Flapless, Immediate Implantation & Immediate Loading with Socket Preservation in the Esthetic Area Using the Alpha-Bio Tec's MultiNeO™ Implants

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Abstract

Success rates of between 93-100% in cases of implant placement have been referenced in dental literature in the last recent years. Today, it is widely accepted that stability of the hard and soft tissues around the implant depends not only on the bone volume in the relevant area, but also on the buccal bone width.

The decisions a specialist must make prior to beginning such procedures include:

- Immediate vs. delayed implantation
- Immediate vs. delayed loading
- Flap vs. flapless procedure
- Bone augmentation or none

All of these decisions depend on clinical parameters such as ridge dimensions, buccal bone volume, thickness of the soft tissue, occlusion, reason for the extraction, and absence of active inflammation.

Flap vs. Flapless Procedure

The flapless procedure has significant advantages which include the preservation of soft and hard tissue volume around the implant, decreased surgical time, improved patient comfort, and reduced recovery time.[1] In multiple studies, flapless implant placement yielded improved clinical, radiographic, and immunological results when compared with flapped implantation. Current research also suggests that non-invasive implant surgical techniques contribute to early rehabilitation, pleasing esthetics and satisfactory functional outcomes.[2] Submerged flapless surgery may allow better vascularization of the peri-implant mucosa and therefore obtain more richly vascularized supracrestal connective tissue around the implant.[3]

Significant disadvantages of flapless implant placement include the inability to visualize anatomic landmarks and vital structures, potential for thermal osseous damage from the obstructed external irrigation, inability to contour bone morphology, increased risk of implant misplacement in relation to angulation or depth, keratinized gingival tissue loss, and the inability to manipulate soft tissues around emerging implant structures. [1]

Essential Clinical Considerations

① Position of the implant

When placing implants in the maxillary anterior area (the “esthetic zone”), it is important to remember that implants placed closer to the palatal aspect of the crestal bone, as well as those more apically positioned, according to dental literature, demonstrated less buccal implant exposure over time.[4]

② Diameter of the implant

Similarly, crestal bone resorption and resulting implant exposure at the buccal aspect have been reported to be significantly greater when using wider implants (2.7±0.4 mm) than when using narrower implants (1.5±0.6).[5] Therefore, it may be preferable to use as narrow implants as possible in the esthetic zone. The following cases all used Alpha-Bio Tec. MultiNeO™ implants, available in Ø3.75, Ø3.5 and Ø3.2mm diameters. [5]

③ Immediate or delayed implantation

According to dental literature, superior crestal bone preservation can be obtained by placing the implant immediately after extraction.[6]

④ Auxiliary procedures

A width of at least 2 mm of buccal bone width is recommended in immediate placement of implants. However, according to dental literature, (97.4%) of the buccal bony walls of anterior extraction sites holds a width of less then 2 mm and only 2.6% of the walls were 2 mm wide.[7] In other words, only a limited number of extraction sites in the anterior maxilla can be considered for immediate placement of an implant without auxiliary procedures. In most situations, procedures such as guided bone regeneration will be required to achieve adequate bone contour around the implant and optimal esthetic outcome in sites where immediate implants are considered. Ridge preservation with an intra socket osseous graft and a membrane should strive to preserve the original ridge dimensions and contours.[8]

Clinical Cases Demonstrating Flapless Procedures in the Esthetic Area

The treatment plan in all of the following cases included: periodontal treatment, extraction, immediate implantation, placement of an abutment, socket preservation using bovine bone and immediate loading. MultiNeO™ Ø3.75, Ø3.5 and Ø3.2mm implants were used in all cases.

Following extraction of the relevant tooth or teeth, the intrasocket soft tissue was removed and the extraction site was completely cleared. The drilling sequence was a 2 mm drill followed by a 2.8mm drill at 1000 RPM into the mid palatal wall of the socket. The implants were inserted from the buccal direction into the osteotomy and the direction was then changed towards a more palatal position and inclination. All implants were placed 1-2 mm subcrestally at a torque greater than 35Ncm. After the final positioning of the implant, a 15 degree Alpha-Bio Tec's abutment was placed and then closed at a 20Ncm torque.

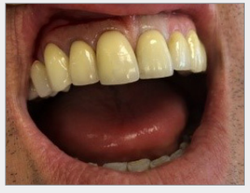
Buccal bone width was narrower than 2mm in all of the cases below, therefore, the clinical decision was to perform a socket preservation technique in order to reduce the resorption of the buccal plate. Based on the recommendations in dental literature, bovine bone was added to the gap between the implant and the socket.

Finally, the implants were immediately loaded with the previous crowns or with temporary crowns. The crowns were adjusted to minimize contact in centric occlusion as well as to eliminate any contact during lateral and protrusive movements.

Post-operative instructions: Augmentin 875mg twice daily (in cases of penicillin allergy, 600 mg Dalacin daily was substituted) starting from the day before surgery and continuing for a total of 10 days, chlorhexidine mouthwash twice a day for 10 days, and Nsaids for pain relief. Patients were requested not to chew or cut food with the implanted teeth. Periapical or panoramic X- rays were taken both immediately following the surgery and again after 4 months.

Case I:

Tooth 11 – Extraction, flapless immediate implantation and loading with socket preservation (Dr. Gadi Schneider and Dr. Yoram Brookmeyer) **(Figs. 1-2)**.



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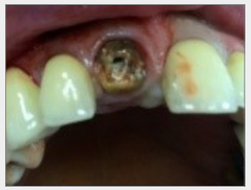

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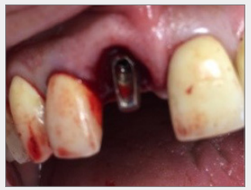
Extraction of teeth prior to immediate implantation - it is important to be as gentle and as careful as possible, since the buccal wall of bone is generally very thin (≤ 2mm) in the premaxillary area **(Fig. 3)**.



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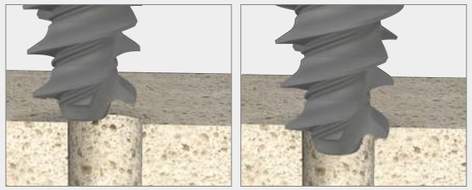
In this case, the buccal wall was successfully preserved during extraction.

Drilling - 1000 rpm, external irrigation in the mid palatal wall of the socket using a 2mm drill followed by a 2.8mm drill. Parallelism should be checked from at least 2 points, generally the occlusal view and the buccal view. A MultiNeO™ implant was placed using the centering feature at 45Ncm torque.

MultiNeO™'s Centering feature - a unique (patent pending) design. The centering feature takes the MultiNeO™ implant exactly to the point of penetration of the bone without the need for direct visibility. This makes locating the osteotomy entrance much easier, particularly when the osteotomy is hidden by neighboring teeth or covered with blood, so that it cannot be seen.



Implant position – parameters:

- At least 1mm deeper than crest level at a 5° palatal angulation and at more palatal position
- At least 1.5mm between the implant and adjacent teeth **(Figs. 4-5)**

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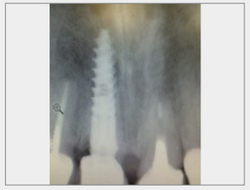
In this case, because of the thin buccal plate (< 2mm), a socket preservation technique using bovine bone (Alpha-Bio's GRAFT) was necessary in order to preserve the crestal ridge of bone **(Fig 6)**.

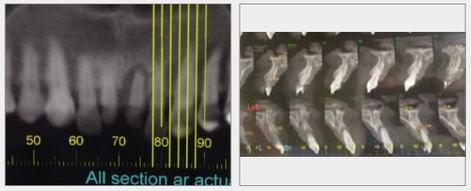


6

When placing the abutments, it is very important to position them correctly prosthetically. In this case, the original crown was placed as a temporary crown and adjusted to be out of occlusion. A periapical X-ray was taken postoperatively on the day of implantation.

Case II:

Teeth 11-21 – Extraction, flapless immediate implantation and loading, socket preservation (Dr. Gadi Schneider and Dr. Yoram Brookmeyer) **(Figs. 7-10)**



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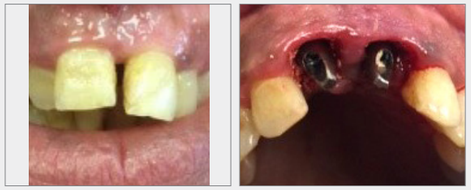

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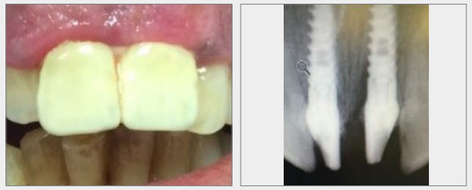
Implant position - at least 1.5mm between implant and adjacent teeth and 3mm between implants **(Figs. 11, 12)**



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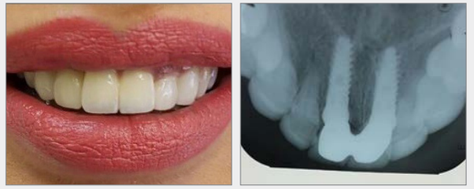
6 months Follow-up. **(Figs. 13-14)**



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Deploying Alpha-Bio Tec's MultiNeO™ for Combined Immediate Post-extraction Implant and Flapless Implantation

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Dr. Paolo Borelli graduated in dentistry from the University of Turin, Italy. In 2006, he obtained a Masters in Prosthetics from the University of Turin. Since 2004, Dr. Borelli has been a member of the Order of Doctors, Turin. He co-authored two books, "Prosthetic Rehabilitation" Vol. 3 (UTET, 2004) and "Biological Approach to Edentulous Patient Treatment" (Quintessence, 2008). Dr. Borelli is a co-founder of the Study Club of Genoa, Milan and Turin, which focuses on guided surgery techniques. He is a teaching assistant in oral surgery in Koeszeg, Hungary under the direction of Professor Dr. P. Famà. Dr. Borelli has been a guest speaker at seminars and conferences in Italy and abroad and he manages a private practice in Turin, Italy.

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DDS, Italy

Dr. Massimiliano Favetti graduated with honors from the University of L'Aquila, Italy in 1995, where he collaborated with the ENEA Research Center on the study of biocompatibility of metals in dentistry. Dr. Favetti specializes in prosthetics, implantology and oral surgery. Since 2008, he has been on the Board of Experts, Italian Civil Court, Rome. His main interests are piezoelectric surgical techniques and CAD/CAM systems for prosthetics and implantology; he has been a guest speaker on these topics at various conferences and courses. Dr. Favetti has used the Alpha-Bio Tec. implant system since 2005. He is currently the owner of Dentamed Clinics, Rome.

Deploying Alpha-Bio Tec's MultiNeO™ for Combined Immediate Post-extraction Implant and Flapless Implantation

Abstract

The upper molar area often presents challenges for immediate implantation. In addition to favorable anatomical conditions, such as divergent roots and a barely pneumatized maxillary sinus, it is necessary to have high performance implant systems available, able (despite the limited availability of bone typical of these conditions) to achieve high primary stability.

This case study presents a 41-year old patient who, following, the failure of a fixed prosthesis on her natural teeth, was rehabilitated using two Alpha-Bio Tec's MultiNeO™ implants. A flapless implant was selected to be inserted in area 15 and an immediate post-extraction implant in area 16.

Background

An immediate post-extraction implant presents tremendous advantages for the patient in reducing the edentulous phase and the number of surgical steps. In order to be placed successfully, such an implant requires careful planning, optimal site preparation and the utilization of suitable implants by the clinician [1].

The utilization of immediate implants is a viable alternative to replacing missing teeth in cases of severe periodontal disease, periapical pathology, extensive cavities or incurable fractures [2].

In extreme conditions, such as poor bone density, it is recommended to utilize spiral implants, with which it is possible to obtain adequate primary stability [3].

The new Alpha-Bio Tec's MultiNeO™ implant features a very refined design, allowing for easily obtained high torque values as a result of its ability to stabilize bone tissue. This feature becomes even more important when operating in complex post-extraction sites, such as in multi-rooted teeth, where the scarce bone availability needs to be optimized. Another feature of this new implant system is its versatility – its ability to be used in any bone density and for any surgical technique, from flapless implants to those combined with regenerative procedures.

Overview

The patient is a 41-year old woman, moderate smoker (5-6 cigarettes per day), with no meaningfully adverse health history. The patient reports pain around an old implanted prosthesis in the maxillary right quadrant. Clinical examination of the area reveals inflammation and gingival bleeding around tooth 16, while a radiographic evaluation of the area shows good bone availability. The recommended approach is to remove the existing bridge (14 – pontic – 16), place a new crown on tooth 14, place an implant using a flapless technique in the area of the missing tooth 15, extract tooth 16, and place an immediate post-extraction implant as a replacement of tooth 16.

Extraoral Examination

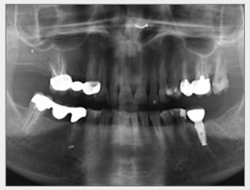
Patient presents toned perioral muscles and a high smile line that permits full exposure of the front teeth, also due to protrusion of the maxillary central and lateral incisors.

Intraoral Examination

Good level of oral hygiene and absence of tooth mobility. Thick mucosal biotype with no evidence of lesions. All teeth show signs of wear and tear as a result of parafunctional activity, which may also be the cause of the widespread gingival recession. Mucosal swelling in evident in the area of tooth 16. Some incongruous prosthetic artifacts exist.

Radiographic Examination

The initial ortho-panoramic radiography **(Fig. 1)** shows sufficient bone availability to enable the implant placement in areas 15 and 16 without adopting regenerative techniques.



1 Initial orthopantomography

Materials Used

- Ø 3.75 x 11.5mm MultiNeO™ implant (Alpha-Bio Tec, Israel) in area 15
- Ø 4.2 x 10 mm MultiNeO™ implant (Alpha-Bio Tec, Israel) in area 16
- Temporary TLAC-AR abutment (Alpha-Bio Tec, Israel) on implant in area 15
- HS6-5 healing screw (Alpha-Bio Tec, Israel)
- Final TLAO-2 abutments (Alpha-Bio Tec, Israel) on implants in areas 15 and 16

Additional Materials

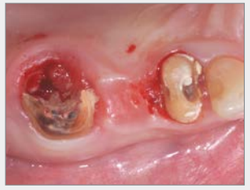
- Absorbable haemostatic sponges (Cutanplast Dental; Ogna Lab, Italy)
- Non-absorbable polyamide suture (Supramid; B. Braun Melsungen, Germany)
- Temporary polycarbonate crown (InLine, BM. Dental, Italy) on implant in area 15
- Final crown in IPS e-max CAD (Ivoclar Vivadent, Italy) on tooth 14
- Final crowns with Prettau® CAD zirconium structure (Zirkonzahn, Italy) and ZirPress veneering (Ivoclar Vivadent, Italy) on implant areas 15 and 16

Treatment Objectives and Work Plan

The treatment plan includes the removal of the existing prosthesis in the maxillary right quadrant and the placement of two implants: in area 15 using a flapless technique and in area 16 as an immediate post-extraction implant. Immediate screw retained prosthetic rehabilitation in area 15 is scheduled after the end of the surgical phase to reduce any imperfections resulting from missing teeth. The final prosthesis, expected to be placed approximately 3 months after surgery, will be constructed by creating a ceramic crown with chair side CAD/CAM technique on tooth 14, and zirconium-ceramic crowns on the abutments in areas 15 and 16.

