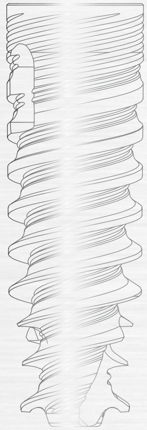
multiNEO™
CLINICAL BOOK



2016 First Edition

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To:

With Regards,

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MultiNeO™'s Performance – Treatment Concepts and Indications:

Scientific Overview

Scientific Background

Dr. Gadi Schneider

DMD, Specialist in Periodontology

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 Dr. Schneider was in charge of the medical and clinical development of various implants. Dr. Schneider is a leading international lecturer in the field of complicated implant surgical procedures, and has published more than 50 clinical studies, cases and articles. Dr. Schneider manages a private practice that specializes in Periodontics and Implantology.

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 sophisticated designs, 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 MultiNeO™ 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 to 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 MultiNeO™ 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 MultiNeO™ implant does not have a uniform external shape throughout; rather, each section has the shape most suited for its function. The MultiNeO™ profile varies along the implant length to result in an enhanced ability to condense the bone during insertion without exerting excessive forces.

The MultiNeO™ implant is comprised of three distinct sections:

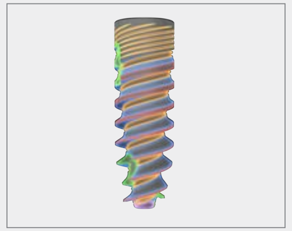
1. **Straight coronal section -** to gain high primary stability.
2. **Implant body with a slight taper–** for optimal bone condensing and smooth insertion for all bone types.
3. **Taper apical section with deep threads** For optimal primary stability, high cutting efficiency, and the ability to penetrate 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 MultiNeO™ 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 (0.1-0.3mm) in the MultiNeO™ implant combine high primary retention with optimum load distribution in the bone. The depth of the apical threads (0.65mm) 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]

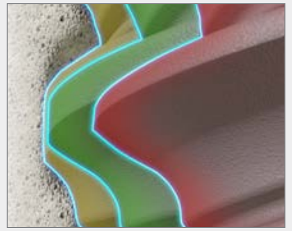
Thread Shape: This section describes the geometry of the threads in each portion of the implant. In the MultiNeO™ implant, the **coronal section** has fine, square threads, which provide excellent load distribution and stability. Their location in the top section of the implant reduces crestal resorption,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

The **body** of the MultiNeO™ 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 MultiNeO™ - an implant inserted quickly and easily, reaches high primary stability and demonstrates increased bone-implant contact along with improved stress distribution.

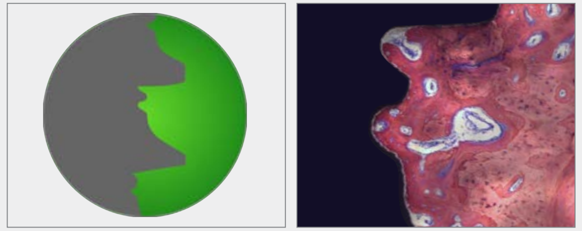
Other FEA studies also suggested the superiority of the square thread since it had the least stress concentration when compared with other thread shapes (Chun et al. 2002) [2]

- 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 MultiNeO™ thread, resulted in the combination of several features into one implant:

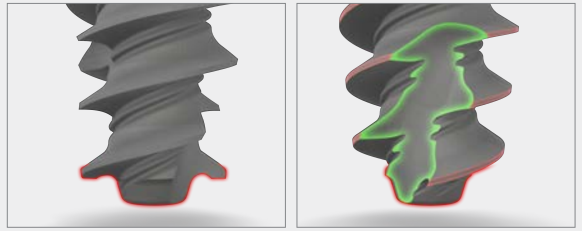
- A 35° attack angle, which varies along the implant thread slope, results in smooth and non-traumatic insertion through all bone types. This unique attack angle balances the dual requirements of delicate penetration into the bone with the subsequent retention of the implant.
- Two internal micro-threads 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

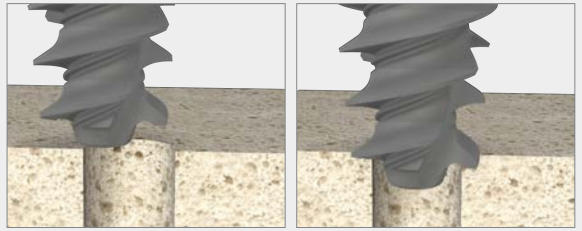
The apical section of the MultiNeO™ implant is relatively narrow (2.9mm) which enhances its ability to easily penetrate into very narrow osteotomies. This narrow apex is suitable for clinicians who prefer small diameter drills. Since the apical section threads are sharp and deep, they provide good initial 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]



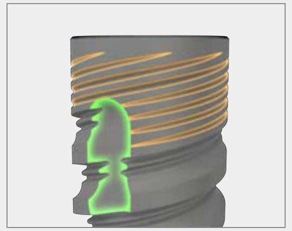
Centering Feature (patent pending)

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 MultiNeOTM, 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 MultiNeOTM:

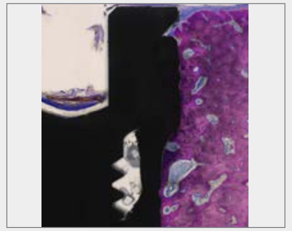
- **Micro-threads** combined with a rough surface all the way to the top of the implant result in an increased surface area, improved load distribution and a significant reduction of crestal bone resorption. The presence of the microthreads contributes to the stability of the crestal bone, leading to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



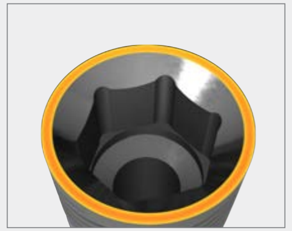
Coronal flute area histology

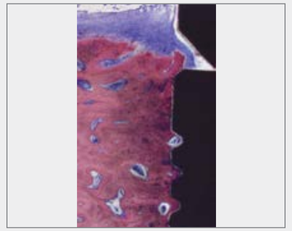
A straight coronal section leaves greater bone volume around the crestal portion of the implant, reducing the pressure in the cortical area without impairing the initial high primary stability of the implant.

- **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 0.25mm, 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]



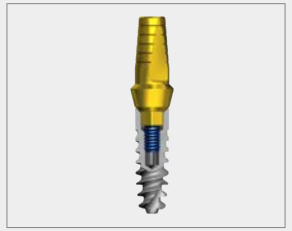


MultiNeOTM Platform

The implant-abutment connection plays a significant role in long-term implant and marginal bone stability. The MultiNeOTM 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 & 5.0mm 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 in the long run. [9] A tight fit requires accurate manufacturing capabilities.

The MultiNeOTM 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 MultiNeOTM 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 MultiNeO™ 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 MultiNeO™ implant developers didn't compromise on. Each MultiNeO™ implant platform was separately designed to achieve maximum stress reduction and to prevent platform deformation, flowering or breakage.

Fatigue tests showed that all MultiNeO™ 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 MultiNeO™ implants, the MultiNeO™ narrow implants were designed to have a CHC connection with a significant switch (0.35mm 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 MultiNeO™ 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 MultiNeO™ implant fulfill the core objectives;

Primary Stability Enhancers:

- The straight design of the coronal section of MultiNeO™ 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 MultiNeO™ 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.

The pre-clinical study has shown outstanding bone to implant contact. The clinical studies have shown the advantages of using the MultiNeO™ 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 MultiNeO™ implants in Mini Pigs

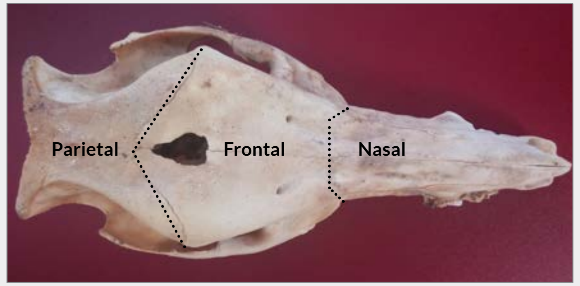
Introduction

The MultiNeO™ 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 and market needs. This enabled the creation of an innovative implant which combines improved mechanical durability and high biological integration. Each aspect of the MultiNeO™ 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 preclinical in-vivo study using MultiNeO™ 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 common 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)**. 13 female Sinclair mini-pigs 7.5 months of age and 48-53kg in weight was selected and 26 MultiNeO™ 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.



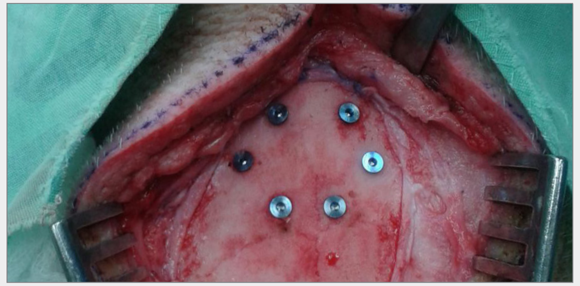
1 Mini pig scull sections

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 MultiNeO™ drilling sequence:

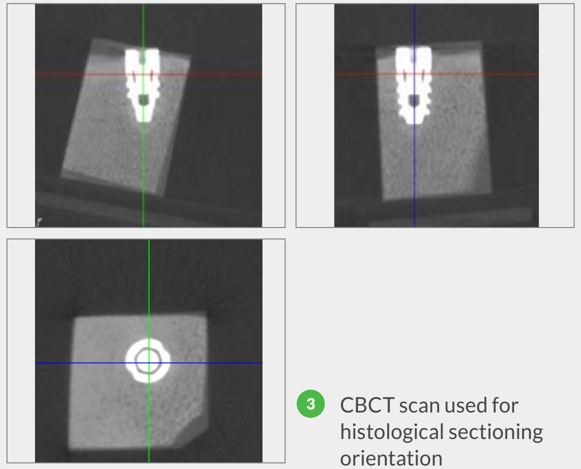
Ø 1.2mm marking ➔ Ø 2.0mm drill ➔ Ø 2.8mm drill ➔ Ø 3.2mm drill (cortical release only)

26 MultiNeO™ 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)**.



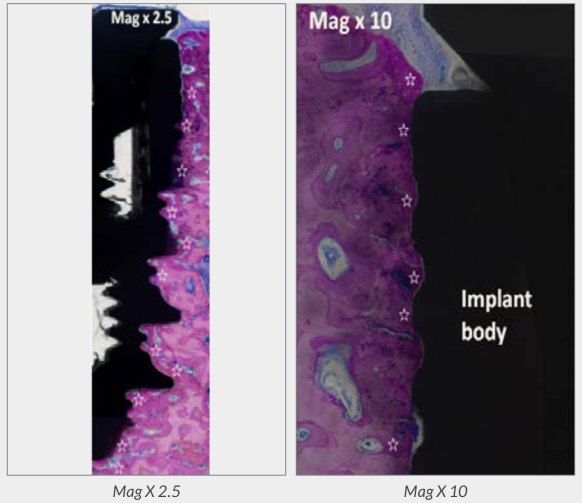
2 Implantation site showing 6 MultiNeO™ implants with cover screws

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)**.



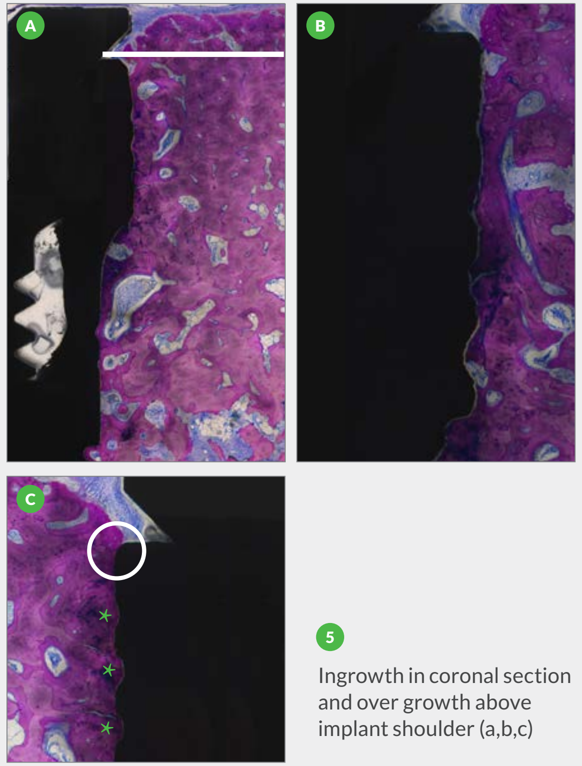
3 CBCT scan used for histological sectioning orientation

Results: The animals were separated into 2 healing time groups (1 month and 3 months). Both groups healed uneventfully 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)**.

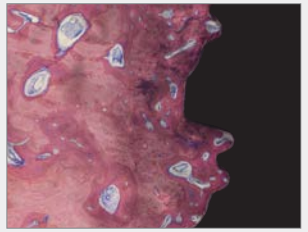


4 Low & high magnification MultiNeO™ histological pictures

Special attention was taken in evaluating all sections of the implant: coronal, body and apical sections, 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.



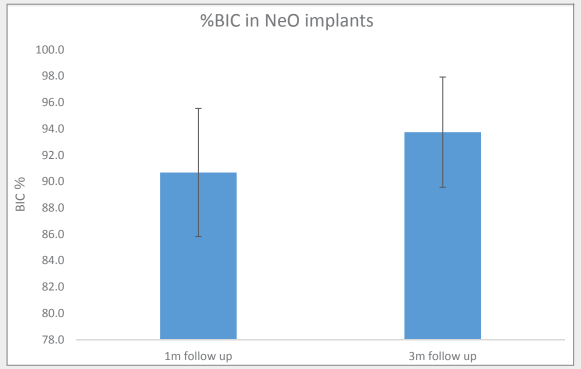
5 Ingrowth in coronal section and over growth above implant shoulder (a,b,c)



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 90.7% after 1m healing and 93.7% after 3m healing. The maximum BIC% value after 3m healing was 99.4% **(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 3 months 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 MultiNeO™ implant profile and due to its exceptionally 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 MultiNeO™ 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's Standard Operating Procedures (SOPs). The following report, which is an example of such an examination, describes Alpha-Bio Tec's MultiNeO™ 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 (2.5×10^{-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).

