implant
clinical review

proven results through evidence-based research

BIOHORIZONS®

SCIENCE • INNOVATION • SERVICE

BIOHORIZONS®

99.2% average implant success rate[1]

BioHorizons is dedicated to developing evidence-based and scientifically proven products. From the launch of the External implant system (Maestro) in 1997, to the Laser-Lok 3.0 implant in 2010, dental professionals as well as patients have confidence in our comprehensive portfolio of dental implants and biologics products.

Our commitment to science, innovation and service has aided us in becoming one of the fastest growing companies in the dental industry. BioHorizons has helped restore smiles in 85 markets throughout Asia, North America, South America, Africa, Australia and Europe.

global leader for biologic based solutions

SCIENCE

BioHorizons uses science and innovation to create unique products with proven surgical and esthetic results.

INNOVATION

Our advanced implant technologies, biologic products and computer guided surgery software have made BioHorizons a leading dental implant company.

products sold in 85 markets

SERVICE

BioHorizons understands the importance of providing excellent service. Our global network of professional representatives and our highly trained customer care support team are well-equipped to meet the needs of patients and clinicians.

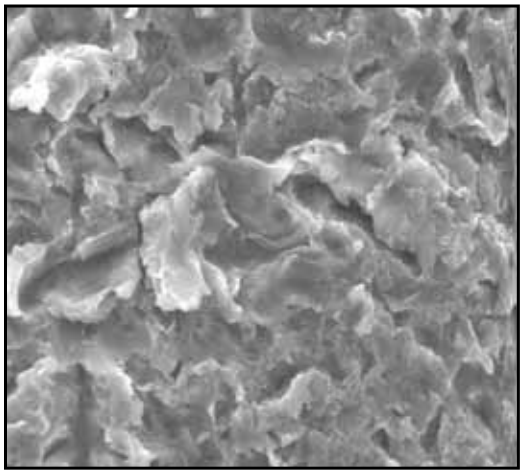
Study summary

BIOHORIZONS®

Innovative solutions

Since the beginning, BioHorizons has been committed to providing the most comprehensive line of evidence-based, scientifically-proven dental implants and tissue regeneration solutions. Our philosophy is that successful products are the result of rigorous Science and relentless Innovation. This approach to product development took root back in 1994 when the original Maestro implant design was first conceived in the biomedical engineering department at the University of Alabama in Birmingham (UAB). Throughout the years, BioHorizons has consistently applied biomedical engineering to numerous product innovations and today is the proud owner of 24 unique patent awards.

This implant clinical review is a compilation of many of the studies BioHorizons has supported over the years to guide implant and prosthetic development. The scientific method was followed using a wide variety of models including laboratory, animal and human. Within these models, implant performance was evaluated in many different conditions with special emphasis on load analysis including non-functional and functional immediate load as well as early and delayed load.



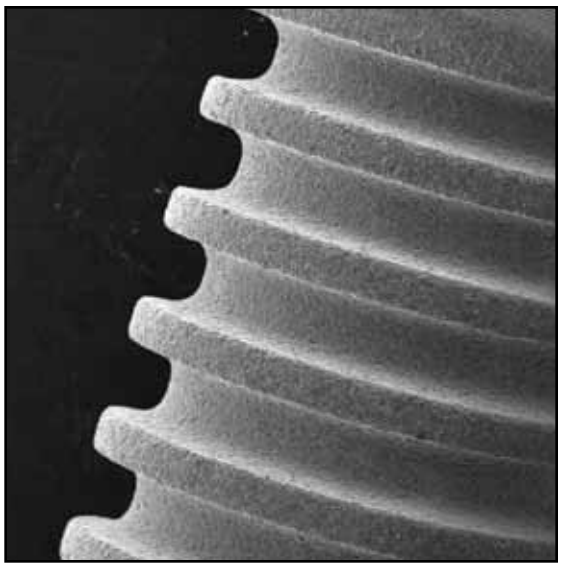
High magnification of RBT implant (1500x) showing highly irregular surface. (Courtesy of Jack Ricci, NYU)

In vitro validation

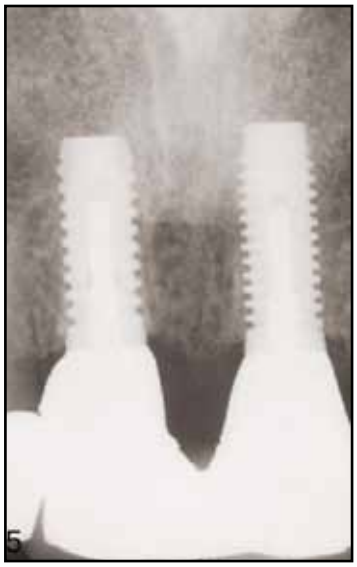
Laboratory tests were conducted to evaluate the amount of load implants can sustain both in static and fatigue. Whether evaluating the implant connection of the Maestro[11] or the implant design of the One-piece 3.0,[12] BioHorizons implants have been shown to rank at the top when compared to competitive designs.

In vivo research

To evaluate various features of the implants including thread design and implant surface, a series of animal studies were implemented with a focus on bone response. In these studies, it was shown that the BioHorizons thread design and implant surface exhibited higher bone-to-implant contact[13,14] and greater reverse torque measurements[14] than the designs typically used by other companies.



Scanning Electron Microscope (SEM) of BioHorizons square thread design.



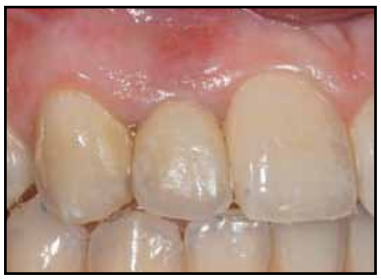
Two maxillary centrals are splinted together, supported by Maestro D2 and D3 implants. The 1-year total bone loss is 0.4 mm on the D2 implant (left) and 0.5 mm on the D3 implant. This corresponds to the 0.5 mm smooth collar below the implant platform. (Courtesy of C. M. Misch)

Clinical evidence

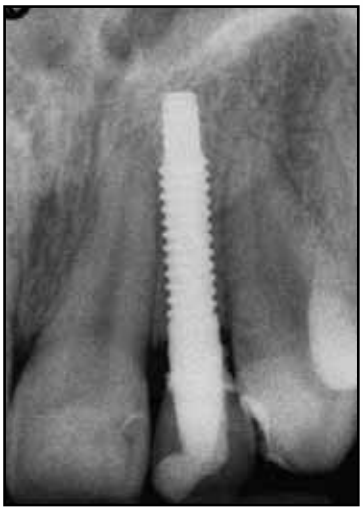
To assess how BioHorizons implants can benefit patients, a number of human studies were sponsored with long term follow-up out to 10 years. Several clinical scenarios were used to determine how effective BioHorizons implants are when: immediately placed,[4] immediately loaded,[5,6,15] used in the posterior maxilla,[8] used in sinus augmentations,[9] used in poor quality bone and used in patients with compromised immune systems.[16] BioHorizons implants have been shown to have an extremely high survival rate (99.2% average),[1-10] excellent bone-to-implant contact[15] and minimal bone loss.[3,6,8,17]

Improving patient's lives

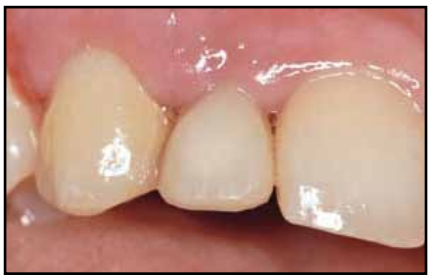
Innovation in our industry is only significant if it gives the clinicians effective and reproducible results that materially improve the welfare of the patients. The success BioHorizons has shown in many research studies is proof that BioHorizons continues to create innovative, relevant solutions for the dental community.