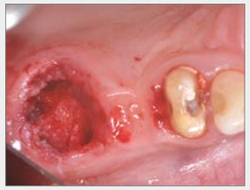
Surgical Phase

The old bridge was removed after administering plexus anesthesia. Impairment of tooth 16 (unsalvageable) was evidenced **(Fig. 2)**.



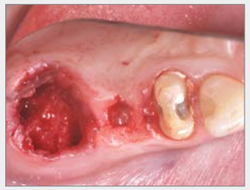
2 Initial situation after removal of the old prosthesis

The extraction of the root residues revealed a very well represented inter-radicular septum, enabling implant placement **(Fig. 3).**



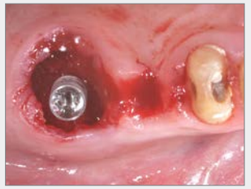
3 Inter-root septum after extraction of tooth 16

A mucosal operculum in area 15 was performed while simultaneously preparing the two implant sites. The passage of a 2 mm pilot drill revealed low bone density (D3), and therefore under-preparation of the sites was decided upon in order to obtain the necessary primary stability. For the site in area 15, which received an Ø3.75 x 11.5mm MultiNeO™ implan, it was sufficient to use a 2 mm drill up to 11.5mm depth. Area 16 was prepared to receive the Ø4.2 x 10mm MultiNeO™ implan with a 2mm drill to 10mm depth; a crest housing was created for implant installation with a 2.8mm drill to 4mm depth **(Fig. 4)**.



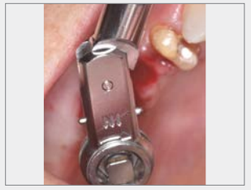
4 Under-preparation of the implant sites

The geometric characteristics of the MultiNeO™ implant, making it self-tapping and self-compacting, allows it to reach high torque values even in compromised sites **(Fig. 5)**.



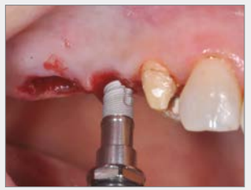
5 MultiNeO™ implant insertion in inter-root septum of tooth 16

The progression of the implant within the site is gradual, and the steep rise in the insertion torque occurs only in the last few millimeters, easily reaching values of 50Ncm **(Fig. 6).**



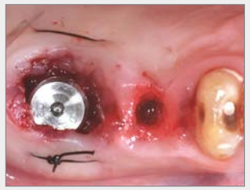
6 Tightening of MultiNeO™ implant with dynamometric ratchet; high insertion torque (50Ncm)

At directly accessible sites, it is advisable to use a straight manual driver that allows, where enough bone density is present, altering the implant placement trajectory in order to optimize the prosthetic axis. In fact, the MultiNeO™ implant features such a powerful apical thread that it is possible to use it as an actual osteotome **(Fig. 7)**.



7 MultiNeO™ implant insertion with manual driver in area 15

The surgical procedure was completed by filling the post-extraction alveoli of area 16 with absorbable hemostatic sponges (Cutanplast Dental, Ogna Lab, Italy), applying a healing screw on the implant (HS6-5, Alpha-Bio Tec., Israel) and suturing the area with non-absorbable polyamide pseudo-monofilament (Supramid, B. Braun Melsungen, Germany **(Fig. 8)**.

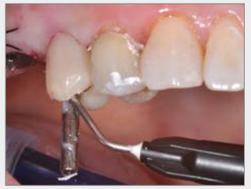


8 Placement of healing abutment and suture in area 16

Immediate loading of the implant in area 15 was accomplished by modifying a temporary abutment (TLAC-AR, Alpha-Bio Tec, Israel) **(Fig. 9)**.

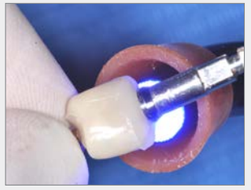
9 Grinding of temporary TLAC-AR abutment

To avoid clogging the opening passage during the provisional fitting procedures, a long transfer screw was used to hold the temporary abutment in place and then the suitably pre-constructed crown, pre-molded in polycarbonate (InLine, BM. Dental, Italy), was fitted over it **(Fig. 10)**.

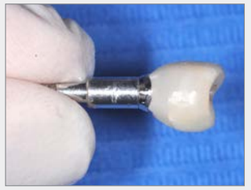


10 Placement of temporary crown on abutment

The provisional crown was bonded to the abutment using a flowable composite and then the screwed-on crown was removed from the patient's mouth. This procedure allowed adjustment of the screwed-on provisional outside of the oral cavity **(Fig. 11)**, thus achieving a high degree of accuracy in the finishing and polishing of the emergence profile **(Fig. 12)**.

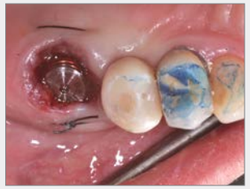


11 Realization of screwed on provisional



12 Finished and polished temporary crown

The provisional crown was attached to the implant by tightening the screw to 20 Ncm and closing the hole with another flowable composite **(Fig. 13)**.



13 Application of temporary abutment and closing the hole with flowable composite

To limit the risk of overload on the implant, the provisional was adjusted to eliminate contacts in both in centric occlusion and in lateral and protrusive movements **(Fig. 14)**.

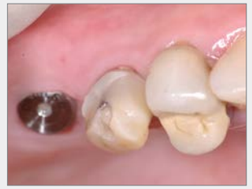
14 Provisional without occlusal load

The patient was discharged with a recommendation to adhere to the following drug regimen: Amoxicillin + Clavulanic Acid: 1 g every 12 hours for the following three days, Ketoprofen 1 g every 8 hours on the first day and as needed in the following days, Chlorhexidine 0.2% spray at least 3 times a day for the next 7 days.

Additional Check-Ups

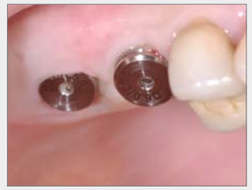
A week after surgery, the sutures were checked and removed. As the patient reported no discomfort, her follow up check-up was planned a month after surgery.

At 35 days after surgery, despite all the recommendations provided to the patient about the diet to be followed during the healing period, she showed up at the follow-up visit with a damaged screwed-on provisional on 15, evidently due to some masticatory overload **(Fig.15)**.



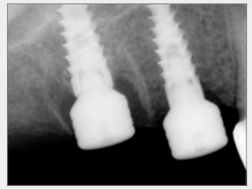
15 Damaged provisional at 35 days after surgery

The decision was made to remove the provisional and (to avoid additional stress that could effect the implant stability) to apply a HS6-5 healing screw instead **(Fig. 16)**.



16 Application of healing screw in place of provisional

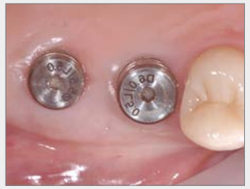
The intraoral radiography did not show any evidence of bone loss around the implants **(Fig. 17)**.



17 Intraoral radiography at 35 days after surgery

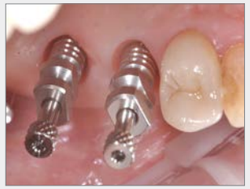
Prosthodontics Phase

During the osseointegration phase, the old crown was replaced on tooth 14 with AIPS e-max CAD integral ceramic (Ivoclar Vivadent, Italy) produced directly in the dental clinic in a single session with the CAD/CAM Cerec system (Sirona, Germany), **(Fig. 18)**.

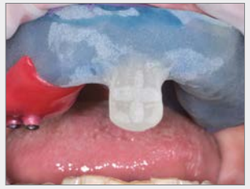


18 Crown in IPS e-max CAD on tooth 14 made with Sirona Cerec

At 90 days after surgery the final impressions were taken with a single-phase individual open tray procedure, positioning the HTLO impression transfers **(Fig. 19)** on the implants utilizing VPES (Vinyl Polyether Silicone) EXA'lence GC (GC EUROPE, Belgium), **(Fig. 20)**.



19 Alpha-Bio Tec. HTLO transfer placed on implants



20 Dental impression in VPES with open tray technique

Two TLAO-2 (Alpha-Bio Tec, Israel) abutments were provided to the laboratory. After pouring plaster models, the abutments were modified by grinding them to 0° **(Fig. 21)**.

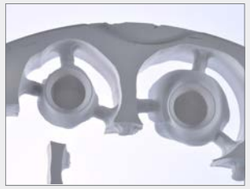
21 TLAO-2 abutments prepared on model

It was decided to adopt a fully digital work flow that, in addition to maintaining accuracy of the details of the impressions, also allows for optimizing execution times, reducing costs and achieving remarkable aesthetics. The CAD/CAM (Zirkonzahn, Italy) system first allowed us to perform scans of the prepared models **(Fig. 22)**, followed by the design of the two crowns of 15 and 16 with the pressed zirconium technique **(Fig. 23)** and finally, milling of the prosthetics.

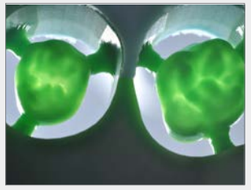
22 CAD/CAM scanned models

23 CAD design of teeth 15 and 16 for press technique on zirconium

The structures were milled from hard Prettau® zirconium **(Fig. 24)**, while the anatomical occlusal details were milled from hard castable resin **(Fig. 25)**.



24 Milled structures from hard Prettau® zirconium disks

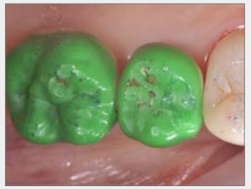


25 Anatomical details milled from hard castable resin

After sintering the structures in zirconium and controls on the model **(Fig. 26)**, the crowns were sent for fitting trying in the patient's mouth.

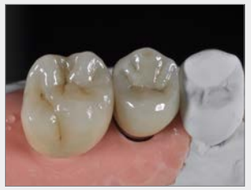
26 Controls on the model

The intraoral test was carried out without difficulty and basically consisted of the optimization of occlusal contacts **(Fig. 27)** using articulating paper of 40 microns thickness.



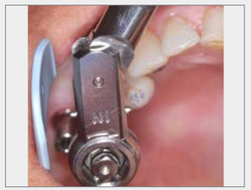
27 Intraoral occlusal functionalization

Once sent back to the laboratory, the crowns were finalized with structural ceramization techniques by means of die casting, utilizing ZirPress Ivoclar ceramic (Ivoclar Vivadent, Italy), characterized by saturating the surface of the color **(Fig. 28)**.

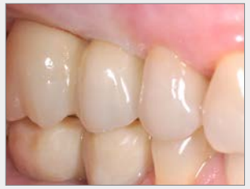


28 Crowns designed in the laboratory with ceramic die casting technique

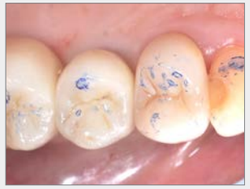
In the final session, the abutments were positioned by tightening them to 30Ncm **(Fig. 29)** and crown shape, color and contacts were crosschecked **(Figs. 30-31)** prior to cementation.



29 Abutment 30Ncm tightening torque

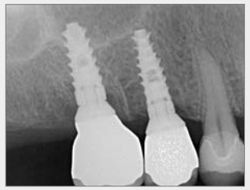


30 Cemented crowns

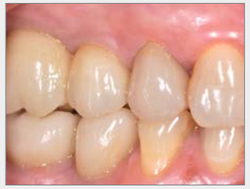


31 Control of occlusal contacts after cementation

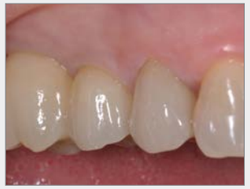
The final radiographic control **(Figs. 32-35)** was performed to ensure not to leave any residual cement, and highlights the fit of all the prosthetic structures.



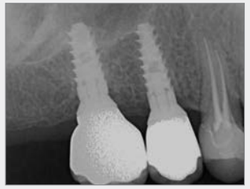
32 Final X-ray



33 Restored hemiarch at 11 months from implant placement and at 8 months from final loading



34 Detail of zirconia-ceramic crowns on MultiNeO™ implants.



35 X-ray at 11 months after surgery

Summary

State-of-the-art techniques and technologies applicable to implant prosthetics make it possible to recommend quick solutions to a patient, such as the immediate insertion of implants post-extraction and flapless surgery interventions, wherever possible. In addition to doing an extremely thorough planning, it is essential that suitable implants are available in order to proceed to their immediate placement and, if appropriate, to their immediate prosthetization. The Alpha-Bio Tec MultiNeO™ implant represents the ultimate expression of the versatile features of an implant, as it can be implanted in virtually all conditions, from conventional implants to immediate implant surgery, and deploying all techniques, from flapless surgery to immediate loading. The predictability of a prosthetic implant treatment depends on many factors. Consequently, in addition to high-quality implants and prosthetic components, it is essential to achieve a high level of prosthesis. The new CAD/CAM technologies, new materials and new laboratory techniques [5] can help in this endeavor, while also minimizing technical execution time as described in this case.

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Closed Sinus Lift Using Alpha-Bio Tec's MultiNeO™ Implant

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Senior Medical and R&D Consultant, Alpha-Bio Tec Dr. Gadi Schneider received his DMD from the Hebrew University, Hadassah School of Dental Medicine, Jerusalem, 2000. He completed his post-graduate studies in Periodontology at the Hebrew University and has been a specialist in Periodontology since 2004. Also in 2004, Dr. Schneider received his European Federation Certificate of Periodontology and has since been an instructor and lecturer at the Hebrew University, Hadassah School of Dental Medicine. As the Senior Medical and R&D Consultant at Alpha-Bio Tec's Dr. Schneider was in charge of the medical and clinical development of various implants. Dr. Schneider is a leading international lecturer in the field of complicated implant surgical procedures, and has published more than 50 clinical studies, cases and articles. Dr. Schneider manages a private practice that specializes in Periodontics and Implantology.