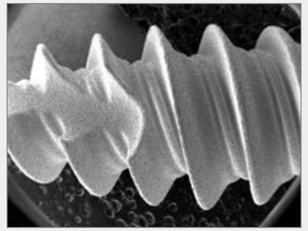
Report Goal

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

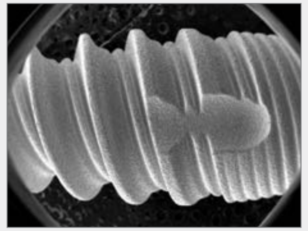
Results

(a) §§SEM Examinations

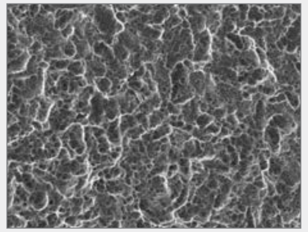
Implant overview and surface morphology images were observed by SEM with §§SE field in different magnifications **(Figs. 1-6)**.



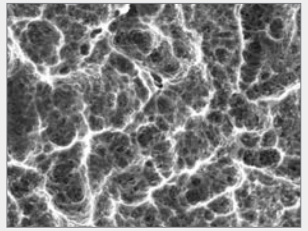
1 Implant overview as observed by SEM (apical and middle threads)



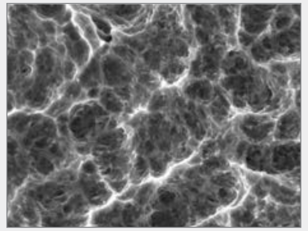
2 Implant overview as observed by SEM (middle and coronal threads)



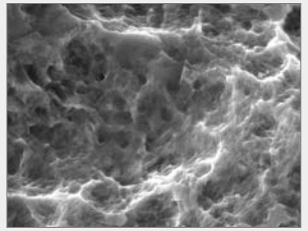
3 Surface morphology of the implant (x1000 magnification)



4 Surface morphology of the implant (x3000 magnification)



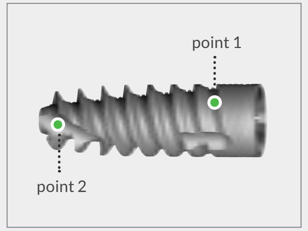
5 Surface morphology of the implant (x5000 magnification)



6 Surface morphology of the implant (x12000 magnification)

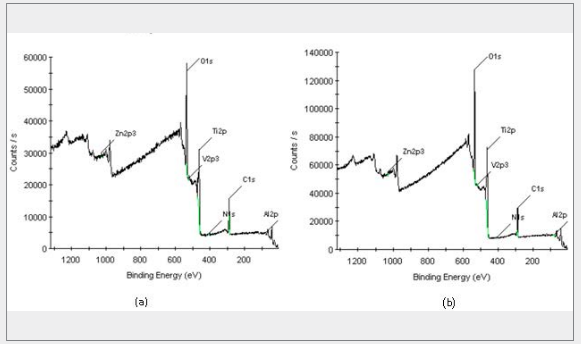
ⓑ §§ SEM Examinations

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 MultiNeO™ 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.

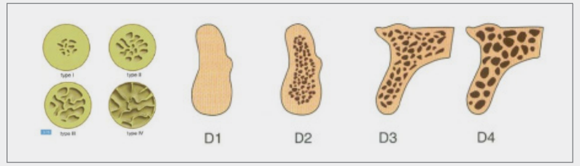
Bone Classification and Implant Osteotomy

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 Alpha-Bio Tec's implants offer 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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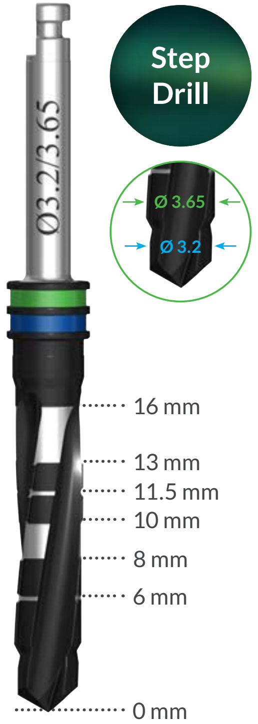
MULTINEO™ Drill Protocol

Step Drilling Sequence

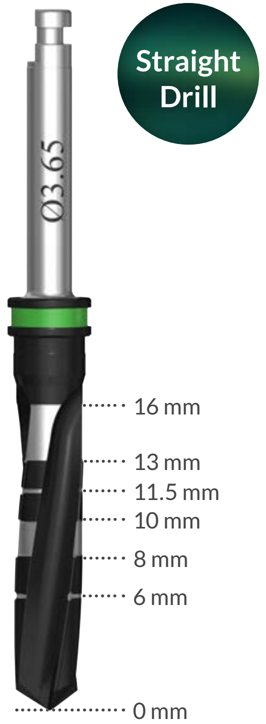
Ø Implant	Soft bone Type IV	Medium bone Type II&III	Hard bone Type I
Ø 3.2	2.0	2.0 2.4/2.8	2.0 2.4/2.8 2.8/3.0
Ø 3.5	2.0 2.0/2.4	2.0 2.4/2.8 2.8/3.0	2.0 2.4/2.8 2.8/3.2
Ø 3.75	2.0 2.4/2.8	2.0 2.4/2.8 2.8/3.2	2.0 2.4/2.8 2.8/3.2 3.2/3.65 Cortical
Ø 4.2	2.0 2.4/2.8 2.8/3.2	2.0 2.4/2.8 3.2/3.65	2.0 2.4/2.8 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

MultiNeO™'s Performance –
Treatment Concepts and Indications

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

Dr. Gadi Schneider
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Senior Medical and R&D Consultant, Alpha-Bio Tec

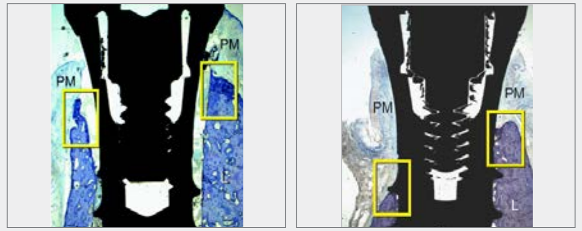
Senior Medical and R&D Consultant, Alpha-Bio Tec Dr. Gadi Schneider received his DMD from the Hebrew University, Hadassah School of Dental Medicine, Jerusalem, 2000. He completed his post-graduate studies in Periodontology at the Hebrew University and has been a specialist in Periodontology since 2004.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

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

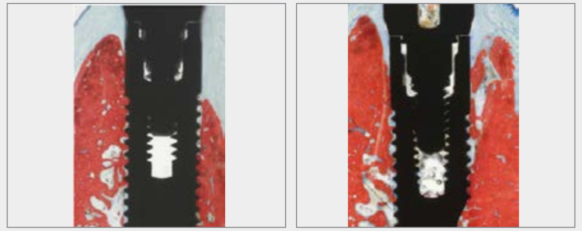
- Coronal-apical position: Clinically, implants are often inserted at crestal bone level. However, implants may be inserted subcrestally in esthetic areas to minimize risk of future implant collar exposure and to allow sufficient space in the vertical dimension to develop an adequate emergence profile. 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

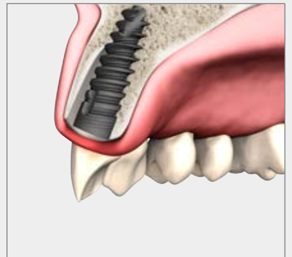
The predictable way to avoid this problem is to use a very fine drill and mark the perfect position at the midpalatal wall of the socket **(Fig.4)**.

4 Marking drill in mid-palatal wall of the socket

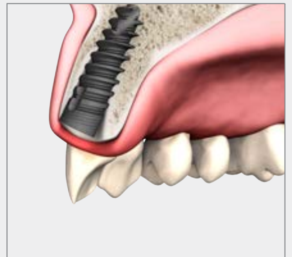
The key factor is to create a large enough hole that will prevent the pilot drill from slipping to the bottom of the socket **(Fig. 5)**.

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



- Too buccaly
- Buccal inclination
- Bone level

6 Correct implant position

7 Incorrect implant position

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

8 Maintained bone level

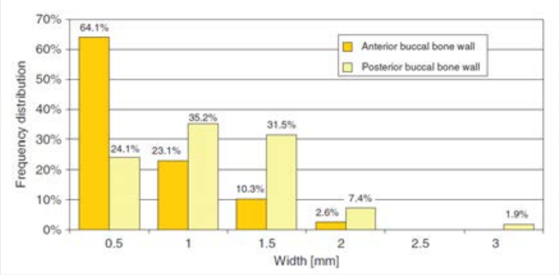
9 Buccal bone resorption

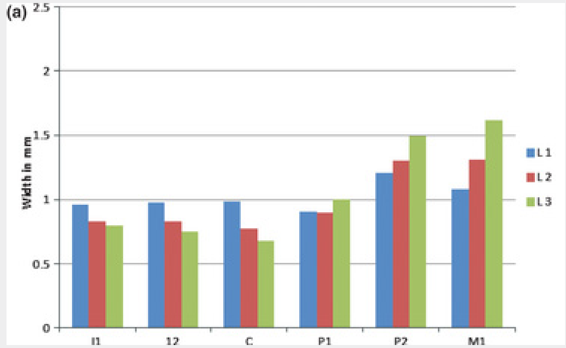
How to Prevent Buccal Bone Loss at Immediate Implantation

- **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 ± 1.10mm was adequate to maintain the height of the facial alveolar bony wall following implant installation into healed sites. A width of at least 2mm was recommended in immediate placement of an implant [9]. A minimal requirement of >2mm 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 ≤1mm, 97.4% <2mm and only 2.6% of the walls were 2mm 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 (≥1mm), especially at the pre maxilla area after 1 year.

- **Socket preservation**

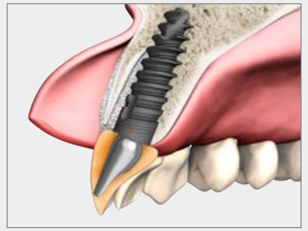
  Ridge preservation with an intra socket osseous graft and a membrane should preserve original ridge dimensions and contours. The ridge preservation procedure has been tested in various studies with membrane alone or membrane plus graft, showing reduced ridge alteration compared to extraction alone. Nevins 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)**.

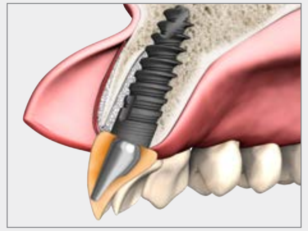
10 Buccal bone volume preserved compared to 1-2 mm buccal bone resorption

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



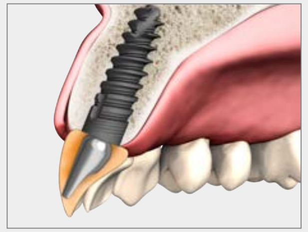
STEP ①

Adding Alpha-Bio Tec's bovine bone in the gap between the implant and the buccal bone and outside over the buccal plate



STEP ②

Adding Alpha-Bio Tec's 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 1mm 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±0.4mm) compared to narrower implants (1.5±0.6mm). 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 MultiNeO™ 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 0.3mm
- Microthreads 1.5mm 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 include 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

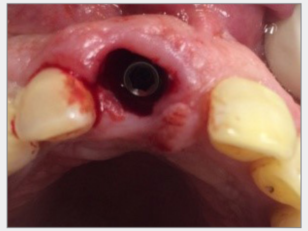
Extraction – as gentle as possible, the buccal wall is generally very thin ≤ 2mm especially in the premaxillae area, therefore, it is very important to extract very gently and maintain the buccal wall complete. **(Figs 11)**

11

The buccal wall preserved. Drilling – 800 Rpm, external irrigation, in mid palatal wall of the socket, using 2mm drill following a 2.8mm drill. Parallelism should be checked at least from 2 points – buccal view and birds view. **(Fig. 12)**

12

Placing of the MultiNeO™ implant by using the outstanding centering feature, at 45Ncm torque. Implant position – palatal position- at least 2mm buccal bone, at least 1mm deeper than crest level, in 5° palatal angulations and at least 1.5mm between implant and teeth. **(Fig. 13)**



13

Placing abutments – it is very important to position the prosthetic pats correctly. Due to the thin buccal plate (< 2mm)- socket preservation technique was performed filling with bovine bone Alpha-Bio's GRAFT) in the socket of 11-21 for the purpose of ridge preservation. **(Fig. 14)**

14

Natural Bovine Bone in the socket

Temporary rehabilitation using the patient extracted tooth [11] **(Fig. 15)**

15

Post-op.

4-week follow-up **(Fig.16)**


16

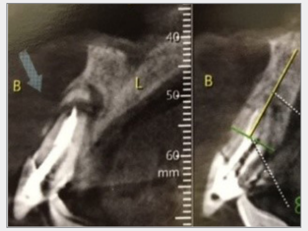
6 months follow-up. **(Figs. 17-18)**


17


18

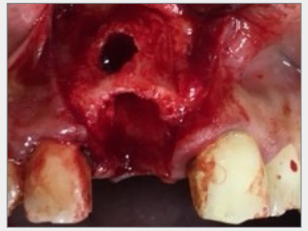
Case II

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. 19-22).


