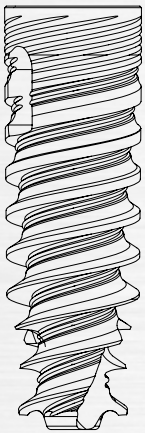
neo CLINICAL BOOK

2016 First Edition



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To: _____

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With Regards,

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Scientific Overview

Scientific Background

Dr. Gadi Schneider

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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 the 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.

Alpha-Bio Tec. a recognized leader in implant technology reinforced its reputation with the launch of the first Spiral Implant on the market, creating a new generation of active implants.

Alpha-Bio Tec's innovative solutions are based on more than 28 years of proven clinical know-how, strong in-house R&D comprised of superior engineering and highly experienced clinicians. It is well-rooted in the company's commitment to deliver sophisticatedly designed, high-quality and intuitively simple solutions for dental specialists worldwide.

More than two years of dedication and ongoing research by our multidisciplinary team enable us to introduce you to the next sensation in implantology.

Main objectives were defined for the development of the NeO Implant:

- Provide Implantologists a unique user experience: simple and easy-to-use
- Long term stability and excellent esthetic results – No compromises!
- Balance between high primary stability and minimal bone stress
- Significantly increased Bone Implant Contact (BIC)
- High cutting efficiency, enable delicate implant insertion
- An innovative, sophisticated and modern implant based on the latest scientific literature
- Optimal solution for the majority of clinical procedures, both simple and complex

These objectives have all been achieved in the NeO implant, which presents well known and clinically proven features along with unique and innovative ones.

External Shape

Body and threads design are at the heart of implant development. Insertion forces and the impact on the surrounding bone are derived from the design features. The NeO implant does not have a uniform external shape throughout; rather, each section has the shape most suited for its function. The NeO profile varies along the implant length to result in an enhanced ability to condense the bone during insertion without exerting excessive forces.

A NeO implant is comprised of three distinct sections:

1. **Straight coronal section -**
   to gain high primary stability.

2. **Implant body with a slight taper–**
   for optimal bone condensing and smooth insertion for all bone types.

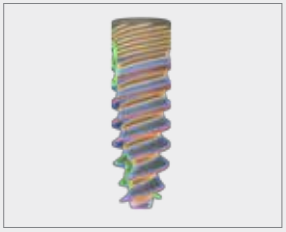
3. **Taper apical section with deep threads**
   For optimal primary stability, high cutting efficiency, and the ability to penetrate a small diameter osteotomy.

The internal core of the implant has a highly tapered shape which acts as an osteotome to provide improved bone condensing ability.

An ideal implant design should provide a balance between compressive and tensile forces while minimizing shear force generation. For instance, tapered implants have been shown to produce more compressive force than cylindrical implants which have more shear forces (Lemons 1993). This may explain why some authors considered cylindrical implants had a higher implant failure rate than tapered screw implants. (Misch et al. 2008) [1]

Threads Design

Threads design varies throughout the implant and according to the intended function of each section of the implant. Threads design includes thread pitch, depth and shape, which all play a role in optimizing the distribution of forces on the surrounding bone. This distribution can be observed at the time of primary placement, during healing and when loading the implant.



Stress decreases between implant pitch when pitch dimensions are from 1.6 to 0.8mm, then increases again when the pitch is lower than 0.8mm. Stresses are more sensitive to thread pitch in cancellous bone (Kong et al. 2006) [1]

Thread pitch: It is known that implants with more threads i.e. smaller pitch, have a higher percentage of Bone to Implant Contact (BIC) and high resistance to vertical forces. However, a larger pitch enables faster insertion and higher primary stability. The NeO implant combines both features using a double system pitch composed of an ideal pitch thread (1.2mm) for fast and smooth insertion along with two internal micro threads, which increase the BIC by 20% and dramatically improve the distribution of forces.

Thread depth: Thread depth influences both the insertion force and the BIC. A shallow thread will be easier to insert into dense bone. A deep thread will result in much greater primary stability and is used mainly in situations involving soft bone or immediate implantation. A combination of deep and shallow threads gives the dentist both features in one implant without the need to compromise either one . The depth (0.3-0.65mm) and the variable thread width (0.1-0.3 mm) in the NeO implant combine high primary retention with optimum load distribution in the bone. The depth of the apical threads (0.65 mm) provides greater functional surface area and therefore increased primary stability, which is a distinct advantage in immediate implantation.

Shallow thread depth permits easier insertion into denser bone with no need for tapping (Misch et al. 2008). Results revealed that the optimal thread height ranged from 0.34 to 0.5mm and thread width between 0.18 and 0.3mm, with thread height being more sensitive to peak stresses than thread widths (Kong et al. 2006) [1]

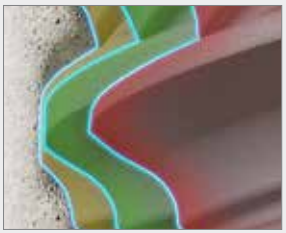
Thread shape: This section describes the geometry of the threads in each portion of the implant. In the NeO implant, the **coronal section** has fine, square threads, which provide excellent load distribution and stability. Their location in the top section of the implant reduces crestal resorption, increases BIC and creates higher reverse torque.

The **body** of the NeO combines a variable reverse buttress shape with sharp threads to balance the requirements of high retention and minimal stress in the bone surrounding the implant.

The **apical** section has sharper and deeper threads, enabling increased retention in areas where the bone is relatively soft, coupled with the flexibility required for absorption of the transmitted forces. The combination of these newly-developed features with Alpha-Bio Tec.'s well proven history of producing innovative implants has resulted in the NeO - an implant inserted quickly and easily, reaches high primary stability and demonstrates increased bone-implant contact along with improved stress distribution.

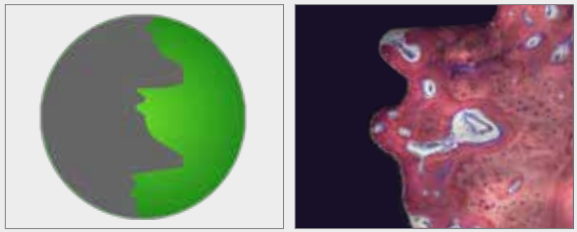
Other FEA studies also suggested the superiority of the square thread since it had the least stress concentration when compared with other thread shapes (Chun et al. 2002) [2]

- There is an implant system that is characterized by progressive threads, this means threads have higher depth in the apical portion and then decreases gradually coronally. This design might increase the load transfer to the more flexible cancellous bone instead of crestal cortical bone. Allegedly, this may contribute to less cortical bone resorption. (Abuhussein H et al. 2010) [1]



Thread structure: Comprehensive research, which was conducted prior to developing the structure of the NeO thread, resulted in the combination of several features into one implant:

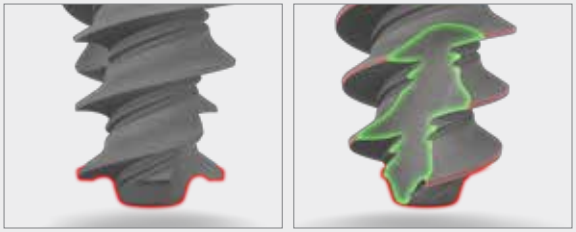
- A 35º attack angle, which varies along the implant thread slope, results in smooth and non-traumatic insertion through all bone types. This unique attack angle balances the dual requirements of delicate penetration into the bone with the subsequent retention of the implant.
- Two internal micro-threads increase BIC and reduce stress.
- The buttress shape of the thread wall resists lateral stress after insertion, thereby contributing to high immediate stabilization.



The Apical Section

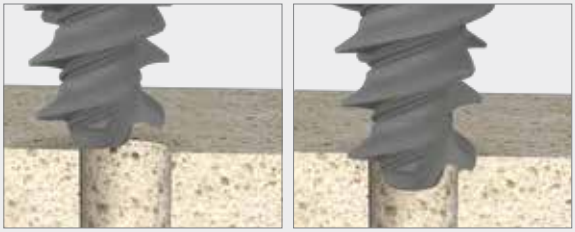
The apical section of the NeO implant is relatively narrow (2.9mm) which enhances its ability to easily penetrate into very narrow osteotomies. This narrow apex is suitable for clinicians who prefer small diameter drills. Since the apical section threads are sharp and deep, they provide good initial retention as well as good primary stability in immediate implantation cases and in soft bone.

The deeper the threads, the wider the surface area of the implant.' Greater thread depth may be an advantage in areas of softer bone and higher occlusal force because of the higher functional surface area in contact with bone (Abuhussein H. et al. 2010).[1]



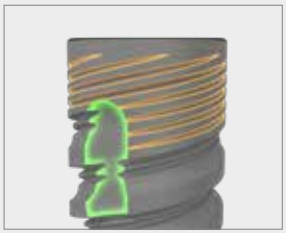
Centering feature (patent pending)

The centering feature (patent pending) is a unique Alpha-Bio Tec. design. The centering feature guides the implant exactly to the point of penetration to the osteotomy without the need for direct visibility. This feature, makes locating the osteotomy entrance much easier, particularly when the osteotomy is hidden by neighboring teeth, or covered with blood, and therefore cannot be seen. After placing the apical centering section inside the osteotomy entrance, the unique apical threads attack angle aids in engaging the implant into the bone. The apical flute assists in effective cutting of the bone.



The coronal section

High focus was taken on developing the coronal section of the NeO, as it directly impacts both primary and long term stability. The main goal was to reduce stress in order to preserve bone while not compromising the initial stability of the implant.



Several stress reducing elements were combined in the NeO:

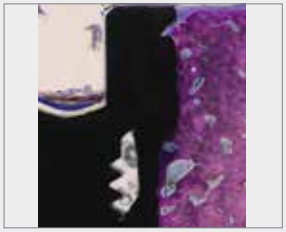
- **Micro-threads** combined with a rough surface all the way to the top of the implant result in an increased surface area, improved load distribution and a significant reduction of crestal bone resorption. The presence of the microthreads contributes to the stability of the crestal bone, leading to a long-term esthetic result.

Minimal marginal bone loss and a 100% implant survival rate over a 3-year follow-up of immediate implants with rough surface neck and microthreads subjected to immediate non-occlusal loading. [3] *The presence of retentive elements at the implant neck will dissipate some forces leading to the maintenance of the crestal bone height according to Wolff's law (Hansson 1999).* [4]

Abrahamsson & Berglundh (2006) [5] *found increased BIC at 10 months in implants with microthreads in the coronal portion (81.8%) when compared with control nonmicrothreaded implants (72.8%).*

Statistically significant lower marginal bone loss was found around micro threaded implant versus non micro threaded ones (Lee et al. 2007) [6]

- **Coronal flute -** Cortical bone is an exceptionally hard tissue. The coronal part of the NeO implant is straight with no active threads, only micro-threads which distribute the pressure on the surrounding bone. While these features contribute to bone preservation, they reduce the cutting efficacy of the implant. Coronal flutes improve the cutting efficiency during implantation, while the presence of the concavity, reduce the pressure from the cortical part. In addition, the flute design allows for the accumulation of blood cloth and bone particles during implant insertion, which accelerates wound healing and bone growth. After wound healing, the coronal flute aids in gaining long term stability as more bone grows into the flute beyond the osteotomy line (refer to the histology below).



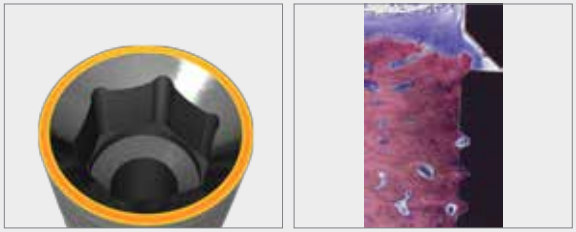
Coronal flute area histology

A straight coronal section leaves greater bone volume around the crestal portion of the implant, reducing the pressure in the cortical area without impairing the initial high primary stability of the implant.

- **Platform switching** has a beneficial effect on the preservation of alveolar bone around implants. Platform switching increases the distance between the bone and the implant-abutment connection, and thereby reduces chronic inflammation, which can lead to bone resorption.

Even with a mismatch of only 0.25 mm, it was evident that platform switching resulted in less resorption of the alveolar crest compared with the conventionally restored implants (Farronato et al. 2011). [7]

Crestal bone height loss was altered when the outer edge of the implant-abutment interface is horizontally repositioned inwardly and away from the outer edge of the implant platform (Lazzara & Porter, 2006). [8]



NeO platform

The implant-abutment connection plays a significant role in long-term implant and marginal bone stability. The NeO implants are supplied with a choice of two platforms: a conical hex connection (CHC) for 3.2 & 3.5mm diameter implants, and an internal hex connection (IH) for 3.75, 4.2 & 5.0 mm implants.

The two greatest challenges when choosing the right implant-abutment connection are a good biological seal and minimal micro-movements.

Conical Hex Connection (CHC)

Internal Hex Connection (IH)

Biological seal: The biological seal is the result of a conical fit interface between implant platform and abutment. A good biological seal has been proven to reduce the risk of bacterial leakage and to contribute to the prevention of peri-implantitis the long run. [9] A tight fit requires accurate manufacturing capabilities.

The NeO IH platform is a 45º conical edge platform and the conical hex connection CHC is an 11.25º conical connection platform. Both platforms are manufactured with meticulous tolerances, which assure a very accurate biological seal. Alpha-Bio Tec's routine quality assurance sampling ensures a stable and consist production output.

Though bacterial leakage is a crucial aspect in implant abutment design there is no "perfect" seal which can fully prevent bacteria from leaking. Implant abutment gaps, which were measured in the literature to be around 0.8 microns and more [10], are not a total barrier against leakage, taking into consideration the fact that bacterial dimensions can be smaller than 0.8 micron.

The NeO platforms are designed to ensure the best possible biological seal and minimize bacterial leakage. Precise fit and proper design ensure accurate sealing in both IH and CHC connections without compromising the implant's mechanical durability.

Minimized micro-movements: Micro-movements are one factor which may lead to abutment screw loosening, and can also contribute to bone loss. This micro-movement effect is decreased by the best possible friction fit between implant and abutment both for the CHC connection and the IH connection due to their conical platform edge.

Micro-movements may also be observed at the rotational axis of the implant abutment connection. Recent studiesindicate that rotational misfit between implant and abutment plays an important role in screw-joint loosening. The NeO IH and CHC connections are equipped with antirotational hex elements which enable precise restoration, reduce rotational micro-movements, improve screw fastening and better stress distribution [11].

Stress absorption: Minimizing implant platform mechanical stress is a feature that NeO implant developers didn't compromise on. Each NeO implant platform was separately designed to achieve maximum stress reduction and to prevent platform deformation, flowering or breakage.

Fatigue tests showed that all NeO implants are able to stand extreme forces for more than 5,000,000 cycles as required by ISO 14801:2007 standard.

Torque fracture tests showed platform durability of more than 4 times the recommended torque strength until failure.

The IH & CHC platform designs reduce horizontal stress on the crestal bone due to both the conical fit and the lead-in-bevel fit that distribute forces deeper into the implant, thereby reducing stress at the implant-abutment interface and in the screw.

Platform switching: In order to provide significant platform switching and reduce stress on the crestal bone[12] for all NeO implants, the NeO narrow implants were designed to have a CHC connection with a significant switch (0.35 mm to 0.5 mm) for use in very narrow areas, while the standard implants have a 3.5mm conical IH platform entrance with a graduated platform switch section (up to 0.75 mm).

All these features, combined with Alpha-Bio Tec's new coated drill line, along with close adaptation between the step drills and the implant shape, preserve soft and hard tissue for the short and long run and hence improve esthetic results.

Conclusion

Worldwide Implantologists that have used the NeO reported a different and unique sensation. This sensation is the outcome of the gentle and effective cutting efficiency of the implant and its primary stability. The features of the NeO implant fulfill the core objectives;

Primary stability enhancers:

- The straight design of the coronal section of NeO implants produces greater contact surface between the bone and the implant coronal part thus providing better initial stability.
- The osteotome-like tapered core of the implant combined with slightly tapered implant body, increased pitch and variable threads generate optimal bone condensing ability.
- Micro-threads significantly increase the BIC surface area.
- The narrow, tapered apical section of the implant easily penetrates even a small diameter osteotomy. Its sharp and deep threads together with the gripping tips were developed to produce firm primary engagement as well as increased primary stability.

