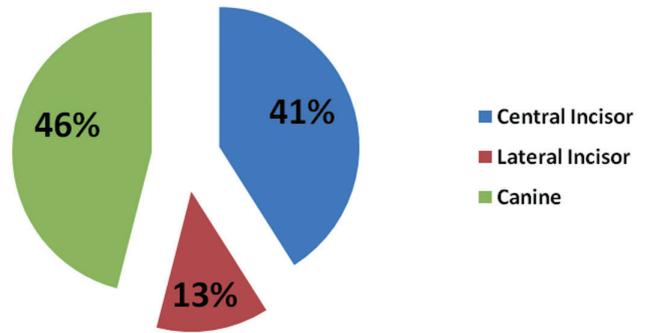


Figure 6 Distribution of implants according to their position in the maxilla.

thetic and functional demands of this area.^{3,7} Providing the patient with a rapid predictable solution for tooth loss in the anterior region is of utmost important in those cases. According to our observations, panoramic views of this area might overestimate the available bone height because it reflects the height of the buccal plate at the nasal spine area. Thus, a CT scan or CBCT scan should be recommended for implant planning in this region. Nasal floor elevation, as seen from the present results, might serve as a viable and predictable treatment method when bone height deficiency exists. Nevertheless, long-term follow-up is warranted in order to assess the longevity of augmented bone in the nasal cavity.

One of the benefits that might explain the high survival rates of the implants placed with nasal floor elevation is the bi-cortical stabilization that is achieved when inserting the implant through the alveolar bone crossing the cortical bone of the crest, as well as the cortical bone of the nasal floor. This stabilization promotes implant integration even in cases with immediate provisionalization.

Grafting of the maxillary sinus is a method used to achieve sufficient bone height for posterior maxillary implant placement and has proved highly successful.¹⁵⁻²⁰ Sinus floor augmentation procedures are routinely performed, although the function of the maxillary sinus is not fully understood. Nasal floor elevation is a very similar procedure and might be a preferred treatment modality in the appropriate cases.²¹ Possible complications for nasal floor elevation might include bleeding, swelling, pain, hematoma, graft infection by cross-contamination, implant displacement, rhinitis and sinusitis. In our clinical experience, the procedure is not recommended in cases of recurrent epistaxis, previous septum repair, chronic recurrent rhinitis or chronic known allergy.

In conclusion, nasal floor elevation might serve as a predictable procedure, which allows implant placement in areas with significant atrophy together with increased implant stability due to the bicortical support.

REFERENCES

- Berglundh T, Persson L, Klinge B. A systematic review of the incidence of biological and technical complications in implant dentistry reported in prospective longitudinal studies of at least 5 years. *J Clin Periodontol* 2002; 29:197–212.
- Esposito M, Grusovin MG, Coulthard P, Thomsen P, Worthington HV. A 5-year follow-up comparative analysis of the efficacy of various osseointegrated dental implant systems: a systematic review of randomized controlled clinical trials. *Int J Oral Maxillofac Implants* 2005; 20:557–568.
- Levin L, Pathael S, Dolev E, Schwartz-Arad D. Aesthetic versus surgical success of single dental implants: 1- to 9-year follow-up. *Pract Proc Aesthetic Dent* 2005; 17:533–538.
- Levin L, Sadet P, Grossmann Y. A retrospective evaluation of 1387 single-tooth implants: a six-year follow up. *J Periodontol* 2006; 77:2080–2083.
- Levin L, Laviv A, Schwartz-Arad D. Long-term success of implants replacing a single molar. *J Periodontol* 2006; 77:1528–1532.
- Saadoun AP, Le Gall MG. Periodontal implications in implant treatment planning for aesthetic results. *Pract Periodont Aesthet Dent* 1998; 10:655–664.
- Levin L, Ashkenazi M, Schwartz-Arad D. Treatment options of untreatable traumatized anterior maxillary teeth for future use of dental implantation. *Refuat Hape Vehashinaim* 2004; 21:54–59, 101–102.
- Salama H, Salama MA, Li TF, Garber DA, Adar P. Treatment planning 2000: an esthetically oriented revision of the original implant protocol. *J Esthet Dent* 1997; 9:55–67.
- Rateitschak HK, Wolf FH. *Implantology*. New York: Theme Medical Publisher, 1995:267–275.
- Misch CM, Misch CE, Resnik RR, et al. Reconstruction of maxillary alveolar defects with mandibular symphysis grafts for dental implants: a preliminary procedural report. *Int J Oral Maxillofac Implants* 1992; 7:360–366.
- Atwood DA. Reduction of residual ridges: a major oral disease entity. *J Prosthet Dent* 1971; 26:266–279.
- Watzek G. *Endosseous implants: Scientific and clinical aspects*. 1st ed. Chicago: Quintessence Publ, 1996:29–59.
- Tallgren A. The continuing reduction of the residual alveolar ridges in complete denture wearers: a mixed longitudinal study covering 25 years. *J Prosthet Dent* 1972; 27:120–132.
- Rubo de Rezende ML, de Melo LG, Hamata MM, Monteiro-Amado F. Particulate inlay nasal graft with immediate dental implant placement in a patient with repaired alveolar cleft: case report. *Implant Dent* 2008; 17:332–338.
- Chanavaz M. Maxillary sinus: anatomy, physiology, surgery, and bone grafting related to implantology – eleven years of surgical experience (1979–1990). *J Oral Implantol* 1990; 16:199–209.
- Bergh van den JPA, ten Bruggenkate CM, Disch FJM, Tuinzing DB. Anatomical aspects of sinus floor elevations. *Clin Oral Implants Res* 2000; 11:256–265.
- Bergh van den JPA, ten Bruggenkate CM, Groeneveld HHJ, Burger EH, Tuinzing DB. Recombinant human bone morphogenetic protein-7 in maxillary sinus floor elevation surgery in 3 patients compared to autogenous bone grafts. A clinical pilot study. *J Clin Periodontol* 2000; 27:627–636.
- Aimetti M, Romagnoli R, Ricci G, Massei G. Maxillary sinus elevation: the effect of macrolacerations and microlacerations of the sinus membrane as determined by endoscopy. *Int J Periodontics Restorative Dent* 2001; 21:581–589.
- Nkenke E, Schlegel A, Schultze-Mosgau S, Neukam FW, Wiltfang J. The endoscopically controlled osteotome sinus floor elevation: a preliminary prospective study. *Int J Oral Maxillofac Implants* 2002; 17:557–566.
- Levin L, Herzberg R, Dolev E, Schwartz-Arad D. Smoking and complications of onlay bone grafts and sinus lift operations. *Int J Oral Maxillofac Implants* 2004; 19:369–373.
- Higuchi KW, Block MS. Current trends in implant reconstruction. *J Oral Maxillofac Surg* 1993; 51(Suppl 1): 7–19.