19 Pre-op. CT shows root fracture


20 Pre-op. - birds view

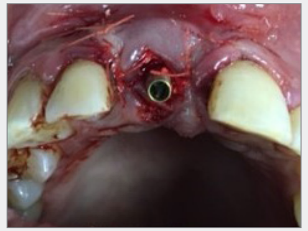

21 Pre-op.


22 Tooth extraction and debridement

After drilling with the first 2mm 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. 23-26)**


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


24 Sutures vicryl 5-0


25 Immediate loading


26 Post-op. X-ray

Bone defects and gaps between implants and bone were filled with Alpha-Bio's GRAFT bovine bone. The graft was covered with bond appetite.

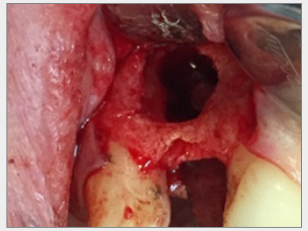
!

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. 27-31)


27 Extraction of tooth 12

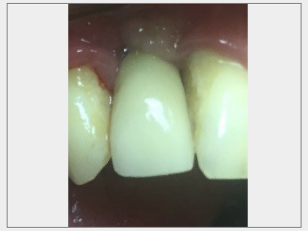

28 Debritment of bone defect


29 Bovine bone augmentation

30 Placing gortex non resorpable membrane

31 Post-op. panoramic X-ray

6 months follow-up. **(Figs. 32-33)**



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

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Dr. Stuardo Valenzuela Manfredi received his DMD from Universidad Mayor, Santiago, Chile (2005). In 2011, he completed his specialty in Oromaxillofacial Implantology at the Universidad de Chile (cum laude), and since 2012 he has been a member of the Oral Implantology Society, Chile. In 2015, Dr. Valenzuela received a Diploma in Digital Dentistry, Universidad de los Andes, Chile. He is the Clinical Director of the Alpha-Bio Tec. Chile Training Center, in which he is the leader speaker for introductory courses in surgery and prosthetics. Dr. Valenzuela manages VM Dental Studio, a private practice in Santiago, Chile, dedicated to implantology and aesthetic dentistry. During his career, Dr. Valenzuela has participated in numerous rehabilitation and implant surgery courses and is a frequent guest speaker at industry seminars and conferences worldwide.

Dr. Jorge Aravena Diaz received his DMD from the University of Chile, Santiago, Chile (2008). In 2012, Dr. Aravena completed his post-graduate studies in Oral Rehabilitation at the University of Chile (summa cum laude), and is a member of the Prosthodontics and Oral Rehabilitation Society, Chile. Dr. Aravena was a member of the Prosthodontics Department, University of Chile, Santiago, Chile from 2008-2013 and is currently a member of the Oral Rehabilitation Department, Diego Portales University, Santiago, Chile.

Placement of Alpha-Bio Tec's Narrow MultiNeO™ 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 MultiNeO™ implant.

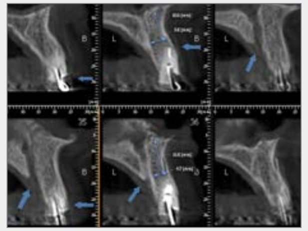
Case Overview

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 11.5mm MultiNeO™ implants **(Fig 2)**.



2 CBCT examination

Materials Used

- Two Ø3.5 x 11.5mm MultiNeO™ 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 MultiNeO™ 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 MultiNeO™ 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

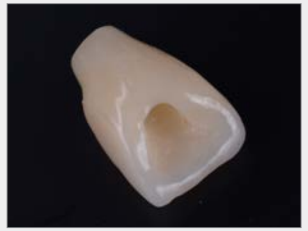
12 View 7 days after surgery

13 View 5 weeks after surgery

Prosthetics

(Figs. 14-21)

14 Alpha-Bio Tec Ti-base abutment sandblasted with 50 µm aluminium oxide (pre adhesive cementation).



15 E.max press Crown. The cutback technique was used, the third incisal and buccal surface were loaded with IPS e.max ceram.

16 The hybrid e.max crown has perfect fit with the Ti-Base Abutment.

17 Indirect method: teeth 11-21 completed restorations, just after the cementation of the ceramic structures to the Ti-Base abutments with adhesive procedure using Ivoclar Vivadent Multilink N resin Cement.

18 Palatal view of the emergency of the screws, giving retroviability to the implant restorations, one of the most important characteristic that screw-retained restorations give to the clinicians.

19 The maxila just before the installation of the final restoration, the adaptation is absolutely passive to the implant prosthetic platforms with the Ti-Base abutments.

20 Buccal gingival contour maintenance after 10 months of the implants placement on fresh sockets in 11 and 21.

21 45 days follow up visit, perfect integration of the restorations with the soft tissues and compatible teeth bio-mimetics.

Conclusion

This clinical case has described the usage of the MultiNeO™ implants in immediate implantation and loading procedure in the aesthetic zone. The unique design of the MultiNeO™ implant contributed to the high primary stability achievement and provision of esthetically effective result.

Immediate Implantation Using Alpha-Bio Tec's MultiNeO™ Implant

Dr. Albert Franck Zerah
DMD, France

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 MultiNeO™ 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.

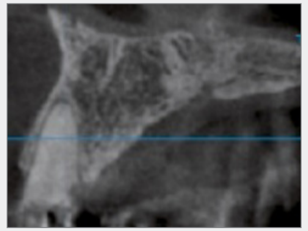
Background

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

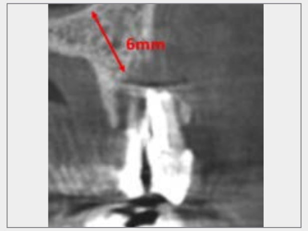
The extraction must be done in a completely non-traumatic way, preserving the residual alveolar ridges as much as possible. (A surgical bur can be used to cut the remaining root, and the root can be extracted in several pieces without prying open the residual bone, thereby preserving its integrity). 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 3mm of "implantable" bone beyond the alveolus must be confirmed in order to achieve primary stability in the implanted bone. **(Fig. 3)**

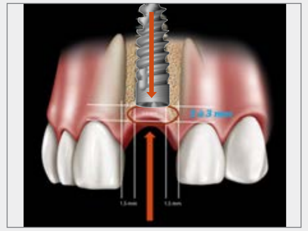


3 Measurement of residual bone beneath the alveolus

Moreover, to avoid resorption of the wall around the proposed implant, it is essential that the remaining wall has a thickness of at least 1mm. 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).

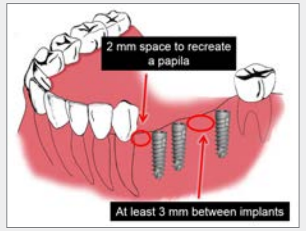
The analysis of the residual bone volume must also follow two basic rules:

a) The implant abutment must never be situated more than 3mm 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 no more than 1.5 and 2mm from an adjacent tooth (basic rule for regrowth of the interdental papillae), and the distance between two implants must be between 2.5 and 3mm. **(Fig. 5)**



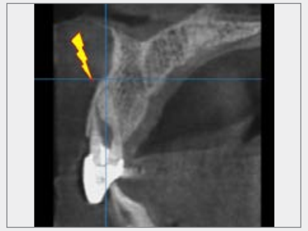
5 Distance between two implants and the adjacent tooth

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

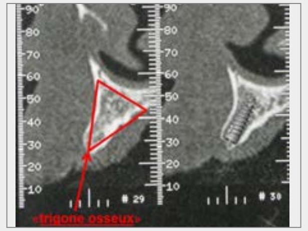
Basic protocols also govern immediate implantation in the aesthetic area. These protocols are implemented for implants in anterior quadrants, whether upper or lower. The greatest challenge is, of course, management of the antero-superior area. Here, the orientation and thinness of the cortical tissue, 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)**



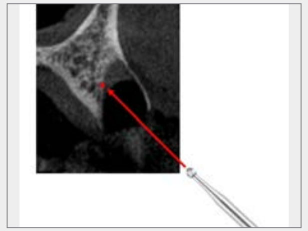
6 Alveolar axis

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



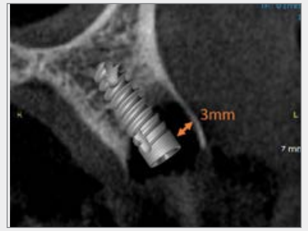
6 Triangle of bone

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)**



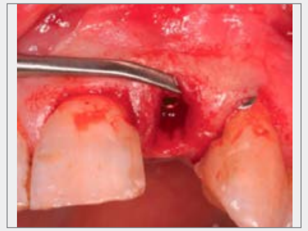
8 Positioning of the marking ball bur

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 1mm. **(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

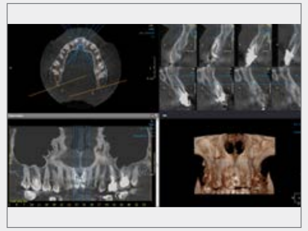
The three clinical cases presented here are characteristic of three different indications: with or without bone filling, with or without a membrane, with temporary fixed denture prosthesis, removable denture prosthesis, or without transitional prosthesis.

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

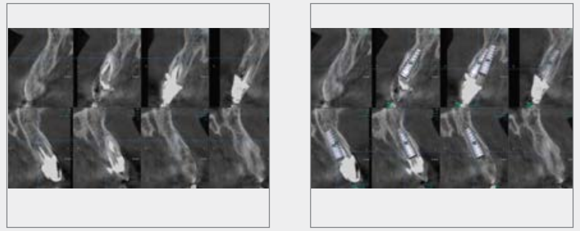
As this patient felt pain every time she closed her mouth, an immediate implantation at the two sites was decided upon after analysis of the surrounding bone and mucous tissue. A radiological assessment was done using panoramic and cone-beam imaging. **(Fig. 12, 13)**

12 Panoramic radiography



13 Cone-beam radiography

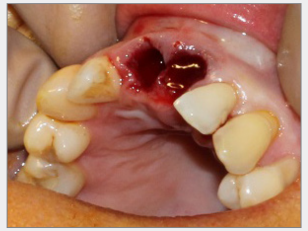
A pre-implant simulation was done to visualize the positioning of the planned implants. **(Fig. 14)**



14 Implant simulation

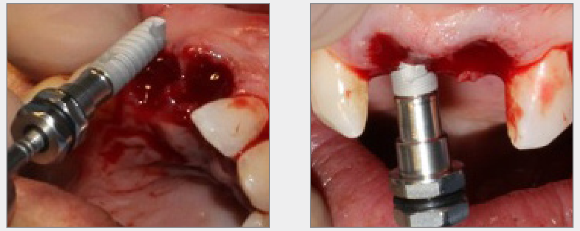
This case was a particular challenge due to the patient's Class 3 malocclusion. Where the incisors were to be repositioned in the normal line of occlusion, it would be physically impossible for the patient to close her mouth (lack of inter-occlusal space).

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. Therefore, the extractions were done in a non-traumatic manner by severing the roots, as stated above, in order to preserve the vestibular cortices. **(Fig. 15)**



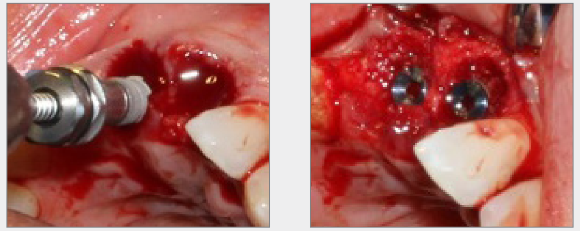
15 Extractions

After having marked the bone at the midpoint of the alveolus, and after preparing the implant shafts, two Ø4.2 X 13mm MultiNeO™ implants were placed. **(Fig. 16)**



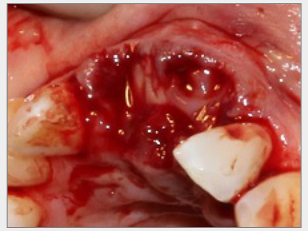
16 Placement of MultiNeO™ implants

As the space between the implants and the margin of the alveoli were greater than 1mm, 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)**

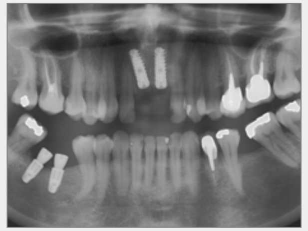


18 Protection of the site using PRF

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.

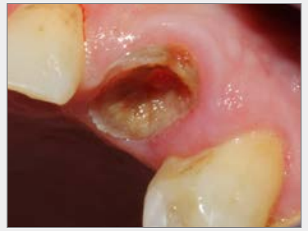
19 Sutures

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

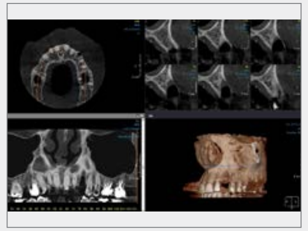
Case II: Male patient, age 55, presented with a canine tooth of which only the root portion remained. The patient had lost the crown of this tooth a long time ago, and it was confirmed by x-ray that this root was completely unrecoverable as the decay was too extensive. **(Fig. 21)**



21 Initial state

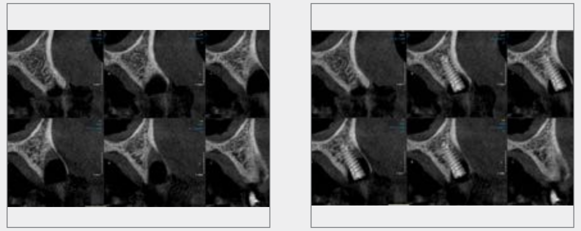
A radiological assessment was carried out using panoramic and cone-beam imaging, which also showed agenesis of the 2nd maxillary right premolar. **(Fig. 22, 23)**

22 Panoramic radiography



23 Cone-beam radiography

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



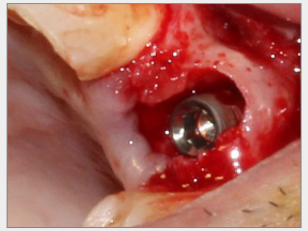
24 Implant simulation

Temporary fixed or removable prostheses were 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.