Stress-reducing elements:

Coronal micro threads decrease the load transfer to crestal cortical bone which results in significant bone preservation.

- The concave geometry of the coronal cutting flute minimizes the pressure applied to the cortical bone. A rough surface up to the top of the implant provides increased BIC and, therefore, results in reduced crestal bone resorption.

- The NeO implant's advanced thread shape with a sharp attack angle contributes to fast and smooth insertion while minimizing the lateral stress after insertion.

- The geometry of the body micro threads disperses the forces applied to the bone .

- Platform switching has been shown to preserve the cortical bone around the implant neck by repositioning the implant-abutment connection away from the bone.

Pre-clinical study has shown outstanding bone to implant contact, clinical studies have shown the advantages of using the NeO in the majority of clinical procedures, including complicated clinical cases such as:
immediate implantation, immediate loading ,guided bone regeneration, narrow ridges, vertical & horizontal augmentation, sinus lift augmentation and more.

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Pre-Clinical Study

Histological evaluation of NeO implants in mini pigs

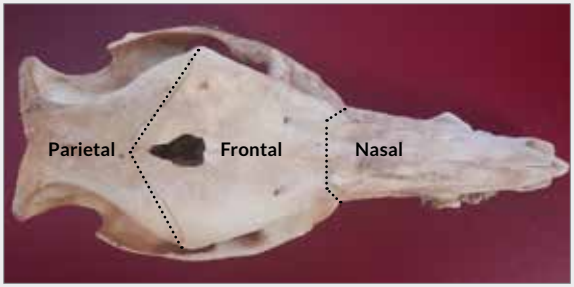
Introduction

The NeO implant was designed in close collaboration between Alpha-Bio Tec's research & development team and clinical experts taking into consideration recent well proven clinical data as well as market needs. This enabled the creation of an innovative implant combining improved mechanical durability and high biological integration. Each aspect of the NeO implant was strictly analyzed during both in-vitro and in-vivo studies. A high Bone to Implant Contact (BIC) score leading to good osseointegration was demonstrated in histological examination following pre-clinical in-vivo study using NeO implants in mini-pig skulls. The following section describes the process, method and results of this study.

Materials & Methods

Animal Model Selection: When choosing the appropriate animal model to simulate human maxillofacial bone, the bone architecture of the selected animal should closely resemble the human jaw bones so that a comparable healing response can be obtained. According to the scientific literature several animals have been used to simulate human jaw bones, with the most commons being rabbits and canines. It is questionable whether rabbit bones may adequately represent human maxillofacial bone due to their thin cortical component and different bone microarchitecture. Canine models are widely used as animal models for dental implant studies. The canine mandible and maxilla mimic the same anatomic structures as human jaw, though tooth extraction is required for such studies and conseqently ethical and moral issues arise.

Mini pigs are considered to be closely representative of the human jaw bone [1,2,3], however their fast growth rate should be taken into consideration especially when long-term studies are performed. In the current study we used the parietal bone of Sinclair mini pig's. This is a flat and sufficiently wide bone that extends from the frontal bone to the occipital bone **(Fig1)**. A female Sinclair mini-pig 7.5 months of age and 51kg in weight was selected and six (6) NeO implants Ø 3.75/7.5mm were implanted through the cortical and into the trabecular bone of its parietal bone. The study protocol was approved by the ethical committee at Assaf-Harofeh Medical Center, Israel.



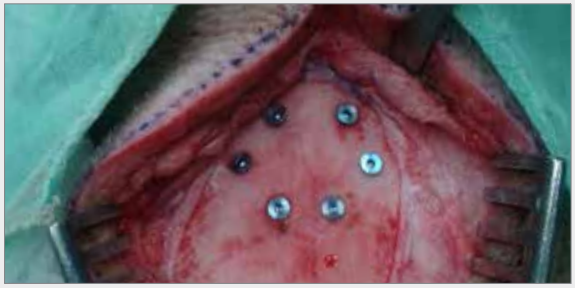
1 Mini pig scull sections

Surgical Procedure: The surgery was performed at GLPigs, the Pre- Clinical Research Unit at Assaf Harofeh Medical Center, Israel. General anesthesia was administered to the animal and the bone was exposed via a linear skin incision.

The implant site was prepared by Prof. Ofer Moses and Dr. Omer Cohen (Tel-Aviv University, Israel) using Alpha-Bio Tec's surgical drills under sterile external irrigation, following the suggested NeO drilling sequence:

Ø 1.2mm marking ➔ Ø 2.0mm drill ➔ Ø 2.8mm drill ➔ Ø 3.2mm drill (cortical release only)

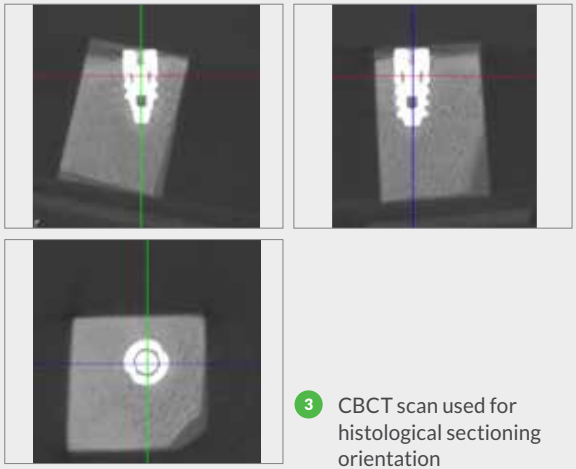
Six NeO Ø3.75/7.5mm implants were inserted after osteotomy preparation, and cover screws were used to seal the implants' internal hexagon followed by suturing and wound closure **(Fig 2)**.



2 Implantation site showing 6 NeO implants with cover screws

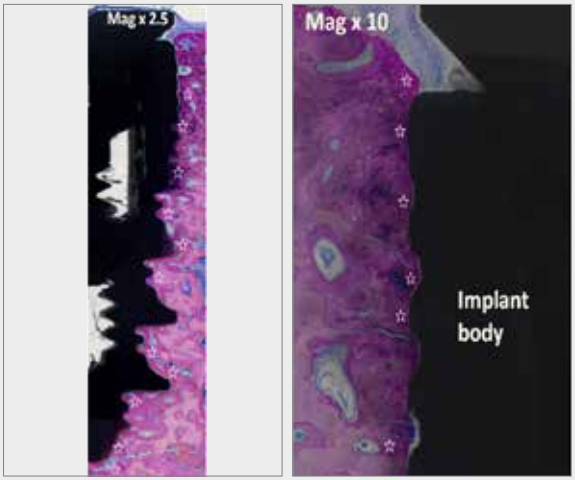
At 4 weeks post-surgery the animal was sacrificed and the housing bone with implants was harvested. Biopsies were fixed in 4% formalin and were prepared for non-declassified histological processing according to hard tissue processing guidelines.

Histological Examination: the samples were sent to Prof. Dr. Dieter D. Bosshardt from the Robert K. Schenk Laboratory of Oral Histology, University of Bern, Switzerland for histological examination. The non-decalcified ground section blocks were stained with Toluidine Blue - Fuchsin and were sectioned following a pre-positioning phase using micro-CT and cone beam CT (CBCT) scanning of the blocks in order to gain uniformity in sectioning **(Fig 3)**.



3 CBCT scan used for histological sectioning orientation

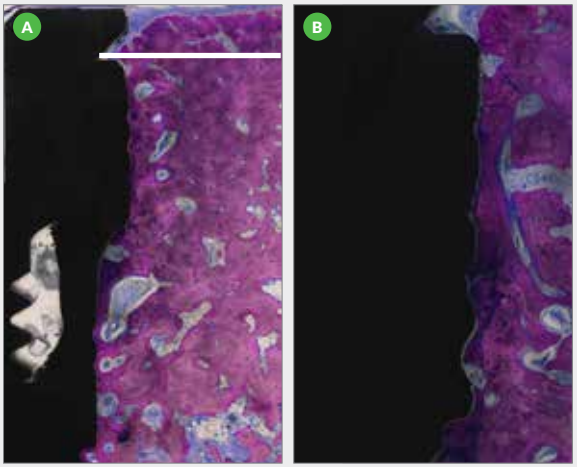
Results: The animal healed uneventfully after 1 month with no complications. Low and high magnification showed new (woven) bone close to the implant profile along with blood vessels with no signs of inflammation **(Fig 4)**.



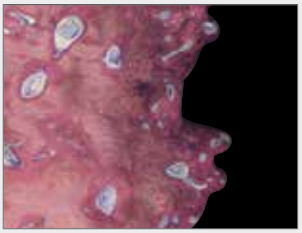
Mag X 2.5 *Mag X 10*

4 Low & high magnification NeO histological pictures

Special attention was taken in evaluating all sections of the implant: coronal section, body and apical section to ensure consistent results along the implant profile. All implants showed an over growth of bone on top of the implant shoulder (white line in **(Fig. 5a)**). Woven bone inspected at the flute area showing osseointegration, demonstrating an attractive implant surface which encouraged good growth during wound healing of the prepared osteotomies. Areas coronal to the cutting flute **(Fig 5)** and micro threads located within the implant body threads **(Fig 6)** showed excellent adaptation and osseointegration. Results have shown full integration with the expected woven young bone and close adaptation to the macro and micro design of the body.



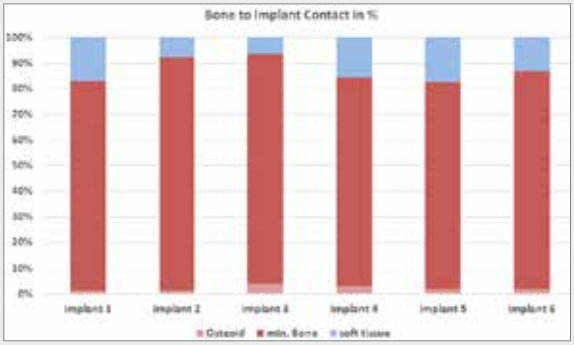
5 Ingrowth in coronal section and over growth above implant shoulder (a,b,c)



6 Woven bone (dark pink area) ingrowth and intimate adaptation to microthreads implant zone.

Bone Implant Contact (BIC):

Bone to implant contact (BIC) value was measured on czi-Files with Zeiss ZEN lite imaging software by Prof. Dr. Dieter D. Bosshardt for all implants. The average BIC value was 87.24% while the maximum value was 94% **(Fig 7)**.



7 Mineralized bone = Woven + Lamellar Bone

The BIC value represents the percentage of bone area that has direct contact with the implant surface. Similar preclinical studies on pigs which measured BIC values on dental implants reported values of 56.5, 77.2, 48.9, and 61.93 [3-5]. Information concerning BIC values taken from the literature on real human BIC values of dental implants varied from 38.9% to 92.4% [6-12].

Conclusion

Histologic evaluation showed homogeneous osseointegration with healthy young woven bone 1 month after implantation. BIC values were high in comparison to similar studies with a small standard deviation. The excellent demonstrated osseointegration is due to the unique design of the NeO implant profile and due to its exeptionally clean surface as was demonstrated by other tests such as XPS and SEM as explained in the next chapter.

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Implant Surface Purity

Background

Alpha-Bio Tec. Quality Assurance (QA) and Quality Control (QC) departments routinely provide information about production and QA procedures to academic and professional communities in order to demonstrate the company's high production standards especially when it comes to the implant surface – Alpha-Bio Tec`s NanoTec ™. The following report describes in detail the surface purity of the NeO implant.

Alpha-Bio Tec. Implant Surface – NanoTec ™

Alpha-Bio Tec's Implant Surface - NanoTec ™ is created through the combination of a sand-blasting process to form a macro surface of 20-40 microns and a double thermal acid etching process to create micro pitting between 1 to 5 microns and nano pores. The advantages of this implant surface - confirmed by retrospective clinical data showing an overall clinical success rate of 98.3% and a 99.6% clinical success rate when using the immediate loading procedure - are to increase early bone-to-implant contact (BIC); increase stability; shorten the healing period; and produce higher performance predictability [1,2].

SEM and XPS analasys

Alpha-Bio Tec. implants are routinely examined by third party, certified laboratories as part of Alpha-Bio Tec. Standard Operating Procedures (SOPs). The following report, which is an example of such an examination, describes Alpha-Bio Tec. NeO implants from batches 15077742 (SEM) and 15051383 (XPS) were analyzed in the Israel Institute of Metals at the Technion Research and Development by two different experts: one for the scanning electron microscopy (SEM) and the other for x-ray photoelectron spectroscopy (XPS) analysis.

Materials and Methods

§SEM

A Scanning Electron Microscope (SEM) is a type of electron microscope that produces images of a sample by scanning it with a focused beam of electrons. The electrons interact with atoms in the sample, producing various detectable signals that contain information about the sample's surface topography and composition. SEM enables the topical evaluation of the implant surfaces. Secondary Electron imaging (SE) - are the emitted lower-energy electrons that result from inelastic scattering. The energy of secondary electrons is typically 50 eV or less. This facilitates drawing conclusions about the surface topography and morphology in various magnifications. It also allows an overview image of the new implant mechanical features.

The implant surface was observed by §SEM with §§SE field. SEM images were taken at different magnifications of x48, x1000, x3000, x5000 and x12000.

§§§XPS

X-ray photoelectron spectroscopy (XPS) is a surface-sensitive quantitative spectroscopic technique that measures the elemental composition at the parts per thousand range, empirical formula, chemical state and electronic state of the elements that exist within a material.

XPS spectra are obtained by irradiating a material with a beam of x-rays while simultaneously measuring the kinetic energy and number of electrons that escape from the top 0-10 nm of the material being analyzed. XPS requires high vacuum (P ~ 10−8 millibar) or ultra-high vacuum (UHV; P < 10−9 millibar) conditions, although a current area of

development is ambient-pressure XPS, in which samples are analyzed at pressures of a few tens of millibar. The following XPS measurements were performed in UHV (2.5x10 $^{-10}$ Torr base pressure) using 5600 Multi-Technique System (PHI, USA). The samples were irradiated with an Al Kα monochromated source (1486.6 eV) and the outcome electrons were analyzed by a spherical capacitor analyzer using as slit aperture of 0.8 mm. All the measurements were done at a take-off angle (the angle between the sample surface and the analyzer) of 45° (Appendix 1).

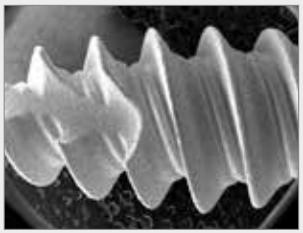
Report Goal

Compositional and chemical bonding analysis of Alpha-Bio Tec. NeO implant in predefined different points.

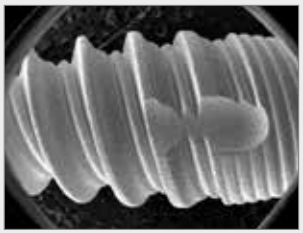
Results

(a) §§ SEM Examinations

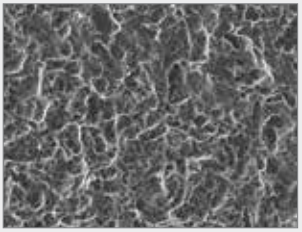
Implant overview and surface morphology images were observed by SEM with §§ SE field in different magnifications **(Figs. 1-6)**.