Restored One-piece 3.0 (1 week post-op)



Radiographic appearance 6 mo. post-op



Definitive restoration at 12 months

Functional surface area: Thread-form parameter optimization for implant body design

Strong JT, Misch CE, Bidez MW, Nalluri P.
Compend Contin Educ Dent. 1998;19(spec issue):4-9.

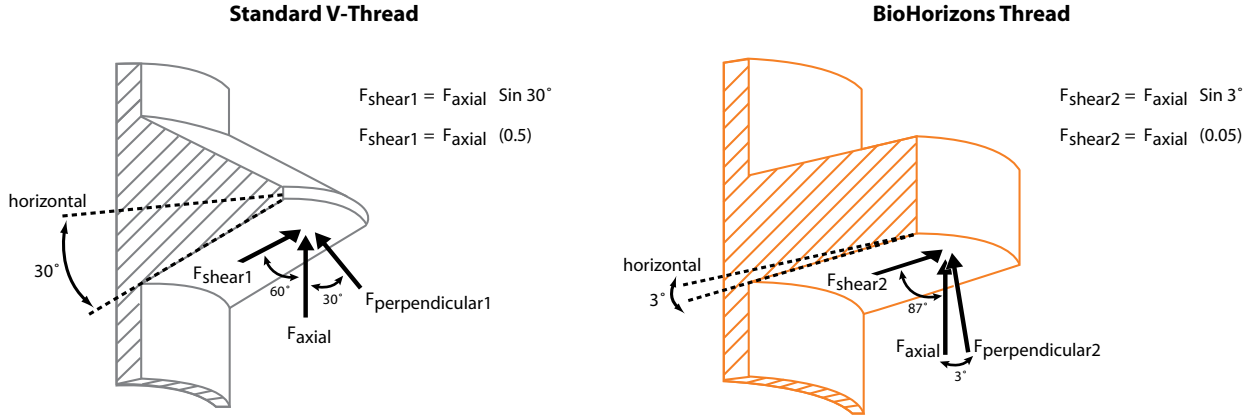


Figure 1. With F_{axial} constant (i.e. applied load), the shear force on the V-thread face (F_{shear1}), is approximately **10 times greater** than the shear force on the BioHorizons thread face (F_{shear2}).

Table 1: Functional surface areas for the different types of commercially available thread forms (n=456)

Thread-form geometry	Functional surface area (mm^2)*
V-thread	136
Reverse-buttress thread	117
Square thread, D1	159
Square thread, D2	187
Square thread, D3	**210**
Square thread, D4	**245**

* To make a valid comparison between different thread forms, a standard major diameter of 4.0mm and an implant length of 10mm were used for calculation purposes.

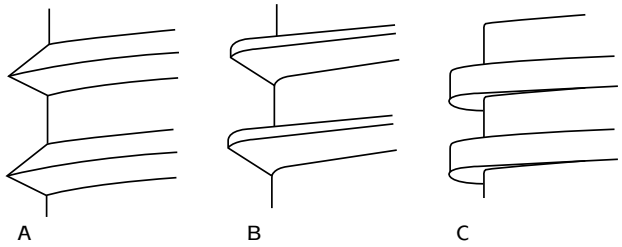
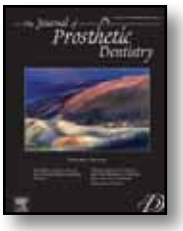


Figure 2. Schematic of (A) a v-thread, (B) a reverse-buttress thread, and (C) a square thread.

ABSTRACT

In a root-form dental implant, functional thread surface area is defined as the area that is able to dissipate compressive and tensile (nonshear) loads to the bone and provide initial stability upon implant placement. Functional surface area establishes the portion of the implant surface that provides for initial osteoblast contact to the implant surface. Together, functional surface area and the host bone density determine the biomechanical load distribution of the implant. This investigation, based on mathematical models and validated by computer models, determined the functional surface area for three thread forms found in dental implant designs: the v-thread, the reverse buttress, and the square thread. The results of this investigation demonstrate that substantially greater functional surface area can be obtained in a square thread from, and that the surface area increases by varying geometric thread-form parameters, such as pitch and thread depth.



Influence of hex geometry and prosthetic table width on static and fatigue strength of dental implants

Boggan RS, Strong JT, Misch CE, Bidez MW.
J Prosthet Dent. 1999 Oct;82(4):436-440.

Table 1: Static and fatigue strengths of dental implant systems

Implant type	Material	Static failure load	Fatigue failure load
1.0 mm external hex, 4mm platform diameter	Titanium alloy	966 N	350 N
1.0 mm external hex, 5mm platform diameter	Titanium alloy	1955 N	625 N
0.7 mm external hex*	Grade I CP titanium	756 N	242 N
0.6 mm internal octagon*	Titanium alloy	587 N	400 N
1.7 mm internal hexagon*	Titanium alloy	814 N	367 N

* Platform diameter was not stated, data from Balfour and O'Brien.

ABSTRACT

Component fracture and screw loosening are prevalent concerns of contemporary dental implants. This laboratory investigation examined the influence of design factors such as the platform diameter and the hex height on the mechanical strength and quality of fit of the implant-abutment interface. Static and compressive bending tests were conducted on 4 and 5 mm diameter bone density-based implants. SEM evaluation of the implant-abutment interface was also conducted to assess the quality of fit between mating components. The 5 mm diameter implant was stronger in both static and fatigue conditions than the 4 mm diameter implants. A comparison of the results in published literature indicated that both implants were equal to or superior to alternative prosthetic connections in an identical testing configuration. Test results demonstrated the validity of wide diameter implants to reduce the likelihood of component fracture in contemporary dental implant systems.

The impact of loads on standard diameter, small diameter and mini implants: A comparative laboratory study

Allum SR, Tomlinson RA, Joshi R.
Clin. Oral Impl. Res. 2008 May;19(6):553-559.

Table 1: Maximum loads sustained and the maximum bending moments recorded for each implant design

Rank	Implant type	Implant diameter	Maximum loads means (±SDs)	Maximum bending moments means (±SDs)
1	Straumann Standard RN SLA	4.1 mm	989 N (107N)	11,558 N mm (1251 N mm)
2	**BioHorizons Maximus**	**3 mm**	**648 N (45N)**	**7050 N mm (560 N mm)**
3	Straumann Standard NN SLA	3.3 mm	619 N (50N)	6992 N mm (1317 N mm)
4	NobelDirect	3 mm	572 N (53 N)	5598 N mm (623 N mm)
5	Straumann Standard RN SLA	3.3 mm	515 N (39 N)	5311 N mm (455 N mm)
6	Osteocare Mini	2.8 mm	237 N (37 N)	2319 N mm (411 N mm)
7	Hi Tec	2.4 mm	261 N (31 N)	2251 N mm (297 N mm)
8	Osteocare Mini	2.35 mm	147 (25 N)	1350 N mm (224 N mm)

ABSTRACT

Objectives: While caution in the use of small-diameter (≤3.5 mm) implants has been advocated in view of an increased risk of fatigue fracture under clinical loading conditions, a variety of implant designs with diameters <3 mm are currently offered in the market for reconstructions including fixed restorations. There is an absence of reported laboratory studies and randomized-controlled clinical trials to demonstrate clinical efficacy for implant designs with small diameters. This laboratory study aimed to provide comparative data on the mechanical performance of a number of narrow commercially marketed implants.

Materials and Methods: Implants of varying designs were investigated under a standardized test set-up similar to that recommended for standardized ISO laboratory testing. Implant assemblies were mounted in acrylic blocks supporting laboratory cast crowns and subjected to 30° off-axis loading on an LRX Tensometer. Continuous output data were collected using Nexygen software.