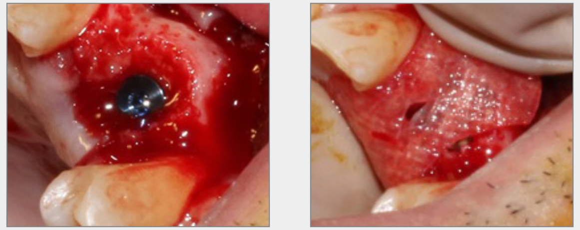
25 Site post-extraction

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 Ø4.2 X 13mm MultiNeO™ 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 MultiNeO™ 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

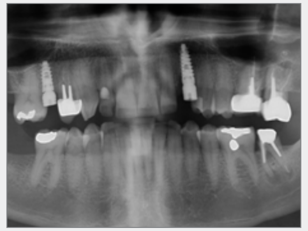
Normally, this membrane is stabilized using tacks, but in this case, because the patient did not wish to have a temporary prosthesis, the membrane was fixed with a healing abutment. To accomplish this, a hole was made in the membrane and the abutment and the membrane were put in place at the same time.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

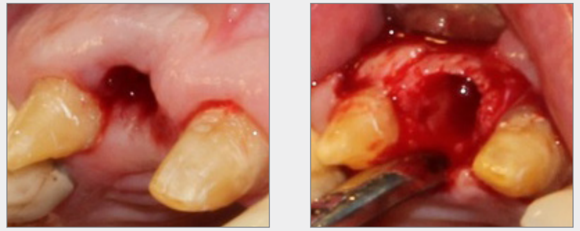
Panoramic imaging was done on this patient in the emergency room, who presented with a crown fracture of the central upper right incisor, a fracture of the enamel of the central upper left incisor, and extreme mobility of the implant located in the second upper right premolar. **(Fig. 32)**

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)**

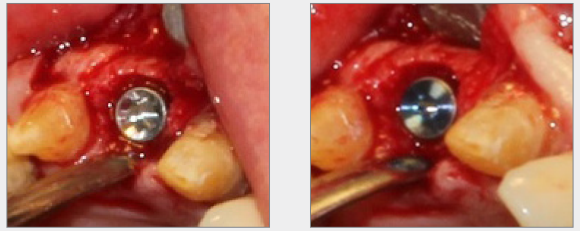
33 Temporary bridge from teeth 12 to 21

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 MultiNeO™ implant was placed as close to the palate as possible. **(Fig. 35)**



35 Placement of the MultiNeO™ 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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MultiNeO™ Implant Placement in the Esthetic Sector and Immediate Loading of a Temporary Prosthesis

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Opinion leader in Spain for Alpha-Bio Tec.

MultiNeO™ Implant Placement in the Esthetic Sector and Immediate Loading of a Temporary Prosthesis

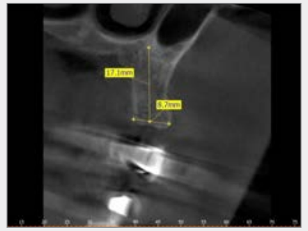
Abstract

A 58 year old male patient came for consultation presenting a metal ceramic bridge placed 20 years ago. The bridge was bonded to only two teeth, 21 and 23. It was decided to extract teeth 21 and 23 and place three MultiNeO™ implants in positions 21, 24 and 25. After placement of the implants, impressions were taken to make a temporary screwed restoration in PMMA resin using CAD/CAM technology. When the implants were properly osseointegrated, an implant-supported ceramic restoration was implemented.

Background

A 58-year-old male patient came to the clinic with a mobility problem of an old metal ceramic bridge in pieces 21 to 25. After a clinical examination, it was observed that pieces 21 and 23 cannot be restored by any means **(Figs. 1-3)**


1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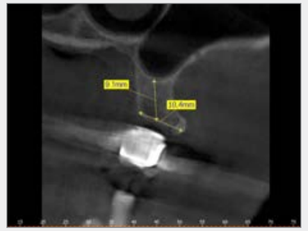
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X-ray Examination

The pertinent radiological study was initially conducted via panoramic radiography and in CBCT thereafter (photo 01, CBCT1, CBCT2 and CBCT2). In the radiological study, it was observed that the bone dimensions for the placement of implants in positions 21, 24 and 25 are optimal in both width and height, even for implementing a temporary implant-supported restoration that will be loaded immediately after 48 hours.

Materials Used

- 2 MultiNeO™ implants ø3.75 x 13 mm (Alpha-Bio Tec)
- 1 MultiNeO™ implant ø3.75 x 11.5 mm (Alph-Bio Tec)
- For bone drilling, the new two step drills were used following the protocol indicated by Alpha-Bio Tec for the
- ø3.75 MultiNeO™ implants.
- 3 TLAC-R 5220 temporary abutments
- 3 HLTO 5061 impression transfers
- 3 analogs IA 5080

Treatment Plan

- Immediate implants and immediate loading
- Extraction of the tooth-supported bridge at 21 to 25 was performed and pieces 21 and 23 were extracted.
- Implants were placed in positions 21, 25 and 25.
- After 48 hours, the temporary implant-supported bridge was installed.

Surgical Phase

1. The patient's metal ceramic bridge was initially extracted **(Fig.4)**


4

2. Extraction of pieces 21 and 23 was carried out, and the alveoli were thoroughly cleaned **(Fig.5)**


5

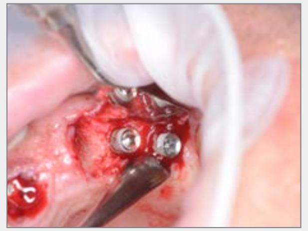
3. The implant site was prepared in position 21 using the flapless technique. Once drilling was completed, the alveolus was completely filled with a putty-type collagen bone paste and then the MultiNeO™ implant was placed at a torque of 45 Ncm **(Fig. 6)**


6

4. The osstell value was measured, obtaining an ISQ value of 77, perfect for proceeding with immediate loading **(Fig.7)**


7

5. The flap was performed in the posterior area for placement of implants in positions 24 and 25, and low speed drilling technique was used at this time to increase the insertion torque of the implants due to low bone density in this area **(Figs.8-9)**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Prosthodontics

6. Placement of healing caps on the three implants.

7. Filling of the alveolus of piece 23 with putty-type collagen bone paste and suture of the flap.

8. An impression was taken using an open tray transfer and new placement of healing screws.

9. After 48 hours, we received the temporary bridge to be installed in the mouth **(Figs. 1-14)**


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10. State of the soft tissue after 48 hours **(Fig. 15)**


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11. State of the soft tissue without healing caps **(Figs. 16-17)**


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12. Installation of the temporary bridge made in PMMA resin using CAD/CAM and screwed at torque 30Ncm **(Figs. 18-20)**


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13. Final control x-ray **(Fig. 21)**


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14. After 3 months, an impression was taken and an esthetic test was conducted for the definitive prosthesis design **(Figs. 22-26)**


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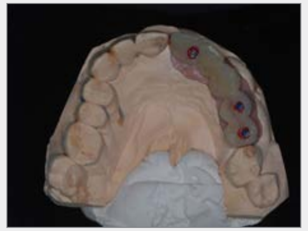
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15. With a successful test, the definitive prosthesis was sent to be made in metal ceramic and screwed on overcastable rotary attachments in chrome cobalt.

16. Definitive metal ceramic prosthesis **(Figs. 27-32)**


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17. Removal of temporary prosthesis to install the definitive prosthesis **(Figs. 33-35)**


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18. Installation of the definitive metal ceramic prosthesis perfectly adapted to the emergency profiles generated with the temporary prosthesis **(Figs 36 - 39)**.

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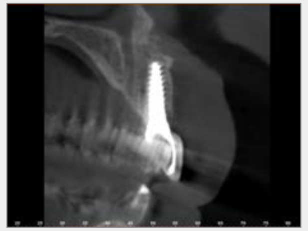
18. Control x-ray using CBCT of the already installed definitive prosthesis to verify connection adjustments and bone status four months after implant placement. **(Fig. 40)** (implant in position 21), **(Fig. 41)** (implant in position 24), **(Fig. 42)** (implant in position 25), **(Fig. 43)** (view of implants 24 and 25 jointly in relation to anatomical structures such as the maxillary sinus)



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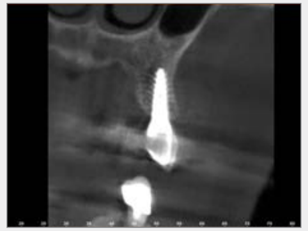

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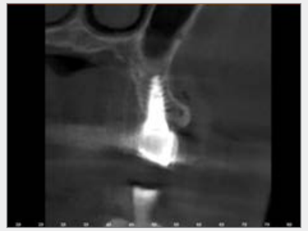

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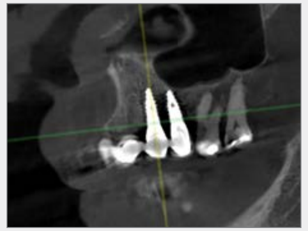

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Summary

The case was resolved using Alpha-Bio Tec MultiNeO™ implants, postextraction in combination with deferred implants and immediate loading of the prostheses after 48 hours. High insertion torque was necessary for the immediate placement of the prosthesis. In addition, there has been a good bone stability throughout the treatment, without any type of bone resorption of the alveolar crest. The results were satisfactory.

Alpha-Bio Tec MultiNeO™ implants were chosen instead of other types of implants due to their macro-design, which is ideal for immediate implantation, achieving high levels of insertion torque necessary for making an immediate prosthesis at the time of installation.

Conclusion

The case would have been fully completed in a few months after the corresponding osseointegration period has transpired.

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

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

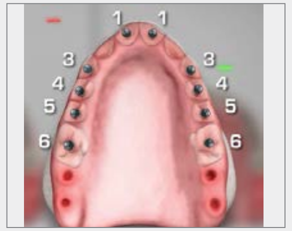
! Number of implants - 8-10 implants per jaw increases the retention of the restoration

- 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)**

1



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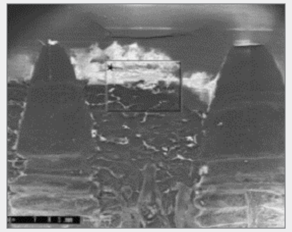
Recommended options for the distribution of the implants in the mandible:

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



3 3mm 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 13mm. In certain cases, some 8 mm implants can be used when combined 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]

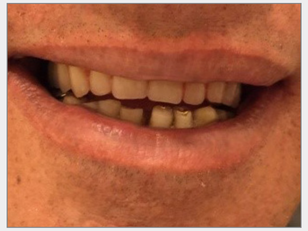
Clinical Advantages of the MultiNeOTM Implant System

- 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

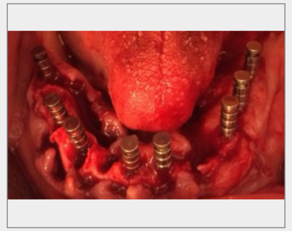
Initial periodontal treatment to improve the condition of the gingiva and reduce the bacterial load before surgery, which was scheduled for 3 weeks following initial preparation. No extractions were performed until the day of surgery. All teeth were scheduled to be extracted on the day of surgery with 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 MultiNeOTM 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 2mm 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)**

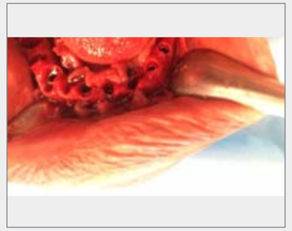
6 Buccal view



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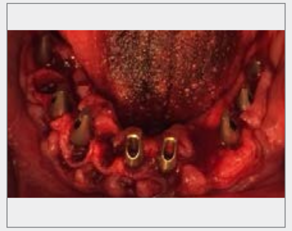
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Bone defects and gaps between implants and bone were filled with Alpha-Bio's GRAFT natural bovine bone. The graft was covered with calcium sulfatae which serves both as a membrane and as a space maintainer. **(Fig 10-11)**


10


11

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)**


12


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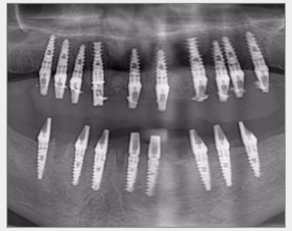
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Post-Operative Instructions

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.

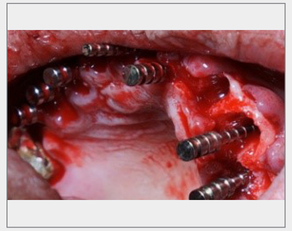
Treatment plan for the day of surgery:

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

Immediate implantation of 8 MultiNeO™ 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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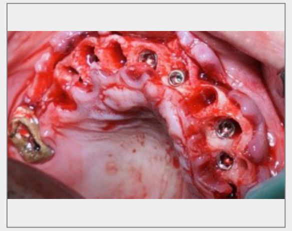
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17


18

Immediate implantation


19

Alpha-Bio's GRAFT natural bovine bone


20

Alpha-Bio's GRAFT collagen membrane


21

Post-operative 8 MultiNeO™ implants


22


23

Immediate loading and temporary rehabilitation

Case III: Maxilla and Mandible

Treatment plan as detailed above.