Closed Sinus Lift Using Alpha-Bio Tec's MultiNeO™ Implant

Case Overview

There are two approaches to maxillary sinus floor elevation currently in common use: the lateral approach (often called an "open sinus lift") and the crestal approach ("closed sinus lift"). The lateral approach, the so-called lateral antrostomy or lateral window technique, was originally described by Tatum (1986)[1]. Several years later, Summers (1994)[2] advocated a new approach: the osteotome technique. Compared with the lateral window approach, the osteotome procedure is now considered a less-invasive technique. It is reported to reduce both operative time and post-operative discomfort. It requires less grafting material and also improves peri-implant bone density, thereby allowing greater initial stability of implants. Despite having so many advantages, the crestal approach nevertheless has some restrictions on patient selection, the most important one being the initial alveolar bone height.

Numerous articles have discussed the influence of graft materials, implant surface preparation, and timing of implant placement on the success of implant therapy combined with sinus lift procedures. However, only a few clinical reports have discussed the issue of initial alveolar bone height. For instance, the decision between one-or two-stage approaches for a lateral window sinus lift is generally based on the initial alveolar bone height. Although an early study[3] suggested that a two-stage procedure is indicated when alveolar crestal bone is <3–4mm, Fugazzotto[4] suggested that 4mm of initial bone height appeared to be adequate to ensure sufficient primary stability and to allow placement of implants simultaneously with the sinus lift procedure.

In 1998, a clinical study by Zitzmann & Scharer[5] proposed criteria for selecting procedures of sinus floor elevation. In patients with severe resorption, such as those with bone heights of 4mm or less, the two-step lateral antrostomy was indicated. However, with residual bone heights of 4–6mm, simultaneous implant placement could be performed. Several studies have made similar observations and suggestions for 4–5mm as the minimum initial bone height for the one-stage procedure.

For the osteotome procedure, it has been suggested that there should be at least 5–6mm of alveolar crestal bone remaining below the sinus floor when this indirect sinus elevation is performed together with implant placement[2]. A prospective clinical study showed that when more than 6mm of residual bone height was present, the osteotome technique could be used to the bone height by an additional 3–4mm. The success rate was about 95% after 30 months of follow-up[5]. Another multicentre retrospective study also reported a high survival rate of 96% when the pre-treatment bone height was >5mm, but this was reduced to 85.7% when the pre-treatment bone height was <5mm[6].

A consensus report in a recent European Workshop on Periodontology[7] indicated that in cases with <6mm of residual bone height, 17% of subjects experienced implant loss in the first 3 years following the lateral window procedure. For the osteotome procedure, better results were found in patients with ≥5mm of residual bone[8].

The aim of this study was to undertake a meta-analysis of the associations between the average initial alveolar bone height and implant survival rates, and to examine whether the associations were different for these two sinus lift procedures. We also looked at whether there is an optimal residual alveolar bone height, such as 5mm, recommended commonly in the literature for maxillary implant placement combined with sinus floor lifting using either the lateral window or the osteotome technique.

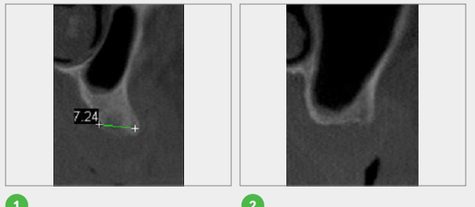
The overall implant survival rate was 92.7% for 331 implants placed in <5mm ridge height and 96.9% for 2,525 implants inserted in ≥5mm ridge height. The difference was significant (p = .0003).

Conclusions: The trans alveolar sinus augmentation technique could be a viable treatment in case of localized atrophy in the posterior maxilla even in cases of minimal residual bone height. The prognosis is more favorable when the residual ridge is at least 5mm high. For the osteotome technique, 1,208 implants in eight studies were considered, showing a survival rate varying from 95.4% to 100% after 3- year follow-up[9].

Step 1 - Closed Sinus Lift Procedure

Decide according to the CT scan whether to perform a closed or an open sinus lift. If there is at least 5mm of residual alveolar bone height, the clinical decision will tend towards a closed sinus lift.

The clinical challenge - the posterior part of the maxilla is usually considered the least predictable area for implants because of the combination of both reduced quantity and quality of bone. The MultiNeO™ implant, due to its unique design, is able to deal with these clinical situations with successful and predictable results **(Figs. 1-2)**.



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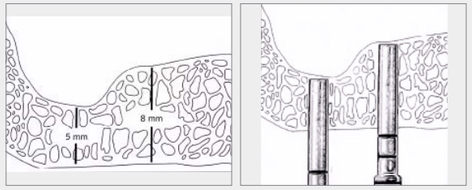
Step 2 - Osteotome Technique

Mark the intended positions of the implants and start to drill to a depth of 1mm away from the sinus floor **(Figs. 3-4)**.



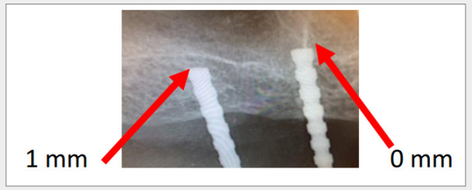
3 Typical bone dimensions for using the bone osteotome sinus floor elevation [10]

4 Bone added osteotome sinus floor elevation procedure [10]

Step 3 - X-ray examination

Take a periapical X-ray in order to validate the distance from the sinus floor. If the distance is bigger than 1mm one must continue drilling until you almost reach the sinus floor.

For example: in order to place a Ø3.75mm MultiNeO™ implant using a closed sinus lift and in the case of type III bone, the drilling sequence is a 2mm drill followed by a 2.8mm drill, only through the cortical bone **(Fig. 5)**.



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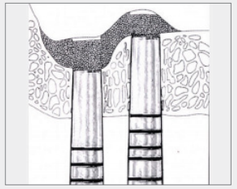
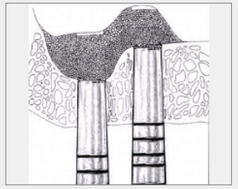
Step 4 - Bone Grafting

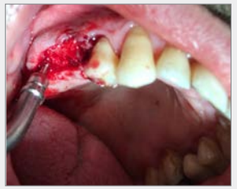
Place 1mm of bovine bone into each osteotomy in turn, and use an osteotome in order to break the sinus floor and raise it to the desired depth, then continue to add bovine bone in 1mm increments until reaching the desired height **(Figs 6-9)**.



6 The osteotomy is widened, and successive osteotome are seated to the sinus floor [10]



7 With the addition of each measured load of bone, the largest-sized osteotome previously used is reinserted to the sinus floor [10]



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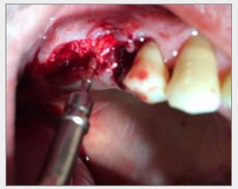

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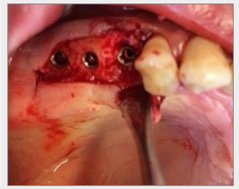
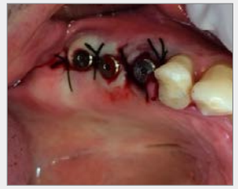
Step 5 - Placing the Implant

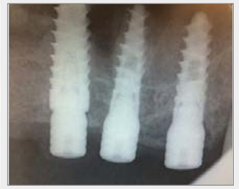
At this point in time, all the engagement of the implant comes from its coronal section. In the case illustrated below, the following implants were used: Ø3.75mm/11.5mm - Ø4.2/11.5mm and Ø5.0/11.5mm MultiNeO™ Implants. The cylindrical coronal part, the microthreads and the unique variable and angled threads all contribute to the high primary stability and the reduced stress on the surrounding cortical bone of this implant. The insertion torque was 25-30Ncm **(Figs. 10-13)**.



10 When the anteral floor is displaced, the graft inserted freely, thus elevating the intact membrane [10]

11





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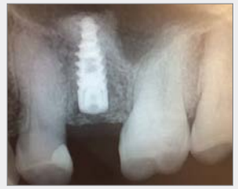
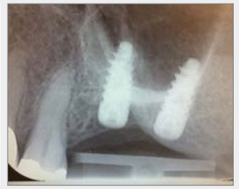
Step 6 - Post-op. X-ray

Take a post-operative periapical X-ray in order to check that the implant is surrounded by bone and validate the Schneiderian membrane (lining the sinus) **(Figs. 14-15)**.





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New Perspectives in the Treatment of the Severe Atrophic Posterior Maxilla: Interpositional Sandwich Osteotomy Combined with Sinus Floor Grafting Using Alpha-Bio Tec's MultiNeO™ Implants

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Dr. Fahim Atamni completed his dental degree in the Johann Wolfgang Goethe University, Frankfurt am main, Germany in 1984 and received his PhD in dental medicine in 1987. From 1985- 1989, he specialized in Oral Surgery at the Department of Oral and Maxillo-Facial Surgery (Prof. Dr. Dr. Frenkel, Prof. Dr. Dr. Bitter), Johann Wolfgang Goethe University and received his specialization certificate in Oral Surgery from the State Medical Board of Hessen, Germany. Earlier in his career he was a clinical instructor and lecturer for undergraduate and postgraduate dental students, Department of Oral and Maxillo-Facial Surgery at Johann Wolfgang Goethe University. Since 2004, postdoctoral education in Oral Surgery- Habilitation, Department of Oral and Maxillo-Facial Surgery and Oral Implantology, Prof. Dr.Dr. Topalo, USMF "N. Testemitanu" in Chisinau, Moldova.
He manages a private dental clinic in Tel-Aviv, Israel. Dr. Atamni is an author and co-author of over 40 scientific publications in the field of Maxillary Sinus Floor Augmentation and alternative methods and the author of the book "Lateral Wall Sinus Floor Augmentation – State of the Art".
He is an active member in number of leading organizations in the field of implantology.

New Perspectives in the Treatment of the Severe Atrophic Posterior Maxilla: Interpositional Sandwich Osteotomy Combined with Sinus Floor Grafting Using Alpha-Bio Tec's MultiNeO™ Implants

Abstract

Dental implant rehabilitation in the posterior maxilla fundamentally depends on an adequate quantity of bone. Tooth loss in the posterior maxilla is naturally followed by extensive loss of the alveolar ridge and increased maxillary sinus pneumatization that often makes implantation unfeasible.

Traditionally, maxillary sinus floor augmentation is the common surgical technique used to overcome this situation. When the deficiency in the vertical dimension relates more to severe ridge resorption, crestal ridge augmentation should also be considered. Posterior maxillary sandwich osteotomy combined with sinus grafting, using interpositiona bone graft can also address this problem. This case study describes a successful application of this technique in a 55 year old male, who previously underwent failed implant surgery of the left posterior maxilla, which led to a severe vertical ridge defect.

Alpha-Bio Tec's MultiNeO™ implants, with adequate length and diameter were inserted in two-stage lateral wall sinus floor augmentation, combined with interpositional sandwich osteotomy. Deproteinized natural bovine bone mineral (DBBM) and resorbable collagen membrane (Alpha-Bio's GRAFT) were also used. Prosthetic restoration was performed using solid abutments following a standard prosthetic protocol. This case report provides insight into an innovative technique for overcoming the combined bone deficiency resulting from intrasinusal and alveolar bon resorption. Additionally, the MultiNeO™ implant system was employed.

This system with its unique features, optimizes implant stability, maximizes tissue integration and improves long-term implant survival.

Background

Continuous alveolar ridge resorption in the vertical dimension of the posterior maxilla accompanied with prominent sinus cavities, make implant placement difficult and prosthetic rehabilitation compromised or impossible. Rehabilitation of the severe atrophic posterior ridge can be resolved in different ways.

The most common surgical technique used to overcome this situation is maxillary sinus floor augmentation which is considered a reliable treatment procedure to regain bone volume deficiency. When the deficiency in the vertical dimension relates more to severe alveolar crest resorption due to previous pathologies or surgeries, vertical ridge augmentation in conjunction with sinus floor grafting should be considered to achieve both an aesthetic and functional rehabilitation [1-3].

Different surgical techniques are currently utilized to augment the alveolar ridge deficiency in the posterior maxilla which is related to alveolar crest resorption. The numerous surgical approaches consist of proposed guided bone regeneration (GBR), alveolar distraction osteogenesis (ADO), titanium mesh and autogenous bone graft (AB), and onlay bone graft [4-7].

Guided bone regeneration was introduced in 1991 by Dahlin and colleagues [6]. The use of an expanded polytetrafluoroethylene membrane is a treatment option that has been used with varying degrees of success [8, 9]. This technique has been considered to be a highly sensitive one. Distraction osteogenesis maintains the majority of the vascularity to the bone segment. The drawbacks of this technique are patient cooperation, high sensitivity and a second surgery to remove the device [10]. Titanium mesh and autogenous bone graft have been successfully used and have shown promising results since its introduction [7].

Onlay grafts have been well documented, but the results has not been promising. Bone resorption of up to 50% has been reported even when autogenous bone from different sites (symphysis menti, ramus mandible, calvaria, iliac crest) were used [5]. Vertical onlay grafting can also be complicated by graft exposure and infection [11,12].

Another possible approach is an interpositional bone graft [13,14]. The rationale of this technique is based on the theory that graft material placed between two pedicled bone segments, will undergo complete healing and graft consolidation with less resorption. This technique enables the positioning of the graft in a well-delimited area, offering the advantage of ensuring greater vascular supply to the inlay graft to maintain new bone formation. This is important since vascularity seems to be the main factor in determining whether the graft can be maintained in situ. This technique allows the simultaneous correction of both the vertical and the sagittal dimensions, if required, improving the intermaxillary relationship.

This procedure is also indicated for esthetic reasons, particularly for patients with broad smiles that extend to the first molar region. In addition, this procedure can avoid a ridge-lapped restoration due to mislocated implants which may create the need for long clinical crowns or bad conditions for adequate oral hygiene. Sandwich osteotomy (also known as interpositional sandwich osteotomy or segmental osteotomy) in the posterior maxilla has been scarcely covered in the literature. Conversely, sandwich bone graft in the anterior maxilla and posterior mandible has been well documented [15-17].