Results: Load/displacement curves demonstrated good grouping of samples for each design with elastic deformation up to a point of failure approximating the maximum load value for each sample. The maximum loads for Straumann (control) implants were 989 N (±107 N) for the 4.1 mm RN design, and 619 N (±50 N) for the 3.3 mm RN implant (an implant known to have a risk of fracture in clinical use). Values for mini implants were recorded as 261 N (±31 N) for the HiTec 2.4 mm implant, 237 N (±37 N) for the Osteocare 2.8 mm mini and 147 N (±25 N) for the Osteocare mini design. Other implant designs were also tested.

Conclusions: The diameters of the commercially available implants tested demonstrated a major impact on their ability to withstand load, with those below 3 mm diameter yielding results significantly below a value representing a risk of fracture in clinical practice. The results therefore advocate caution when considering the applicability of implants ≤3 mm diameter. Standardized fatigue testing is recommended for all commercially available implants.

Notable quotes:

- Fractures have been reported following the clinical use of well-documented implant designs. (Adell et al. 1981; Morgan et al. 1993; Rangert et al. 1995; Eckert et al. 2000)
- One recent systematic review reported that implant fractures constitute between 5% and 20% of all implants lost during function. (Ber glundh et al. 2002)
- Various workers have previously highlighted the risk of fatigue fracture of smaller diameter implants, especially in areas of high loading. (Rangert et al. 1995; Polizzi et al. 1999; Ronouard & Rangert 1999; Eckert et al. 2000; Zinsli et al. 2004)

Histomorphometric analysis of the bone-implant contact obtained with 4 different implant surface treatments placed side by side in the dog mandible

Novaes AB Jr, Souza SL, de Oliveria PT, Souza AM.
Int J Oral and Maxillofac Implants. 2002 May-Jun;17(3):377-383.

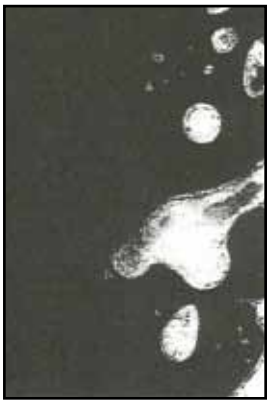


Figure 1. Bone-implant contact in an SBM sample (Stevenel's blue and alizarin red 5; original magnification X100).

Table 1: Percentages of bone-to-implant contact for all implants

Implant no.	Machined	HA	TPS	SBM
1	32.2	71.9	39.8	70.6
2	53.3	36.4	26.4	29.4
3	39.7	46.4	33.8	47.6
4	34.7	73.9	34.5	87.6
5	54.0	44.9	-	75.4
6	29.0	49.0	44.8	84.3
7	48.6	33.6	54.8	-
8	41.7	86.1	39.5	78.9
9	44.5	69.1	84.2	64.8
10	48.5	67.7	82.6	77.7
Mean	**41.7**	**57.9**	**48.9**	**68.5**
SD	7.8	18.0	21.1	18.8

Overall mean and SD: 54.0 ± 19.2%.
HA = hydroxylapitite coating
TPS = titanium plasma spray
SBM = sandblasting w/ soluble particles

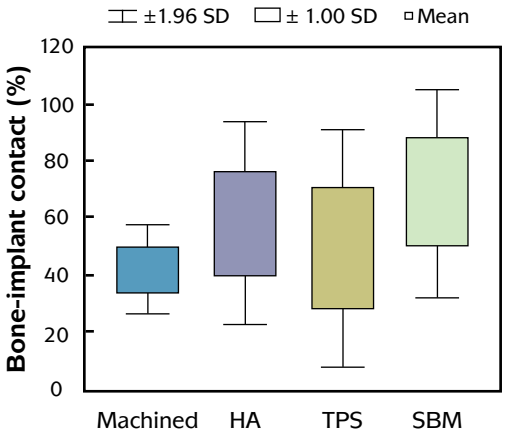


Figure 2. Mean percentages of bone-to-implant contact and standard deviations of the 4 implant surfaces examined.

ABSTRACT

Purpose: The different implant systems available today present several types of surface treatments, with the aim of optimizing bone-implant contact. This study compared 4 different types of implant surfaces.

Materials and Methods: The first, second, third, and fourth mandibular premolars were extracted from five young, adult mongrel male dogs. Ninety days after removal, four 3.75-mm-diameter, 10-mm-long screw-type implants (Paragon) were placed with different surface treatments in mandibular hemiarches. The dogs received two implants of each of the following surface treatments: smooth (machined), titanium plasma spray (TPS), hydroxylapitite coating (HA) and sandblasting with soluble particles (SBM). The implants were maintained unloaded for ninety days. After this period, the animals were sacrificed, and the hemimandibles were extracted and histologically processed to obtain non-decalcified sections. Two longitudinal ground sections were made for each implant and analyzed under light microscopy, coupled to a computerized system for histomorphometry.

Results: The following means were obtained for bone-implant contact percentage: machined = 41.7%, TPS = 48.9%, HA = 57.9%, and SBM = 68.5%.

Discussion: The means for all treatments that added roughness to the implant surface were numerically superior to the mean found for the machined surface. However, this difference was statistically significant only between groups SBM and machined (Tukey test, $P < .05$).

Conclusions: The SBM-treated surface provided a greater bone-implant contact that a machined surface after 90 days without loading in this model.

Editor's Note: SBM (Sandblasted with Soluble Particles Medium) is equivalent to RBT (Resorbable Blast Texturing) surface treatment. Both surface treatments are performed by Bio-Coat in Southfield, Michigan.

Effects of implant thread geometry on percentage of osseointegration and resistance to reverse torque in the tibia of rabbits

Steigenga J, Al-Shammari K, Misch C, Nociti Jr. FH, Wang H-L.
J Periodontol. 2004;75(9):1233-1241.

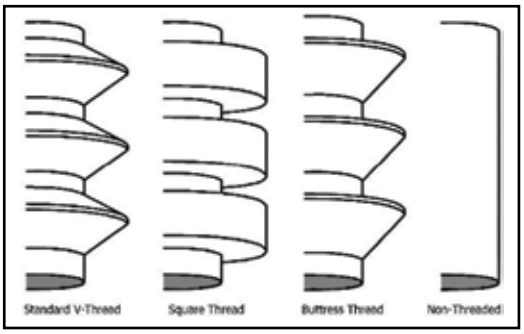


Figure 1. Standard thread shapes in dental implant design. The V, square, and reverse buttress threads were evaluated in this study.

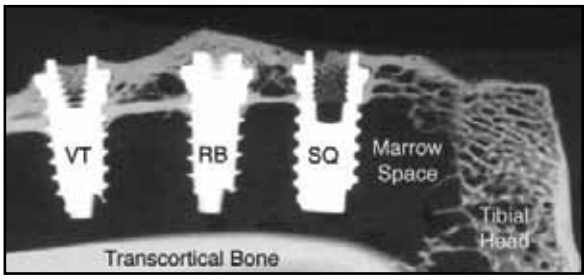


Figure 2. Radiographic bone density. VT: V-thread; RB: reverse buttress thread; and SQ: square thread. No significant differences were found in the radiographic density results.

	V-Thread	Reverse Buttress Thread	Square Thread
Reverse torque value (N = 36 implants)	15.58 ± 6.07 *	15.46 ± 6.22 †	23.17 ± 9.68 *†
Percentage of BIC (N = 69 implants‡)	65.46 ± 9.64 *	63.05 ± 12.45 †	74.37 ± 8.63 *†

Table 1. Reverse torque removal values (N-cm) and percentage of bone-to-implant contact (BIC) (N = 12 rabbits).

*† Statistical significance ($P < 0.05$) when comparing square thread to V-thread and reverse buttress thread design.
‡ Three of 72 specimens could not be read due to a processing error.