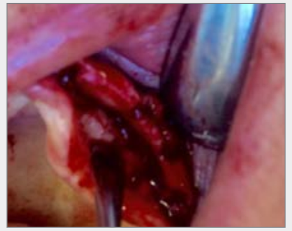
Maxilla - 10 MultiNeO™ implants:

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 MultiNeO™ 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 2-2.8mm through the cortical layer only in order not to cause cracks at the buccal bone. **(Figs. 24-29)**

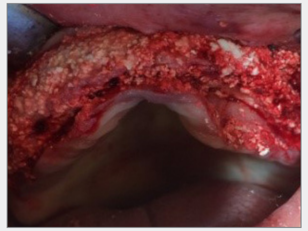



24 25

Upper arch implantation

26

Lower arch implantation



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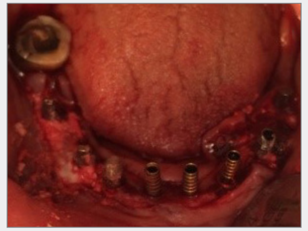
Alpha-Bio's GRAFT natural bovine bone in the upper arch

28

Alpha-Bio's GRAFT natural bovine bone + abutments

29

Immediate loading with temporary rehabilitation



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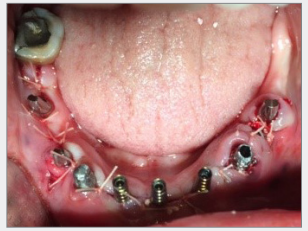
8 MultiNeO™ implants Ø3.5, Ø3.2, Ø3.75 were placed at >35Ncm



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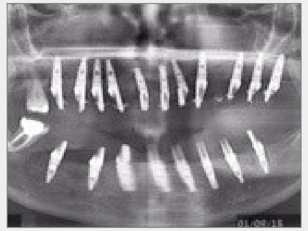
Suturing



32

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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Ridge Augmentation of a Seibert 3 Deficiency Using Sonic Welding and Simultaneous Placement of Alpha-Bio Tec's MultiNeO™ Implant

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Dr. Eyal Bijaoui completed his dental training at the University of Tel-Aviv in 2007. After spending a number of years in general practice, in 2011 he enrolled to a 4-years full time degree in Periodontology and dental implantology at the Unviersity of Tel-Aviv.

Ridge Augmentation of a Seibert 3 Deficiency Using Sonic Welding and Simultaneous placement of Alpha-Bio Tec's MultiNeO™ 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 a sensitive technique and its predictability is questionable. Since all other restorative possibilities were ruled out on the patient level, ridge augmentation using sonic welding together with MultiNeO™ implant placement was chosen.

1 Upon arrival - mobility grade 3 of tooth 23

2 6 months post extraction of area 23

Case Overview

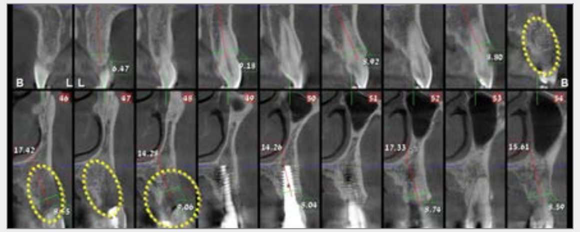
The patient is 31-year old male. He is generally healthy and reports being a transient smoker.

Extraoral Examination

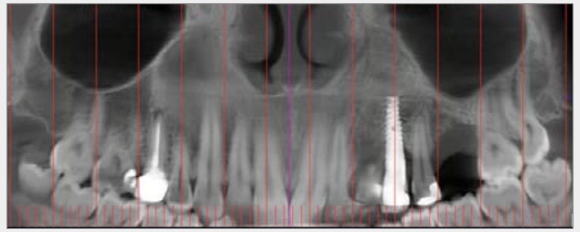
Mouth opening of 48mm, no abnormalities in TMN or mastication muscles, low smile line.

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 5mm 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



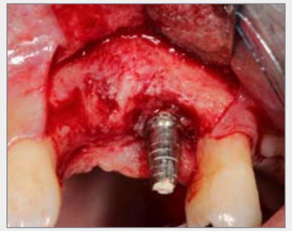
4 Preoperative panoramic X-ray

It was decided to use an Alpha-Bio Tec MultiNeO™ 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)**.

5



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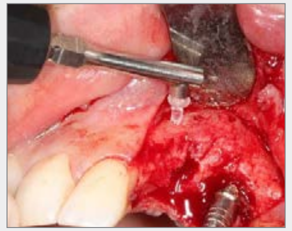
Flap elevation - crest exhibits satisfying width but only from approx. 6mm apically to the CEJ of tooth 22

7



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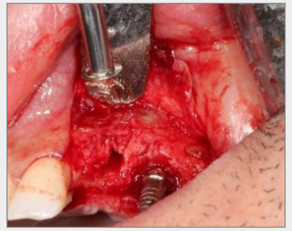

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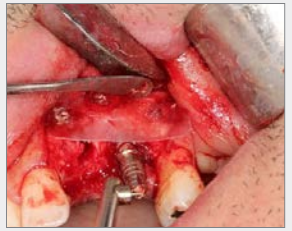
From left to right - preparation for the pins; placing the first pin out of 3



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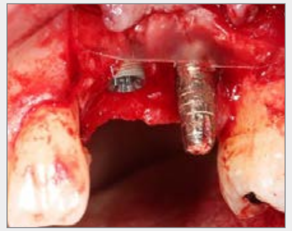

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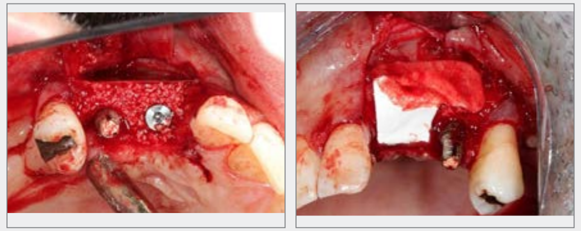
From left to right - resorbable PLGA membrane is placed and welded on to pins; Alpha-Bio Tec MultiNeO™ implant (Ø3.75 / L11.5 mm) is inserted and placed 4mm supra-crestally

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 was fixed, the Alpha-Bio Tec MultiNeO™ implant was placed supra-crestally in its preferred location (2-3mm apically to CEJ of the adjacent teeth). The space between the polymeric membrane and the 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.

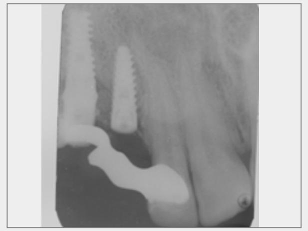


12 13

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

14 15

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



16 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.

Immediate Implants with Simultaneus Bone Regeneration

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Immediate Implants with Simultaneus Bone Regeneration

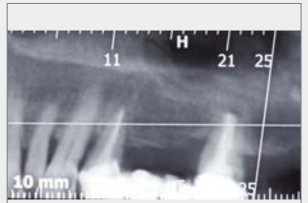
Introduction

The replacement of lost teeth through the use of osseointegrated implants is a well-documented practice. By using certain protocols, predictable and stable results can be obtained. Fifty years of modern implantology development have revolutionized the design, the surface and the prosthetic connections of the implants. Likewise, the gained knowledge about the alterations that the maxilla undergoes as a consequence of edentulism, have led to the possibility of preventing and reversing the atrophy of alveolar ridges, obtaining better functional and aesthetic results in its rehabilitation.

Clinical Case

A sixty-year-old woman consulted due to mobility in a bridge between teeth 24 to 27. Additionally, she reported that teeth 22 and 23 have migrated, generating a noticeable aesthetic defect **(fig. 1,2)**.

1 Pre-surgical clinical view



2 Panoramic view obtained from the CBCT

She has been treated for the past fifteen years for periodontal disease. The patient was a heavy smoker, but quitted the habit 6 years ago.

It was concluded that removing the teeth that support the bridge, as well as the lateral incisor and canine, is the best solution. Additionally, during the same surgical procedure, three implants were placed after the extraction, along with bovine bone filling for alveolar ridge preservation not only in the implant zone, but also where the future pontics will be. For the provisionalization, a transitory implant in the 25 position was installed, which allowed to later fix a provisory bridge anchoring it to this implant and adhering it to tooth 21. Other teeth were not included in the treatment due to the patient's request.

A surgery on study models was carried out, manufacturing the provisional restoration through CAD/CAM, where a veener was made to adhere to the central incisor, which is in a palatine version **(fig. 3)**.

3 Studying cast with provisonal bridge for the surgery

Materials Used

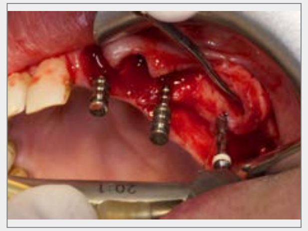
- 2 MultiNeO™ Ø 3.5 x 10mm implants
- 1 SPI Ø 3.75 x 10mm implant
- Arrow Ø 2.4 x 10mm implant (as transitory implant)
- Alpha-Bio's GRAFT natural bovine bone
- Alpha-Bio's GRAFT collagen membrane
- Straight titanium abutments-
  (ETLASP2-CHC + ETLASP3-CHC TLAC-R Non-Engaging)
- CAD/CAM bases
  CCTB-R 5025 + CCTB-CHC-R 5025

Surgical Description

The extraction was carried out in the least traumatic way using adequate techniques and instrumentation. It is of utmost importance to preserve the integrity of the vestibular plate, which is usually very thin **(fig 4)**.

4 Extractions and flap design

After the extractions, a flap was raised to access the alveolar ridge. The primary stability, and the prosthetically guided position and orientation were taken under consideration for the drilling **(fig 5)**.



5 Direction control for the implant drilling

It is essential to place the implant 3mm apical towards the beginning of the clinical crowns and towards the palatine, leaving 2mm of vestibular bone width. The correct three-dimensional position will allow the preservation and development of adequate peri-implant tissues, generating predictable aesthetic and functional results. Among the challenges of installing immediate implants, one difficulty lies in their trend towards vestibular orientation. Therefore, special care should be taken when drilling the bone, seeking to overcome the resistance towards the alveolar palatine wall. Likewise, when inserting the implant, special care should be taken that it should not deviate from the chosen orientation **(figs.6, 7)**.

6 Implant placement

7 Implants are placed in their final position with the motor

When a subcrestal implant placement is performed, it is recommended to use healing screws that exceed the level of the bone margin, facilitating the second surgical stage **(fig. 8)**.

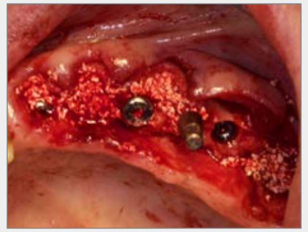
8 Observe the position of the implants in relation to the alveolus, using 3mm height healing caps, facilitating their uncoverage during the second stage of surgery

After the implants are in place, the implant bed for the transitional implant should be prepared, attempting to obtain enough primary anchoring so as to be able to fix the provisional restoration **(fig. 9)**.

9 Placement of the Arrow implant

The use of a transitory implant, lets us in some cases to provide a better provisional restoration during the treatment. In this particular case, avoiding the use of a removable denture, that can jeopardize the results. This implant combined with a natural tooth provide enough support for this interim bridge.

After the implants and their corresponding healing caps are placed, a xenograft is used to fill the extraction socket, and increase the bone profile to compensate for the loss generated by the dental extraction. The biomaterial should be covered with resorbable collagen membranes, and then proceed with the flap closure. In this particular case, the closure was complemented with a palate connective tissue graft, allowing the membranes to be covered and avoiding their exposure in the mouth **(figs 10, 11)**.



10 After connecting the healing caps, the regenerative material is put in place

11 Wound closure with connective tissue graft for the complete sealing of the membranes

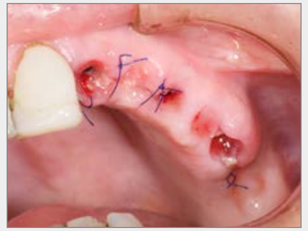
The provisional restoration was cemented to the transitional implant and to tooth 21, leaving it separated from the surgical wound **(fig 12)**.

12 Provisory bridge in the immediate post-operatory stage

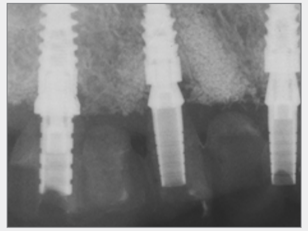
The stitches were removed ten days later, and the implants were left for three months to complete the osseointegration period **(fig 13)**.

13 Clinical image 3 months after surgery for the implant uncoverage

At the second surgical stage, the implants were uncovered, and the transitional implant was removed. The provisional restoration on the implants was fixed with straight titanium abutments, allowing the healing of soft tissues, and at the same time creating a correct emergency profile. The correct implant location allowed the dental surgeon to work with a screwed provisional restoration, which facilitated the addition of material in future appointments **(figs 14, 15, 16)**.



14 One week after the second stage of the surgery, the soft tissues modelling through the implant supported restauration begins to show visible changes



15 Radiographical view with provisional restauration, bone level is obtained through the implant placement and the bone regeneration becomes evident

16 Provisional restorations in place and the soft tissue profile can be seen

Prosthetic Procedures

The use of provisional restorations in aesthetically compromised sites is essential, allowing the possibility of generating harmonious profiles in both abutments and pontics, which will be reproduced in the impressions and in the final restoration.

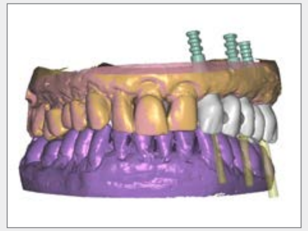
This procedure should be carried out at least two months after the implants are uncovered, ensuring tissue stability **(fig. 17)**.

17 Soft tissue evolution becomes evident, guided by the provisional restoration and it is ready for the definitive impression

At the moment that the impressions are taken, impression copings should be personalized and splinted, assuring the exactness of the working cast **(18).**

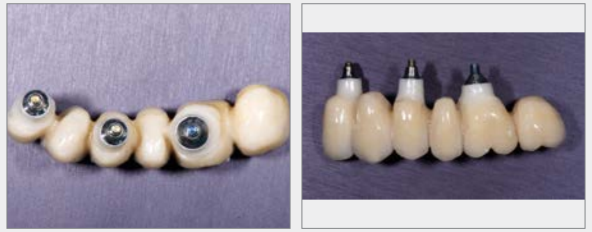
18 Definitive impression is taken with splinted impression copyings

The final restoration is made on porcelain with a zirconia framework obtained by CAD/CAM **(fig. 19)**, using bridge titanium bases.