Since its description in the 70's, sandwich osteotomy with interpositional bone graft has been found to be reliable in the reconstruction of ridge deficiencies of atrophic mandibles. A visor osteotomy was first described in 1975 by Harle to increase the height of an atrophic posterior mandible to improve denture retention [18]. In 1976, Schettler and Holtermann described a sandwich osteotomy in the anterior mandible [19]. In 1974 Stoelinga et al. successfully combined both the sandwich technique and visor osteotomy technique, to successfully augment severely atrophic edentulous mandibles [20]. In 1977, Peterson and Slade modified Harle's description of the visor osteotomy by raising the pedicled portion along a greater length of the mandible [21]. Many modifications followed, but dental implants were not considered at that time [22-25]. In 1982, Frost et al. described a further modification of Harle's visor osteotomy by incorporating an interpositional onlay graft [26]. In 1987, Mercier et al. reported on various types of visor osteotomies, evaluating the long term rate and patterns of resorption of the mandible [27]. Due to high complication rates and risks of graft resorption, visor osteotomy became very unpopular and vanished for a long time from the literature.

Recently, sandwich osteotomy has become popular among surgeons due to the low incidence of graft exposure, lack of complications, and graft tissue vascularization. This type of graft has been reported as a viable and predictable procedure with a high success rate [28-30]. The main advantages of this technique are the potential for three-dimensional reconstruction, a more stable alveolar crest with long-term outcomes, and minimal morbidity [31, 32].

By using this technique, it is possible to readjust crestal ridge height defects of up to 8mm thus enabling the precise placement of the implants, and the repositioning of mislocated implants [16, 31, 33-35]. This optimizes the implants' long-term function, esthetics and stability.

Recent literature has shown a preference for using biomaterials as an alternative to autogenous grafts, without negatively affecting the clinical success. This is due to the fact that the technique leads to increased vascularization and predictability [36, 37]. Interpositional grafting in the posterior maxilla in conjunction with sinus floor grafting has very little literature exposure even though it is one of the most successful techniques to obtain alveolar height and width to enable placement of long implants [38-40]. Posterior segmental osteotomy as described by Wunderer and confirmed by Bell, combined with sinus floor grafting appears to be an optimal strategy for implant rehabilitation [41, 42]. To the best of my knowledge, this modified, procedure as described in the case study, has almost never been attempted. The technical aspects of this procedure will be presented here along with a clinical correlation using an innovative implant system.

Piezoelectric bone surgery was used to create the repositioning of the lateral window to the sinus cavity and to perform a complete osteotomy of the mobile segment. Piezosurgery was used since it can maintain the palatal periosteum and preserve the flap [43, 44].

This case study describes a new perspective in the treatment of severe atrophic posterior maxilla, based on the previous sandwich osteotomy techniques, with interpositional bone graft combined with sinus grafting using Alpha Bio Tec's MultiNeO™ implants.

Case Overview

A 55-year old male patient came to our clinic with a partially edentulous right posterior maxilla. This condition negatively affected him in terms of his chewing ability and esthetics. The patient reported that he underwent a previous implant surgery in the right posterior maxilla almost 10 years ago, and one year ago, the two inserted implants were removed due to a lack of osseointegration. The patient requested an evaluation for the purpose of rehabilitation with an implant supported prosthesis. The patient was in a good physical health, a nonsmoker with no contributing medical history including maxillary sinus diseases or allergies. The patient was not on any medications.

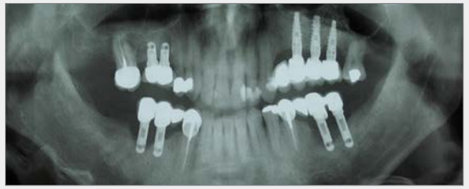
A clinical history and examination including soft and hard tissue was completed with the following results:

Maxilla: absence of teeth in positions 15 and 16, and severe bone deficiency of the vertical dimension of the alveolar ridge. An implant supported restoration from 24 to 26. Moderate periodontal problems with slight loss of bone support around almost all remaining teeth, pockets of 3-6 mm with bleeding on probing (BOP).

Mandible: implant supported restorations bilaterally including teeth 35-37, 45-47. Gingival height defects of the inserted implants 36,37,46,47 exhibiting progressive peri-implantitis and pocket depth of up to 12mm. the implants seemed to be in a hopeless condition.

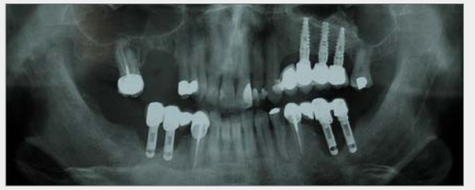
Radiographic Examination

The first panoramic radiograph, taken two years prior to treatment, showed two inserted short implants at regions 15 and 16 with a certain degree of radiolucency around the implants. An apical lesion on the mesial root of the second right molar was seen. The patient also had three inserted implants in an augmented left sinus supporting a four unit fixed prosthesis. Severe angular bone defects of the implants in the mandible was clearly seen **(Fig 1)**.



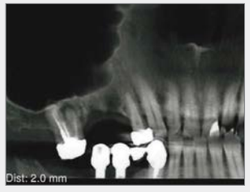
1 Panoramic radiograph demonstrating two inserted short implants in regions 15 and 16 with certain radiolucency around the implants and apical lesion on the mesial root of the second right molar.

The second panoramic radiograph taken immediately before treatment showed severe alveolar ridge resorption due to previously failed implant surgery and the removal of two implants in the right second premolar and first molar area. An enlarged apical lesion of the mesial root of the right second molar was present. There was also a pneumatized maxillary sinus with limited residual bone height (RBH) that was insufficient for implant placement **(Fig 2)**.

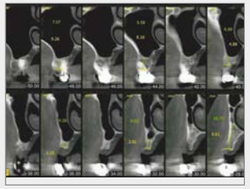


2 Panoramic radiograph demonstrating severe alveolar ridge resorption due to a previous failed implant surgery and the removal of two implants in the right second premolar and first molar area, and an enlarged apical lesion of the mesial root of the right second molar.

CT scanning revealed a bone height deficiency of 6mm in the region of the failed implant surgery i.e. missing teeth related to the bone level of the remaining adjacent teeth. In addition, the CT scan showed a healthy maxillary sinus, no preexisting sinus pathology, a healthy osteomeatal complex, an RBH of 5.0mm and of 5mm width in average, and existing small-sized maxillary septa on the lateral wall. The posterior superior alveolar artery (PSAA) was small. Moderate thickness of the lateral wall and wide latero-medial angle of the sinus were recognizable **(Fig 3, 4)**.



3 Panoramic view of the CT-scan showing pneumatization of maxillary sinus coupled with severe marginal bone loss. An apical lesion of the mesial root of the right second molar is clearly visible.



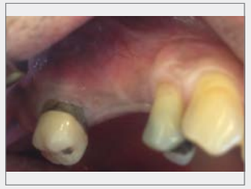
4 CT-scan showing alveolar bone height of 5 mm in areas requiring augmentation procedure.

Treatment Plan

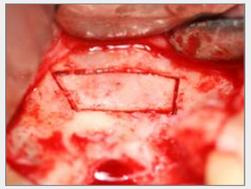
Based on the clinical and radiographic examination and due to the increased alveolar bone defect and lack of bone mass along with the pneumatized right maxillary sinus, the proposed treatment plan involved segmental sandwich osteotomy with the interposition of a DBBM bone graft combined with staged lateral wall sinus floor augmentation. Delayed implant placement at sites 15, 16 for a two-unit fixed implant supported prosthesis was planned for 6 months after the first surgery. In the second stage of surgery, radiectomy of the involved mesial root of the second right molar and corresponding bone grafting was also proposed. The patient gave his written informed consent.

Surgical Technique

The surgical procedure was carried out under local anesthesia (Lidocaine 2% including 1:100,000 adrenaline) with a low-trauma surgical technique, following the concept of the outfracture osteotomy sinus grafting technique. The patient received a preoperative antibiotic prophylaxis, clavulanate- potentiated amoxicillin (Augmentin Glaxosmithkline). After a mid-crestal incision and adequate vertical releasing incisions **(Fig 5)**, a full-thickness mucoperiosteal flap was reflected to expose the sinus lateral wall, with the borders of the maxillary sinus kept in mind. No palatal mucosa was elevated. Using a piezoelectric surgical saw (Mectron piezosurgery, via Lorita, Italy) **(Fig 6)**, a thin osteotomy line was outlined 3mm away from the anterior and inferior borders and extended antero-posteriorly and in vertical dimension to be 10mm and 5mm respectively.

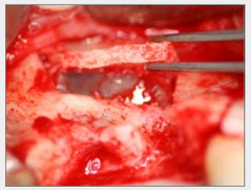


5 Clinical view showing the healthy conditions of the alveolar ridge.

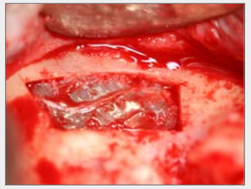


6 Rectangular bony window is outlined with piezoelectric saw, taking care to maintain the integrity of the Schneiderian membrane.

The size of the lateral window was determined by the number of implants to be placed taking into consideration the remaining adjacent teeth. Repeated outlining of the antrostomy borders with the piezosurgical saw was done to ensure that the bony window was completely separated from the surrounding bone and to minimize the risk of an unintended perforation of the sinus membrane. The piezosurgical saw was tilted to obtain a tapered osteotomy. This ensured the stability of the bony window when it was replaced. The bluish grey line beneath the osteotomy line indicated the Schneiderian membrane, a sign to cease further bone separation. After the lateral window was mobilized in one piece, a small Freer elevator was carefully inserted into the osteotomy line and the bony window was easily dissected from the sinus membrane and was placed in saline **(Fig 7, 8)**.

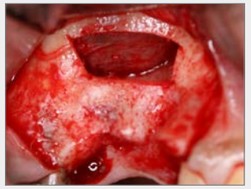


7 Removal of the repositioning lateral window – note the thickness of the lateral window.



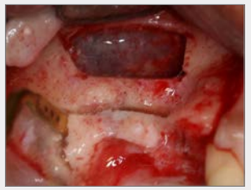
8 Intact exposed sinus membrane with intact PSAA.

The sinus membrane was carefully elevated in traditional fashion, inferiorly, anteriorly, and posteriorly until the desired elevation was obtained to permit the placement of 13mm long implants and space was created for the bone graft under the sinus membrane **(Fig 9)**.



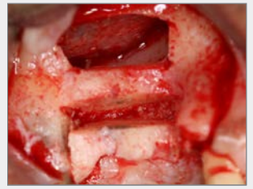
9 Elevated membrane – note the exposed medial wall.

Care was taken to mobilize the sinus mucosa around the inner bone surface. The elevation was accomplished without membrane perforation. Using a piezoelectric saw, a horizontal osteotomy was created, 2mm below and parallel to the sinus floor under direct visualization, and then connected to two vertical cuts which tapered to the alveolar crest just behind the first premolar, and in the posterior it reached to just in front of the second molar **(Fig 10).**



10 Using a piezoelectric saw, the alveolar bony segment is outlined keeping it attached to the palatal flap.

This buccal cut was then connected through the residual alveolar bone to the palatal bone. The osteotomy cuts were made through the palatal bone in a manner that I felt the piezoelectric saw exit the bone but not the palatal mucosa. After all the bone cuts were completed, chisels were used to down fracture and mobilize the palatal pedicled bone segment (about 8mm) to the desired alveolar level related to the adjacent teeth. Care was taken to maintain the soft tissue pedicle on the palatal surface and not to lacerate it. The coronal bone fragment was carefully mobilized by rotation and elevation. The lateral aspect of the segment was elevated more than the palatal aspect, producing a transverse width increase in addition to the vertical augmentation effect **(Fig 11)**.

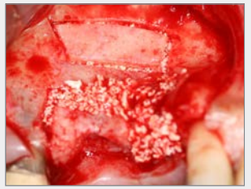


11 Clinical view of the down-fractured and mobilized palatal pedicled bone segment taking care to maintain the integrity of the sinus floor and to maintain the segment attached to the gingiva.

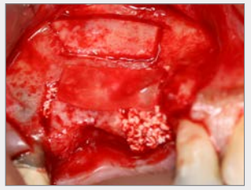
Once the segment has been moved inferiorly, the graft material (DBBM) was mixed with blood from the wound and hydrated with saline. It was then applied in the created space underneath the elevated sinus mucosa. The material was gently packed first at the superior aspect of the sinus and against the medial wall of the created compartment **(Fig 12)**.

12 DBBM is inserted into the sinus cavity and in the created space after segment mobilization.

The material was not compressed but lightly placed into the sinus with a small bone condenser. Sufficient material was placed until the desired vertical height was achieved. DBBM was also placed as an interpositional graft into the created zone below the sinus floor. There was no need for fixating the segment because of the excellent primary stability, which was attributed to the fact that DBBM has excellent mechanical properties for stabilizing the fragment. Once the bone grafting was completed the previously removed lateral bony window was repositioned and gentle pressure was applied **(Figs 13, 14)**.



13 The removed bony window is positioned in situ – no fixation is required.



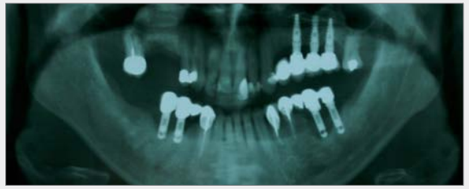
14 The interpositional grafted site is covered with a collagen membrane.

No rigid fixation was required and there was no need to cover the 1-2mm bony gap between the repositioned window and the intact lateral wall.

A periosteal incision was made to release the flap coronally as needed and was sutured tension-free until the incision was perfectly sealed. Clavulanate-potentiated amoxicillin (Augmentin Glaxosmithkline) twice a day, and a non-steroidal analgesic were prescribed. Chlorhexidine rinses and a nasal decongestant were also prescribed twice a day for 10 days. Nose blowing, sucking liquid through a straw, and smoking cigarettes, all of which create negative pressure, were avoided for at least two weeks after surgery.

Coughing or sneezing had to be done with an open mouth to relieve pressure. Putting pressure at the surgical site, ice, elevation of the head, rest and appropriate oral hygiene were also recommended. Care had to be taken not to pressurize the reconstructed area with any prosthesis. Radiographic control using a panoramic radiograph was performed immediately after surgery to confirm the absence of graft material displacement into the sinus cavity and to insure the adequate location of grafted material intrasinusal and interpositional. The early and late postoperative period was uneventful.

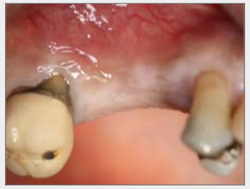
6 months after grafting, a panoramic radiograph was taken to evaluate postsurgical changes of both the osteotomized segment and the augmented sinus. The radiograph showed excellent consolidation with well-defined contours of the fragment and the augmented sinus floor showing more than 20mm of bone height **(Fig 15)**.