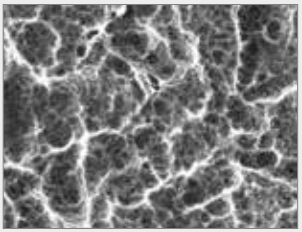
1 implant overview as observed by SEM (apical and middle threads)



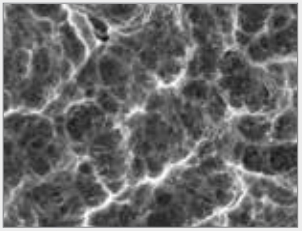
2 implant overview as observed by SEM (middle and coronal threads)



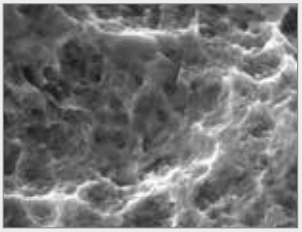
3 Surface morphology of the implant (x1000 magnification)



4 Surface morphology of the implant (x3000 magnification)



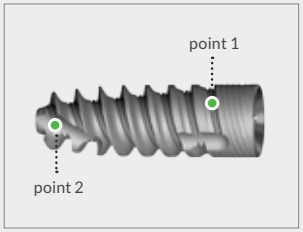
5 Surface morphology of the implant (x5000 magnification)



6 Surface morphology of the implant (x12000 magnification)

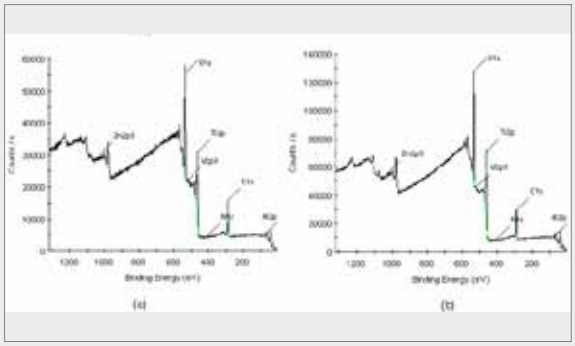
(b) §§ SEM Examinations

The sample was analyzed in two different points **(Fig. 7)**;



7 Image of analyzed implant

The XPS spectra obtained from the analyzed areas **(Fig. 8)** and the quantitative atomic concentration results are summarized in Table 1.



8 (a), (b) XPS spectra in point 1 and point 2 respectively

Table 1

At%	O	Ti	C	Al	V	N	Zn
point 1	54.10	16.92	25.21	1.64	0.78	0.76	0.58
point 2	50.86	16.55	28.26	2.77	0.20	0.69	0.67

Summary and Conclusions

Conclusions

This report demonstrates the excellent NanoTec ™ surface cleanliness and structure of NeO implants by SEM and XPS examinations.

The atomic composition that is demonstrated in this report proves the purity of the Alpha-Bio Tec. implant. this atomic composition combined with implant surface morphology is reported in many independent, objective scientific reports as facilitating successful osseointegration [3-8].

Despite the lack of broad scientific consensus regarding what is the optimal composition of outer implant surface to ensure osseointegration, Alpha-Bio Tec. implants surface have proven they provide predictable clinical outcomes in retrospective and prospective clinical studies. The results also support the low failure rate of Alpha-Bio Tec. implants that are returned from users (the company provides a life time warranty and “no questions asked” return policy that assure good representation of actual implants failure rates).

As part of Alpha-Bio Tec’s Standard Operating Procedures (SOPs), its implants are subject to strict analytical evaluations concerning the implants surface cleanliness and structure. These evaluations, which are performed internally as well as by third party academic institutions, enable Alpha-Bio Tec. to verify the high quality of its production process.

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Appendix 1: Performed Measurements

*Survey: spectrum in a wide energy range (0 - 1400 eV). It gives an estimate of the elements present on the sample surface and is taken at a low resolution.

**Utility Multiplex: spectra taken for different peaks in a low energy range window at an Intermediate (Utility) Resolution. It is taken for all the elements present for the atomic concentration (AC%) calculation. An AC table is given as an output of these measurements. AC calculation accuracy:

± 2% for AC around 50%		
± 5%	-	20%
± 10%	-	5%
± 20%	-	1%

***High Resolution Multiplex: spectra taken for different peaks in a low energy range window at a High Resolution (PE = 11.75 eV, 0.05 eV/step). These measurements allow precise energy position and peak shape determination, necessary for bond bonding analysis.

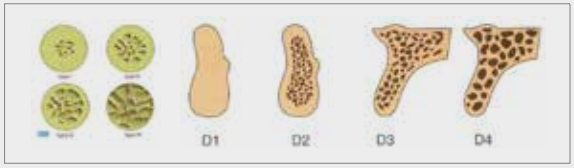
Bone Classification and Implant Osteotomy

The high success rate of dental implants has made implants the 'first choice' of dental professionals for the replacement of missing teeth. Alpha-Bio Tec. has become a leader in dental implant design, manufacturing quality implants with a high success rate.

Alpha-Bio Tec's drilling protocol is based on bone type classification. It offers a simplified drilling sequence table, drill heat-reduction features and a unique drill design that are all coordinated with Alpha-Bio Tec's implant body and core designs.

Bone quality is a collective term referring to the mechanical properties, architecture, degree of mineralization, chemical composition and remodeling properties of bone [1] . Several classification measures have been developed to assist clinicians in illustrating bone quality using a set of acceptable terms [2-3], although the most widely accepted system in oral implantology is from Lekohlm and Zarb [2,4,5].

Lekholm and Zarb[2] classified bone quality into four levels (Types I–IV) according to bone composition (e.g. ratio between compact bone and spongy bone) and subjective bone resistance when drilling. Accordingly, clinical use of the Lekohlm and Zarb[2] classification for the assessment of bone quality and the establishment of a specific treatment plan are based on this property [6] .



Bone Classification

The new surgical drills (straight and step drills) were designed to simplify, and enhance the dental professional's work in order to make it more efficient. The new drilling protocol allows for optimal insertion torque according to bone type and implant design, ultimately ensuring high primary stability with minimal bone stress to enable best possible osseointegration.

The new drilling protocol complies with the Lekholm and Zarb[2] bone classification, as follows:

Hard bone – bone type I
Medium bone – bone type II + III
Soft bone – bone type IV

The Alpha-Bio Tec. protocols controls and standardizes the preparation of the implant site to achieve optimal values of insertion torque and to avoid excessive compression of the hosting bone. This will maximize the bone remodeling surrounding the implant to increase the BIC, and results in the secondary stability of the implant.

Distinguishing between bone type II and type III is particularly difficult. As a result, bones were divided into three separate categories: hard (type I), medium (combination of type II + III) and soft (type IV). By dividing the bone into these categories, dental professionals were given a wider selection of drilling protocols, thereby reducing the risk of error and improving overall drilling protocol accuracy.

Some of ABT's implants offers convergence in its apical part. Implants that are cylindrical or slightly tapered with convergence in their apical part are suitable for step drill procedures. Step drills allow dental professionals to achieve an optimal osteotomy which is well matched to the implant, resulting in high primary stability.

The step drill stabilizes the drilling and may reduce drilling procedure time, which is not only more efficient but also should decrease the amount of heat produced [7]. Nevertheless, experienced implantologists should still be able to achieve a perfect match by using the standard straight drill with adaptation of the drilling protocol. Overall drill enhancement, deploying step drills and adhering to the three new categories in drill protocol, contributes to easier, more accurate clinical use of Alpha-Bio Tec's implants for optimal clinical results.

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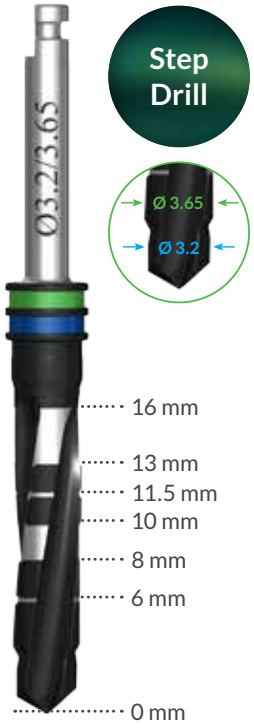
NEO Drill Protocol

Step Drilling Sequence

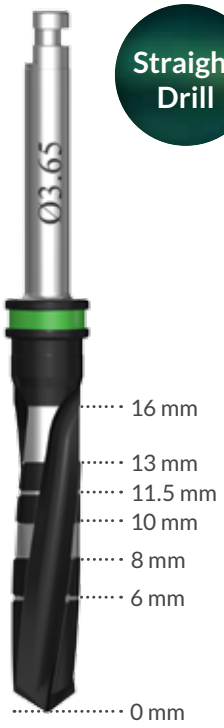
Ø Implant	Soft bone Type IV	Medium bone Type II&III	Hard bone Type I
Ø 3.2	2.0	2.0 2.4/2.8	2.0 2.4/2.8 2.8/3.0
Ø 3.5	2.0 2.0/2.4	2.0 2.4/2.8 2.8/3.0	2.0 2.4/2.8 2.8/3.2
Ø 3.75	2.0 2.4/2.8	2.0 2.4/2.8 2.8/3.2	2.0 2.4/2.8 2.8/3.2 3.2/3.65 Cortical
Ø 4.2	2.0 2.4/2.8 2.8/3.2	2.0 2.4/2.8 3.2/3.65	2.0 2.4/2.8 3.2/3.65 3.65/4.1 Cortical
Ø5.0	2.0 2.4/2.8 3.2/ 3.65	2.0 2.4/2.8 3.2/3.65 3.65/4.1	2.0 2.4/2.8 3.2/3.65 3.65/4.1 4.1/4.5 4.5/4.8 Cortical



Cortical – Drill through cortical plate with the larger diameter

Straight Drilling Sequence

Ø Implant	Soft bone Type IV	Medium bone Type II&III	Hard bone Type I
Ø 3.2	2.0	2.0 2.4/2.8	2.0 2.8 2.8/3.0
Ø 3.5	2.0 2.0/2.4	2.0 2.8 2.8/3.0	2.0 2.8 2.8/3.2
Ø 3.75	2.0 2.4/2.8	2.0 2.8 2.8/3.2	2.0 2.8 2.8/3.2 3.65 Cortical
Ø 4.2	2.0 2.8 2.8/3.2	2.0 2.8 3.2 3.2/3.65	2.0 2.8 3.2 3.2/3.65 4.1 Cortical
Ø5.0	2.0 2.8 3.2 3.2/ 3.65	2.0 2.8 3.2 3.65 3.65/4.1	2.0 2.8 3.2 3.65 4.1 4.1/4.5 4.8 Cortical



Cortical – Drill through cortical plate
Step drill can be replaced with straight drill by drilling 3mm less

NeO’s Performance –
Treatment Concepts and Indications

Immediate Implantation at the Esthetic Area: Post-Extraction Hard Tissue Changes and the Influence of Immediate Implantation

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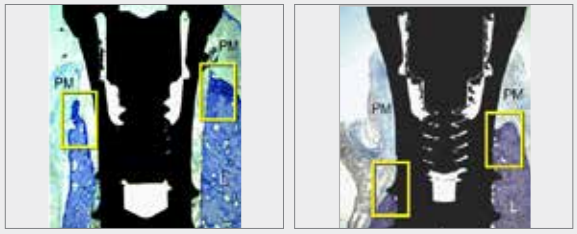
Senior Medical and R&D Consultant, Alpha-Bio Tec. Dr. Gadi Schneider received his DMD from the Hebrew University, Hadassah School of Dental Medicine, Jerusalem, 2000. He completed his post-graduate studies in Periodontology at the Hebrew University and has been a specialist in Periodontology since 2004. 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 the 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.

Immediate Implantation at the Esthetic Area: Post-extraction hard tissue changes and the influence of immediate implantation

Background

At present, replacing missing teeth by means of dental implants has become a predictable treatment option. After tooth loss, there is a progressive degeneration of the alveolar bone in both the horizontal and the vertical dimensions. The most rapid reduction in the alveolar bone occurs during the first months after tooth extraction. There is a height decrease of the buccal bone wall and bone bundles disappear. Dimensional changes within 6 months after tooth extraction are mean horizontal ridge width reduction of 3.8 mm and mean vertical ridge height reduction of 1.24 mm [1].

Immediate post-extraction implant placement has been suggested to preserve the dimensions of the alveolar ridge, reducing the number of surgical and clinical procedures. Animal studies have proven that implant placement in fresh extraction sockets will result in considerable bone resorption, greater in the buccal than in the lingual plate [2] **(Fig. 1)**. Implant placement does not prevent bone changes after extraction.



1

Buccal bone resorption at 3 months after immediate implantation

Which is preferred: Immediate or delayed approach?

- According to the scientific literature, studies that were conducted on animals with immediate approach, recommended the immediate approach in relation to the staged approach with regard to alveolar crest maintenance [3].

- The percentage of bone height and bone width reduction favored the early placement compared to the late approach [4] (taking the above into consideration, immediate implantation is preferred over late implantation, especially at anterior areas).

Implant Position at Immediate Implantation

- Coronal-apical position: Clinically, implants are often inserted at crestal bone level. However, implants may be inserted subcrestally in esthetic areas to minimize risk of future implant collar exposure and to allow sufficient space in the vertical dimension to develop an adequate emergence profile. In this sense, the study of Caneva et al. (2010)[5] suggested that implants must be placed 1 mm subcrestally to reduce or eliminate the exposure of the rough portion of the implant above the alveolar crest **(Fig. 2).**

  Other authors demonstrate positive results with deeper implant placement[6]. Moreover, the subcrestal placement of an implant may also facilitate an earlier BIC (Bone to Implant Contact) at the neck of the implant.

  The percentages of total BIC were higher for implants placed 2 mm subcrestally after 8 weeks, and significantly greater after 12 weeks of healing, when compared with total BIC results of implants placed at the bone crest level [7].

- More 'apically' positioned implants - suffered less 'implant exposure' at buccal aspects [8].
- Buccal-palatal / lingual position - further positioning of the implant to the palata/lingual aspect, the less 'implant exposure' had occurred at the buccal aspect **(Fig. 2)**.

2 Buccal bone position - Bone level and centered VS. 0.8 mm subcrestally and palatinally (CanevaM, COIR., 2010)

Optimal Implant Positioning: Step-by-Step Clinical Presentation

The position of the apical part of the socket, especially at the esthetic area, is at the center of the ridge width with a tendency to more buccal position. When using the pilot drill directlly, it will slip into the most apical part of the socket and will eventually cause an undesired buccal position of the ostetomy **(Fig. 3)**.

3 Pilot drill used too buccaly

The predictable way to avoid this problem is to use a very fine drill and mark the perfect position at the midpalatal wall of the socket **(Fig.4)**.

4 Marking drill in mid-palatal wall of the socket

The key factor is to create a large enough hole that will prevent the pilot drill from slipping to the bottom of the socket **(Fig. 5)**.

5 Pilot drill correct position

Notice the correct position of the implant **(Fig. 6)** vs. incorrect position **(Fig. 7)**

- More Palatinally
- 5° palatal inclination
- 1-2 mm subcrestal

6 Correct implant position

- Too buccaly
- Buccal inclination
- Bone level

7 Incorrect implant position

and the maintenance of bone level **(Fig. 8)** vs. buccal bone resorption **(Fig. 9)**, correspondingly.

8 Maintained bone level

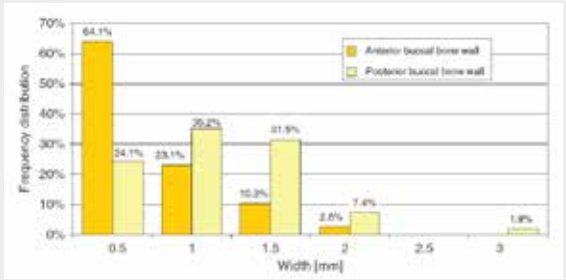
9 Buccal bone resorption

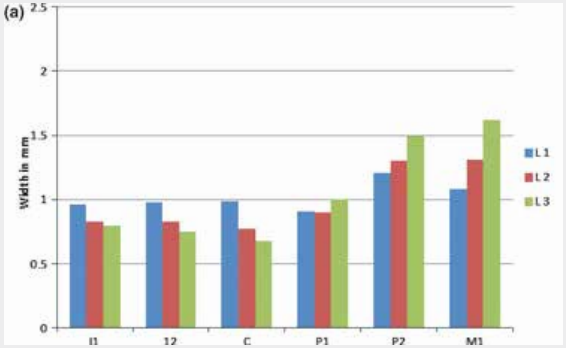
How to Prevent Buccal Bone Loss at Immediate Implantation

- **Anatomical facts related to buccal bone width at immediate implantation**

  The recommended bone volume buccal to the implant is approximately 2 mm. A mean width of 1.8 ± 1.10 mm was adequate to maintain the height of the facial alveolar bony wall following implant installation into healed sites. A width of at least 2 mm was recommended in immediate placement of an implant [9]. A minimal requirement of >2 mm augmentation ridge procedure should be performed to obtain this minimal dimension.