19 CAD/CAM restoration planning

This type of restoration allows the easy reproduction of emergency profiles along with obtaining an optimal aesthetic result **(figs 20-21)**.



20 Final restoration is made on porcelain with a zirconia framework obtained by CAD/CAM, using bridge titanium bases

21 Clinical result obtained with definitive bridge and lithium disilicate veneer in 2.1

Being able to cement the abutments outside of the mouth assures the easy removal of any excess cement, diminishing the risks of any biological complications. At the same time, the screw retained restoration ensures an easy recovery, this being an old but valid principle in implant retained restoration **(fig. 22)**.

22 A week after the final restauration is installed, the bridge is removed and healthy tissues are observed

During the radiographical control, posterior to the finalization, the correct bridge fit can be observed, as well as the correct bone behaviour around the MultiNeO™ implants (teeth 23 and 24), in maintaining the tissue level.

This reflects the effect generated by the change of platform the implant and the abutment. The use of low resorption rate bone graft also helped to maintain bone and soft tissues levels, both around the implants and in the pontic sites **(fig. 23-24)**.

23 Radiographical control, six months after the uncoverage and implant loading.

24 Final restoration. 6 months follow up.

Conclusions

The use of immediate implants with bone regeneration techniques helped in maintaining and creating a better tissue profile, as well as obtaining bone walls with enough thickness around the implants.

The MultiNeO™ implant design facilitates its placement, obtaining a good primary anchoring, without compressing the tissues. The change of platform, along with the high stability of the prosthetic components, helps preserve an optimum bone level for good aesthetic results. Keeping a correct data transfer between the clinic and laboratory facilitates the restoration design ultimately giving the desired results.

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Post-Implant Removal with Bone Regeneration And Immediate Loading Using Alpha-Bio Tec's MultiNeO™ implant

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Post-Implant Removal with Bone Regeneration and Immediate Loading Using Alpha-Bio Tec's /MultiNeO™ Implant

Abstract

The case shows immediate loading in a patient with coronal fracture. A 33-year-old patient with tooth number 24 fractured. A CT scan revealed a chronic periapical lesion of the vestibular root. The patient was treated with a post-extraction of Alpha-Bio Tec's MultiNeO™ implant, xenograft bone regeneration, resorbable collagen membrane and non-functional immediate loading using a PEEK abutment.

Background

Tooth fractures with aesthetic alterations are situations that require efficient and predictable treatments. The post-extraction implant is an example for such a treatment. The osseointegration capacity of the MultiNeO™ implant has been previously demonstrated [1, 2, 3].

There is no significant difference between the post-extraction implant and the delayed implant with regard to success rates or peri-implant tissues [4, 5]. Ideal situations have been described for the placement of these implants [6].

Implant placement is not contraindicated in teeth with chronic periapical infections, provided that they are previously curetted and treated with antibiotics [7].

Immediate loading is defined as functional or non-functional loading within 48 hours [8]. The success rate of immediate loading implants is between 96.9% and 98.99% [9, 10]. Because there is no difference between delayed loading implants and immediate loading implants, some practitioners recommend doing immediate loading [11].

It is important to avoid micro-movements during the healing phase [12, 13] which is why we do non-functional immediate loading.

The basic requirement for immediate loading is the primary stability of the implant, which depends on the design of the implant, bone quality and milling [14].

The post-extraction immediate loading implant is a procedure that is well documented in the literature.

Case Overview

A 33-year old female patient came for a consultation due to a tooth fracture, requesting a dental implant that has, if possible, a base without palatal coverage. The patient smokes 10 cigarettes per day. No medical history was reported.

Extra-oral inspection: Mouth opening of 45mm. High smile line and normal ATM. Normal mastication muscles.

Intra oral inspection: Tongue, palate and floor of the mouth are normal. Normal salivation. Normal palate anatomy. Thin gingival biotype. No periodontal disease.

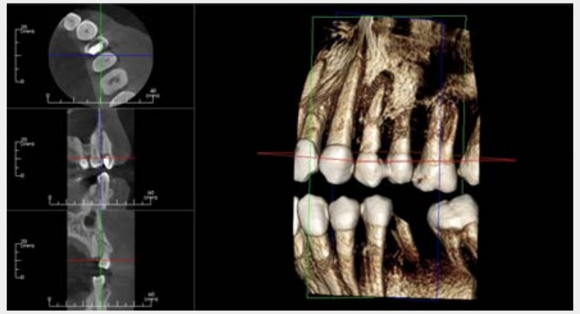
Maxilla: Residual root of tooth number 16, coronal fracture of tooth number 24, cavities in numbers 25 and 26, and wear facets on numbers 11 and 21. Fracture of the distal radius of tooth number 22.

Mandible: Fillings in 37 and 46. Residual rot of 36. Cavities on the vestibular surface of 34.

Radiographic findings

Orthopantomogram: Residual rot was observed in numbers 15 and 36. Coronal fracture of tooth number 24 with radiolucency in the periapical area.

CT Scan: Periapical lesion of the vestibular root of tooth number 24 with bone loss was observed at this level.



X-ray

Materials Used

- 3.75 X 13mm MultiNeO™ Implant (Alpha-Bio Tec)
- PEEK Abutment H 1.0

Treatment Plan

In response to the demands of the patient, who asked for a quick and aesthetic solution for the fracture of tooth number 24, we proceeded to do the following:

- Atraumatic extraction of tooth number 24 and curettage of the periapical lesion through a fold in the vestibular floor to prevent vertical shocks.
- Implant placement, xenograft bone regeneration, placement of a resorbable collagen membrane through the vestibular fold and alveolar preservation.
- Non-functional immediate loading and occlusion control.

The treatment was done in one visit to the dental office.

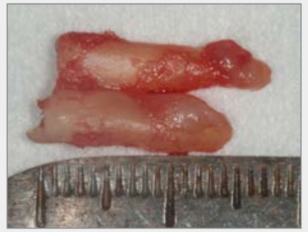
Surgical Phase

1 Patient smile: High smile line, thin gingival biotype

2 Intraoral views: Coronal fracture of tooth number 24

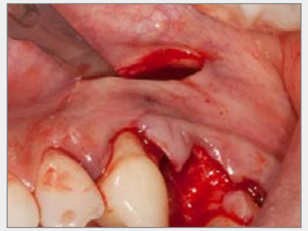
3 Fold opening without vertical unloading

4 Atraumatic extraction of residual root

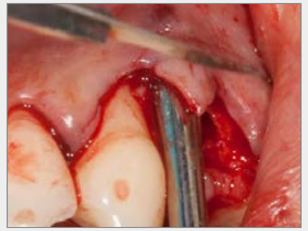


5 Residual rot with periapical lesion in vestibular root

6 Opening of fold in the vestibular floor for curettage of the periapical lesion and to observe for bone defects for subsequent regeneration

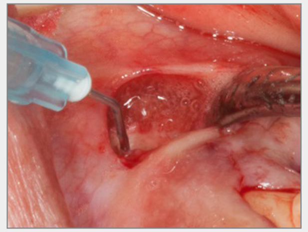


7 Fold on the vestibular floor



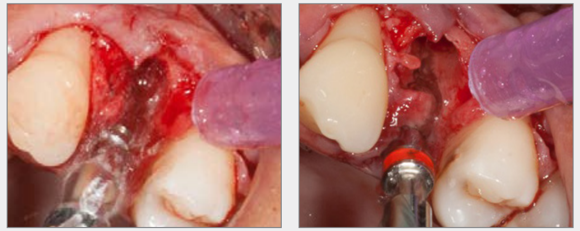
8 Extraction with a periapical lesion of the vestibular root

9 Curettage of periapical injury



10 Disinfection with chlorhexidine 0.12%

11 Visualization of the vestibular defect



12 Implant bed preparation

13 Alpha-Bio Tec's MultiNeO™ implant

14 Placement of implant in palatal position

15 Placement of implant in palatal position

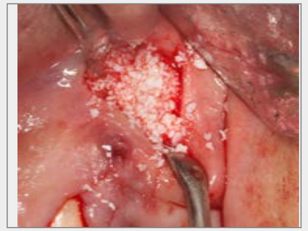
16 Note integrity of the vestibular wall in the coronal portion and the position of the implant

17 Post operational X-ray

18 Placement of PEEK abutment for immediate loading

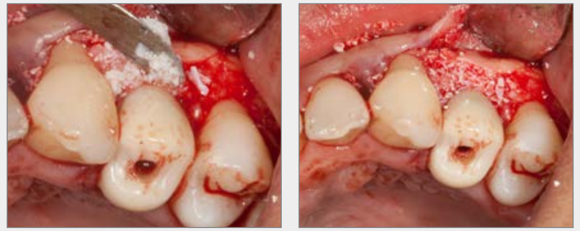
19 Previously prepared acrylic temporary cover

20 Placement of temporary cover for non-functional immediate loading



21 Xenograft placement on periapical lesion to help in defect regeneration

22 Vestibular gap



23 Filling of the vestibular gap and xenograft placement on the vestibular wall to prevent reabsorption

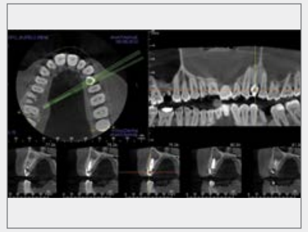
24 Placement of resorbable collagen membrane

25 Resorbable membrane covering apical defect and vestibular wall of the socket

26 Silk suture 5.0 (fold on vestibular floor and suspensory points for vestibular closure are sutured, helping to stabilize the membrane)

27 Occlusion control to ensure that there are no contacts in centric or eccentric movements, laterality and protrusive occlusion (non-functional immediate loading)

28 Follow up X-ray - 6 weeks after surgery

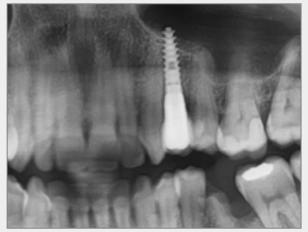


29 CT scan showing the material of the vestibular area, conservation of volume and position of the implant

30 Follow up, six weeks after surgery. Proper healing of the soft tissues is seen

31 3 months follow up. Soft tissues healing and X-Ray follow up

32 Smile line



33 3 months follow up with final crown

Summary

In this case, the use of the MultiNeO™ implant for post-extraction immediate loading in an aesthetic area was a good choice because we achieved primary stability thanks to its design. The prosthetic phase did not present any difficulties due to the accessories that the clinic has for this purpose. The result was predictable, aesthetic and functional in line with the expectations of the professional and the patient. This type of treatment negated the use of removable dentures and shortened the recovery and procedure time.

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

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Flapless, Immediate Implantation & Immediate Loading with Socket Preservation in the Esthetic Area Using the Alpha-Bio Tec's MultiNeO™ 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. MultiNeO™ implants, available in Ø3.75, Ø3.5 and Ø3.2mm diameters. [5]

③ Immediate or delayed implantation

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

④ Auxiliary procedures

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

Clinical Cases Demonstrating Flapless Procedures in the Esthetic Area

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

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

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

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

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

Case I:

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


1

2

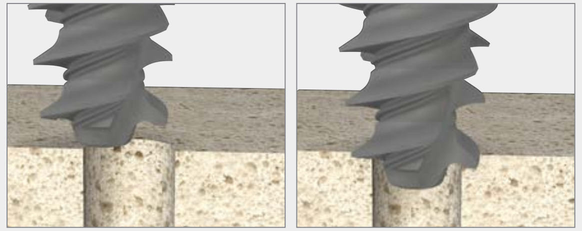
Extraction of teeth prior to immediate implantation - it is important to be as gentle and as careful as possible, since the buccal wall of bone is generally very thin (≤ 2mm) in the premaxillary area **(Fig. 3)**.

3

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

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

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



Implant position – parameters:

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

4

5

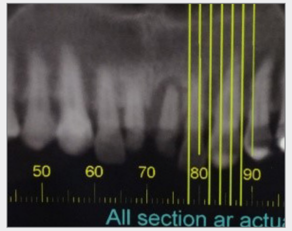
In this case, because of the thin buccal plate (< 2mm), a socket preservation technique using bovine bone (Alpha-Bio's GRAFT) was necessary in order to preserve the crestal ridge of bone **(Fig 6)**.

6

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

Case II:

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



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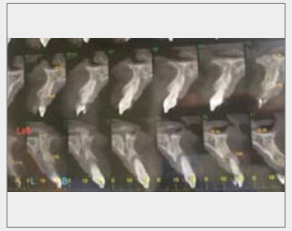

8

9

10

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

11

12

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

13

14

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

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

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

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

Abstract

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

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

Background

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

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

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

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

Overview

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

Extraoral Examination

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

Intraoral Examination

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

Radiographic Examination

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

1
Initial orthopantomography

Materials Used

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

Additional Materials

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

Treatment Objectives and Work Plan

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

Surgical Phase

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

2
Initial situation after removal of the old prosthesis

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

3 Inter-root septum after extraction of tooth 16

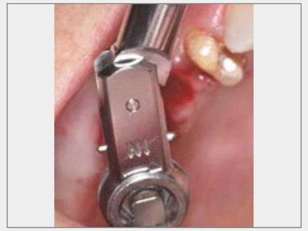
A mucosal operculum in area 15 was performed while simultaneously preparing the two implant sites. The passage of a 2 mm pilot drill revealed low bone density (D3), and therefore under-preparation of the sites was decided upon in order to obtain the necessary primary stability. For the site in area 15,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

4 Under-preparation of the implant sites

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

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

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



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

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

7 MultiNeO™ implant insertion with manual driver in area 15

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

8 Placement of healing abutment and suture in area 16

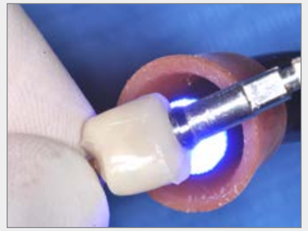
Immediate loading of the implant in area 15 was accomplished by modifying a temporary abutment (TLAC-AR, Alpha-Bio Tec, Israel) **(Fig. 9)**.