ABSTRACT

Background: Dental implant thread geometry has been proposed as a potential factor affecting implant stability and the percentage of osseointegration. Therefore, the aim of this prospective, randomized, parallel arm study was to evaluate the effects of dental implant thread design on the quality and percent of osseointegration and resistance to reverse torque in the tibia of rabbits.

Methods: Seventy-two custom-made, screw-shaped, commercially pure titanium implants (3.25 mm diameter × 7 mm length) were placed in the tibiae of 12 white New Zealand rabbits. Each tibia received three implants of varying thread shapes: one with a V-shaped, one with a buttress, and one with a square thread design. The rabbits were sacrificed following an uneventful healing period of 12 weeks. Implants in the right tibiae underwent histologic and histomorphometric assessments of the bone-to-implant contact (BIC) and the radiographic density of surrounding bone, while implants in the left tibiae were used for reverse-torque testing. Differences between the three thread designs were examined using analysis of variance (ANOVA).

Results: Data showed that the square thread design implants had significantly more BIC and greater reverse-torque measurements compared to the V-shaped and reverse buttress thread designs, while no differences were found in radiographic bone density assessments.

Conclusion: These results indicate that the square thread design may be more effective for use in endosseous dental implant systems.

The effects of loading time on osseointegration and new bone formation around dental implants: A histologic and histomorphometric study in dogs

Ghanavati F, Shayegh SS, Rahimi H, Sharifi D, Ghanavati F, Khalesseh N, Eslami B.
J Periodontol. 2006;77(10)1701-1707.

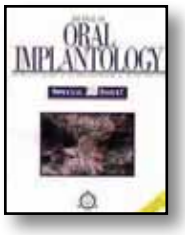
ABSTRACT

Background: Immediate loading of dental implants has been introduced as a method of reducing implant treatment time without compromising its prognosis. In this research, the effects of loading time on the amount of bone-to-implant contact and bone formation around dental implants were evaluated histologically.

Methods: Three months prior to implantation, the lower premolar teeth of 15 dogs were extracted. Three or four dental implants were placed in the healed extraction sites for each dog (N = 48). Dividing the dogs into three groups, the implants were either loaded 48 hours or 1 week later with metallic or prefabricated acrylic crowns or were left unloaded until the time of sacrifice. Three months after implant insertion, the animals were sacrificed and samples were investigated to define the amount of bone-to-implant contact, lamellar and woven bone percentage, and local inflammation of the newly formed bone.

Results: No significant difference in the observed criteria was reported among the three groups (P >0.05); however, the unloaded group had the highest degree of bone-to-implant contact and the group loaded 48 hours after the primary implant insertion had the least. The prosthesis type had no significant effect on the implant success rate (P>0.05). The lamellar and woven bone percentage of newly formed bone also did not differ in the three groups (P>0.05). One implant from each group failed in this study.

Conclusion: Loading time does not seem to significantly affect the degree of osseointegration and bone-to-implant contact and the composition of newly formed bone around dental implants.



A bone-quality based implant system: First year prosthetic loading

Misch CE, Dietsh-Misch F, Hoar J, Beck G, Hazen R, Misch CM.
J Oral Implantol. 1999;25(3):185-197.

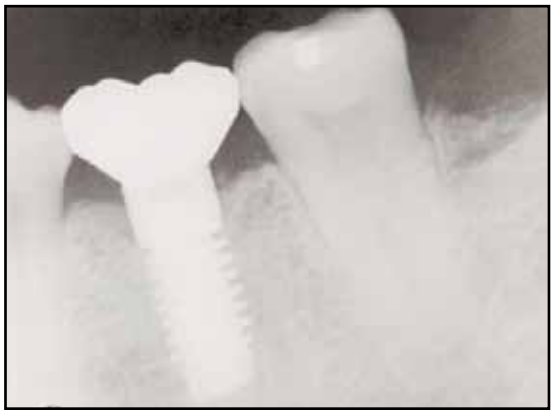


Figure 1. This mandibular first molar has bone above the Maestro D2 implant body platform after 1 year of loading. The total bone loss is recorded as 0 mm, rather than a positive number, which would decrease the mean vertical bone loss data. (Courtesy of F. Dietsh-Misch)

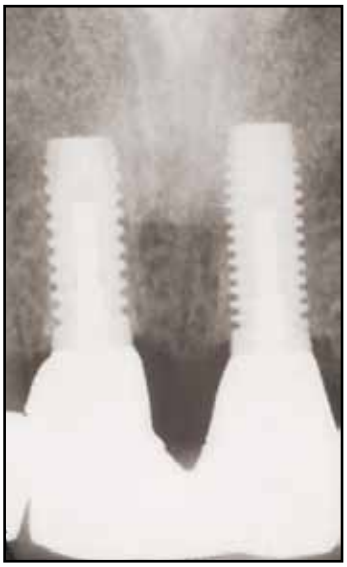


Figure 2. Two maxillary centrals are splinted together, supported by Maestro D2 and D3 implants. The 1-year total bone loss is 0.4 mm on the D2 implant (left) and 0.5 mm on the D3 implant. This corresponds to the 0.5 mm smooth collar below the implant platform. (Courtesy of C. M. Misch)

ABSTRACT

This report presents the data from a prospective study of a bone quality based implant system. The surgical survival of 975 implants was 99.4%, with 100% survival in D4 bone. Three critical phases of bone loss were identified: bone remodeling from stage I to stage II surgery; stage II uncovery to prosthesis delivery (transition period); and prosthesis delivery up to the first year loading (early loading bone loss). The stage I to stage II uncovery crestal bone remodeling resulted in a mean vertical bone loss of .021 mm to 0.36 mm (SD = 0.90 mm), dependent on whether the implant became exposed to the oral cavity during osseous healing. No statistically significant difference was found among the four implant designs, implant diameter, bone density or location. The stage II uncovery to prosthesis delivery mean vertical bone loss ranged from 0.12 mm to 0.20 mm. One hundred three consecutive patients were restored, with 360 implants and 105 prosthesis in function for a period of 12 to 26 months. No early loading implant failure occurred. The mean early loading bone loss was 0.29 mm (SD = 0.99 mm). Past clinical reports indicate most failures or crestal bone loss occur by the first year of loading. This study suggests the bone quality based dental implant design minimizes overall failure and crestal bone loss, regardless of bone density.

Posterior implant single-tooth replacement and status of adjacent teeth during a 10-year period: A retrospective report

Misch CE, Misch-Dietsh F, Silc J, Barboza E, Cianciola EJ, Kazor C.
J Periodontol. 2008 Dec;79(12):2378-2382.

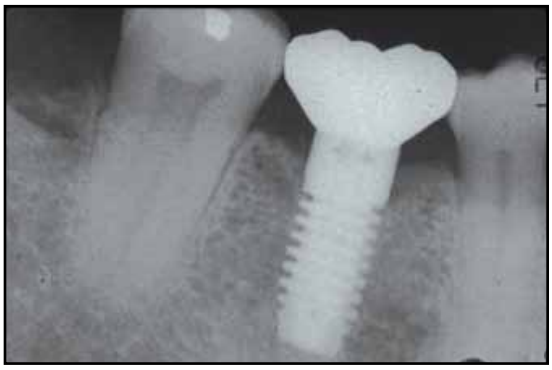


Figure 1. The teeth adjacent to an implant were virgin (second premolar) or minimally restored (second molar) in 76% of patients.

Period (years)	Implants at start of interval	Implants lost to follow-up during interval	Implant failures during interval	Interval survival (%)	Cumulative survival (%)
0 to 1	1,377	0	12	99.1	99.1
1 to 2	1,120	245	0	100	99.1
2 to 3	1,007	113	1	99.9	99.0
3 to 4	805	202	0	100	99.0
4 to 5	732	72	1	99.9	98.9
5 to 9	563	168	0	100	98.9

Table 1. Life-table analysis of implant survival.