  In the anterior sites, a vast majority of the buccal bony walls 87.2% had a width ≤1 mm, 97.4% <2 mm and only 2.6% of the walls were 2 mm wide. In most situations, when immediate implants are considered in esthetic sites, auxiliary procedures, such as guided bone regeneration, may be needed to achieve adequate bone contour around the implant and optimal esthetic outcome. [10]





Due to the desired buccal bone volume and the anatomical facts, more than 50% of the cases demonstrated buccal mucosal recession (≥1 mm), especially at the pre maxilla area after 1 year.

- **Socket preservation**

  Ridge preservation with an intra socket osseous graft and a membrane should preserve original ridge dimensions and contours. The ridge preservation procedure has been tested in various studies with membrane alone or membrane plus graft, showing reduced ridge alteration compared to extraction alone. Nevins et al. [11] from a study in man, concluded that fresh extraction sockets in the maxillary front tooth region that were grafted with a deproteinized bovine bone mineral demonstrated less loss of ridge buccal plate than non-grafted control sites.

This finding was confirmed in animal experiments using the canine model [2].

Measurements performed in histological sections demonstrated that socket grafting with the use of deproteinized bovine bone mineral made it possible to preserve most of the ridge dimensions. In a systematic review on ridge preservation after tooth extraction, Vignoletti et al.[12] concluded that socket grafting with biomaterial may result in less vertical and horizontal contraction of the bone crest, moreover, that there is no clear guideline supported by scientific evidence to indicate the type of biomaterial to be used. The placement of bovine in fresh extraction socket provided additional amounts of hard tissue, improved the level of marginal BIC and prevented soft tissue recession **(Fig. 10)**.

10 Buccal bone volume preserved compared to 1-2 mm buccal bone resorption

Guided Bone Preservation Technique: Step-by-Step Clinical Presentation

STEP ①

Adding alpha bio bovine bone in the gap between the implant and the buccal bone and outside over the buccal plate

STEP ②

Adding alpha bio collagen membrane over the bovine bone (optional)

STEP ③

Using the guided bone preservation technique preserving the buccal bone volume

The indications for immediate implant placement without the need of bone fillers and biomaterials are as follows: intact socket architecture, a buccal bone plate > of 1 mm in thickness and thick gingival biotype.

Choosing the Most Suitable Implant for Immediate Implantation at Esthetic Areas

- **Implant diameter -** Resorption at the buccal aspects is significantly greater using wider implants (2.7±0.4 mm) compared to narrower implants (1.5±0.6 mm). In several patients (two central incisor, two lateral incisors and four canines), 1.6 mm of soft-tissue buccal recession was observed at ten-year follow-up. In all cases, the implants were wide[13], Narrow implants presents less bone resorption.

- **Platform switching -** Radiographic monitoring has observed a smaller than expected vertical change in the crestal bone height around “platform switching” implants. In this manner, the use of platform-switched prosthetic components results in less bone loss than conventional standard implants with wide diameter prosthetic components.

- **Implant–abutment interface characteristics and implant neck configurations -** Present a major design challenge to implant manufacturers. It is possible that the addition of retention grooves (microthreads) at the implant neck may further reduce the amount of bone loss following implant placement. Several research projects have shown that implants with coronal retention grooves exhibit the lowest levels of Mean Bone Level and lead to a more stable outcome [14].

- **Implant coronal surface -** In conclusion, this prospective study found minimal marginal bone loss and a 100% implant survival rate over a 3-year follow-up of immediate implants with rough surface neck and microthreads subjected to immediate non-occlusal loading15. Several authors have found statistically significant differences in bone loss between implants with a rough surface neck and microthreading in comparison with a rough surface neck without microthreading. Bratu et al.[16] observed implants designed with microthreads and roughened up to their prosthetic platform which display significantly less early bone loss and more bone-level stability compared with polished neck implants.

The NeO implant combines all the above recommendations for predictable and esthetic results.

- Narrow implant diameters Ø3.2, Ø3.5 , Ø3.75
- Rough surface to the top
- Platform switching 0.3 mm
- Microthreads 1.5 mm length

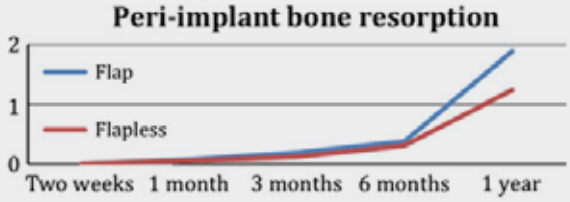
Choosing the Right Technique for Immediate Implantation at the Esthetic Area

Flapless or Flapped

Immediate implantation can be performed with or without a flap according to the amount of bone left at implantation site. The following cases describe both techniques:

Flapless Technique

Advantages of flapless technique has included preservation of soft and hard tissue volume around the implant, a reduction in surgical time, early rehabilitation, improved patient comfort and recovery and good esthetic and functional outcomes [17]. Moreover, flapless surgery may allow better vascularization of the peri-implant mucosa obtaining more richly vascularized supracrestal connective tissue around the implant.



(perez-COIR Impl. Res. 00, 2015)

Based on the findings of the present prospective randomized controlled clinical trial and the existing relevant literature, bone loss is apparently minimal or even nonexistent around flapless implants during the first preloading period of 3-4 months after implant placement. Other studies on flapless implants with longer follow-up periods indicate that there is no significant additional bone loss after implant loading[18].

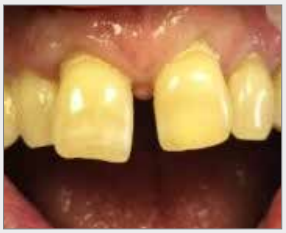
Disadvantages of flapless technique, on the other hand, include the inability to visualize anatomic landmarks and vital structures, the potential for thermal osseous damage from the obstructed external irrigation, the inability to

perform bone augmentation, the 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.

Case I

Flapless immediate implantation and loading – tooth 11 – extraction, immediate implantation and loading, flapless and socket preservation

Extraction – as gentle as possible, the buccal wall is generally very thin ≤ 2 mm especially in the premaxillae area, therefore, it is very important to extract very gently and maintain the buccal wall complete. **(Figs 11,12)**



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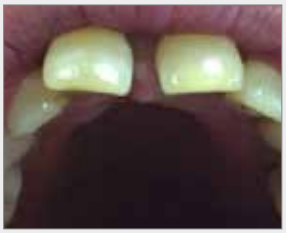
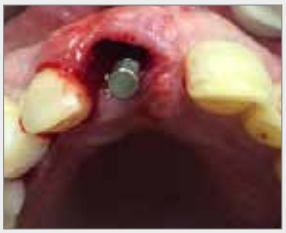


12

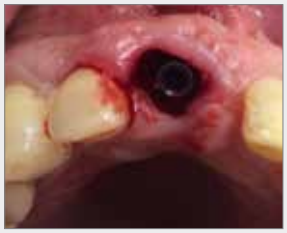
The buccal wall preserved. Drilling – 800 Rpm, external irrigation, in mid palatal wall of the socket, using 2 mm drill following a 2.8 mm drill. Parallelism should be checked at least from 2 points – buccal view and birds view. **(Figs. 13,14)**

13



14

Placing of the NeO implant by using the outstanding centering feature, at 45 Ncm torque. Implant position – palatal position- at least 2 mm buccal bone, at least 1 mm deeper than crest level, in 5° palatal angulations and at least 1.5 mm between implant and teeth. **(Figs 15,16)**



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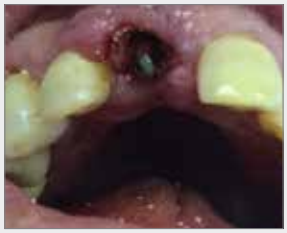


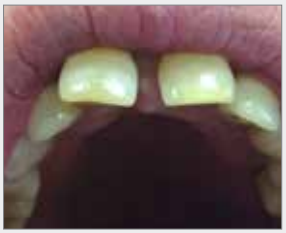
16

Placing abutments – very important to position prosthetic correctly. Due to the thin buccal plate (< 2 mm) - socket preservation technique was performed filling with bovine bone (Alpha-Bio Graft) in the socket of 11-21 for the purpose of ridge preservation. **(Fig. 17)**

17

Natural Bovine Bone in the socket

Temporary rehabilitation using the patient extracted tooth [11] **(Figs. 18-20)**

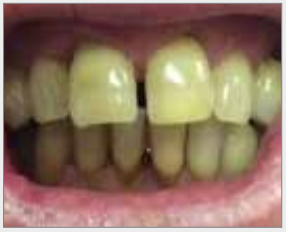


18 Pre-op.

19 Post-op.

20 Post-op.

At 4-week follow-up **(Fig. 21)**



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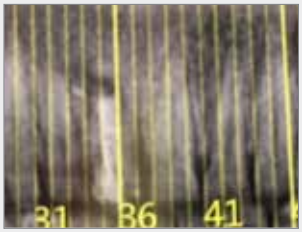
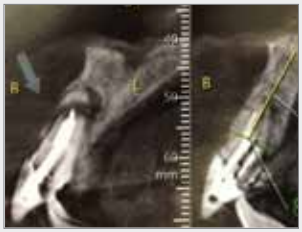
Case II

Flapped immediate implantation and loading - tooth 11– extraction, immediate implantation and loading, open flap, guided bone regeneration. Pre-op X-ray and CT are shown in (Figs. 22-26).

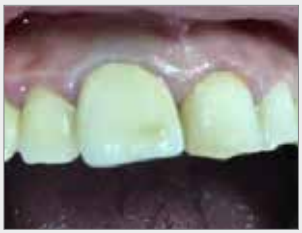


22 Pre-op. X-ray

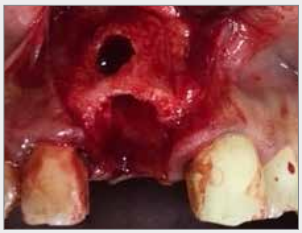


23 Pre-op. CT shows root fracture

24 Pre-op. - birds view



25 Pre-op.

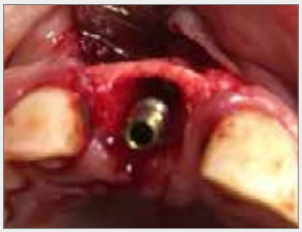


26 Tooth extraction and debridement

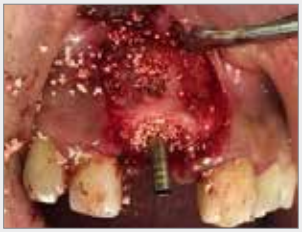
After drilling with the first 2 mm pilot drill, parallel guides were placed and parallelism was checked from 2 directions (birds view and buccal view). The drilling was at a speed of 1000 RPM with external irrigation.

The implant was placed according to the CT scan and the treatment plan. The implant was placed in a torque of 35Ncm and not more than 50Ncm, and stabilized by its apical part. The position of the implant was palatinally, sub crestally and in palatal inclination. Osteoplasty was performed in order to reduce sharp bone edges and to open enough place for the abutments, tightened to 20Ncm. **(Figs. 27-33)**

27 NeO inserted at 35 Ncm

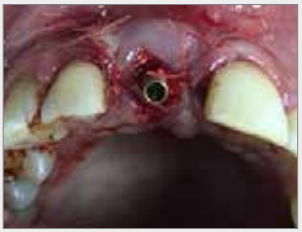


28 Straight abutment (20Ncm)



29 Natural Bovine Bone - defect and gap bovine bone – defect and gap

30 Graft covered with CaS



31 Sutures vicryl 5-0

32 Immediate loading

33 Post-op. X-ray

Bone defects and gaps between implants and bone were filled with Alpha-Bio Tec. Bovine bone graft. The graft was covered with bond appetite.

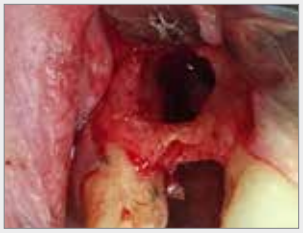
The flap was sutured with primary closure around the abutment after preserving the papillas and closed back carefully. Temporary rehabilitation was delivered at the same day by Dr. Yoram Brookmeyer. Panoramic X-ray was done 3 weeks after immediate loading.

Case III

Flapped immediate implantation and loading in an extended bone defect - tooth 12 – extraction, immediate implantation and loading, bone augmentation (Figs. 34-41)

34 Tooth extraction followed by extended bone defect

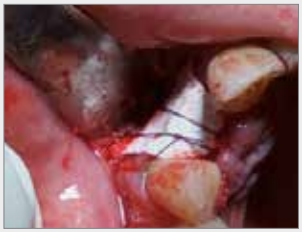
35 Extraction of tooth 12



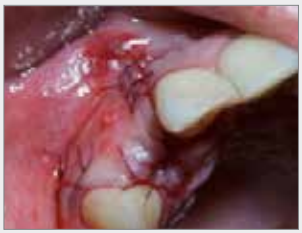
36 Debritment of bone defect

37 Guided pin and implant placement

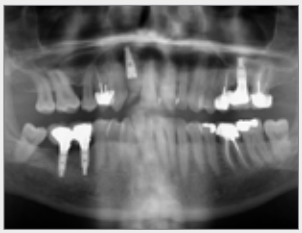
38 Bovine bone augmentation



39 Placing gortex non resorpable membrane



40 Sutures



41 Post-op. panoramic X-ray

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Placement of Alpha-Bio Tec's Narrow NeO Implant into a Fresh Socket in the Aesthetic Zone with Immediate Loading

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Placement of the Alpha-Bio Tec's Narrow NeO Implant into a Fresh Socket in the Aesthetic Zone with Immediate Loading

Abstract

Delayed implant placement has proven to be a highly predictable and acceptable treatment method. The use of immediate loading on post-extraction implants, particularly in aesthetic zones, has risen considerably as patients actively seek shorter treatment times.

The aim of this case study is to illustrate the use of narrow diameter implants in the aesthetic zone with immediate loading, using the new Alpha-Bio Tec's NeO implant.

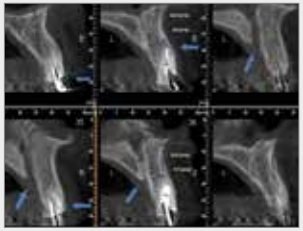
Case Overview

A 59-year old female patient wished to improve her esthetics in the anterior zone. Following clinical and radiological evaluations, teeth 21 and 11 were considered "non-restorable" **(Fig. 1)**.

1 Initial view of teeth 21 and 11

X-Ray Examination

Excellent ridge width and height were demonstrated in the CBCT, suitable for immediate implant placement on the day of tooth extraction. No periapical pathology or other contraindication was observed. As a result, an extraction and immediate endosseous implantation and placement of a provisional restoration were proposed. Measurements showed suitable space for the placement of 2 Ø3.5 x 11.5 mm NeO implants **(Fig 2)**.



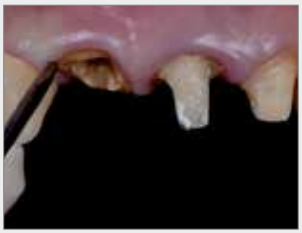
2 CBCT examination

Materials Used

- Two Ø3.5 x 11.5 mm NeO implants (Alpha-Bio Tec., Israel)
- Two Esthetic Standard Abutments ETLAS3.6-CHC (Alpha-Bio Tec. Israel)
- 1.5mm MRDX1.5 Marking Drill (Alpha-Bio Tec. Israel)
- 2.0 mm DRX2.0 Standard Drill (Alpha-Bio Tec. Israel)
- 2.0/2.5mm Coated step Drill (Alpha-Bio Tec. Israel)
- Alpha-Bio's Graft Natural Bovine Bone.

Surgical Phase

Preservation of the alveolar bone is the key to success in immediate implants. Extraction of the tooth was atraumatic, using periotomes and small periosteal elevators. The broken root of 11 was removed without excessive enlargement of the socket and without damage to the buccal plate **(Figs. 3,4)**.