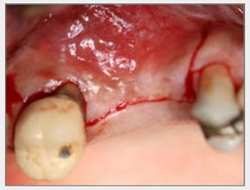
15 Panoramic radiograph taken 6 months after sinus floor augmentation and interpositional grafting showing excellent consolidation with well-defined contours of the fragment and the augmented sinus floor showing more than 20mm of bone height.

The 8 mm alveolar defect was corrected by about 6mm which left the site amenable to a more anatomical dental restoration. The clinical appearance of the alveolar crest had improved dramatically.

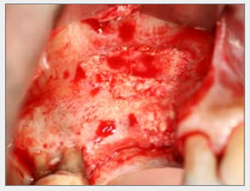
After a healing period of 6 months, a full thickness flap was reflected as in the grafting surgery and a fairy well-consolidated bone graft was clearly visible **(Fig 16-18)**.



16 Clinical view of healthy soft tissue 6 months after uncomplicated healing.



17 Mid-crestal incision line with mesial and distal vertical releasing incisions.



18 Full-thickness flap was reflected and a fairy well consolidated bone graft is clearly visible.

The alveolar ridge was prepared to receive implants in accordance with a conventional surgical protocol. Initially, the planned implant positions were marked with a pilot bur. In the implant positions a 2mm diameter twist drill was used to attain the desired length **(Fig 19)**.

19 After the planed implant positions were marked with a pilot bur, a 2.0mm diameter twist drill was used to attain the desired length.

Further preparation was performed using a 2.8mm diameter twist drill for the outer 0.8mm of bone preparation **(Fig 20)**.

20 Further preparation was performed using a 2.8mm diameter twist drill for the outer 0.8mm of bone preparation.

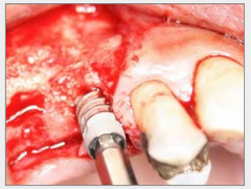
Then, a 3.65mm diameter twist drill was used for the final preparation of the bone **(Fig 21)**.

21 A 3.65mm diameter twist drill was used for the final preparation of the bone.

The aim of the selection of the described drill protocol, which is in accordance with the underpreparation concept, was to obtain adequate primary stability for the inserted implants in the case. All the twist drills used for the implant site preparation are manufactured by Alpha-Bio Tec. Implants were placed using the standardized surgical procedure, with the border of the implant neck approximating the alveolar bone crest (bone-level) **(Fig 22).**

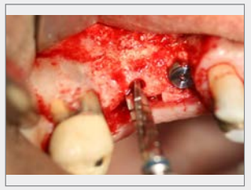
22 4.2 X 13mm MultiNeO™ implant

Two MultiNeO™ implants (Alpha-Bio Tec) 4.2mm in diameter and 13mm in length, were inserted into the right augmented area of the sites 15,16 with an insertion torque of 60-70Ncm **(Fig 23-27)**.

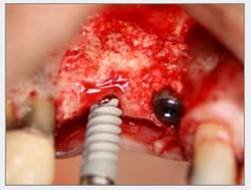


23 A standard implant, 4.2mm diameter, 13mm long, was placed at site 15.

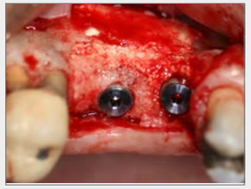
24 Insertion torque values were measured and recorded for implant 15.



25 Implant site preparation at site 16.

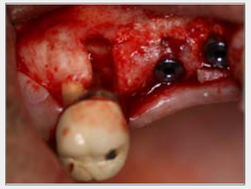


26 Standard implant, 4.2mm diameter, 13mm long, was placed at site 16.



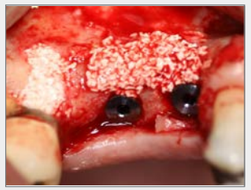
27 Two implants in situ – note the favorable biological inter-implant distances.

Radictomy of the mesial root of the second molar was done followed by enucleation of the apical lesion **(Fig 28)**.



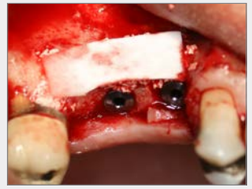
28 Radictomy of the involved mesial root of the second right molar.

The inserted implants presented no vertical or horizontal mobility at the end of the surgery. DBBM was used for grafting the empty space of the removed mesial root of the second molar and further contour grafting to shape, contour and realign the alveolar ridge after completion of the implant placement **(Fig 29)**.

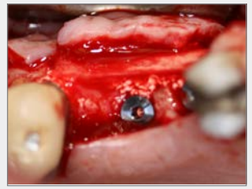


29 Grafting the empty space of the removed mesial root of the second molar and further contour grafting to shape the ridge using DBBM.

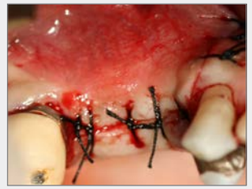
A resorbable collagen membrane was placed over the grafted region (Alpha-Bio's GRAFT) **(Fig 30)** and a soft tissue flap was mobilized from the buccal to close the wound primarily **(Figs 31, 32)**.



30 The grafted area was covered using a collagen membrane.

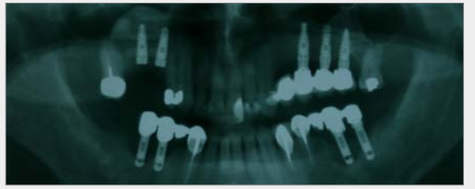


31 Occlusal view showing the grafting material, collagen membrane and repositioned flap prior closure.



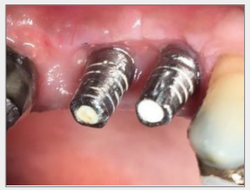
32 After surgery was completed, the flap was closed primarily tension-free with interrupted sutures.

The patient was kept on an antibiotic regimen in the form of 1.5g amoxicillin three times a day for 7 days postoperatively. Clinical examinations were carried out one week, one month, and two months after surgery. The soft tissues were examined for signs of inflammation or suture breakdown. The implants were then allowed two months to osseointegrate before temporary restoration. The definitive restoration took place two months later. Radiographic confirmation using panoramic radiography of the desired implants positions into the grafted osteotomy and the sinus was evident one week postoperatively **(Fig 33)**.



33 Panoramic radiograph taken 6 months after implants placement and radictomy of the mesial root of the right maxillary second molar showing well-osteointegrated implants into the grafted osteotomy and the grafted sinus at site 15, 16

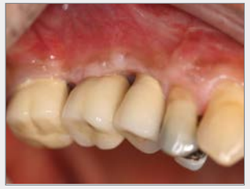
Standard transmucosal abutments were attached at the second stage of surgery after two months **(Fig 34)** and provisional crowns were inserted **(Fig 35)**.



34 Clinical view of prepared solid abutment for temporary prosthesis.

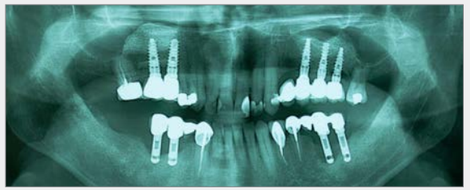
35 Temporary prosthesis in situ; note the crown design at the neck for soft tissue management.

Following a standard prosthetic protocol, final prosthetic restoration proceeded two months after the provisional crown placement **(Fig 36)**.



36 Final prosthesis in situ; note the ingrowth of soft tissue.

The dental restoration featured an improved alveolar plane, equalized crown-to-implant ratios, and a more favorable gingival shape. Six months after implant placement, the crestal bone remained stable and graft consolidation was clearly seen in the taken panoramic radiograph **(Fig 37)**.



37 Panoramic radiograph taken 6 months after loading showing well-defined contours of the osteotomized fragment and the augmented sinus floor besides well-osteointegrated implants.

Conclusion

This case report assessed the performance of a novel surgical technique to overcome posterior maxillary bone deficiency. It combined interpositional sandwich osteotomy with lateral wall sinus floor augmentation using DBBM alone, and Alpha-Bio Tec's MultiNeO™ implants which are characterized by their unique design and geometry. It has been well demonstrated that these implants achieve and maintain successful tissue integration due to their design and surface architecture. These features increase the primary and subsequently secondary stability, factors that are prerequisite for the implant's long-term survival.

The main finding emerging from this study is that modified interpositional sandwich osteotomy combined with sinus floor augmentation is effective for patients with posterior maxillary atrophy resulting from severe crestal ridge atrophy accompanied with a pneumatized sinus. The described technique also provides sufficient bone volume to enable implant placement in positions that are optimal from a prosthetic and esthetic standpoint.

The technique appears to be a viable alternative to other vertical augmentation techniques (GBR, onlay graft, distraction osteogenesis, etc.) to enable implant rehabilitation in terms of increasing bone volume, reshaping the alveolar crest and normalizing the interocclusal relationship.

Potential advantages of this technique include avoidance of complications such as flap dehiscence, graft exposure, infections, segment displacement or instability, reduced need for compliance, less operative time, consistent gain of alveolar form and vertical mass along with the lower cost of the procedure.

From a technical and surgical management standpoint, this technique is easily conceptualized, provided the presence of available bone inferior to the sinus floor of at least 6mm. Otherwise, the surgeon will need to modify the surgical technique.

This technique exhibits a high level of result predictability due to the continuous contact between the graft and a four-wall defect, which strongly favors its nutrition and considerably lowers the degree of reabsorption.

However, it appears that some resorption of the fragment cannot be avoided, possibly due to the poor blood supply to the fragment because of buccal flap elevation and the osteotomy of the remaining alveolar bone. Therefore, augmentation should be slightly exaggerated to compensate for resorption.

Since there are only a few such results available in the literature, it is necessary to carry out further research to validate the predictability of this regenerative technique [13,14,45,46].

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Performance of Alpha-Bio Tec's MultiNeO™ Implants after Staged Lateral Wall Sinus Floor Augmentation in a Periodontally Compromised Patient

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He is an active member in number of leading organizations in the field of implantology.

Performance of Alpha-Bio Tec's MultiNeO™ Implants After Staged Lateral Wall Sinus Floor Augmentation in a Periodontally Compromised Patient

Abstract

Maxillary sinus floor augmentation is the most common surgical technique for vertical augmentation of the atrophic posterior maxilla caused by increased pneumatization of the maxillary sinus and bone resorption after teeth extraction. It is considered a reliable treatment to restore bone volume deficiency. There is considerable controversy surrounding the desired characteristics of the implants used in augmented sinuses.

This case study evaluates the new Alpha-Bio Tec's MultiNeO™ implants with their unique design, surface characteristics and geometry, inserted in a 65-year old male patient with severe marginal bone loss combined with sinus pneumatization. Alpha-Bio Tec's MultiNeO™ implants with adequate length and diameter were inserted in a two-stage lateral wall sinus floor augmentation using deproteinized natural bovine bone mineral (DNBM) and a resorbable collagen membrane (Alpha-Bio's GRAFT). Prosthetic restoration was performed using solid abutments following a standard prosthetic protocol. It is well demonstrated that MultiNeO™ implants can achieve and maintain successful tissue integration. This case study provides insight into the unique features of implant design that may optimize implant stability and improve long term implant survival.

Background

The placement of dental implants in the edentulous posterior maxilla often presents difficulties due to insufficient bone quantity as a result of increase pneumatization of the maxillary sinus and bone resorption after tooth extraction. To overcome this situation, maxillary sinus floor augmentation can be achieved by the lateral window approach or crestal approach [1-11]. The lateral window approach originally described by Geiger and Pesch [12] and Tatum [13] in the 70's, is considered to be the gold standard approach to increase the height and width of the residual bone in the atrophic posterior maxilla. The ultimate goal of this procedure is to restore the resorbed posterior maxilla with dental implants through the dynamic process of osseointegration as originally described by Branemark *et al* [14].

Today, two key techniques of sinus floor augmentation are in use: a one-stage technique with a lateral window approach, where implants can be placed simultaneously with sinus floor grafting, and a two-stage technique with delayed implant placement after a healing period of 4-6 months. The decision depends on the residual bone available and the possibility of achieving primary stability of the inserted implants at the time of surgery. Several studies have reported excellent long term survival rates for implant placed into one and two-stage augmented maxillary sinus using the lateral window approach [6, 7]. The lateral approach is still the most common surgical procedure for sinus floor augmentation.

In addition to the various techniques utilized for sinus floor augmentation, many other variables are important and may affect the outcome of this procedure, including: one-stage or two-stage, the use of different grafting materials, use of a barrier membrane, and the use of different implants with varying length, width, and surface characteristics. Various types of grafting materials have been successfully utilized for sinus augmentation particularly when using the lateral approach.

The original protocol used autologous 97 disadvantages are related to harvesting autologous bone, such as prolonged operation time, surgical complications, and increased morbidity. To overcome these disadvantages, various osteoconductive and osteoinductive bone substitutes have been used for many years in sinus grafting procedures [17]. These materials include allografts, xenografts, alloplasts, and growth factors or composite materials [16, 17].

Two factors are important in clinical decision-making regarding the choice of bone substitutes, the time dependent new bone formation and the time-dependent volumetric stability of the substitute. Implant design refers to the three-dimensional structures of an implant with all its retentive elements and features [18]. Implant design is one of the critical factors to achieve and maintain osseointegration, and consequently, long term implant survival [19]. This phenomenon is closely influenced by chemistry and surface topography [20]. Topography of titanium surfaces is considered one of the most important factors in the success of dental implants [21, 22].

In recent years, new innovative implant surface treatments have been proposed to improve the surface quality of titanium dental implants, to obtain a higher rate of bone-to-implant contact (BIC), and to reduce healing periods [23-29]. All methods led to specific microstructure surfaces with a higher performance, due to a greater BIC area, increasing the cellular response, promoting faster healing and consequently, long term clinical implant survival.

Primary stability of dental implants is one of the most important factors associated with long term successful osseointegration [30, 31] and it is even more critical in immediate loading. Primary stability is predicated by implant geometry, insertion torque value, bone density, the amount of BIC, and surgical implant site preparation. Secondary stability (biologic) is depended on implant surface and geometry, bone density, tissue and loading conditions. Implant design also contributes to obtaining secondary stability and plays an important role in load distribution.

Since the highest stress is at the coronal portion of the bone and implant [32], such a load concentration may lead to implant marginal loss. To overcome this situation, micro-thread design can distribute the stress evenly and preserve marginal bone level [33]. Therefore, not only loading conditions, but also the surface macro architectures can stimulate bone apposition around the implant's neck. Furthermore, thread or groove configuration is the optimal surface macro architecture of screw-shaped implant design related to stress distribution.