ABSTRACT

Background: The purpose of this case series study was to evaluate posterior single-tooth implant survival and the long-term conditions of the adjacent teeth.

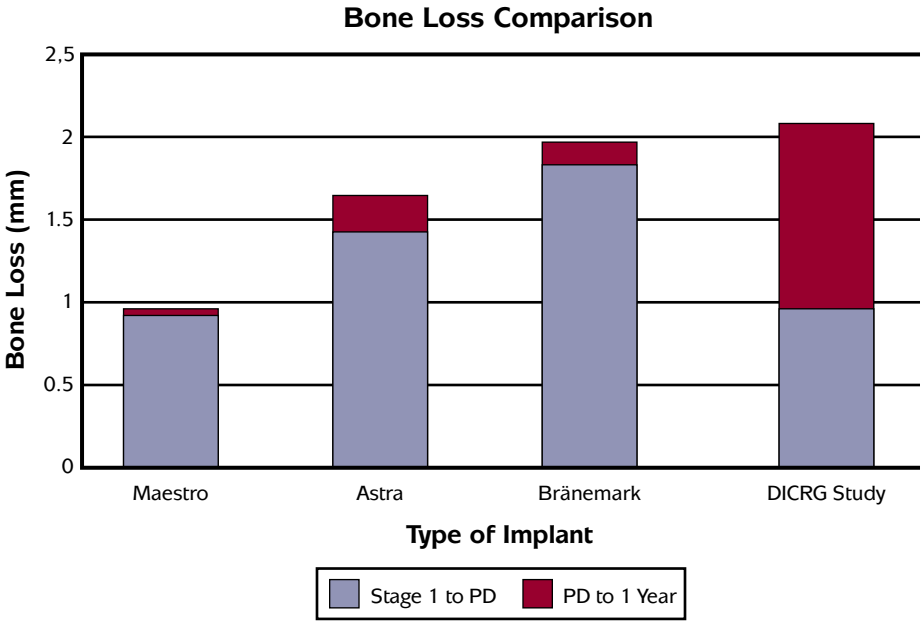
Methods: A retrospective evaluation of 1,162 consecutive patients with a single missing posterior tooth treated with 1,377 external hex implants supporting 1,365 restorations surrounded by natural teeth over a 1- to 10-year period was reviewed from four private offices. Implant survival data were collected relative to stage I to stage II healing, stage II to prosthesis delivery, and prosthesis delivery to up to 10 years of follow-up. Long-term adjacent tooth conditions were assessed, including decay, endodontic therapy (root canal therapy [RCT]), and/or extraction during the follow-up period.

Results: Of the 1,377 implants inserted, there were 11 surgical failures from stage I to stage II healing. There was one failure from stage II healing to prosthesis delivery. There were two prosthetic-phase failures. The surgical success rate was 99.2%, whereas the overall survival rate was 98.9% at an average of 61 months of follow-up (range, 12 to 125 months). A total of 2,589 adjacent teeth were followed during the study. No natural adjacent tooth was lost during this period. Interproximal decay developed in 129 adjacent teeth (5%), and nine adjacent teeth required RCT (0.4%) as a result of decay or restoration.

Conclusions: The use of single-tooth implants as replacements for posterior missing teeth is a viable long term treatment. Adjacent natural teeth complications are minimal for as long as 10 years after implant insertion.

A prospective multi-center clinical investigation of a bone quality-based dental implant system

Kline R, Hoar JE, Beck GH, Hazen R, Resnik RR, Crawford EA.
Implant Dent. 2002;11(3):224-234.



ABSTRACT

This article reports the five-year results of an independently monitored, prospective, multi-center, clinical trial of a bone quality-based implant design. At six study centers, 495 implants were placed in 151 cases with an average follow-up period of 1.6 years (range 1.0 to 3.6 years), following prosthesis delivery. The majority of the implants placed were D2 or D3 implants to support fixed partial dentures or implant-supported overdentures. Using strict success criteria, there were three implant failures, resulting in a cumulative 99.5% success rate according to Kaplan-Meier survival analysis. Radiographic analysis revealed a mean bone loss of 0.06 mm at one year and bone gain of 0.04 mm at two years following prosthesis loading. There were no statistical differences in the results by center, implant type, bone density, area of the mouth, or prosthesis type. The results of this five-year study revealed a high success rate and limited bone loss in all areas of the mouth, independent of bone quality.

Retrospective Multicenter Analysis of Immediate Provisionalization Using One-Piece Narrow-Diameter (3.0-mm) Implants

Dong-Seok Sohn, Min-Su Bae, Jeong-Uk Heo, Jun-Sub Park, Sun-Hae Yea, Georgios E. Romanos

Int J Oral Maxillofac Implants. 2011 Jan-Feb, 26(1): 163-8.

Figure 1. Initial intraoral photograph showing narrow mesiodistal and labiolingual width.

Figure 2. The implant was placed with a minimum torque of 30Ncm. Bone grafting was performed and a resorbable membrane was placed on the bone graft, per the usual guided bone regeneration technique.

Figure 3. Clinical image of single tooth treated with One-Piece 3.0 at 3 years

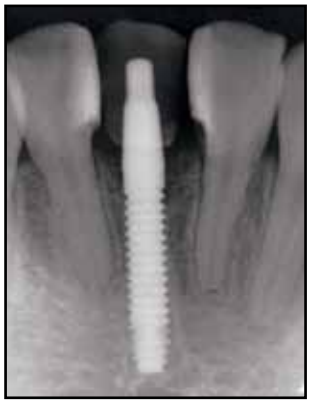


Figure 4. Periapical radiograph at the time of implant placement and immediate provisionalization.

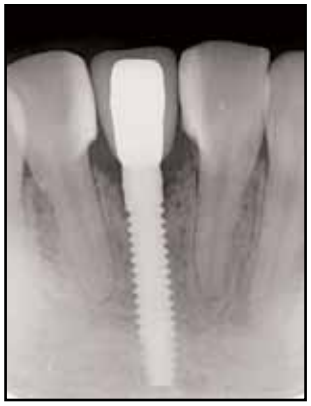


Figure 5. X-ray of single tooth treated with One-Piece 3.0 at 3 years

ABSTRACT

Purpose: The aim of this retrospective analysis was to report on the clinical outcome of immediate provisionalization using one-piece narrow-diameter implants.

Materials and Methods: The dental records of patients who received narrow implants were reviewed. Narrow-diameter (3.0-mm) one-piece implants were used to support restorations of missing maxillary lateral incisors and mandibular incisors. All implants were placed in a one-stage procedure according to the protocol recommended by the manufacturer, with immediate placement o f provisional restorations. Following an average healing period of 3 months in the mandible and 5 months in the maxilla, the definitive prostheses were fabricated. The survival rate of the implants was analyzed, and radiographic evaluation was performed.

Results: Thirty-six patients (20 men and 16 women), aged from 42 to 72 years (average age of 53 years), were treated with 62 one-piece narrow implants. A success rate of 100% was observed over a period up to 33 months (mean, 23 ± 4.3 months). Among these, 8 implants were placed in maxillary lateral incisor positions and 54 implants were placed in mandibular incisor areas. Forty-four implants supported fixed partial prostheses, and 18 implants supported single crowns. The majority of the implants were 15 mm in length. Mean marginal bone loss at the 12-month follow-up visit was 0.53 ± 0.37 mm (range, 0 to 1.4 mm).

Conclusions: The results obtained in the retrospective analysis suggest that the one-piece narrow-diameter implant can predictably restore missing maxillary lateral incisors and mandibular incisor with narrow interdental spaces and labiolingual widths.

Initial clinical efficacy of 3-mm implants immediately placed into function in conditions of limited spacing

Reddy MS, O'Neal SJ, Haigh S, Aponte-Wesson R, Geurs NC.
Int J Oral Maxillofac Implants. 2008 Mar-Apr;23(2):281-288.