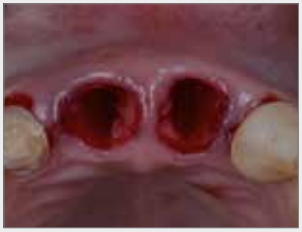


3 Extraction of the tooth

4 Extraction of the root

The osteotomy was prepared according to the manufacturer's drilling sequence. The Alpha-Bio Tec. step drills, which feature a step optimized to comply with implant body design, provide more stable guidance than other similar drills due to the narrower diameter leading the drilling process. **(Figs. 5, 6)**

5 Drilling using Alpha-Bio Tec. step drills



6 Occlusal view of the osteotomy

The first implant was placed in the socket of 21. The NeO implant's macro design achieves very high primary stability due to its tapered core and variable thread design, resulting in excellent bone condensing ability **(Fig. 7)**.

7 Implant placement in socket 21

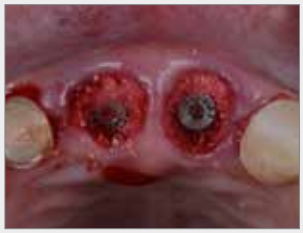
Implant placement in socket 11 followed, the success of which was attributed to the cervical part of the implant which has micro threads and two cutting flutes to reduce pressure on the cortical bone **(Fig. 8)**

8 Implant placement in socket 11

The NeO implant was placed palatally to preserve the buccal bone and increase the gap between the buccal bone and the implant. **(Fig. 9)**

9 Occlusal view following implantation

This gap was filled with bovine xenograft **(Figs. 10)**.



10 Gap filled with bovine xenograft

Screwed provisional restorations were inserted on the day of surgery **(Fig. 11)**, the results of which are shown 7 days and 5 weeks after of the surgery **(Figs. 12, 13)**.

11 Screwed provisional restorations

12 View 7 days after surgery

13 View 5 weeks after surgery

The case will be finalized and updated in the coming months with the delivery of the final prosthetics to the patient.

Immediate Implantation Using Alpha-Bio Tec's NeO Implant

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Dr. Albert Franck Zerah graduated from the Faculty of Dental Surgery, in 1987. Dr. Zerah served as clinic head of the Stomatology and Maxillofacial Department, Broussais Hospital, Paris and head of the Department of Oral Surgery (Oral and Maxillofacial Reconstruction and Implantology), Clinique de la Dhuys, Bagnolet (France), from 1992-1995. He continued his post-graduate studies in dental surgery, periodontology and implantology at New York University until 1999, followed by post-graduate studies in orthodontics at Bordeaux University until 2001. Since 2001, Dr. Zerah has held the position of Head of the Oral Surgery Department (Oral and Maxillofacial Reconstruction and Implantology), Clinique Victor Hugo, Paris. He serves as a training cycle director for various implant manufacturers and as a research director, focusing on the development of new implants. Dr. Zerah is the Chairman of SPIOA (Parisian Society of Implantology and Orthodontics); Research Director, with a focus on piezosurgery, for the EMS Society; Director of piezosurgery training for the Mectron society, and Research Director, focusing on OP 300 (orthopantomograph technology for dental imaging) for the Instrumentarium Society.

Immediate Implantation Using Alpha-Bio Tec's NeO Implant

Abstract

For several years, it was generally accepted that placement of an implant should be deferred, often for several months, following a root extraction. In the 1970s, analysis of bone remodeling mechanisms showed that bone resorption made implant placement difficult, with results that were less than cosmetically optimal in most cases. For this reason, implant specialists began to consider placing implants directly following an extraction, to counteract the adverse effects of bone resorption, treating the implant like a "metal beam" to support and stabilize bone volume. Since the 2000s, immediate implantation has become established practice whenever the environmental context is suitable. This case study will use three clinical cases to illustrate the rules and protocols for implant crowns, in order to achieve good aesthetic and functional outcomes in a predictable way.

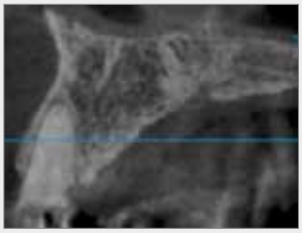
Background

Basic Rules

Immediate implantation should be done whenever possible. However, as stated above, several rules must be complied with. Failure to do so will lead to almost certain, and oftentimes resounding failure, as the post-surgery clinical state will be more difficult to manage in other respects (significant bone loss, unsightly gingival recession, and often damage to adjacent teeth).

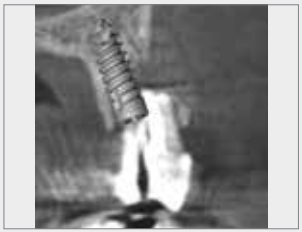
What are the rules to follow when planning an immediate implantation?

① First, the post-extraction residual bone volume must be analyzed. Following the extraction, the vestibular bone wall must be intact **(Fig. 1)**, and of at least a minimum thickness.



1 Checking bone wall thickness

The extraction must be done in a completely non-traumatic way, preserving the residual alveolar ridges as much as possible. (A surgical bur can be used to cut the remaining root, and the root can be extracted in several pieces without prying open the residual bone, thereby preserving its integrity). An extremely thorough debridement of the alveolus must be carried out to eliminate any residue of inflammatory or infectious tissue. If part of the vestibular bone wall was destroyed and fenestration is present, a sufficient vestibular bone must remain in place and bone graft filling should be added, in order to achieve high primary stability. **(Fig. 2)**

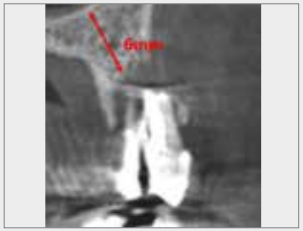


2 Implant with graft in an alveolus, with fenestration

In addition, it is important to assess the width of the alveolus with respect to the diameter of the implant that is to be placed.

There are two possible configurations:

If the width of the alveolus is greater than the diameter of the implant, primary stability is possible. If the width of the alveolus is less than the diameter of the implant, a minimum 3 mm of "implantable" bone beyond the alveolus must be confirmed in order to achieve primary stability in the implanted bone. **(Fig. 3)**

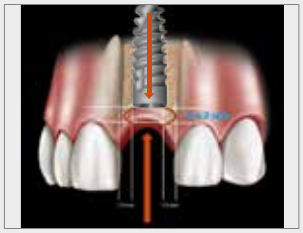


3 Measurement of residual bone beneath the alveolus

Moreover, to avoid resorption of the wall around the proposed implant, it is essential that the remaining wall has a thickness of at least 1 mm. Stress on the bone when it is compressed by the implant placement leads to systematic bone loss in the remaining wall, and thus, failure from an aesthetic standpoint (grayish gingival border).

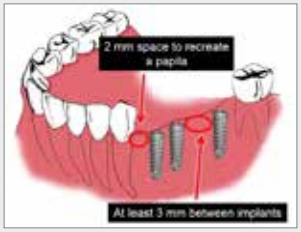
The analysis of the residual bone volume must also follow two basic rules:

a) The implant abutment must never be situated more than 3 mm below the enamel-cementum junction of the adjacent teeth. **(Fig. 4)**



4 Positioning of the implant on the alveolar ridge

b) The implant must be placed at a maximum of between 1.5 and 2 mm from an adjacent tooth (basic rule for regrowth of the interdental papillae), and the distance between two implants must be between 2.5 and 3 mm. **(Fig. 5)**



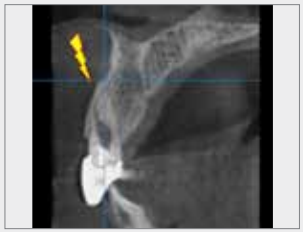
5 Distance between two implants and to one adjacent tooth

② Second, the gingiva must be analyzed, not only around the remaining root, but also around the adjacent teeth. Mucous membranes must show adequate volume, no inflammation, and a height that is conducive to healthy peripheral regeneration, with the subsequent creation of new papillae. An absence of attached gingiva is not a formal counterindication for immediate implant, but does require that a graft be considered, whether in the form of a buried connective tissue graft or a free gingival graft, in order to protect the implant and any bone graft that is done.

Basic Protocols

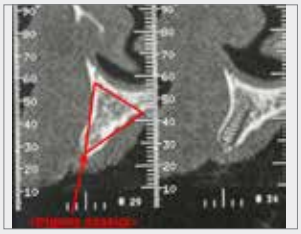
Basic protocols also govern immediate implantation in the aesthetic area. These protocols are implemented for implants in anterior quadrants, whether upper or lower. The greatest challenge is, of course, management of the antero-superior area. Here, the orientation and thinness of the cortical tissue, the soft tissue thickness, the problem of papillae and crowns, and management of aesthetic outcomes of the crown on the implant, all represent challenges that are sometimes very difficult to surmount.

It must be kept in mind that the alveolar axis is usually very close—even too close—to the vestibular cortex. Following the alveolar axis in the placement of the implant, in the majority of cases, puts stress on this cortical tissue, and may even cause perforation of the vestibular bone, inevitably leading to bone loss in this area. **(Fig.6)**



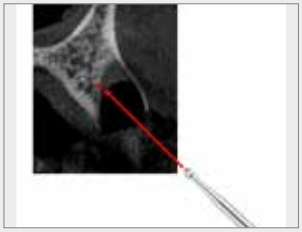
6 Alveolar axis

This is why drilling must be done inside the "triangle of bone," or as close to the palatal bone as possible. **(Fig. 7)**



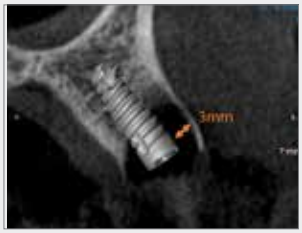
6 Triangle of bone

To do this, a surgical ball bur is used to mark the bone at the center of the alveolus toward the palatal bone, and care is taken to follow the axis created by this ball bur, in order to avoid the alveolar axis. **(Fig. 8)**



8 Positioning of the marking ball bur

The other important step is to fill the gap between the diameter of the implant and that of the alveolus. This filling must be done consistently whenever there is a gap greater than 1 mm. **(Fig. 9)** It must also be covered with a separating membrane to keep the mucus membrane fibroblasts from touching the bone graft.



9 Distance between the alveolus and the implant diameter

When dealing with the soft tissue aspect of this problem, in order to avoid any gingival recession, the gingiva must be incised on the crestal portion and simply separated from the bone, with insertion of a membrane, all the while verifying that no external lesions of the residual bone are present (perforations or significant fractures). **(Fig. 10)**

10 Removal without incision

Lastly, a gingival graft must be placed on the site, perioperatively or postoperatively, whenever there is a deficiency of mucous membrane that jeopardizes the health of the biological space around the implant.

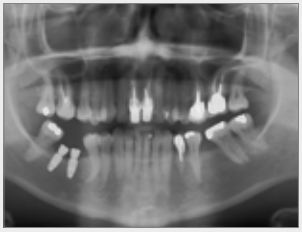
Clinical Cases

The three clinical cases presented here are characteristic of three different indications: with or without bone filling, with or without a membrane, with temporary fixed denture prosthesis, removable denture prosthesis, or without transitional prosthesis.

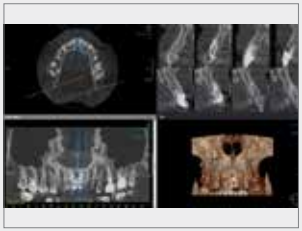
Case I: Female patient, age 35, presented with lesions in her two central upper incisors: an internal crack in the central upper left incisor, which was caused by placement of an excessively long root post, and a fracture-type lesion on the central upper right incisor due to poor positioning of the root post (post outside of the pulp canal axis). **(Fig. 11)**

11 Open mouth, closed mouth

As this patient felt pain every time she closed her mouth, an immediate implantation at the two sites was decided upon after analysis of the surrounding bone and mucous tissue. A radiological assessment was done using panoramic and cone-beam imaging. **(Fig. 12, 13)**

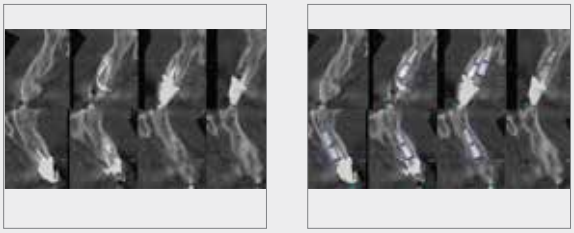


12 Panoramic radiography



13 Cone-beam radiography

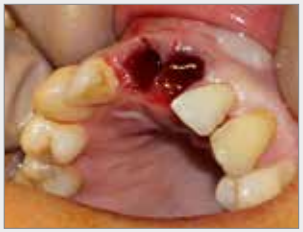
A pre-implant simulation was done to visualize the positioning of the planned implants. **(Fig. 14)**



14 Implant simulation

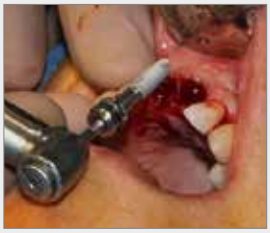
This case was a particular challenge due to the patient's Class 3 malocclusion. Were the incisors were to be repositioned in the normal line of occlusion, it would be physically impossible to for the patient to close her mouth (lack of inter-occlusal space).

A transitional removable prosthesis, made entirely of acrylic, was therefore decided upon. The incisors would be repositioned in front of the lower incisors, using this opportunity to simultaneously resolve the aesthetic problem. The extractions were therefore done in a non-traumatic manner by severing the roots, as stated above, in order to preserve the vestibular cortices. **(Fig. 15)**



15 Extractions

After having marked the bone at the midpoint of the alveolus, and after preparing the implant shafts, two Ø4.2X13 mm NeO implants were placed. **(Fig. 16)**

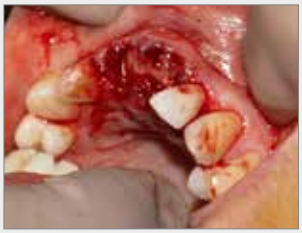


16 Placement of NeO implants

As the space between the implants and the margin of the alveoli was greater than 1 mm, the space was filled with bone drill debris aspirated using a surgical aspirator fitted with a filter. **(Fig. 17)**

17 Filling of the space between the implant and the alveolus

Once the filling was completed, the sites were covered with fibrin (PRF) membranes obtained from a centrifuged sample of the patient's blood. **(Fig. 18)**

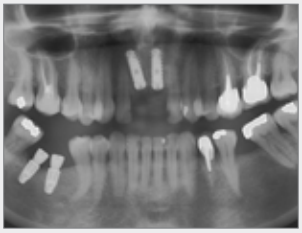


18 Protection of the site using PRF

The gingival tissues were then mobilized by periosteum scarification and sutured with two "far-far near-near" sutures, resembling mattress stitches, which allow purse-string sutures to be achieved. This method eliminates tension where the gingival flaps come together, which is often the reason that the surgical site opens up, endangering the graft and the implants. **(Fig. 19)** This was followed by simple interrupted suturing.

19 Sutures

The entire site was then covered by a transitional prosthesis adapted so that it did not compress the surgical site, but rather protected it. Panoramic imaging was done, showing good primary stability of the implants. **(Fig. 20)**

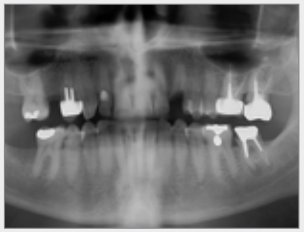


20 Post-operative radiology

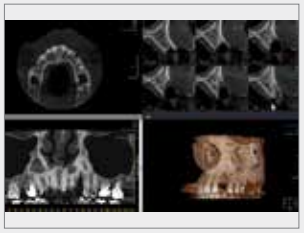
Case II: Male patient, age 55, presented with a canine tooth of which only the root portion remained. The patient had lost the crown of this tooth a long time ago, and it was confirmed by x-ray that this root was completely unrecoverable as the decay was too extensive. **(Fig. 21)**

21 Initial state

A radiological assessment was carried out using panoramic and cone-beam imaging, which also showed agenesis of the 2nd maxillary right premolar. **(Fig. 22, 23)**

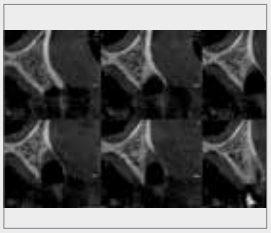


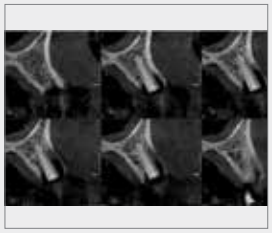
22 Panoramic radiography



23 Cone-beam radiography

Two implants were therefore planned to replace these two teeth. **(Fig. 24)**

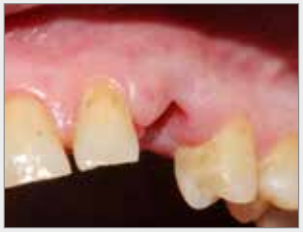




24 Implant simulation

Temporary fixed or removable prostheses were also recommended to the patient, but because he had been living with the problem for a long time, and was not uncomfortable with this clinical condition, he had no problem staying that way.