Macroscopic grooves provide an excellent environment for cell differentiation, bone formation, and remodeling [34, 35]. Different implant thread designs in different bone densities, large and aggressive thread geometry versus small and less aggressive and classical thread design were compared in different studies [36,37] with controversial conclusions. The data showed that through reduction of thread pitch and thread depth, initial mechanical stability in low-density bone might be improved, and consequent healing interval might be decreased [38]. A moderate thread implant design seems to demonstrate a better biomechanical performance than classical or large and aggressive thread design performed in both low-density, cortical and cancellous bone situations [37].

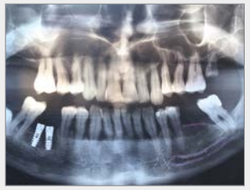
The purpose of this case study was to evaluate the performance of a novel implant system with a unique moderate thread implant design, surface characteristics and geometry inserted in augmented maxillary sinus with DBBM after a healing period of six months. This case study provides insights into the unique features of implant design that may optimize implant stability and improve long term implant survival.

Case Overview

A 65-year old male, referred by his dental practitioner for implant placement in the upper left quadrant, complained about an inadequate chewing ability on the left side. The patient reported that he had undergone implant surgery in the right mandible. He had tried a partial removable denture in the lower jaw but found the discomfort unacceptable. The patient requested an evaluation for the purpose of rehabilitation with an implant-supported prosthesis. The patient was in a good physical health with no contributing medical history including maxillary sinus diseases or allergies. The patient was not on any medications and smoked 10 cigarettes per day.

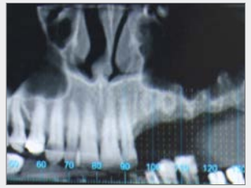
A clinical history and examination including soft and hard tissue were completed with the following results:

- **Maxilla:** missing teeth, severe periodontal problems with extensive loss of bone support around almost all existing teeth, pockets of 5-7mm with bleeding on probing (BOP), and hopeless mobile teeth in the posterior sector.
- **Mandible:** two missing teeth, almost all teeth are hopeless, spontaneous exposure of two implants in region 46 presented with peri-implantitis and pocket depth of 10mm.
- Panoramic radiograph showed massive loss of supporting bone of most existing teeth, maxillary sinus pneumatization with low residual bone height (RBH) which is inadequate for implant placement **(Fig. 1)**.



1 Baseline radiograph showing severe marginal bone loss around almost all existing teeth, particularly in the left posterior maxilla

CT scan showed a healthy maxillary sinus, no preexisting sinus pathology with healthy osteomeatal complex, RBH of 3mm and of 10mm width, existing maxillary septa, small posterior superior alveolar artery (PSAA) in the lateral wall, and wide latero-medial angle of the sinus **(Figs. 2,3)**.



2 Panoramic view of CT-scan showing pneumatization of maxillary sinus coupled with severe marginal bone loss- note the small septa in the left maxillary sinus

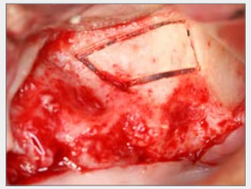
3 CT scan showing alveolar bone height of 1-3mm in areas requiring augmentation procedure

Treatment Plan

After evaluation of the patient, it was decided to extract the hopeless teeth in the left posterior maxilla, including the canine, premolars and molars. Based on the radiographic examination and due to the increased maxillary sinus size, consequent decreased alveolar crest and lack of bone mass, a staged lateral wall sinus floor augmentation with delayed four implant placement at sites 23, 24, 25, and 26 for a four-unit fixed implant supported prosthesis was proposed.

Surgical Technique

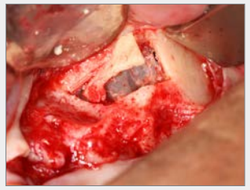
The surgical procedure was carried out under local anesthesia (Lidocaine 2% including 1:100000 adrenaline) with a low-trauma surgical technique, following the concept of the outfracture osteotomy sinus grafting technique. The patient received a preoperative antibiotic prophylaxis, clavulanate-potentiated amoxicillin (Augmentin, Glaxosmithkline).
After a mid-crestal incision and adequate vertical releasing incisions, a full-thickness mucoperiosteal flap was reflected to expose the sinus lateral wall, with the borders of the maxillary sinus kept in mind. A thin osteotomy line was outlined 3mm away from the anterior and inferior borders and extended antero-posteriorly and in the vertical dimension to be 10mm and 5mm respectively, using a piezoelectric surgical saw (Mectron piezosurgery, via Lorita, Italy) **(Fig. 4)**.



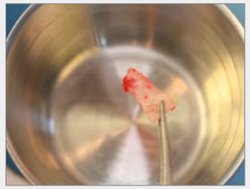
4 Following exposure of the lateral maxillary wall, gentle osteotomy with piezosurgical saw, which is adequate for minimizing bone loss, was performed. A thin osteotomy line is recommended for minimizing bone loss to help repositioning of the bony segment to the original position

The size of the lateral window was determined by the number of implants to be placed. Repeated outlining of the antrostomy borders with the piezosurgical saw was continued, ensuring that the bony window was completely separated from the surrounding bone and minimizing the risk of an unintentional perforation of the sinus membrane. The piezosurgical saw was tilted to obtain a tapered osteotomy to insure the stability of the bony window when it was replaced. The bluish grey line beneath the osteotomy line indicates the Schneiderian membrane,

a sign to interrupt further bone separation. After the lateral window had been mobilized in one piece, a small Freer elevator was carefully inserted into the osteotomy line and the bony window was easily dissected from the sinus membrane and was kept in saline **(Figs. 5, 6)**.



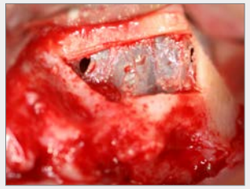
5 The entrance to the lateral sinus wall was prepared by complete outward removal of the bony window which was carefully osteotomized using a piezosurgical saw



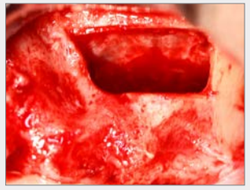
6 The outfractured bone segment is placed in normal saline during sinus grafting

The sinus membrane was carefully elevated in traditional method, inferiorly, anteriorly, and posteriorly until the desired elevation was obtained to permit placement of 13mm long implants and space was created for the bone graft under the sinus membrane. Care was taken to mobilize the sinus mucosa around the existing partial septa and the inner bone surface. A small sinus membrane perforation approximately 3mm occurred during the dissection procedure and the elevation was extended in all directions.

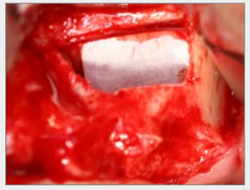
Alpha-Bio's GRAFT Collagen Membrane was placed to seal the perforation before augmenting the sinus **(Figs. 7-9)**.



7 After removal of the bony segment, a small perforation of the sinus membrane is clearly visible

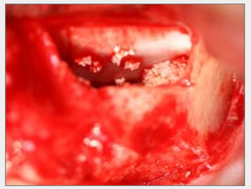


8 The sinus membrane was elevated inferiorly, anteriorly, and posteriorly until the inner bone surface



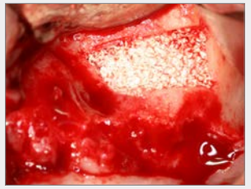
9 The perforation of the sinus Membrane was covered using collagen membrane

The graft material (NBBM) was mixed with blood from the wound and hydrated with saline, then applied in the created space following elevation of the sinus mucosa. The material was gently packed first at the superior aspect of the sinus and against the medial wall of the created compartment **(Fig. 10)**.



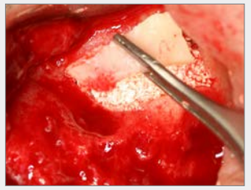
10 Grafting material NBBM was placed gently first at the superior aspect underneath the Collagen Membrane and against the medial wall

The material was not compressed but lightly placed into the sinus with a small bone condenser and sufficient material was placed until the desired vertical height was achieved **(Fig 11)**.



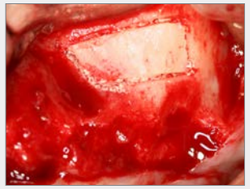
11 Further grafting of the created compartment in all dimensions was achieved

Upon completion of the bone graft, the removed lateral bony window was repositioned and gentle pressure was applied **(Fig .12)**.



12 After completion of the sinus floor augmentation, the outfractured bony window was repositioned

No rigid fixation was required and there was no need to cover the 1-2mm bony gap between the repositioned window and the intact lateral wall **(Fig. 13)**.

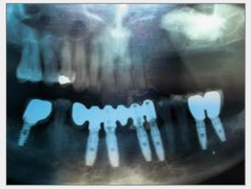


13 Gentle pressure on the repositioned bony window was applied to ensure stabilization; no rigid fixation was required and no need to cover the bony gap

After cleansing and irrigating with saline, tension free suturing was performed.

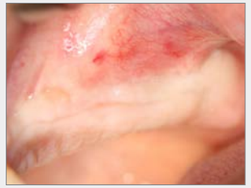
Postoperatively, clavulanate-potentiated amoxicillin (Augmentin, GSK) twice a day, and non-steroidal analgesic was prescribed. Chlorhexidine rinses and nasal decongestant were also prescribed twice a day for 10 days. Blowing the nose, sucking liquid through a straw and smoking cigarettes, all of which create negative pressure, were avoided for at least 2 weeks after surgery. Coughing or sneezing should be done with an open mouth to relieve pressure. Pressure at the surgical site, ice, elevation of the head, and rest besides appropriate oral hygiene were also recommended.

Radiographic control with a panoramic radiograph was performed immediately after the sinus augmentation to confirm the absence of graft material displacement into the sinus cavity and to insure the adequate location of grafted material **(Fig. 14)**. The early and late postoperative period was uneventful. After a healing period of 6 months, implants were placed using the standardized surgical procedure, with the border of the implant neck approximating the alveolar bone crest (tissue-level). Four 4.2 X 13mm MultiNeO™ implants were inserted in the left augmented maxillary sinus in site 23, 24, 25, and 26 with an insertion torque of 50 Ncm.

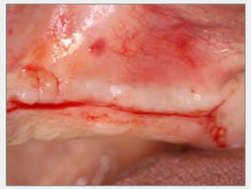


14 Pre-surgical panoramic radiograph taken 6 months after sinus floor augmentation

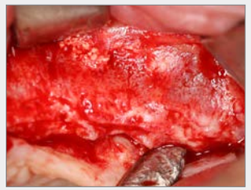
A full thickness flap was reflected as in the grafting surgery. The alveolar ridge was prepared to receive implants according to the conventional surgery protocol **(Figs. 15-17)**.



15 Clinical view after 6 months of uncomplicated healing



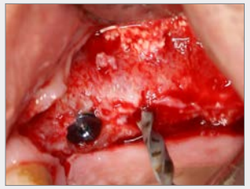
16 Clinical view of a mid-crestal incision line with mesial and distal vertical releasing incisions



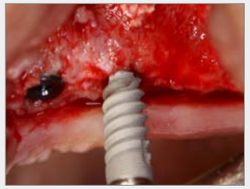
17 Access to the edentulous alveolar ridge was achieved through a full-thickness flap elevation

Initially, the planned implant positions were marked with a pilot bur. A 2mm diameter twist drill was used in the implant positions for the desired length. Further preparation was performed using a 2.8mm diameter twist drill for the outer 0.8 mm of bone preparation. Then, a 3.65mm diameter drill was used for the final preparation of the bone. The aim of the selection of the described drill protocol, which is in accordance with the under preparation concept, was to obtain adequate primary stability for the inserted implants. All the twist drills used for implant site preparation are manufactured by Alpha-Bio Tec The inserted implants presented no vertical or horizontal mobility at the end of surgery **(Figs. 18-25)**.

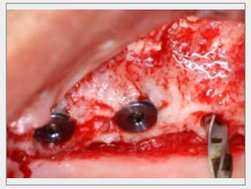
18 After the site preparation, a Ø4.2 X13mm, MultiNeO™ implant was placed at site 23



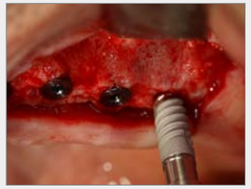
19 Implant site preparation 24



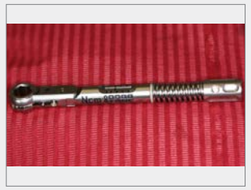
20 Ø4.2 X 13mm MultiNeO™ implnat was placed at site 24



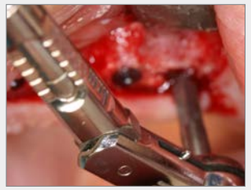
21 Implant site preparation 25



22 Ø4.2 X 13mm standard MultiNeO™ implants were placed at sites 25, 26



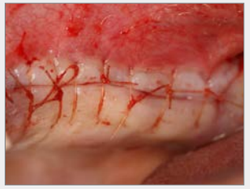
23 Alpha-Bio Tec. torque ratchet



24 Insertion torque values were measured and recorded for each implant site

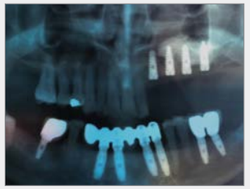
25 Four implants in situ; note the favorable biological inter-implant distances

A submerged technique was used attaching a cover screw and reattaching the mucoperiosteal flap **(Fig. 26)**.



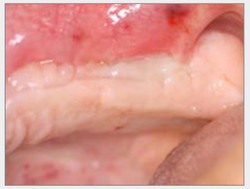
26 After surgery was completed, flap was closed primarily tension-free with resorbable interrupted sutures

The patient was kept on an antibiotic regimen in the form of 1.5g amoxicillin three times a day for 7 days postoperative. The implants were then allowed 2 months to osseointegrate before prosthetic loading. Radiographic confirmation via panoramic radiograph of the absence of implant protrusion into the sinus cavity was evident one week postoperatively **(Fig. 27)**.

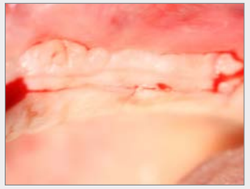


27 Panoramic radiograph obtained two months after implant placement showing well osseointegrated implants at sites 23-26

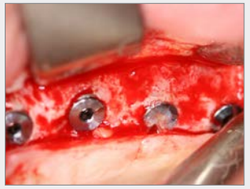
Standard transmucosal abutments were attached at stage-two surgery after 2 months. Following a standard prosthetic protocol, provisional crowns were inserted **(Figs. 28-35)**.