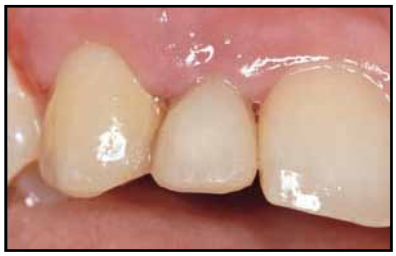


Figure 1. 1 week postoperative appearance.

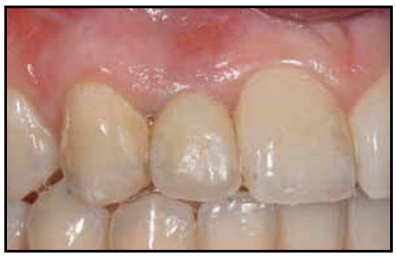


Figure 2. Definitive restoration at 12 months.

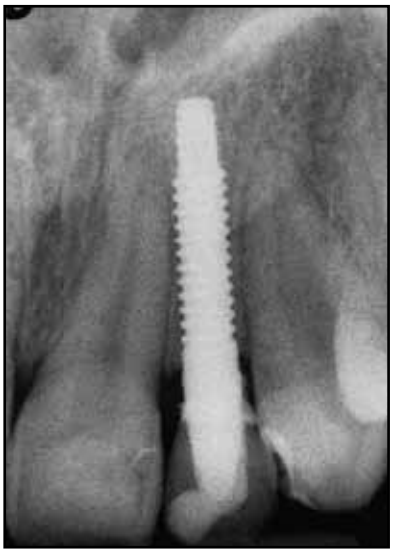


Figure 3. Radiographic appearance at 6 months postoperatively.

Table 1: Radiographic results: Radiographic bone level above the first thread

	Bone level	Change from baseline
Baseline	2.33 ± 0.73 mm	
6 months	1.75 ± 0.78 mm	-0.58 mm*
12 months	1.63 ± 0.81 mm	-0.70 mm*

*$p < 0.01$

ABSTRACT

Purpose: The objective of this study was to determine changes in interdental papillae, alveolar bone loss, esthetics, and initial healing survival when 1-piece narrow-diameter implants were immediately loaded in sites with limited tooth-to-tooth spacing.

Materials and Methods: One-piece titanium alloy implants with a maximum diameter of 3.0 mm and a resorbable blast surface texture on a squarethread form were evaluated. Digital photographs were made at each clinical visit to assess soft tissue healing. Interproximal soft tissue fill of the embrasure was assessed with a modified Jemt index. Standardized radiographs were made at baseline (implant placement) and at 6 and 12 months postsurgery. Radiographic bone height was measured from a consistent landmark on the implant. A 1-sided t test was used to determine statistical differences of bone height.

Results: Thirty-one implants were placed in 17 subjects. One implant had clinical mobility and was removed, for an overall survival rate of 96.7%. Mean bone height on the day of placement and restoration was 2.33 + 0.73 mm above the first thread. Mean bone height was 1.75 ± 0.78 mm at 6 months postrestoration and 1.63 ± 0.81 mm at 12 months postrestoration. There was a statistically significant loss of bone support over the initial 6 months (0.58 mm; $P < 0.01$), with no significant progression thereafter (0.12 mm; NS). Complete fill of papillae was found in 92% of maxillary lateral incisor sites and 60% of mandibular incisor sites.

Conclusion: The use of 1-piece narrow-diameter immediately loaded implants appears to be an effective prosthetic treatment for areas of limited space (Case Series).

Histologic and histomorphometric findings from retrieved, immediately occlusally loaded implants in humans

Romanos GE, Testori T, Degidi M, Piattelli A.
J Periodontol. 2005 Nov;76(11):1823-1832.

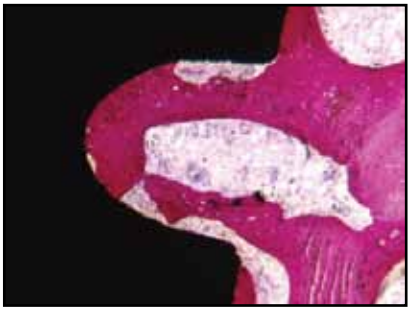


Figure 1. Maestro implant (Tolouidine blue and acid fuchsin; original magnification X50).

Implant System	Specifics	Loading (months)	N Implants	Area	BIC (%)
3i	Osteotite	4	1	Maxilla, 2nd molar	80
3i	Osteotite	2	1	Maxilla, 2nd molar	64.2
Nobel Biocare	TiUnite	6*	1	Maxilla	60
IMZ Twin Plus	Sandblasted	10	2	Mandible	54.2 to 64.5
Maestro	HA-coated/sandblasted	6	3	Mandible	**80.6**
Ankylos	Sandblasted	7*	12†	Maxilla Mandible	65 59
Frialit-2	Sandblasted & etched	10	7	Maxilla (2); mandible (5)	66.8
XiVE	Sandblasted & etched	6	2	Mandible 2nd molar	61 to 72
Total					**66.83 (±8.96)**

Table 1. Histomorphometric data of immediately occlusally loaded implants (human biopsies).
* Heavy smoker undergoing chemotherapy
† Six in the maxilla; six in the mandible

ABSTRACT

Background: The immediate loading treatment concept can be successfully used in implant dentistry. Bone cells migrate onto the implant surface and establish a stable anchorage on the titanium surface. When implants are loaded immediately after surgery, there is a high long-term success rate of the implant-supported reconstruction. Based on histologic observations from different animal studies, the interface of immediately loaded implants can have a direct bone-to-implant connection without any fibrous tissue formation. Mature bone formation is dependent on the loading period. The aim of this study was to demonstrate a histologic analysis of retrieved, clinically stable immediately loaded implants with different implant designs and surfaces. An objective demonstration of the bone-implant interface was presented for the implant systems used.

Methods: A total of 29 implants [N. BioHorizons = 6] with different implant designs and surfaces were retrieved from patients who were treated with implants using an immediate loading protocol and fixed immediate restorations placed the same day after surgery. The loading period was between 2 and 10 months. The bone-implant interface was examined histologically and histomorphometrically.

Results: A high bone-to-implant percentage of 66.8% (±8.9%) [BioHorizons BIC% = 80.6%] was found in the examined retrieved implants. Some marginal bone resorption was observed in the crestal part of the implants.

Conclusion: According to the present histologic and histomorphometric evaluation of retrieved, clinically stable implants, immediate occlusal loading can present a high level of bone-to-implant contact in humans.

Immediate functional and non-functional loading of dental implants: A 2- to 60-month follow-up study of 646 titanium implants

Degidi M, Piattelli A.

J Periodontol. 2003 Feb;74(2):225-241.

Implant	N Implants	N Failures	% Implant Survival	% Prostheses Survival
Maestro	126	0	100	100
Total	422	6	98.6	98.5

Table 1. Immediate functional loading (IFL) implants.

Implant	N Implants	N Failures	% Implant Survival	% Prostheses Survival
Maestro	116	0	100	100
Total	224	2	99.1	98.3

Table 2. Immediate non-functional loading (INFL) implants.

ABSTRACT

Background: The aim of this study was the evaluation, from a clinical point of view, of implants subjected to immediate functional loading (IFL) and to immediate non-functional loading (INFL) in various anatomical configurations.

Methods: The study included 152 patients who had given their informed consent. A total of 646 implants [N. BioHorizons = 242] were inserted. The implants were placed in 39 totally edentulous mandibles, 14 edentulous maxillae, 23 edentulous posterior mandibles, 16 edentulous anterior mandibles, 16 edentulous anterior maxillae, and 15 edentulous posterior maxillae. Fifty-eight implants were used to replace single missing teeth. In 65 cases, IFL was carried out for 422 implants. INFL was carried out in 116 cases, (224 implants).