Non-traumatic extraction of the canine was done, but in this specific case it was decided to defer placement of the implant by four days, since the root had been exposed for too long and there was the possibility of a bacterial infection of the area. **(Fig. 25)** Antibiotic therapy was initiated immediately after the extraction, and four days later, the implants were placed.



25 Site post-extraction

The first implant was placed in the premolar site, because bone drill debris could be recovered by means of the bone filter, as in the surgery above. The canine implant was then prepared, where a Ø4.2X13 mm NeO implant was placed. In this particular case, it was confirmed that there was considerable room between the residual bone and the implant, which was located very close to the palatal bone (a positioning due to the fact that the vestibular wall was thin and therefore fragile). **(Fig. 26)**

26 NeO implant in place

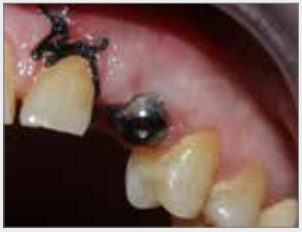
Autogenous bone was then used to fill this space and, given the importance of the space, it was decided to cover it with a resorbable membrane for 4 months. **(Fig. 27)**

27 Fill graft and placement of the membrane

Normally, this membrane is stabilized using tacks, but in this case, because the patient did not wish to have a temporary prosthesis, the membrane was fixed with a healing abutment. To accomplish this, a hole was made in the membrane and the abutment and the membrane were put in place at the same time. **(Fig. 28)**

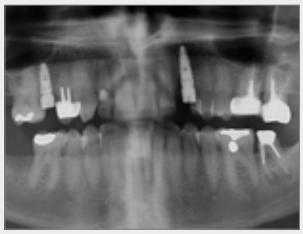
28 Stabilization of the membrane with the healing abutment

Simple interrupted suturing was then done. **(Fig. 29)**



29 Sutures

A radiological examination was done showing that every thing was sealed. **(Fig. 30)**

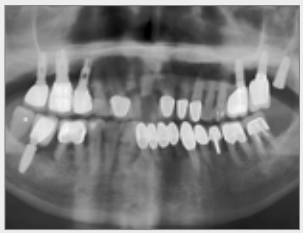


30 Panoramic radiography examination

Case III: Male patient, age 67, victim of a bicycle accident. **(Fig. 31)**

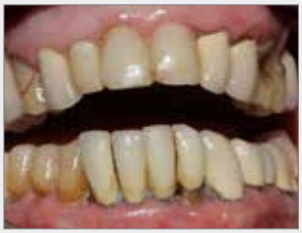
31 Initial state after the accident

Panoramic imaging was done on this patient in the emergency room, who presented with a crown fracture of the central upper right incisor, a fracture of the enamel of the central upper left incisor, and extreme mobility of the implant located in the second upper right premolar. **(Fig. 32)**



32 Post-trauma panoramic radiography

Because of the patient's psychological fragility, the trauma of the accident, and the patient's concern over his appearance, a temporary bridge was chosen to replace the fractured central incisor, using the two adjacent teeth as support without extracting the fractured root (after coating the fractured ceramic crown and trimming the fractured lateral incisor). **(Fig. 33)**

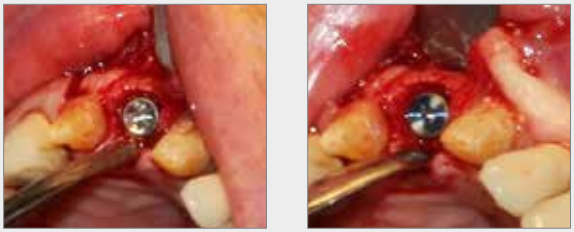


33 Temporary bridge from teeth 12 to 21

Then the root was extracted, non-traumatically as before. **(Fig. 34)**

34 Extraction of the central incisor

Following the same protocol as the previous cases, a Ø4.2X13 mm NeO implant was placed as close to the palate as possible. **(Fig. 35)**

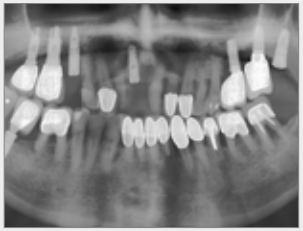


35 Placement of the NeO implant

In this case, it was decided that since the space between the implant and the alveolus was less than 1 mm, the space would not be filled. The gingival flaps on the vestibular and palatal sides were then separated so that they would have a certain laxity and be able to cover the surgical site without too much tension. A "far-far near-near" suture was done, followed by simple interrupted sutures. **(Fig. 36)**

36 Sutures and placement of a temporary bridge

Radiological imaging was then done, confirming the good positioning of the implant. **(Fig. 37)**



37 Post-operative panoramic radiography

Conclusion

As noted above, whenever the criteria are met, the best solution appears to be immediate implantation. This surgical intervention can ensure good stability, thus guaranteeing that the tissues surrounding the implant will be in good condition. It is essential, however, to fully analyze the case, and in the majority of cases to prepare a transitional post-surgical prosthesis, whether fixed or removable. If immediate occlusal loading is to be used, occlusal analysis of the patient and measurement of the interdental space must be carried out with precision. One must therefore "work backwards," starting with the prosthesis before proceeding to the surgery, as nothing is more damaging to one's credibility than a patient leaving without his or her teeth, especially if these were initially promised.

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Full Arch Immediate Implantation, Loading and Guided Bone Preservation Using Alpha-Bio Tec's NeO Implants

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Full Arch Immediate Implantation, Loading and Guided Bone Preservation Using Alpha-Bio Tec's NeO Implants

Introduction

The reported annual failure rates for conventionally and immediately loaded implants are 2.3% and 3.4%, respectively. No clinically significant differences between the annual failure rates, as well as no significant radiographic bone-level changes between conventionally and immediately loaded implants can be found, for up to 5 years of follow-up.[1]

Principles of Immediate Loading

Number of implants - 8-10 implants per jaw increases the retention of the restoration

- Reduces the number of pontics
- Decreases the risk of fracture of the transitional prosthesis
- Compensates for less dense bone

Recommended options for the distribution of the implants in the maxilla:

6 5 4 3 1 1 3 4 5 6 / 5 4 3 2 1 1 2 3 4 5 / 6 4 3 2 1 1 2 3 4 6 / 6 4 3 1 1 3 4 6 / 5 4 3 1 1 3 4 5 **(Figs. 1-2)**

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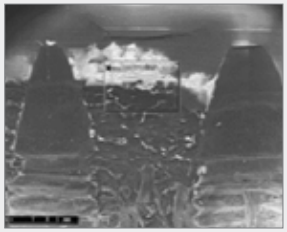
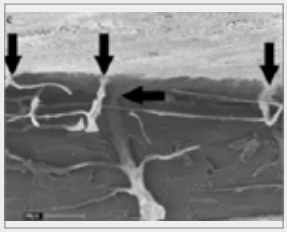
Recommended options for the distribution of the implants in the mandible:

6 4 3 2 2 3 4 6 / 5 4 3 2 2 3 4 5 / 4 3 2 2 3 4

It is extremely important to keep at least 3 mm inter-implant distance. Research has shown that at 3 mm, there is a better blood supply and improved bone remodelling (both de novo bone formation and contact osteogenesis), when compared to a 2 mm inter-implant distance.[2] **(Figs. 3-4)**



3 3 mm inter implant distance



4 Additional blood vessels and blood supply

In all full arch cases you can place one, or in certain cases, even two (in the mandible when the opposing arch has a denture), cantilevers on each side.

The ideal implant length is 10 to 13 mm. In certain cases, some 8 mm implants can be used when combined with with longer implants (particularly in the mandible). With regard to implant diameter, it is important to attempt utilizing implants which are as narrow as possible, especially in the esthetic area and in the mandible, since resorption at the

buccal aspects is significantly greater when wider implants (2.7±0.4mm) are used than with narrower implants (1.5±0.6mm).[3]

Cumulative survival rates of small-diameter implants are reported to be 98.1% and 96.9% for those placed in the maxilla and in the mandible, respectively. [4]

Clinical Advantages of the NeO Implant System

- Available in Ø3.2, Ø3.5, Ø3.75. Ø4.2 and Ø5.0 mm diameters
- Progressive implant with high primary stability and yet, result in reduced pressure on the bone due to optimal pressure distribution
- Tapered
- Penetration to small diameter drilling
- Sharp, deep, variable and angled threads with high cutting efficiency
- Self-drilling
- Self-condensing

Step-by-Step Full Arch Decision Tree

Case I: Mandible

Patient was a 45-year old male, smoker (fewer than 10 cigarettes per day), healthy, no medications. Generelaized severe chronic periodontitis. All teeth with hopeless prognosis. CT scan shows suitable bone depth and width for immediate implantation and loading. **(Fig 5.)**

5 Additional blood vessels and blood supply

Treatment Plan

Initial periodontal treatment to improve the condition of the gingiva and reduce the bacterial load before surgery, which was scheduled for 3 weeks following initial preparation. No extractions were performed until the day of surgery. All teeth were scheduled to be extracted on the day of surgery with immediate implant placement.

Treatment plan for the day of surgery:
Extraction of 45, 44, 43, 42, 41, 31, 32, 33 and 34.

Immediate placement of 8 NeO implants:
46 - Ø3.75/11.5 ; 44 - Ø3.75/11.5 ; 43 - Ø3.75/11.5 ; 41 - Ø3.2/11.5; 31- Ø3.2/11.5 ; 33 - Ø3.75/11.5; 34 - Ø3.75/11.5; 35 - Ø3.75/11.5

After drilling with the first 2 mm pilot drill, parallel guides were placed and parallelism between implants was checked from 2 directions (occlusal view and buccal view). Drilling was at a speed of 1000 RPM with external irrigation. **(Fig. 6-7)**

6 Buccal view

7 Birds-eye view

The implants were placed according to the CT scan and the treatment plan, using a tourqe of between 35Ncm and 50 Ncm. **(Fig. 8)**

Osteoplasty was performed in order to reduce sharp bone edges and to open sufficient space for the abutments. Since narrow implants were used, the abutments were tightented to 20Ncm. **(Fig. 9)**

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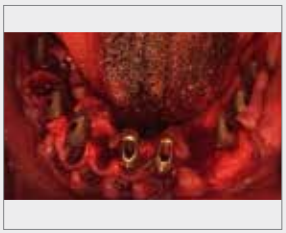

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Bone defects and gaps between implants and bone were filled with Alpha-Bio's graft natural bovine bone. The graft was covered with calcium sulfatae which serves both as a membrane and as a space maintainer. **(Fig 10-11)**

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The flap was sutured with primary closure around the abutments after preserving the papilas and their careful closure. A temporary denture was delivered on the same day. The panoramic X-ray below was taken 3 weeks after full arch immediate loading of both arches. **(Figs. 12-14)**

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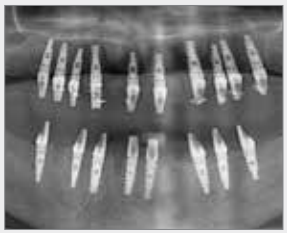

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Post-Operative Instructions

Amoxillin + clavulanic acid 875 mg 2/D for 10 days, corsodyl 2/D for 14 days, Dexamethason 2 mg 5-4-3-2-1/D, Ibuprofen 400 mg 3/D max. Soft diet for 2 months.

Case II: Maxilla

Patient was a 52-year old male, smoker (fewer than 10 cigarettes per day), healthy, no medications. Generalized severe chronic periodontitis. All teeth with hopeless prognosis. CT scan showed suitable bone depth and width for immediate implantation and loading.

Treatment plan for the day of surgery:

Extraction of 15, 14, 13, 12, 11, 21, 22, 23, 24 and 25.

Immediate implantation of 8 NeO implants:

15 - Ø3.75/11.5 ; 14 - Ø3.75/11.5 ; 13 - Ø3.75/11.5 ; 11- Ø3.5/11.5; 21- Ø3.5/11.5 ; 23 - Ø3.75/11.5; 24 - Ø3.75/11.5; 25 - Ø3.75/11.5

Surgical and post-surgical protocal as described above. **(Figs. 15-23)**

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Immediate implantation

19 Alpha-Bio's graft natural bovine bone

20 Alpha-Bio's graft collagen membrane

21 Post-operative 8 NeO implants

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Immediate loading and temporary rehabilitation

Case III: Maxilla and Mandible

Treatment plan as detailed above.

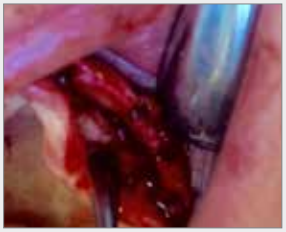
Maxilla - 10 NeO implants:

16 - Ø3.75/11.5; 15 - Ø3.75/11.5 ; 14 - Ø3.5/11.5 ; 13 - Ø3.5/ 11.5; 11 - Ø3.211.5; 21 - Ø3.2/11. ; 22 - Ø3.5/11.5; 23 - Ø3.75/11.5; 26 - Ø3.75/11.5; 27 - Ø3.75/11.5; 25 - Ø3.75/11.5

Mandible - 8 NeO implants:

46 - Ø3.75/11.5; 44- Ø3.75/11.5; 43 - Ø3. 5/11.5; 41- Ø3.2/11.5; 31 - Ø3.2/11. ; 33 - Ø3.5/11.5; 34 - Ø3.75/11.5; 36 - Ø3.75/11.5

Drilling protocol as detailed above, however, since the ridge was extremly narrow, the drilling protocol was 2 mm - 2.8mm through the cortical layer only in order not to cause cracks at the buccal bone. **(Figs. 24-29)**



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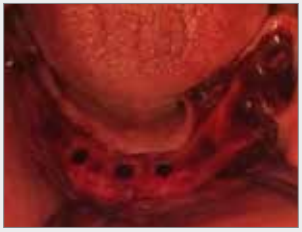
Upper arch implantation



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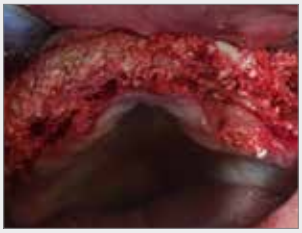
Lower arch implantation



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Alpha-Bio's graft natural bovine bone in the upper arch

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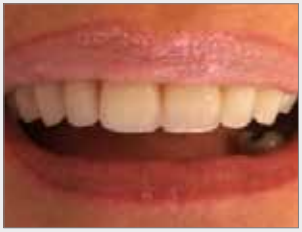
Alpha-Bio's graft natural bovine bone + abutments



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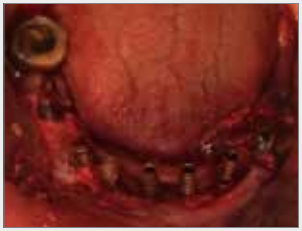
Immediate loading with temporary rehabilitation



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8 NeO implants Ø3.5, Ø3.2, Ø3.75 were placed at >35Ncm

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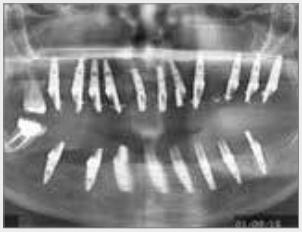
Suturing



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Post-operative panoramic X-ray

With the exception noted above, the surgical and post-surgical protocols were as in the previous cases. **(Fig. 33)**

29 Final restoration

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1. Engelhardt S et al. Annual failure rates and marginal bone-level changes of immediate compared to conventional loading of dental implants: a systematic review of the literature and meta-analysis. Clin Oral Implants Res. 2015 Jun; 26 (6):671-87

2. Tonino Traini, Arthur B. Novaes, Adriano Piattelli, Vula Papalexiou, Valdir A. MugliaThe relationship between interimplant distances and vascularization of the interimplant bone Clin. Oral Impl. Res. 21, 2010; 822–829

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4. Romeo E, Lops D, Amorfini L, Chiapasco M, Ghisolfi M, Vogel G; Clinical and radiographic evaluation of small-diameter (3.3-mm) implants followed for 1-7 years: a longitudinal study. Clin Oral Implants Res. 2006 Apr;17(2):139-48

Ridge Augmentation of a Seibert 3 Deficiency Using Sonic Welding and Simultaneous placement of Alpha-Bio Tec's NeO Implant

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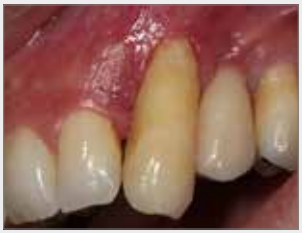
Ridge Augmentation of a Seibert 3 Deficiency Using Sonic Welding and Simultaneous placement of Alpha-Bio Tec's NeO Implant

Abstract

This case study presents a consequence of periodontal destruction associated with localized aggressive patient disease, in a 31-year old patient. A subsequent alveolar bone resorption following extraction of tooth 23 **(Fig. 1-2)**, has led to a Seibert class 3 bone deficiency lacking both buccal-palatal and vertical dimensions. Placing an implant in a narrow crest lacking both vertical and horizontal dimensions would likely result in an unfavourable aesthetic restoration, and will be problematic for OH (Oral Health) maintenance. On the other hand, the results of placing a supra-crestal implant simultaneously with a lateral and vertical GBR is technique sensitive and its predictability is questionable. Since all other restorative possibilities were ruled out on the patient level, ridge augmentation using sonic welding together with NeO implant placement was chosen.