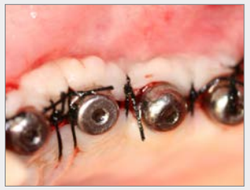
28 Clinical view of good soft tissue healing two months after implant placement



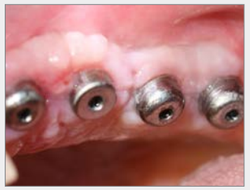
29 Mid-crestal incision with small releasing incisions were made as in implant placement surgery



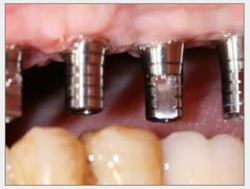
30 Clinical view of second stage surgery to expose the inserted implants at sites 23-26 performed 8 weeks after placement



31 After attaching healing abutment to the implants, the flap was sutured

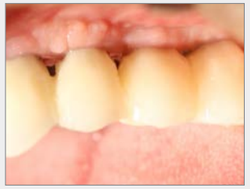


32 Clinical view two weeks after implant exposure, indicating healing of peri-implant soft tissue

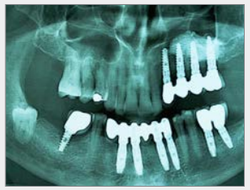


33 Intraoral appearance of connected solid abutments – impression-taking was scheduled three weeks after exposure

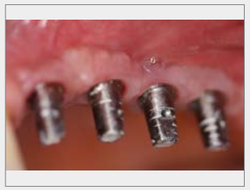
34 Clinical view of prepared solid abutment for temporary prosthesis



35 Temporary prosthesis in situ; note the small mesiodistal dimensions of the teeth to be replaced



36 Panoramic radiograph obtained 6 months after prostheses connection showing the periimplant apical and marginal bone maintenance around MultiNeO™ implants.



37 Clinical view of healthy soft tissue condition around the implants after prostheses decementation.

38 Final restoration 6 months after loading.

Conclusion

This case study assessed the performance of a new implant system (MultiNeO™ implants, Alpha-bio Tec), characterized by its unique design and geometry. The implants were inserted in a staged lateral wall sinus floor augmentation using DBBM alone mixed with patient's blood. It is well demonstrated that these implants can achieve and maintain successful tissue integration due to their design and surface architecture, which seem to to increase the primary and consequently secondary stability, the prerequisite for implant long term survival.

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The Use of Alpha-Bio Tec's Narrow MultiNeO™ Implants with Cone Connection for Restoration of Limited Width Ridges

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The Use of Alpha-Bio Tec's Narrow MultiNeO™ Implants with Cone Connection for Restoration of Limited Width Ridges

Background

Narrow ridges have been treated using two approaches: enhancing bone volume by augmenting the ridge (using one of several different techniques) or by using narrow implants [1]. In cases of severe ridge resorption, particularly in the esthetic zone, the option ofa two-stage surgery is indicated for optimal results [2, 3]. However, in cases involving mild to moderately resorbed ridges, both the implant placement and the augmentation procedure can be done simultaneously if the implants can be adequately stabilized in the residual bone [4].

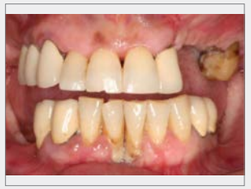
Several parameters are critical in achieving good primary stability for a single stage procedure:

1. Residual ridge volume and dimensions and bone density should be determined by examining the CT scan and the drilling protocol should be modified accordingly [5].
2. Since the implant position determines the decision whether or not to augment the buccal bone, the implant position, both vertically and horizontally, coupled with esthetic, functional, and occlusal considerations of the final restoration, must be decided upon prior to surgery [6].
3. The appropriate implant design should be selected for each individual case.

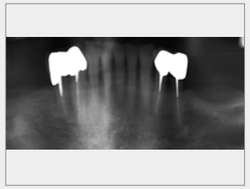
In the following case study, the most suitable implant design was the Alpha-Bio Tec's MultiNeO™ implant, due to its unique design and properties. The MultiNeO™ implant cab be easily stabilized when there is both limited bone dimension and limited bone density due to its tapered spiral implant design, self-tapping apical portion, and its ability to gently condense the bone as it is seated [7]. In the minimally invasive approach to surgery, which is used in order to avoid augmentation procedures that can be costly and time-consuming, narrow implants are indicated. Narrow implants are considered safe and predictable for the long term survival of fixed prostheses [8]. The design of narrow implants can vary and includes one-piece implants, as well as either external or internal connections with a hex or a conical connection. The advantage of internal conical connections has been demonstrated in long term studies, especially with regard to minimal cervical resorption after loading [9]. This advantage is even more important when placing implants in limited bone width ridges. Obviously, it is easier to achieve the minimum primary stability required for immediate loading and restoration when the implant is fully covered with natural bone [10].

Case Overview

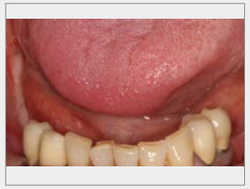
A 54-year old healthy female patient with no known allergies presented with a chief complaint of unstable teeth, missing teeth and inability to chew. **(Figs. 1-3)**



1 Pretreatment status; tooth loss, resorption of ridges and periodontal defects



2 Panoramic X-ray shows atrophic posterior edentulous ridges



3 Posterior laterally atrophic ridges

Dental Background

Loss of posterior teeth due to a history of periodontitis. The patient had a removable partial denture, however, did not use it. The patient requested fixed restorations.

Materials Used

- Ø3.2mm X L13mm MultiNeO™ implants
- Healing abutments HSD3.4-5-CHC Ø3.4XH5mm
- Esthetic Angled Titanium Abutments ETLAL15-CHC
- Alpha-Bio's GRAFT Natural Bovine Bone
- Alpha-Bio's GRAFT Collagen Membrane

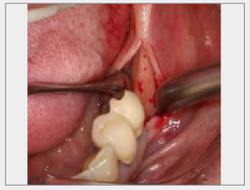
Treatment Plan

Fixed implant supported restorations in the mandible: 3 implants at teeth positions 45, 46, and 47 and 2 implants at positions 36 and 37. (Figs. 4-13) According to the CT scan of these areas, the width of the ridge was 5-6mm in these specific positions.

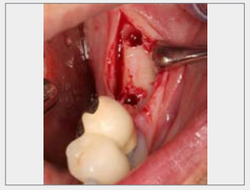
The use of standard implant systems would require GBR in order to obtain a minimum of 2mm of buccal bone. Alternatively, narrow Ø3.2mm MultiNeO™ implants were selected for implantation, with no augmentation procedure on the left side and one stage augmentation on right side with a minimally invasive approach.

Surgical Procedure

A mid-crestal incision distal to the premolar tooth with no releasing flap. Drilling in the relevant molar positions with a pilot drill to the full implant depth and with a 2.8mm drill through the cortical bone (3-4mm). Five 3.2 diameter 13mm length MultiNeO™ implants were inserted in one stage surgery. **(Figs. 4-13)**

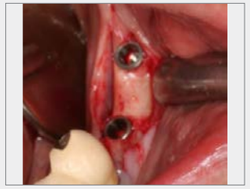


4 Mid-crestal incision shows the narrow ridge

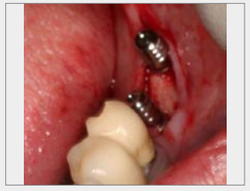


5 Drilling using 2 and 2.8mm drills

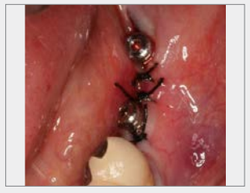
6 Implant placement, first manually and then using a 40Ncm insertion torque



7 Implants were inserted at bone level; 2mm of buccal bone is available

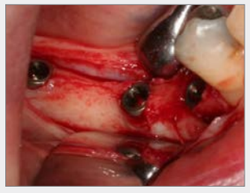


8 Healing caps were connected, platform switching is visible



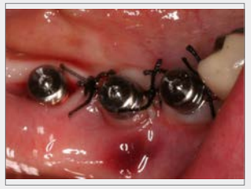
9 Suturing

10 Right side implant placement



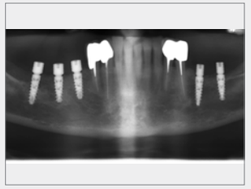
11 Bone level positioning, small exposed areas are visible

12 Buccal augmentation procedure using bovine bone substitute and resolvable membrane (Alpha-Bio's GRAFT)



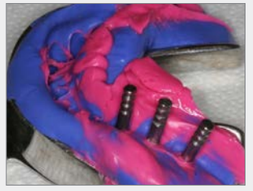
13 Suturing

Prosthodontics Treatment (Figs. 14-20)

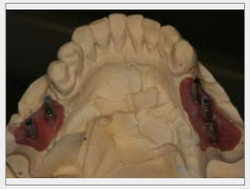


14 X-ray at 3 months after surgery shows good integration and no cervical resorption

15 Impression taken using closed tray transfers for narrow implants



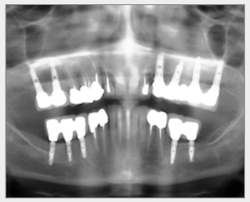
16 Analogs connected to transfers and placed back into the impression



17 Abutment modification and metal casting

18 Metal base of PFM (Porcelain-Fused-to-Metal) crowns is positioned for passive fit

19 Final restoration 4 months after implantation



20 1 year follow up after final restoration of narrow implants shows stable bone support at the cervical area more than standard implant platforms due to platform switching of MultiNeO™ implants

Conclusion

Narrow implants can be used with good prognoses when placed in natural bone. It is important to choose the appropriate implants. The unique design of MultiNeO™ implants results in primary stability following the implant procedure. In addition, the use of conical connection helps to avoid resorption of a thin buccal bone plate after implant loading.

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Deploying Alpha-Bio Tec's MultiNeO™ Self-tapping Implant in an Atrophic Crest: Vestibular-Cortical Stabilization with Bone Graft

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Dr. Paolo Borelli graduated in dentistry from the University of Turin, Italy. In 2006, he obtained a Masters in Prosthetics from the University of Turin. Since 2004, Dr. Borelli has been a member of the Order of Doctors, Turin. He co-authored two books, "Prosthetic Rehabilitation" Vol. 3 (UTET, 2004) and "Biological Approach to Edentulous Patient Treatment" (Quintessence, 2008). Dr. Borelli is a co-founder of the Study Club of Genoa, Milan and Turin, which focuses on guided surgery techniques. He is a teaching assistant in oral surgery in Koeszeg, Hungary under the direction of Professor Dr. P. Famà. Dr. Borelli has been a guest speaker at seminars and conferences in Italy and abroad and he manages a private practice in Turin, Italy.

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Deploying Alpha-Bio Tec's MultiNeO™ Self-tapping Implant in an Atrophic Crest: Vestibular-Cortical Stabilization with Bone Graft

Abstract

In daily clinical practice, it is often necessary to re-treat patients who have previously undergone prosthetic rehabilitations. It is not uncommon, in fact, to have to prosthetically re-treat patients who have a prosthetic abutment (due to decay, root fracture etc), and a rehabilitation with implant support often becomes necessary. In cases in which extractions took place several years earlier, we may find ourselves faced with atrophic crests, into which the insertion of an implant can be difficult and often requires an increase in bone volume. An example is presented below in which, by using self-tapping implants, the vestibular-cortical bone loss is minimized, increasing the odds of implant success.

Introduction

The insertion of implants in atrophic bone crests can easily create fenestrations in the coronal part of the implant site. For this reason, many authors advocate using GBR (Guided Bone Regeneration) to prevent possible dehiscence in the post-surgical phase and to guarantee the survival of implants, which is attributed to adequate bone thicknesses in the cortico-vestibular portion of the crest. [1-2] Vestibular bone loss is frequently caused by the technique used to prepare the implant site, that, for insertion of an implant of Ø3.75mm diameter, usually anticipates an osteotomy with a drill of at least Ø3.2mm diameter [3]. In such cases, the use of self-tapping implants and auto-condensers enables us to reduce the osteotomy to a Ø2.8mm diameter drill, making it possible to save at least 0.4mm of vestibular cortical bone, fundamental in obtaining an optimal aesthetic and functional result that is long-lasting [4].

Case Overview

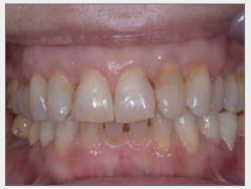
Patient, female, 45-years old, non-smoker, without any particular problems in her medical history, complained about a problem in the mandibular left quadrant. The physical examination revealed bridge decementation from elements 35, 36 and 37. Simply redoing this bridge was impossible, due to the absence of an adequate ferrule as well as uncertainty regarding the long-term prognosis for tooth 37. It was decided, therefore, to replace tooth 36 with an implant and GBR with a resorbable membrane and heterologous graft.

Extraoral Examination

The patient is normotrophic as regards to soft tissues and the perioral musculature without significant asymmetries of the face.

Intraoral Examination

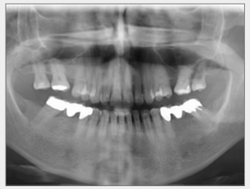
Good level of oral hygiene, some signs and facets of dental wear, absence of mobility problems **(Fig. 1).**



1 Frontal view of the patient

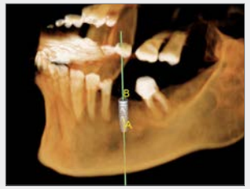
X-ray Examination

The preoperative oral X-ray **(Fig. 2)** suggested that tooth 37 had an uncertain long-term prognosis as bridge abutment.

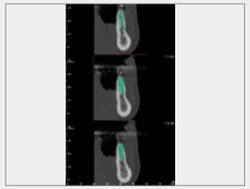


2 Ortho-panoramic X-ray

The CBCT (**Figs. 3a and 3b**) showed the crestal bone to be very thin, but of adequate height for the insertion of a 13mm length implant.



3a CBCT with implant planning



3b CBCT with implant planning

Materials Used

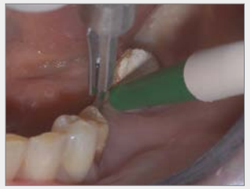
- Ø3.75 x 11.5mm MultiNeO™ implant (Alpha-Bio Tec., Israel) placed in zone 36
- Resorable collagen membrance
- Xenograft
- PTFE 4-0 suture (Omnia, Italy)

Treatment Objectives and Work Plan

The treatment plan included a pre-implant hygiene session. Proper positioning of the implant will require an increase in volume from the vestibular side for the restoration of correct tissue harmony and a correct emergence profile of the prosthetic crown. Several post-surgical follow-up visits were planned at 2, 4, 7 and 14 days to disinfect the incision with chlorhexidine and to check for possible dehiscence of the flap. The prosthetic phase was carried out approximately 4 months after the positioning of the implant and consisted of a zirconia and ceramic crown on a titanium abutment.