Results: In the IFL group 6 of 422 implants failed (1.4%) [N. BioHorizons = 0/0%]; in the INFL group 2 of 224 implants failed (0.9%) [N. BioHorizons = 0/0%]. All the other implants appeared, from clinical and radiographic observations, to have successfully osseointegrated and have been functioning satisfactorily since insertion. All failures were observed in the first few months after implant loading.

Conclusion: Immediate functional and non-functional loading seems to be a technique that gives satisfactory results in selected cases.

Five-year prospective study of immediate/early loading of fixed prostheses in completely edentulous jaws with a bone quality-based implant system

Misch CE, Degidi M.

Clin Implant Dent Relat Res. 2003 May;5(1):17-28.

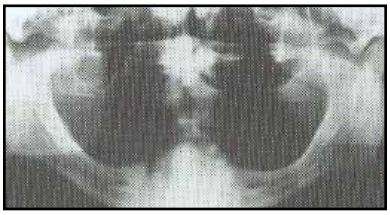


Figure 1. A preoperative radiograph of a completely edentulous patient.

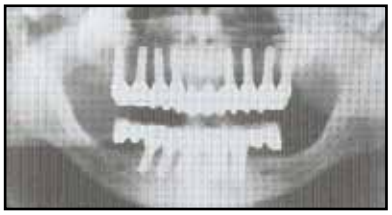


Figure 2. After 4-6 months, a maxillary porcelain-to-metal restoration was delivered. A panoramic radiograph confirmed complete seating.

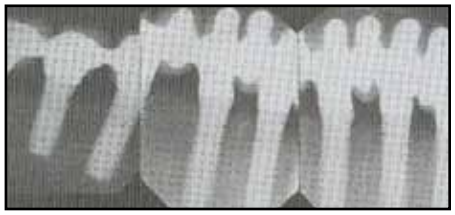


Figure 3. The first year loading periapical radiographs showed an average of 0.07mm bone loss from final prosthesis delivery. After the first year of loading, a slight bone gain was observed, but the vast majority demonstrated 0mm of bone loss.

Table 1: Summary of the prosthesis and implant types and survival

Arch	Immediate Load (Prostheses)	Early Load (Prostheses)	Implant Number/Type	Survival of Implants (%)	Survival of Prostheses (%)
Maxillary	2	10	108 (38 D3, 70 D4)	100	100
Mandible	14	5	136 (121 D3, 15 D2)	100	100
Both	16	15	244	100*	100†

* All implants were in Quality Scale group I to III through to last appointment.
† Average follow-up was 2.6 yr after final prosthesis delivery.

ABSTRACT

Background: The concept of immediate loading of root-form implants for fixed restorations has received increasing interest over the last 5 years. Several authors have commented on parameters that may influence results, including implant number; implant length, bone density, and patient habits. The trigger for bone remodeling around an implant may occur from the surgical trauma of insertion or the mechanical environment of strain at the interface. In the classic two-stage approach, these were divided episodes, separated by 3 to 6 months. Immediate loading compresses this time frame; the two driving mechanisms for bone repair occur concurrently. A scientific approach to the interface development is to match the bone healing response of trauma (woven bone of repair) to the response of mechanical load (reactive woven bone), so the sum of these two entities does not result in fibrous tissue formation and clinical mobility of the implant.

Purpose: It is the purpose of this article to review the scientific rationale of these statements and coordinate them to bone physiology and bone biomechanics.

Materials and Methods: Findings from previous reports in the literature were reviewed and summarized to form the basis of a prospective study using a bone quality-based implant system (Maestro, BioHorizons Implant Systems, Inc., Birmingham, AL, USA). A transitional prosthesis was delivered either on the day of surgery or within 2 weeks for 30 patients and 31 arches. A total of 244 implants were used to support these restorations, for an average of 7.8 implants per prosthesis. After 4 to 7 months, the final restorations were fabricated. One year after the final restoration was loaded, the implant survival was 100%; the 31 restorations also had a survival of 100% over this time frame. This report presents these implants and restorations over a 1- to 5-year period, with an average follow-up period of 2.6 years.

Results: The bone loss from implant insertion to final prosthesis delivery averaged 0.7 mm. The first-year bone loss after final prosthesis delivery averaged 0.07 mm. A slight increase in bone height was observed after the first year, but generally no increase was observed over the remaining evaluation period.

Conclusions: In the current report, no implant failure occurred, and crestal bone loss values were similar to or less than values reported with the conditional two-stage approach. This may be related to the number and position of implants, implant design, and/or the surface condition of the implant loading.

shop online at www.biohorizons.com

Comparative analysis of immediate functional loading and immediate nonfunctional loading to traditional healing periods: A 5-year follow-up of 550 dental implants

Degidi M, Iezzi G, Perrotti V, Piattelli A.
Clin Implant Dent Relat Res. 2009 Dec; 11(4): 257-266.

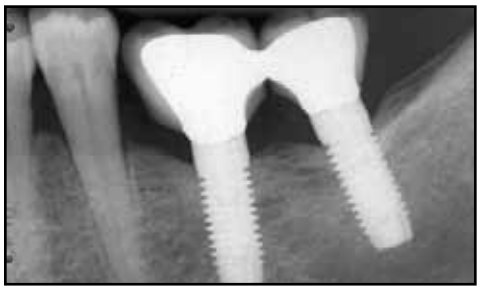


Figure 1. Five-year follow-up X-ray.

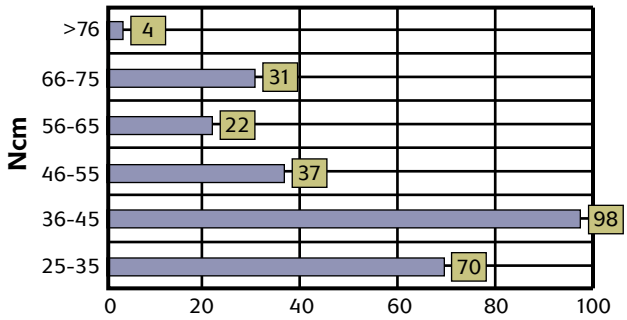


Figure 2. Immediately loaded implants. Insertion torque values.

Table 1: Immediately Loaded Implants

	Number of Cases	Number of Implants	Number of Failures	Implant Survival Rate (%)	Number of Prosthetic Failures	Prosthetic Success Rate (%)
Single tooth	22	22	0	100	0	100
Edentulous mandible	15	102	0	100	0	100
Edentulous maxilla	4	28	0	100	0	100
Anterior mandible	8	22	0	100	0	100
Posterior mandible	16	43	3	93	0	100
Anterior maxilla	9	24	0	100	0	100
Posterior maxilla	8	21	0	100	0	100
Total	**82**	**262**	**3**	**98.8**	**0**	**100**

ABSTRACT

Background: Clinical, radiographical, and histological findings have shown that immediately loaded implants show the presence of mineralized tissues at the interface.

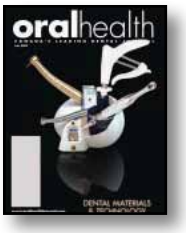
Purpose: The aim of this study was to compare an immediate loading protocol with a two-staged one using an implant with a square thread design.

Materials and Methods: One hundred fifty-five consecutive patients (71 men, 84 women), aged between 18 and 78 years (mean: 54 years) participated in this study. A total of 550 implants (Maestro; BioHorizons, Birmingham, AL, USA) were inserted. In group A, 264 implants were inserted in 82 patients with immediate functional loading with occlusal contact if the patients were completely edentulous, or with immediate nonfunctional loading without occlusal contact if the patients were partially edentulous. In group B, 286 implants were inserted in 73 patients with a one-stage or two-stage surgical procedure. All patients were followed for at least 5 years.