1 Upon arrival - mobility grade 3 of tooth 23

2 6 months post extraction of area 23

Case Overview

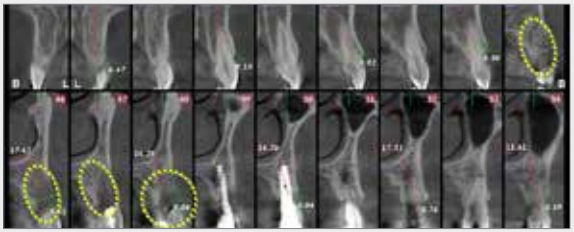
The patient is 31-year old male. He is generally healthy and reports being a transient smoker.

Extraoral Examination

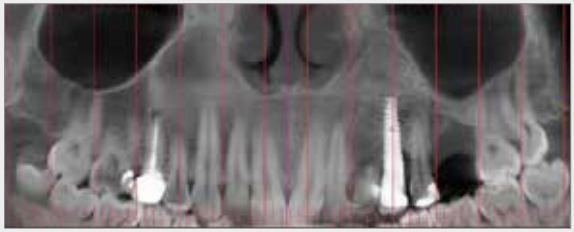
Mouth opening of 48 mm, no abnormalities in TMN or mastication muscles, low smile line.

Intra oral examination

Intra oral examination: Patient is diagnosed as localized aggressive periodontitis patient, exhibiting the loss of tooth 26 and a hopeless condition of 42 and 23 (over eruption, mobility 3, recession and loss of up to 80% of alveolar support) **(Fig. 2)**. The periodontal disease is centered on these three teeth. Periodontal indices are mild to moderate for the rest of the dentition. Probing depth did not exceed 5 mm at any other site and BOP is 30% at first checkup. The patient insisted on a fixed restoration connected to a dental implant for tooth 23 and ruled out any removable prostheses or the use of pontics (either with FPD or a Maryland restoration). On CT scan **(Fig. 3-4)** (sections 45-49) the available bone was satisfying on the aspect of width and height, although the buccal cortical plate was partally missing in the coronal third.



3 Pre-op. CT scan



4 Preoperative panoramic X-ray

It was decided to use an Alpha-Bio Tec. NeO implant (Ø3.75 / L11.5 mm), combined with a lateral and vertical GBR, using a resorbable barrier fixed by resorbable screws (SonicWeld Rx® system), particulated Xenograft and a collagen resorbable membrane.

Surgical Procedure

Paracrestal and vertical buccal releasing incisions were made followed by full thickness flap elevation. **(Figs. 5-6)** Resorbable barrier **(Figs. 10-11)** made of a Poly-D-L-lactic acid polymer (Resorb-X®) which was welded on to resorbable pins (SonicPin Rx®) were previously inserted into the bone **(Figs. 7-9)**.

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Flap elevation - crest exhibits satisfying width but only from approx. 6 mm apically to the CEJ of tooth 22

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From left to right - preparation for the pins; placing the first pin out of 3

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From left to right - resorbable PLGA membrane is placed and welded on to pins; Alpha-Bio Tec. NeO implant (Ø3.75 / L11.5 mm) is inserted and placed 4 mm supra-crestally

The welding is achieved using a SonicWeld Rx® unit, an ultrasound generator producing ultrasonic waves of precisely defined frequency that are focused with a sonotrode. Once the barrier is fixed, the Alpha-Bio Tec. NeO implant was placed supra-crestally in its preferred location (2-3 mm apically to CEJ of the adjacent teeth). The space between polymeric membrane and pristine bone was filled with a Xenograft. A resorbable collagen membrane was placed over the augmented area **(Figs. 12-13)**. Periosteal horizontal releasing incisions were performed at the base of the flap which was sutured without tension using Vicryl 4-0 sutures. A temporary prosthesis (24-X with metal reinforced wire) was placed without gingival or occlusal contact **(Figs. 14-16)**. Healing was uneventful.

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From left to right - space is filled with Xenograft and covered by a resorbable collagen membrane

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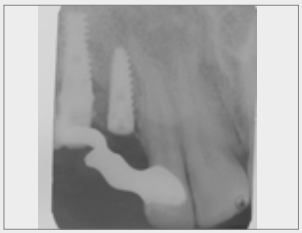
Surgical site is sutured using Vicryl 4-0, horizontal mattresses and simple interrupted sutures; temporary restoration in place over the operated area



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Post-op. X-ray

The case will be prosthetically finalized and updated in the coming months with the delivery of the final prosthetics to the patient.

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

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

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. NeO implants, available in Ø3.75, Ø3.5 and Ø3.2 mm 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. NeO Ø3.75, Ø3.5 and Ø3.2 mm 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 2.8 mm 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. abutment was placed and then closed at a 20 Ncm torque.

Buccal bone width was narrower than 2 mm 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 875 mg 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. 1-3)**.

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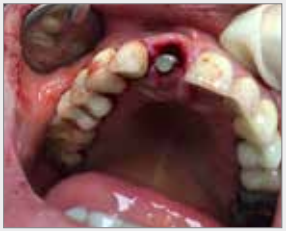

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Extraction of teeth prior to immediate implantation - it is important to be as gentle and as careful as possible, since the buccal wall of bone is generally very thin (≤ 2 mm) in the premaxillary area **(Figs. 4-6)**.

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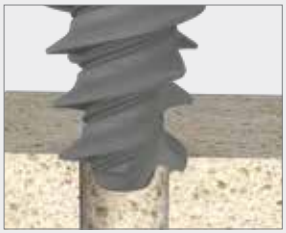
In this case, the buccal wall was successfully preserved during extraction.

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

NeO's Centering feature - a unique (patent pending) design. The centering feature takes the NeO 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 1 mm deeper than crest level at a 5° palatal angulation and at more palatal position
- At least 1.5 mm between the implant and adjacent teeth **(Figs. 7-9)**

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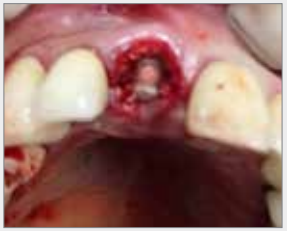

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In this case, because of the thin buccal plate (< 2mm), a socket preservation technique using bovine bone (Alpha-Bio Tec. Graft) was necessary in order to preserve the crestal ridge of bone **(Figs. 10-11)**.

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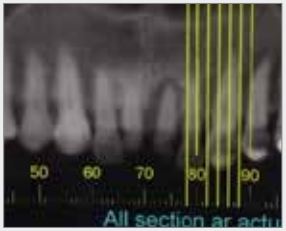
When placing the abutments, it is very important to position them correctly prosthetically. In this case, the original crown was placed as a temporary crown and adjusted to be out of occlusion. A periapical X-ray was taken postoperatively on the day of implantation.

Case II:

Teeth 11-21 – Extraction, flapless immediate implantation and loading, socket preservation (Dr. Gadi Schneider and Dr. Yoram Brookmeyer) **(Figs. 12-17)**



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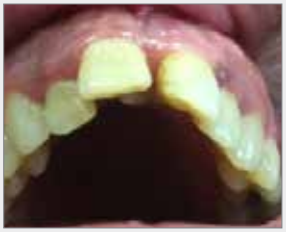

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Implant position - at least 1.5 mm between implant and adjacent teeth and 3 mm between implants **(Figs. 18, 19)**

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

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Deploying Alpha-Bio Tec's NeO 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 NeO 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 NeO 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

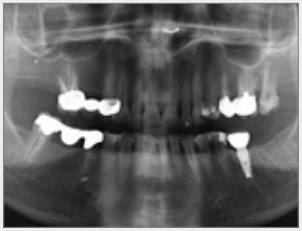
Patient presents toned perioral muscles and a high smile line that permits full exposure of the front teeth, also due to protrusion of the maxillary central and lateral incisors.

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 11.5 mm NeO implant (Alpha-Bio Tec., Israel) in area 15
- Ø 4.2 x 10 mm NeO 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

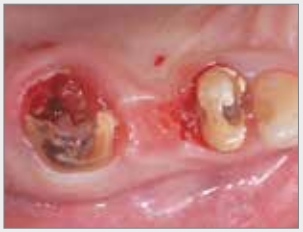
- Absorbable haemostatic sponges (Cutanplast Dental; Ogna Lab, Italy)
- Non-absorbable polyamide suture (Supramid; B. Braun Melsungen, Germany)
- Temporary polycarbonate crown (InLine, BM. Dental, Italy) on implant in area 15
- Final crown in IPS e-max CAD (Ivoclar Vivadent, Italy) on tooth 14
- Final 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.

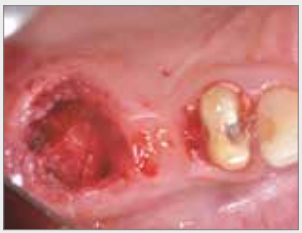
Surgical Phase

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



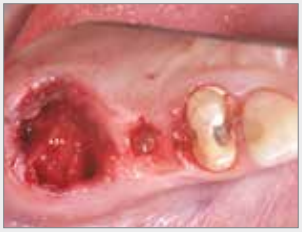
2 Initial situation after removal of the old prosthesis

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 11.5 mm implant (NeO, Alpha-Bio Tec., Israel), it was sufficient to use a 2 mm drill up to 11.5 mm depth. Area 16 was prepared to receive the Ø4.2 x 10 mm implant (NeO, Alpha-Bio Tec., Israel) with a 2 mm drill to 10 mm depth; a crest housing was created for implant installation with a 2.8 mm drill to 4 mm depth **(Fig. 4)**.



4 Under-preparation of the implant sites

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

5 NeO implant insertion in inter-root septum of tooth 16

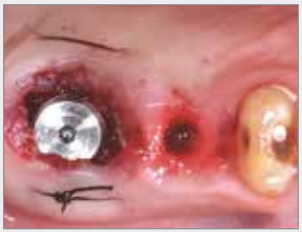
The progression of the implant within the site is gradual, and the steep rise in the insertion torque occurs only in the last few millimeters, easily reaching values of 50 Ncm **(Fig. 6).**

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

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 NeO implant features such a powerful apical thread that it is possible to use it as an actual osteotome **(Fig. 7)**.

7 NeO 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)**.

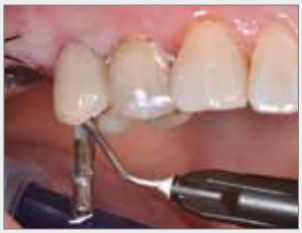


8 Placement of healing abutment and suture in area 16

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.

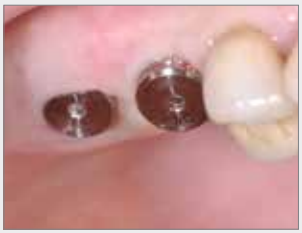
Additional Check-Ups

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)**.

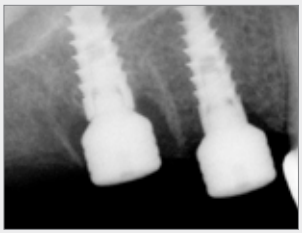
15 Damaged provisional at 35 days after surgery

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)**.

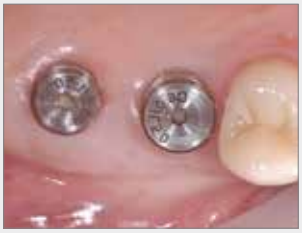


17 Intraoral radiography at 35 days after surgery

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)**.

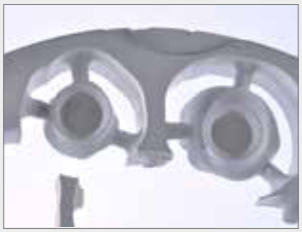
21 TLAO-2 abutments prepared on model

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

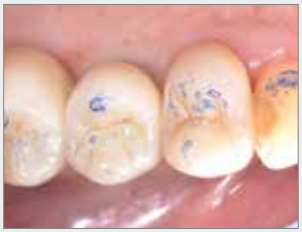
Once sent back to the laboratory, the crowns were finalized with structural ceramization techniques by means of die casting, utilizing ZirPress Ivoclar ceramic (Ivoclar Vivadent, Italy), characterized by saturating the surface of the color **(Fig. 28)**.

28 Crowns designed in the laboratory with ceramic die casting technique

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

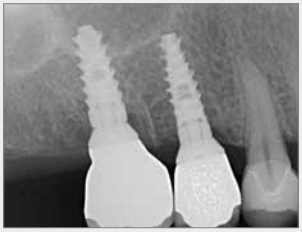
29 Abutment 30 Ncm tightening torque

30 Cemented crowns



31 Control of occlusal contacts after cementation

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



32 Final X-ray

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 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. NeO 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 NeO 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 the 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 NeO 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 <3–4 mm, Fugazzotto[4] suggested that 4 mm 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 4 mm or less, the two-step lateral antrostomy was indicated. However, with residual bone heights of 4–6 mm, simultaneous implant placement could be performed. Several studies have made similar observations and suggestions for 4–5 mm 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 5–6 mm 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 6 mm of residual bone height was present, the osteotome technique could be used to the bone height by an additional 3–4 mm. 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 >5 mm, but this was reduced to 85.7% when the pre-treatment bone height was <5 mm[6].

A consensus report in a recent European Workshop on Periodontology[7] indicated that in cases with <6 mm 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 ≥5 mm 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 5 mm, recommended commonly in the literature for maxillary implant placement

combined with sinus floor lifting using either the lateral window or the osteotome technique.

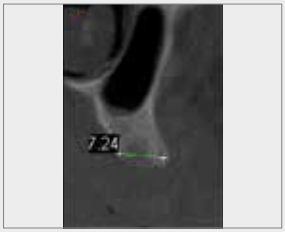
The overall implant survival rate was 92.7% for 331 implants placed in <5 mm ridge height and 96.9% for 2,525 implants inserted in ≥5 mm ridge height. The difference was significant (p = .0003).

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 5 mm 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 5 mm 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 NeO 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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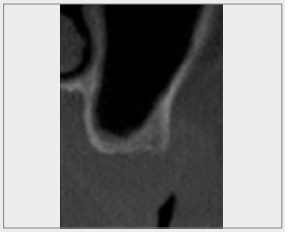

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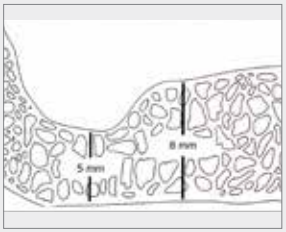
Step 2 - Osteotome Technique

Mark the intended positions of the implants and start to drill to a depth of 1 mm 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

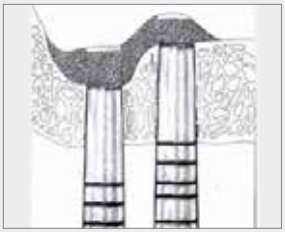
Take a periapical X-ray in order to validate the distance from the sinus floor. If the distance is bigger than 1 mm one must continue drilling until you almost reach the sinus floor.