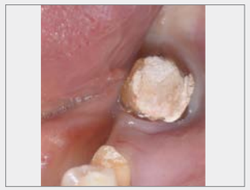
Surgical Phase

After plexus anesthesia, performed with mepivacaine 1:100.000 both in the vestibular and lingual fornix, a crestal incision was made without releasing cuts, so as not to reduce the vascularization of the flap, As predicted by the CBCT **(Figs. 3a, 3b, 4)**,



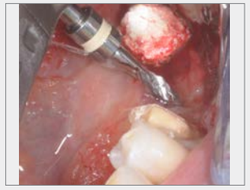
4 Flap incision

the bone crest appears very thin, but of adequate height for the insertion of an implant of 13mm **(Fig. 5)**.



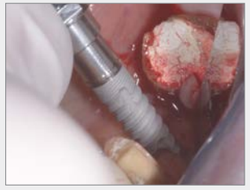
5 Occlusal view of the gap

In order to minimize possible vestibular fenestration in the sub-crestal positioning of the Ø3.75 X 11.5mm implant, we decided upon a 13 mm preparation of the site, beginning the drilling sequence with a 2 mm stop drill. The osteotomy was stopped at the 2.8 mm diameter drill **(Fig. 6)**.

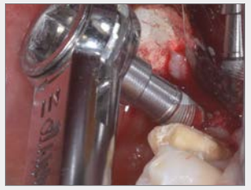


6 Preparation of implant tunnel

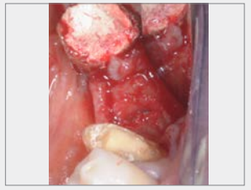
The implant was inserted using a manual ratchet and stabilized in a subcrestal position with approximately 50Ncm of torque **(Figs. 7, 8, 9)**.



7 Manual insertion of the implant



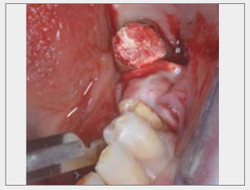
8 Subcrestal insertion of implant



9 Subcrestal insertion of implant

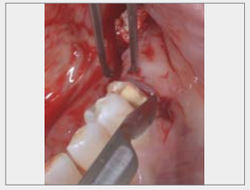
Although no vestibular fenestration was observed at the time of surgery, it was decided to increase the vestibular cortical bone thickness, since some portion of this bone is usually resorbed after implant placement. First, the resorbable membrane was stabilized lingually and, after filling the relevant zone with heterologous bone, the membrane was folded down on the vestibular side to protect the graft **(Figs. 10, 11).**

10 Regeneration with resorbable membrane and heterologous bone

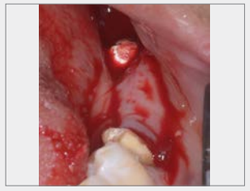


11 Regeneration with resorbable membrane and heterologous bone

The surface of the membrane was then disinfected with a 0.2% chlorhexidine solution, and the flap was closed passively in order to obtain a first degree closure without traction on the suture **(Figs. 12, 13)**.

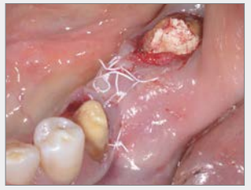


12 Release of the flap and primary intention closure



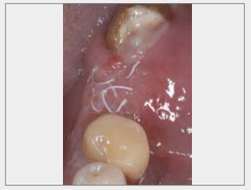
13 Release of the flap and primary intention closure

Two lines of sutures are executed, the first with horizontal external mattresses, later stabilized with a second line of separate points more coronal to the first **(Fig. 14)**.



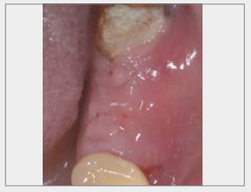
14 Suture

The patient was discharged with the following drug regimen: rinses with 0.12% chlorhexidine diclugonate for 60 seconds twice a day, antibiotic therapy with amoxicillin and clavulanic acid - 1 tablet of 875 mg twice a day, ice on the first day and a semiliquid diet for the first week. At 15 days after surgery, follow-up was performed to verify the healing of the tissues **(Fig. 15)**.



15 Suture follow-up at 15 days

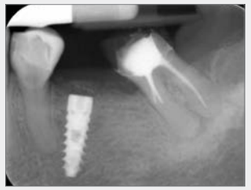
After removal of the suture the site does not show signs of dehiscence of the wound **(Fig. 16)**.



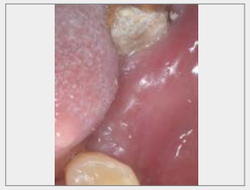
16 Suture removal at 15 days

Prosthetics phase

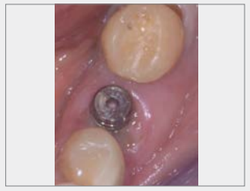
After about 4 months, following the X-ray **(Fig. 17)** and clinical **(Fig. 18)** examination, a second stage operation was performed to insert a healing screw (Ø 4mm – H 4mm) **(Fig. 19)** to stabilize the soft tissue tunnel.



17 X-ray after 4 months to verify correct bone integration

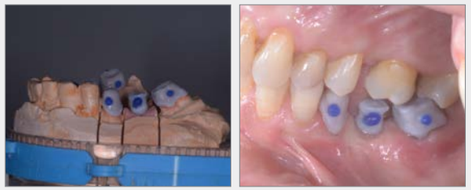


18 Healing of the tissues after 4 months



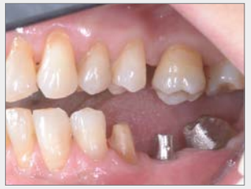
19 Healing screw positioning

3 weeks later, dental impressions were taken with polyvinylsiloxane to produce a zirconium crown featuring layered ceramics. After developing the master mold, we proceeded to mold the various elements, selected and milled the titanium abutment and inserted it **(Fig. 20a-20b)**.



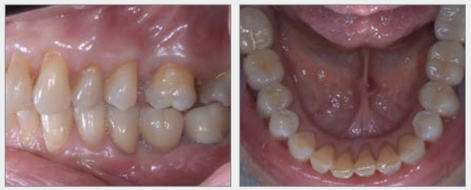
20 Proof of plastic copings on the master mold and in the mouth, before the milling of zirconium

To test the impression, coping plastic caps were placed to assess their proper seating before the final milling of the zirconium piece was done **(Figs. 21)**.



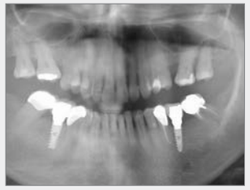
21 Side view of the titanium abutment

The crown size was then determined and the crowns were delivered**.** In order to ensure better management of the occlusion, a large-centric occlusion and non-accentuated cusps were selected **(Fig. 22)**.



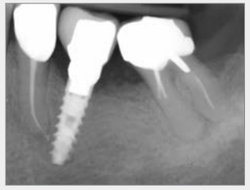
22 Delivery of veneered and characterized crowns; side and occlusal view

Once the cement hardened, an orthopanoramic X-ray was taken to ensure that there was no residual subgingival cement **(Fig. 23)**.



23 Orthopanoramic X-ray at delivery

An additional X-ray was taken three months after the crown was mounted to monitor the stability of the peri-implant bone tissue **(Fig. 24**).



24 Periapical check-up X-ray, 3 months after delivery

Conclusion

Very often it is necessary to rehabilitate atrophic ridges. In these cases, GBR techniques can be used to increase the volume of the peri-implant bone tissue. As shown in this case report, the choice of using easily positioned systems, with self-tapping and self-hardening features, not only allows the osteotomy to be minimized, but it obviously contributes to the reduction of certain complications which enhances the success rate of the treatment itself.

Acknowledgments

We would like to express our thanks to Dr. Andrea Carenzo for performing the prosthetic phase and producing the relevant imagery.

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The Use of Short Implants for Restoration of Limited Bone Height Ridges

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The Use of Short Implants for Restoration of Limited Bone Height Ridges

Background

Inserting short implants is considered a minimally invasive approach for rehabilitating limited bone height ridges. Several studies have shown good predictability of these implants especially in the mandible.[1] The main difficulty when using this technique is the need for sufficient primary stability that can be difficult to achieve due to the reduced length of these implants (less than 10mm) [2,3,5]. To compensate for the implants' reduced length, their design is tapered, self-tapping or spiral. In addition to the "aggressive" design of these implants, wider implant diameters are used to achieve sufficient surface area for long term survival and good predictability. Short implants are not recommended for immediate loading because of the limited primary stability. [4]

Case Overview

A 78 year old female patient, non-smoker, was suffering from pain and mobility in old bi-laterally fixed prostheses in the mandible.

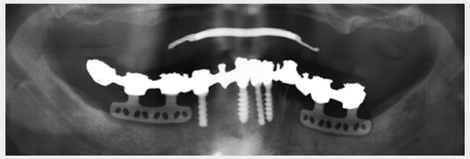
Systemic Background

The patient suffers from hypertension that is controlled by ACE inhibitor medications. The patient takes oral anticoagulants as prophylaxis due to family history of cardiac diseases.

Dental Background

At age 60 (18 years before the current complaints) two blade implants[6] were inserted in both sides of the mandibular molar, spiral one piece implants were inserted in the anterior area of the mandible and fixed cemented restorations were fabricated.

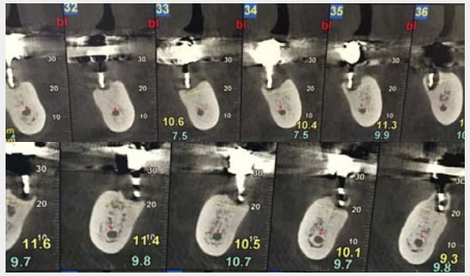
The patient recently felt pain and mobility of the posterior restorations when masticating. **(fig 1.)**



1 Old bilateral fixed prosthesis supported by blade implants. Mobility and pain were felt during mastication.

Treatment Plan

The mobility of the blade implants and the fibro-encapsulation left significant intra bony defects that needed to be restored in order to place new implants for the new fixed implant-supported restoration. [9] A CT scan shows massive infra bony defects, 5-8mm above the mandibular canal at the molar position. **(fig 2)**



2 Intra bony defect and high bone density with limited bone height

Two different treatment plans were presented to the patient:

1. Vertical augmentation (GBR) of posterior ridges and a second stage implant insertion. [11]
2. Short implant (8mm) insertion with simultaneous lateral augmentation in one stage.

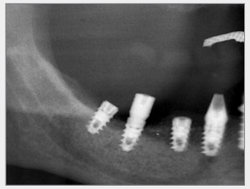
The second option was selected because of the shorter treatment time and less complicated surgery, taking into account the patient's age and systemic conditions.

Materials Used:

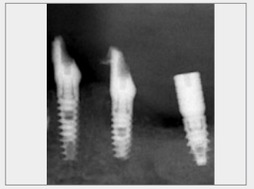
- Ø4.2 X 8mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø4.8 X 8mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø3.75 X 8mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø3.75 X 11.5mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø3.75 X 10mm MultiNeO™ Implant (Alpha-Bio Tec)

The surgery

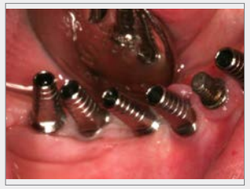
The blade implants were removed and good curettage of the granulation tissue was done leaving socket-like infra bony defects. Ø4.2 X 8mm length MultiNeO™ implants were inserted in the position of the first and second mandibular molar bilaterally. The gap between the implants and bone was filled with bovine bone substitute material (Alpha-Bio's GRAFT) and a resolvable collagen membrane was used to cover the graft. The implants were connected to healing caps due to good primary stability > 25Ncm) and sutured with silk sutures. **(figs. 1-3)** Post-operative medications: Oral antibiotics (875 mg amoxicillin and 125 mg clavulanic acid) twice a day for seven days after surgery and dexamethasone, 6 mg once a day for five days. An NSAID (500 mg of Naproxen) was given to the patient one hour before the operation and later as necessary.



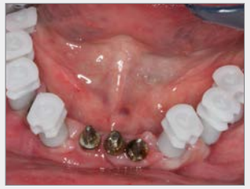
3.1 Right mandible: Four 8mm MultiNeO™ implants were inserted with lateral bone augmentation



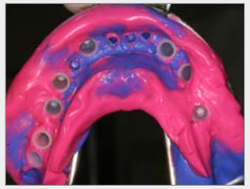
3.2 3,75/8 mm MultiNeO™ implants were inserted in the left mandibular molar area with lateral bone augmentation



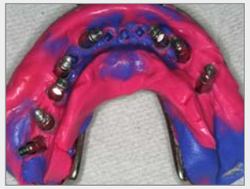
3.3 Snap adapted collar height abutment connection



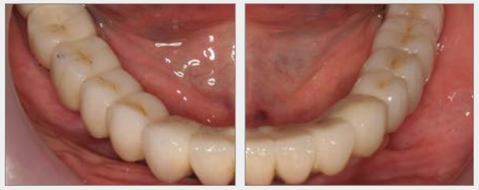
3.4 Connection of snap plastic caps (TLA-SP with adapted collar height abutment)



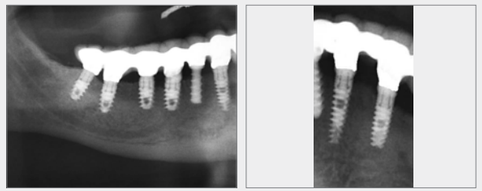
3.5 One stage double mix impression using A-silicon elastomeric material (Hydrorize, Zhermack)



3.6 Analog connection



4 Fabrication of PFM cemented implant supported prosthesis



5 Post OP X-ray showing good osseointegrated implants and stable bone support around all implants after 6 months of function

Discussion

Short implants (L<10mm) are considered a minimally invasive approach for fixed implant supported prosthesis in limited height residual ridges. The surgical difficulty is mainly to achieve minimal primary stability for good osseointergration, especially immediately after implantation. [7] The improved primary stability despite the limited length of the implants is due to the unique spiral design of the MultiNeO™ implants. The spiral design with the double thread design allows good stability in limited available depth. In this case, the infra-bony defect was relatively large due to the encapsulated blade implant, and achieving primary stability was not easily expected and a two stage surgical procedure was to be preferred. [8]

Conclusion

Good primary stability was achieved due to the special design and the high density of the bone. Both of these conditions augured for a good prognosis. This study shows that short implants can be a good choice of treatment for fixed restorations of atrophic jaws especially when using spiral tapered implants that give good primary stability with minimal lateral forces on the cortical bone around the cervical area of the implants.

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