9 Grinding of temporary TLAC-AR abutment

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

10 Placement of temporary crown on abutment

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



11 Realization of screwed on provisional

12 Finished and polished temporary crown

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

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

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

14 Provisional without occlusal load

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

Additional Check-Ups

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

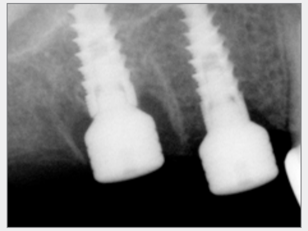
At 35 days after surgery, despite all the recommendations provided to the patient about the diet to be followed during the healing period, she showed up at the follow-up visit with a damaged screwed-on provisional on 15, evidently due to some masticatory overload **(Fig.15)**.

15 Damaged provisional at 35 days after surgery

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

16 Application of healing screw in place of provisional

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



17 Intraoral radiography at 35 days after surgery

Prosthodontics Phase

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

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

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

19 Alpha-Bio Tec. HTLO transfer placed on implants

20 Dental impression in VPES with open tray technique

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

21 TLAO-2 abutments prepared on model

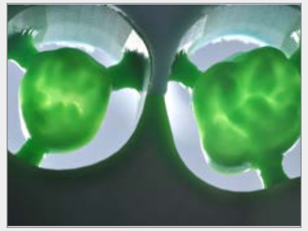
It was decided to adopt a fully digital work flow that, in addition to maintaining accuracy of the details of the impressions, also allows for optimizing execution times, reducing costs and achieving remarkable aesthetics. The CAD/CAM (Zirkonzahn, Italy) system first allowed us to perform scans of the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

22 CAD/CAM scanned models

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

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

24 Milled structures from hard Prettau® zirconium disks



25 Anatomical details milled from hard castable resin

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

26 Controls on the model

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

27 Intraoral occlusal functionalization

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

28 Crowns designed in the laboratory with ceramic die casting technique

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

29 Abutment 30Ncm tightening torque

30 Cemented crowns

31 Control of occlusal contacts after cementation

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

32 Final X-ray

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

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

35 X-ray at 11 months after surgery

Summary

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

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

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

Case Overview

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

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

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

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

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

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

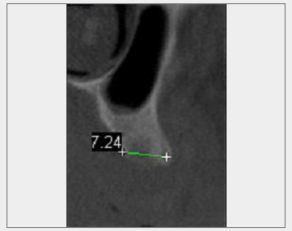
The overall implant survival rate was 92.7% for 331 implants placed in <5mm ridge height and 96.9% for 2,525 implants inserted in ≥5mm ridge height. The difference was significant (p = .0003).

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

Step 1 - Closed Sinus Lift Procedure

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

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



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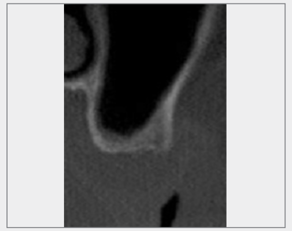

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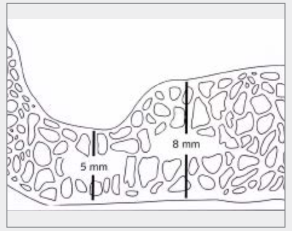
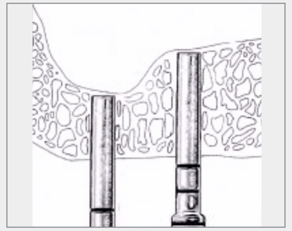
Step 2 - Osteotome Technique

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



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



4 Bone added osteotome sinus floor elevation procedure [10]

Step 3 - X-ray examination

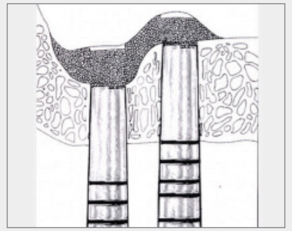
Take a periapical X-ray in order to validate the distance from the sinus floor. If the distance is bigger than 1mm one must continue drilling until you almost reach the sinus floor.

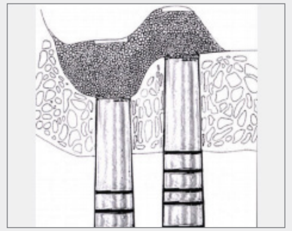
For example: in order to place a Ø3.75mm MultiNeO™ implant using a closed sinus lift and in the case of type III bone, the drilling sequence is a 2mm drill followed by a 2.8mm drill, only through the cortical bone **(Fig. 5)**.

5

Step 4 - Bone Grafting

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





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

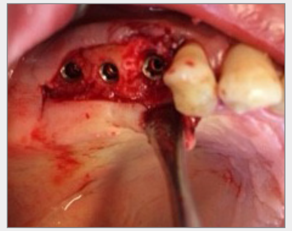
7 With the addition of each measured load of bone, the largest-sized osteotome previously used is reinserted to the sinus floor [10]

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: Ø3.75mm/11.5mm - Ø4.2/11.5mm and Ø5.0/11.5mm MultiNeO™ Implants. The cylindrical coronal part, the microthreads and the unique variable and angled threads all contribute to the high primary stability and the reduced stress on the surrounding cortical bone of this implant. The insertion torque was 25-30Ncm **(Figs. 10-13)**.



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

11

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)**.

14

15

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

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

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

Abstract

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

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

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

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

Background

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

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

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

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

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

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

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

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

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

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

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

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

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

Case Overview

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

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

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

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

Radiographic Examination

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

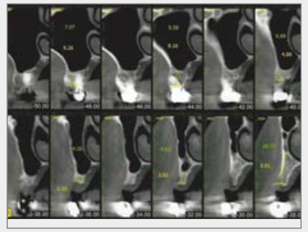
1 Panoramic radiograph demonstrating two inserted short implants in regions 15 and 16 with certain radiolucency around the implants and apical lesion on the mesial root of the second right molar.

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

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

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

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



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

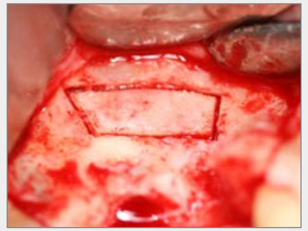
Treatment Plan

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

Surgical Technique

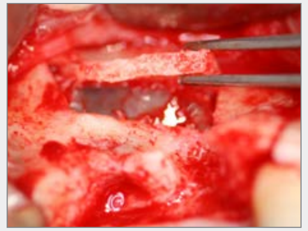
The surgical procedure was carried out under local anesthesia (Lidocaine 2% including 1:100,000 adrenaline) with a low-trauma surgical technique, following the concept of the outfracture osteotomy sinus grafting technique. The patient received a preoperative antibiotic prophylaxis, clavulanate- potentiated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

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



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

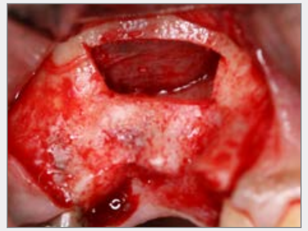
The size of the lateral window was determined by the number of implants to be placed taking into consideration the remaining adjacent teeth. Repeated outlining of the antrostomy borders with the piezosurgical saw was done to ensure that the bony window was completely separated from the surrounding bone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



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

8 Intact exposed sinus membrane with intact PSAA.

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



9 Elevated membrane – note the exposed medial wall.

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

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

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

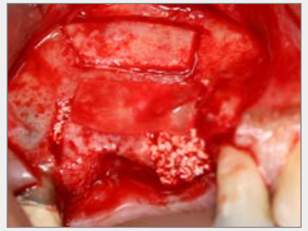
11 Clinical view of the down-fractured and mobilized palatal pedicled bone segment taking care to maintain the integrity of the sinus floor and to maintain the segment attached to the gingiva.

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

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

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

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

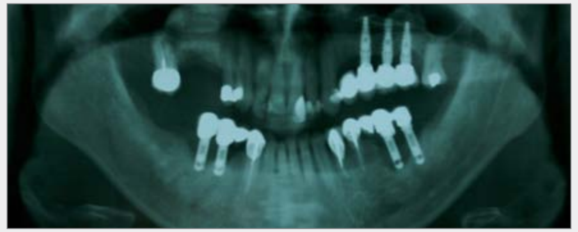


14 The interpositional grafted site is covered with a collagen membrane.

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

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

Coughing or sneezing had to be done with an open mouth to relieve pressure. Putting pressure at the surgical site, ice, elevation of the head, rest and appropriate oral hygiene were also recommended. Care had to be taken not to pressurize the reconstructed area with any prosthesis. Radiographic control using a panoramic radiograph was performed immediately after surgery to confirm the absence of graft material displacement into the sinus cavity and to insure the adequate location of grafted material intrasinusal and interpositional. The early and late postoperative period was uneventful.
6 months after grafting, a panoramic radiograph was taken to evaluate postsurgical changes of both the osteotomized segment and the augmented sinus. The radiograph showed excellent consolidation with well-defined contours of the fragment and the augmented sinus floor showing more than 20mm of bone height **(Fig 15)**.



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

The 8 mm alveolar defect was corrected by about 6mm which left the site amenable to a more anatomical dental restoration. The clinical appearance of the alveolar crest had improved dramatically.
After a healing period of 6 months, a full thickness flap was reflected as in the grafting surgery and a fairy well-consolidated bone graft was clearly visible **(Fig 16-18)**.

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

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

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

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

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

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

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

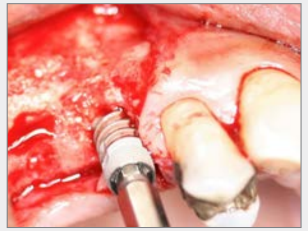
Then, a 3.65mm diameter twist drill was used for the final preparation of the bone **(Fig 21)**.

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

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

22 4.2 X 13mm MultiNeO™ implant

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

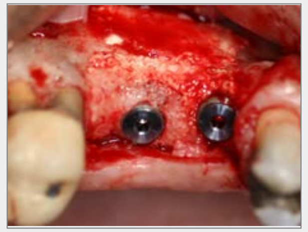


23 A standard implant, 4.2mm diameter, 13mm long, was placed at site 15.

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

25 Implant site preparation at site 16.

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



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

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

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

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

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

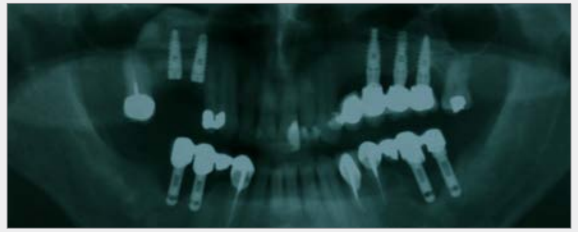
A resorbable collagen membrane was placed over the grafted region (Alpha-Bio's GRAFT) **(Fig 30)** and a soft tissue flap was mobilized from the buccal to close the wound primarily **(Figs 31, 32)**.

30 The grafted area was covered using a collagen membrane.

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

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

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



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

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

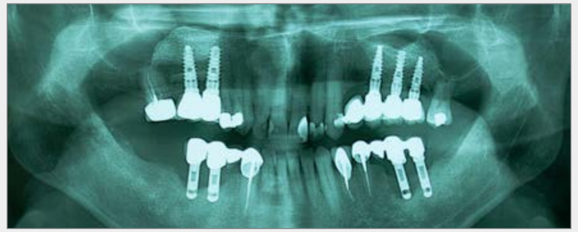
34 Clinical view of prepared solid abutment for temporary prosthesis.

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

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

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

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



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

Conclusion

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

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

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

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

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

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

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

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

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

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

Abstract

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

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

Background

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

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

In addition to the various techniques utilized for sinus floor augmentation, many other variables are important and may affect the outcome of this procedure, including: one-stage or two-stage, the use of different grafting materials, use of a barrier membrane, and the use of different implants with varying length, width, and surface characteristics. Various types of grafting materials have been successfully utilized for sinus augmentation particularly when using the lateral approach. The original protocol used autologous 97 disadvantages are related to harvesting autologous bone, such as prolonged operation time, surgical complications, and increased morbidity. To overcome these disadvantages, various osteoconductive and osteoinductive bone substitutes have been used for many years in sinus grafting procedures [17]. These materials include allografts, xenografts, alloplasts, and growth factors or composite materials [16, 17].

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

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

Primary stability of dental implants is one of the most important factors associated with long term successful osseointegration [30, 31] and it is even more critical in immediate loading. Primary stability is predicated by implant geometry, insertion torque value, bone density, the amount of BIC, and surgical implant site preparation. Secondary stability (biologic) is depended on implant surface and geometry, bone density, tissue and loading conditions. Implant design also contributes to obtaining secondary stability and plays an important role in load distribution. Since the highest stress is at the coronal portion of the bone and implant [32], such a load concentration may lead to implant marginal loss. To overcome this situation, micro-thread design can distribute the stress evenly and preserve marginal bone level [33]. Therefore, not only loading conditions, but also the surface macro architectures can stimulate bone apposition around the implant's neck. Furthermore, thread or groove configuration is the optimal surface macro architecture of screw-shaped implant design related to stress distribution.