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

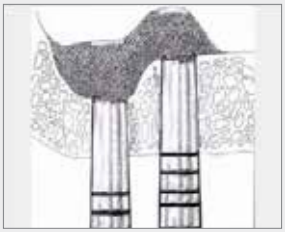
5

Step 4 - Bone Grafting

Place 1 mm 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 1 mm increments until reaching the desired height **(Figs 6-9)**.

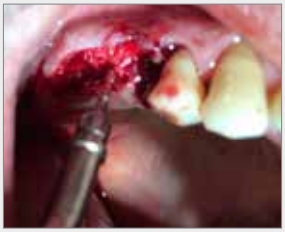


6 The osteotomy is widened, and successive osteotome are seated to the sinus floor [10]



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

8



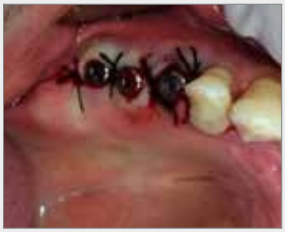
9

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: Ø3.75 mm/11.5 mm - Ø4.2/11.5 mm and Ø5.0/11.5 mm NeO 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 25-30 Ncm **(Figs. 10-13)**.

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

11

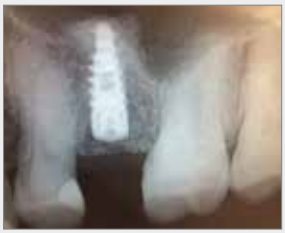


12

13

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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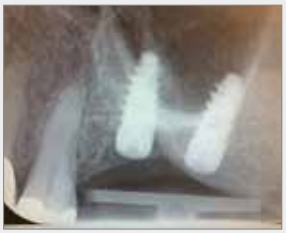

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Performance of Alpha-Bio Tec's NeO Implants after Staged Lateral Wall Sinus Floor Augmentation in a Periodontally Compromised Patient

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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 NeO 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 procedure 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 NeO implants with their unique design, surface characteristics and geometry inserted in a 65-year old male patient presenting with severe marginal bone loss combined with sinus pneumatization. Alpha-Bio Tec's NeO 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 NeO 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, were 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 97disadvantages 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 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, presented in our implant surgery clinic complaining of 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.

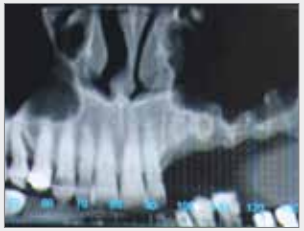
A clinical history and examination including soft and hard tissue was completed with the following results:

- Maxilla: missing teeth, severe periodontal problems with extensive loss of bone support around almost all existing teeth, pockets of 5-7 mm 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 10 mm.
- 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 almost around 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 3.0 mm and of 10 mm 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 1-3 mm 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

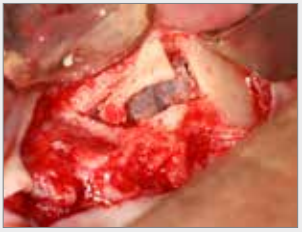
The surgical procedure was carried out under local anesthesia (Lidocaine 2% including 1:100000 adrenaline) with a low-trauma surgical technique, following the concept of the outfracture osteotomy sinus grafting technique. The patient received a preoperative antibiotic prophylaxis, clavulanate-potentiated 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 3 mm away from the anterior and inferior borders and extended antero-posteriorly and in the vertical dimension to be 10 mm and 5 mm 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

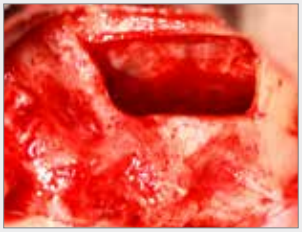
The outfractured bone segment is placed in normal saline during sinus grafting

The sinus membrane was carefully elevated in traditional method, inferiorly, anteriorly, and posteriorly until the desired elevation was obtained to permit placement of 13 mm 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 3 mm occurred during the dissection procedure and the elevation was extended in all directions. Alpha-Bio Tec's 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

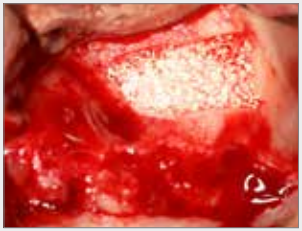
The perforation of the sinus Membrane was covered using collagen membrane

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 1-2 mm 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

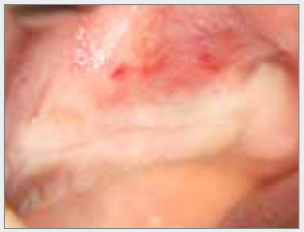
After cleansing and irrigating with saline, tension free suturing was performed.

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). A total of four NeO implants (Alpha-Bio Tec.) 4.2 mm diameter and 13 mm in length were inserted in the left augmented maxillary sinus in site 23, 24, 25, and 26 with an insertion torque of 50 Ncm.

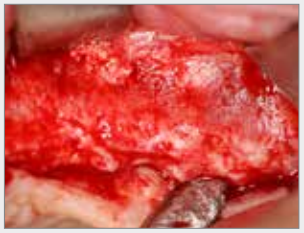
14 Pre-surgical panoramic radiograph taken 6 months after sinus floor augmentation

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

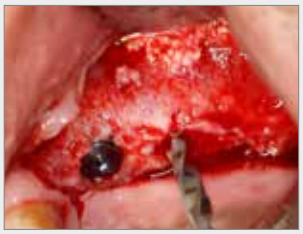
16 Clinical view of a mid-crestal incision line with mesial and distal vertical releasing incisions



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 2.8 mm diameter twist drill for the outer 0.8 mm of bone preparation. Then, a 3.65 mm 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 implant site preparation, a NeO implant, Ø4.2 mm, length 13 mm, was placed at site 23



19 Implant site preparation 24

20 NeO implant, Ø4.2 mm, length 13 mm, was placed at site 24

21 Implant site preparation 25

22 Standard implants, Ø4.2 mm, length 13 mm, were placed at sites 25, 26

23 Alpha-Bio Tec. torque ratchet

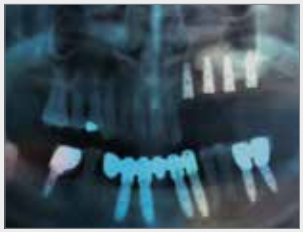
24 Insertion torque values were measured and recorded for each implant site

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)**.

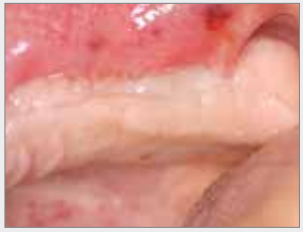
26 After surgery was completed, flap was closed primarily tension-free with resorbable interrupted sutures

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)**.

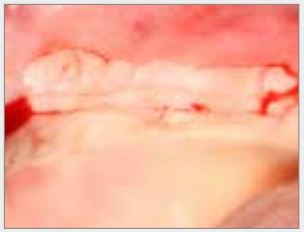


27 Panoramic radiograph obtained two months after implant placement showing well osseointegrated implants at sites 23-26

Standard transmucosal abutments were attached at stage-two surgery after two 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

Conclusion

This case study assessed the performance of a new implant system (Alpha-Bio Tec. NeO implant), 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 NeO Implants with Cone Connection for Restoration of Limited Width Ridges

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The Use of Alpha-Bio Tec's Narrow NeO 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 of 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. NeO implant, due to its unique design and properties. The NeO implant can 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].

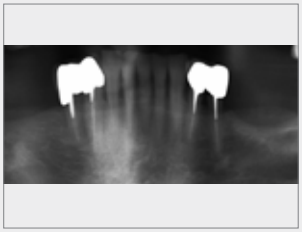
In the minimally invasive approach to surgery, which is used in order to avoid augmentation procedures that can be costly and time-consuming, narrow implants are indicated. Narrow implants are considered safe and predictable for the long term survival of fixed prostheses [8]. The design of narrow implants 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 In Use

Ø3.2mmXL13mm NeO 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 5-6 mm in these specific positions.

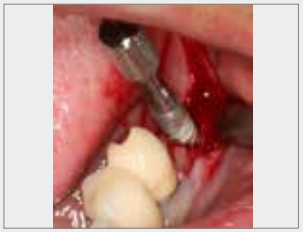
The use of standard implant systems would require GBR in order to obtain a minimum of 2 mm of buccal bone. Alternatively, narrow Ø3.2mm NeO implants were selected for implantation, with no augmentation procedure on the left side and one stage augmentation on right side with a minimally invasive approach.

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 2.8 mm drill through the cortical bone (3-4 mm). Five 3.2 diameter 13 mm length NeO implants were inserted in one stage surgery. **(Figs. 4-13)**

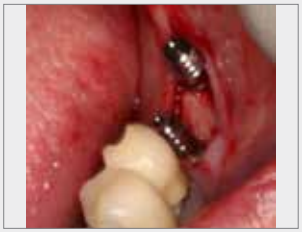
4 Mid-crestal incision shows the narrow ridge

5 Drilling using 2 and 2.8 mm drills

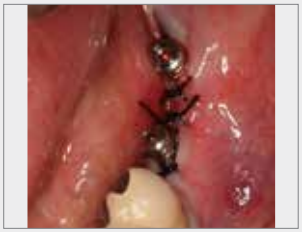


6 Implant placement, first manually and then using a 40N/cm insertion torque

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



8 Healing caps were connected, platform switching is visible



9 Suturing

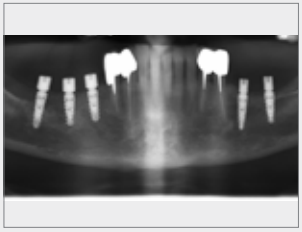
10 Right side implant placement

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. 14-19)



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

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 NeO 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 NeO Self-tapping Implant in an Atrophic Crest: Vestibular-Cortical Stabilization with Bone Graft

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Deploying Alpha-Bio Tec's NeO 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 Ø3.75 mm diameter, usually anticipates an osteotomy with a drill of at least Ø3.2 mm diameter [3]. In such cases, the use of self-tapping implants and auto-condensers enables us to reduce the osteotomy to a Ø2.8 mm diameter drill, making it possible to save at least 0.4 mm of vestibular cortical bone, fundamental in obtaining an optimal aesthetic and functional result that is long-lasting [4].

Case Overview

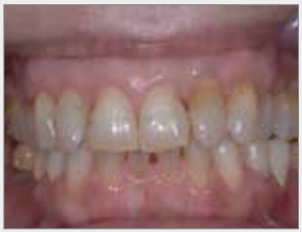
Patient, female, 45-years old, non-smoker, without any particular problems in his medical history, presented complaining about a problem in the mandibular left quadrant. The physical examination reveals bridge decementation from elements 35, 36 and 37. Simply redoing this bridge is impossible, due to 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

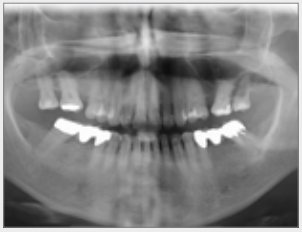
Good level of oral hygiene, some signs and facets of dental wear, absence of mobility problems **(Fig. 1).**



1 Frontal view of the patient

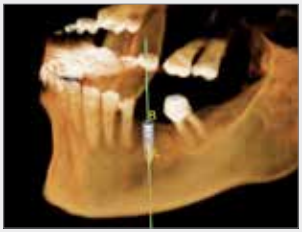
X-ray Examination

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

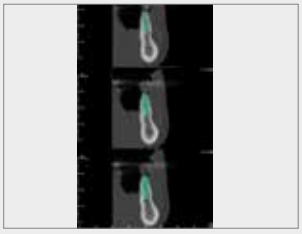


2 Ortho-panoramic X-ray

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



3a CBCT with implant planning



3b CBCT with implant planning

Materials Used

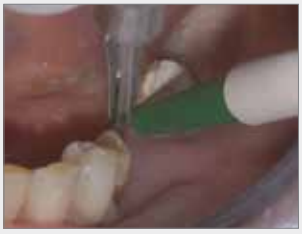
- NeO implant Ø3.75 x 11.5 mm (Alpha-Bio Tec., Israel) in zone 36
- Resorable collagen membrance
- Xenograft
- PTFE 4-0 suture (Omnia, Italy)

Treatment Objectives and Work Plan

The treatment plan includes 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 are 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 will be carried out approximately 4 months after the positioning of the implant and consists of a zirconia and ceramic crown on a titanium abutment.

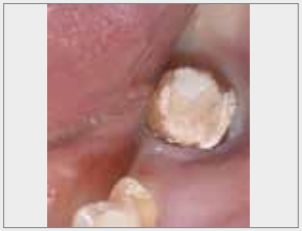
Surgical Phase

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)**,



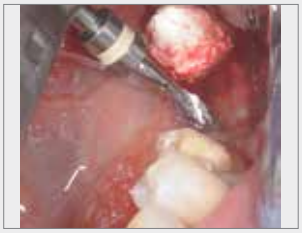
4 Flap incision

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



5 Occlusal view of the gap

In order to minimize possible vestibular fenestration in the sub-crestal positioning of the implant of Ø3.75 x 11.5 mm, 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 50 Ncm of torque **(Figs. 7, 8, 9)**.

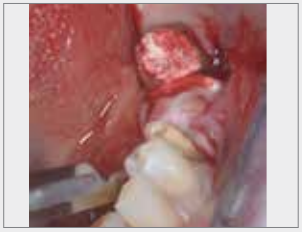
7 Manual insertion of the implant

8 Subcrestal insertion of implant

9 Subcrestal insertion of implant

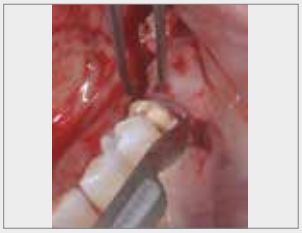
Although no vestibular fenestration was observed at the time of surgery, it was decided to increase the vestibular cortical bone thickness, since some portion of this bone is usually resorbed after implant placement. First, the resorbable membrane was stabilized lingually and, after filling the relevant 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

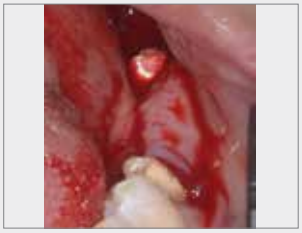


11 Regeneration with resorbable membrane and heterologous bone

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

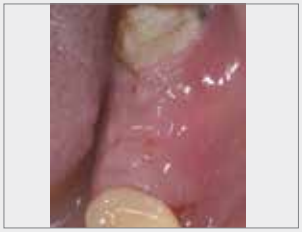
Two lines of sutures are executed, the first with horizontal external mattresses, later stabilized with a second line of separate points more coronal to the first **(Fig. 14)**.

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)**.

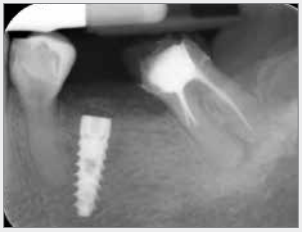
15 Suture follow-up at 15 days

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



16 Suture removal at 15 days

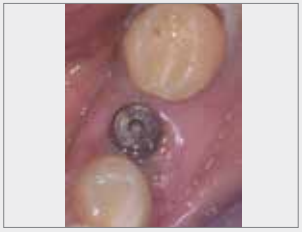
The successful osseointegration of the implant is visible on the 4 month follow-up X–ray and all tissues appear to be well healed **(Fig. 17,18)**



17 Rx after 4 months

18 Tissue healing after 4 months

A healing abutment was then inserted **(Fig. 19)**.



19 Healing abutment

The case will be finalized and updated in the next few months with the delivery of the final prosthetics to the patient.

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CLINICAL BOOK

Alpha-Bio Tec's products are CE-marked in accordance with the Council Directive 93/42/EEC and Amendment 2007/47/ EC. Alpha-Bio Tec. complies with ISO 13485: 2012 and the Canadian Medical Devices Conformity Assessment System (CMDCAS). Product availability may vary between countries.

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