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

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

Case Overview

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

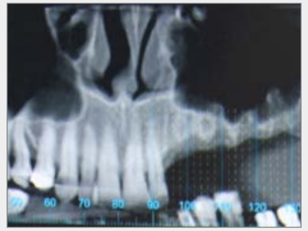
A clinical history and examination including soft and hard tissue were completed with the following results:

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

1

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

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



2

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

3

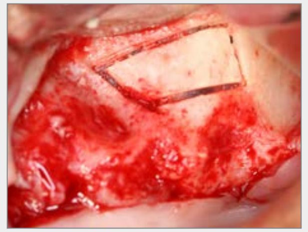
CT scan showing alveolar bone height of 1-3mm in areas requiring augmentation procedure

Treatment Plan

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

Surgical Technique

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



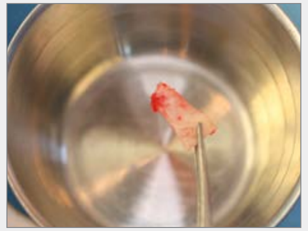
4

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

The size of the lateral window was determined by the number of implants to be placed. Repeated outlining of the antrostomy borders with the piezosurgical saw was continued, ensuring that the bony window was completely separated from the surrounding bone and minimizing the risk of an unintentional perforation of the sinus membrane. The piezosurgical saw was tilted to obtain a tapered osteotomy to insure the stability of the bony window when it was replaced. The bluish grey line beneath the osteotomy line indicates the Schneiderian membrane, a sign to interrupt further bone separation. After the lateral window had been mobilized in one piece, a small Freer elevator was carefully inserted into the osteotomy line and the bony window was easily dissected from the sinus membrane and was kept in saline **(Figs. 5, 6)**.

5

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



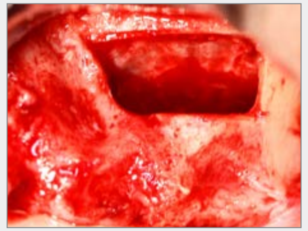
6

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

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

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

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



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

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

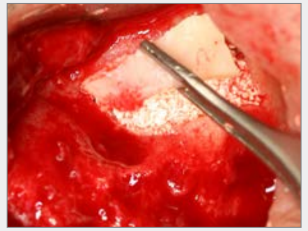
The graft material (NBBM) was mixed with blood from the wound and hydrated with saline, then applied in the created space following elevation of the sinus mucosa. The material was gently packed first at the superior aspect of the sinus and against the medial wall of the created compartment **(Fig. 10)**.

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

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

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

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



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

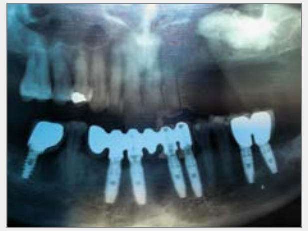
No rigid fixation was required and there was no need to cover the 1-2mm bony gap between the repositioned window and the intact lateral wall **(Fig. 13)**.

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

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

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

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



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

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

15 Clinical view after 6 months of uncomplicated healing

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

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

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

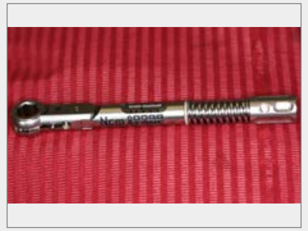
18 After the site preparation, a Ø4.2 X13mm, MultiNeO™ implant was placed at site 23

19 Implant site preparation 24

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

21 Implant site preparation 25

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



23 Alpha-Bio Tec. torque ratchet

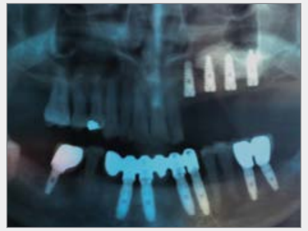
24 Insertion torque values were measured and recorded for each implant site

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

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

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

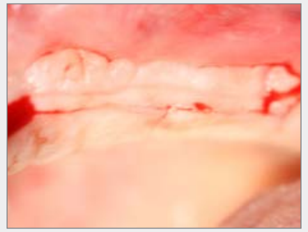
The patient was kept on an antibiotic regimen in the form of 1.5g amoxicillin three times a day for 7 days postoperative. The implants were then allowed 2 months to osseointegrate before prosthetic loading. Radiographic confirmation via panoramic radiograph of the absence of implant protrusion into the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



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

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

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



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

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

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

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

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

34

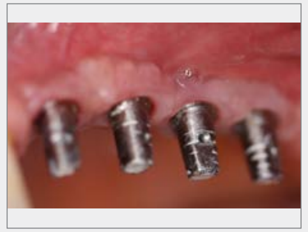
Clinical view of prepared solid abutment for temporary prosthesis

35

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

36

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



37

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

38

Final restoration 6 months after loading.

Conclusion

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

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

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

Background

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

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

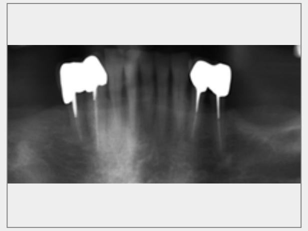
1. Residual ridge volume and dimensions and bone density should be determined by examining the CT scan and the drilling protocol should be modified accordingly [5].
2. Since the implant position determines the decision whether or not to augment the buccal bone, the implant position, both vertically and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

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

Case Overview

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

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



2 Panoramic X-ray shows atrophic posterior edentulous ridges

3 Posterior laterally atrophic ridges

Dental Background

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

Materials Used

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

Treatment Plan

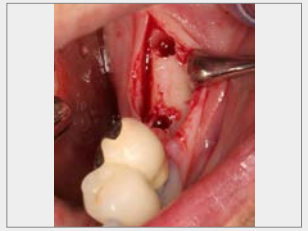
Fixed implant supported restorations in the mandible: 3 implants at teeth positions 45, 46, and 47 and 2 implants at positions 36 and 37. (Figs. 4-13) According to the CT scan of these areas, the width of the ridge was 5-6mm in these specific positions.

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

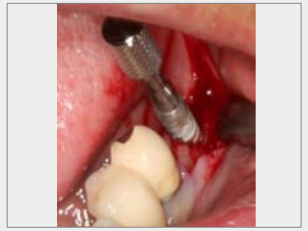
Surgical Procedure

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

4 Mid-crestal incision shows the narrow ridge



5 Drilling using 2 and 2.8mm drills



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

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

8 Healing caps were connected, platform switching is visible

9 Suturing

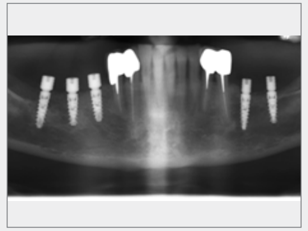
10 Right side implant placement

11 Bone level positioning, small exposed areas are visible

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

13 Suturing

Prosthodontics Treatment (Figs. 14-20)



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

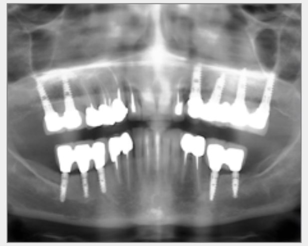
15 Impression taken using closed tray transfers for narrow implants

16 Analogs connected to transfers and placed back into the impression

17 Abutment modification and metal casting

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

19 Final restoration 4 months after implantation



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

Conclusion

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

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

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

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

Abstract

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

Introduction

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

Case Overview

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

Extraoral Examination

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

Intraoral Examination

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

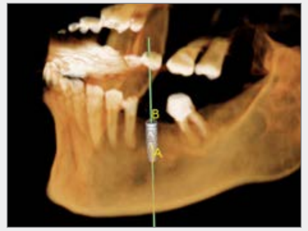
1 Frontal view of the patient

X-ray Examination

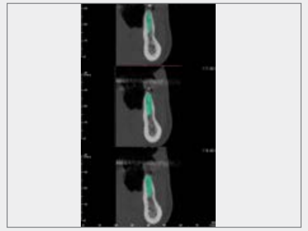
The preoperative oral X-ray **(Fig. 2)** suggested that tooth 37 had an uncertain long-term prognosis as bridge abutment.

2 Ortho-panoramic X-ray

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



3a CBCT with implant planning



3b CBCT with implant planning

Materials Used

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

Treatment Objectives and Work Plan

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

Surgical Phase

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

4 Flap incision

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

5 Occlusal view of the gap

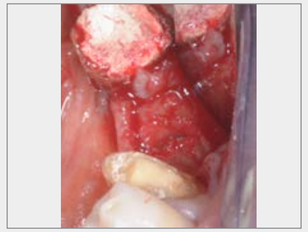
In order to minimize possible vestibular fenestration in the sub-crestal positioning of the Ø3.75 X 11.5mm implant, we decided upon a 13 mm preparation of the site, beginning the drilling sequence with a 2 mm stop drill. The osteotomy was stopped at the 2.8 mm diameter drill **(Fig. 6)**.

6 Preparation of implant tunnel

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

7 Manual insertion of the implant

8 Subcrestal insertion of implant



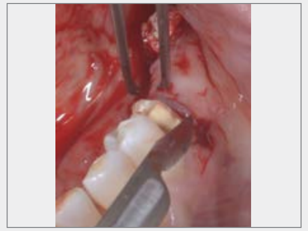
9 Subcrestal insertion of implant

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

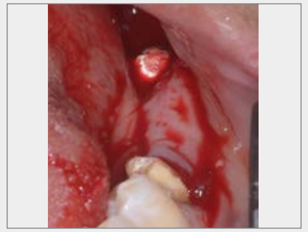
10 Regeneration with resorbable membrane and heterologous bone

11 Regeneration with resorbable membrane and heterologous bone

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



12 Release of the flap and primary intention closure



13 Release of the flap and primary intention closure

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

14 Suture

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

15 Suture follow-up at 15 days

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

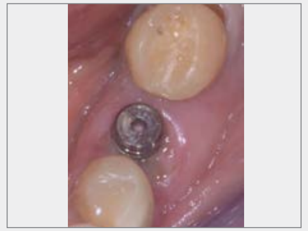
16 Suture removal at 15 days

Prosthetics phase

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

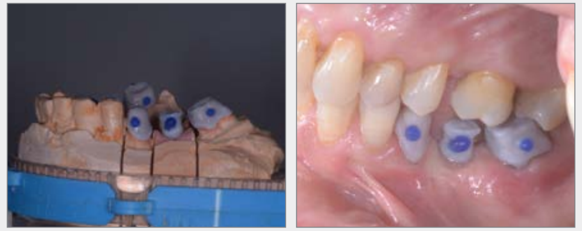
17 X-ray after 4 months to verify correct bone integration

18 Healing of the tissues after 4 months



19 Healing screw positioning

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



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

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

21 Side view of the titanium abutment

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

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

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

23 Orthopanoramic X-ray at delivery

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

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

Conclusion

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

Acknowledgments

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

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

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

Background

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

Case Overview

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

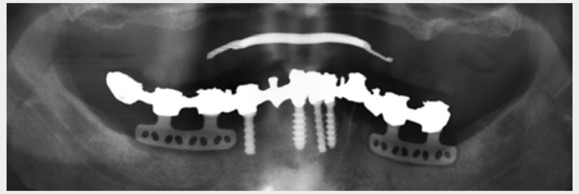
Systemic Background

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

Dental Background

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

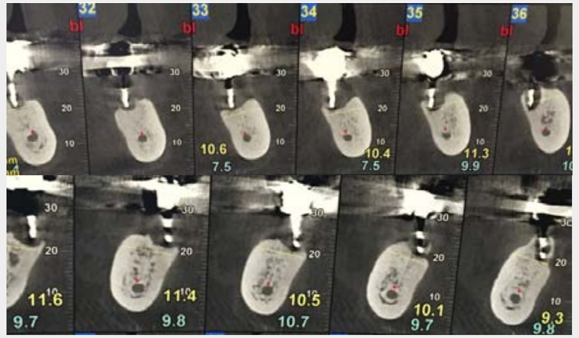
The patient recently felt pain and mobility of the posterior restorations when masticating. **(fig 1.)**



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

Treatment Plan

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



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

Two different treatment plans were presented to the patient:

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

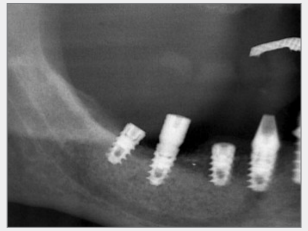
The second option was selected because of the shorter treatment time and less complicated surgery, taking into account the patient's age and systemic conditions.

Materials Used:

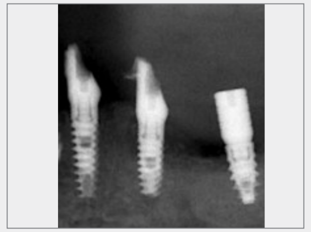
- Ø4.2 X 8mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø4.8 X 8mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø3.75 X 8mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø3.75 X 11.5mm MultiNeO™ Implant (Alpha-Bio Tec)
- Ø3.75 X 10mm MultiNeO™ Implant (Alpha-Bio Tec)

The surgery

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



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



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

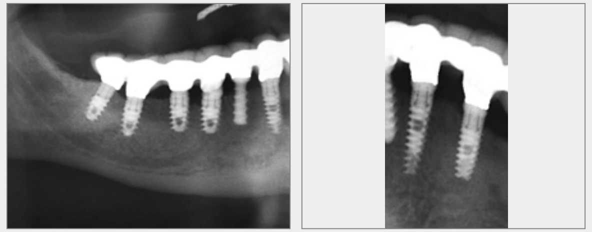
3.3 Snap adapted collar height abutment connection

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

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

3.6 Analog connection

4 Fabrication of PFM cemented implant supported prosthesis



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

Discussion

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

Conclusion

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

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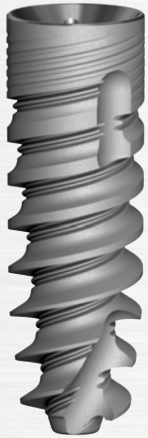

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