Results: In the immediately loaded implants group, three implants failed, all in posterior mandibular sites, with an overall 98.8% 5-year survival rate. In the control group, no implant failed, with a 100% 5-year survival rate. No statistically significant differences were found in the survival rates of the implants in the two groups.

Discussion: A very high implant survival rate was also present in our series for the immediately loaded implants. All the three failed implants were retrieved from the same patient, who had poor oral hygiene, after a loading period of 5 years. These data can suggest that, from a clinical point of view, an abbreviated healing period is compatible with the development and maintenance over a longer time period (5 years) of mineralized tissues at the interface with dental implants.

Conclusion: We can then conclude that shorter healing periods can be highly satisfactory from a clinical point of view.



Endosteal implants in the edentulous posterior maxilla: Rationale and clinical report

Misch CE, Poitras Y, Dietsh-Misch F.
Oral Health. 2000 Aug;8:7-16.

Table 1: Implants (n=456)

	No.	Type	Success	Loss
	15	D2	15	0
	110	D3	109	1
	304	D4	302	2
	27	C-h	27	0
Total	**456**		**453**	**3**

Table 2: Comparison of functional thread surface area (without coatings and all implants are 1mm length)

	BioHorizons®[a]	Nobel BioCare[b]	Paragon™[c]	Steri-Oss®[d]
Type	(a) D2 (b) D3	Standard fixture	Screw-Vent®	Threaded implant
Diameter (mm)	4	3.75	3.75	3.8
Thread surface area	(a) 210 (b) 245	127	151	111
Type	(a) D3 (b) D4	Wide platform	Screw-Vent®	0 1
Diameter (mm)	5	5.5	4.7	2
Thread surface area	(a) 419 (b) 468	183	192	5 134

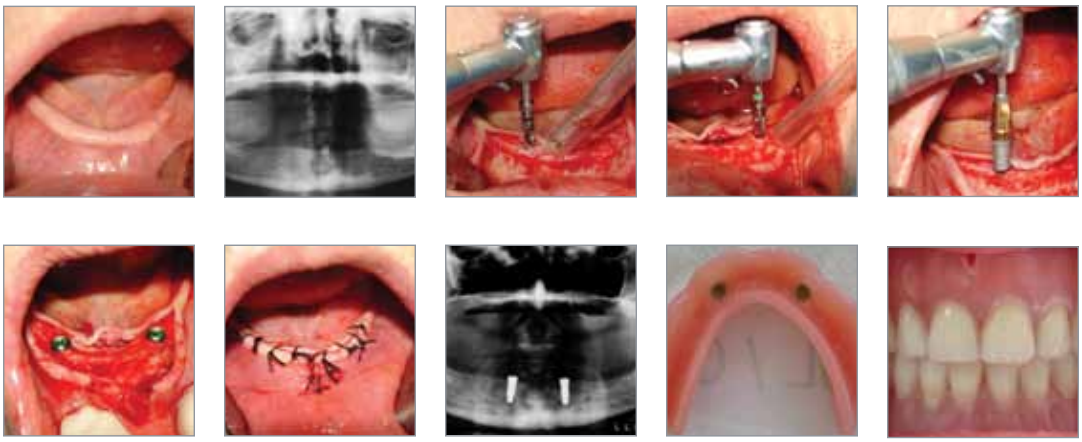
a BioHorizons Implant Systems, Inc. Birmingham, AL 35243
b Nobel BioCare, Inc. Westmont, IL 60559
c Paragon™ Implant Company, Encino CA 91436
d Steri-Oss® Yorba Linda, CA 92887

ABSTRACT

The maxillary posterior region of the mouth sustains greater bite forces compared to the anterior, yet often presents the poorest bone density. A biomechanical approach, often presented to decrease risk factors in regions of high stress or poor bone density, is to increase implant surface area. Most manufacturers provide implants in variable lengths. Sinus grafts permit longer implants; however, finite element analysis support the hypothesis that implant length is a secondary parameter for stress distribution. A more beneficial approach, to enhance implant surface area in the posterior regions, has primarily been to increase the implant diameter. However, when conventional designs and diameters are used, this only increases surface area by 30% yet bite forces increase by more than 300% in the posterior regions. A change in implant diameter and thread design (i.e. BioHorizons Implant Systems, Inc.) may increase surface area by more than 300%. This clinical report demonstrates an implant surgical success rate of 99.4% in the posterior maxilla, using the bone quality-based implant system from BioHorizons. In addition, there were no early loading failures and no prosthetic failures. Crestal bone loss during early loading averaged .71 mm or less, dependent upon a one-stage or two-stage surgical approach. The increase in surface area of this design, coupled with the compressive load thread of this design, may indeed be responsible for the decrease in early loading implant failure and also contribute to a decrease in crestal bone stresses, which may reduce crestal bone loss.

Survival and success of BioHorizons® implants: A retrospective study of cases with 5-year follow-up

B. Sezer, T. Gunbay, M. Güngör, B. Koyuncu 1, E. Çömlekoglu, C. Artunç
Ege University, Faculty of Dentistry, Izmir, Turkey



ABSTRACT

Objectives: The use of osseointegrated implants as an endoestal anchorage device to provide support for dental prostheses is a reliable and widely accepted treatment modality. The purpose of this study was to evaluate the clinical performance of biohorizons implants placed in the maxilla or in the mandible.

Methods: One hundred fifty-five consecutive patients (71 men, 84 women), aged between 18 and 72 years (mean: 54 years) participated in this study. A total of 500 implants (internal; BioHorizons, Birmingham, AL, USA) were inserted. The cases were examined retrospectively in order to evaluate the clinical efficiency of BioHorizons implants and to determine the success rate of implant retained/supported prosthesis after a 5-year period. All implants were assessed clinically and radiographically on a yearly basis.

Results: The 5-year cumulative success rates for maxillary and mandibular implants were 98.7% and 99.6%, respectively. The most common prosthetic complication was abutment accompanied by screw loosening. Of the 500 examined implants, 4 (two in the anterior maxilla, one in the posterior maxilla, one in the posterior mandible) did not integrate before loading. We considered these as early failures.

Conclusion: Within the limitations of the observation period and sample number, the present findings confirmed sufficient success and survival rates of BioHorizons implants placed in the mandible as well as implants placed in the maxilla after a 5-year period. We can then conclude these implants can be highly satisfactory from a clinical point of view.

Type of implant recipient site	# of implants
Standard sites (sufficient bone and keratinized mucosa)	208
Maxillary sites with deficient posterior alveolar ridge (sinus lifting or osteotome technique, implant placement)	82
Sites with horizontal bone defect; simultaneous GBR approach (implant placement + membrane application)	174
Sites with horizontal bone defect; staged GBR approach (bone grafting + membrane application, no implant placement)	36
Total	**500**

Table 1. Classifications of implant recipient sites.

Prosthetic restoration	Maxilla	Mandible	Total
Full-arch bridge (8 implants)	96	80	176
Overdenture (Dolder bar 5 implants)	8	4	12
Overdenture (Ball anchors 2 implants)	20	30	50
Single tooth replacement	44	36	80
Short-span fixed bridges	80	102	182
Total	**248**	**252**	**500**

Table 2. Prosthetic rehabilitation procedures performed.

Augmentation of the maxillary sinus with calcium sulfate: One-year clinical report from a prospective, longitudinal study

De Leonardis D, Pecora GE.

Int J Oral and Maxillofac Implants. 1999 Nov-Dec;14(6):869-878.

Table 1: Implant Clinical Results

	Pilot Group	Test Group	Total
Placement data			
Immediate implants	16	40	56
Staged implants	14	60	74
Implant type			
Biolock	30	75	105
BioHorizons	0	25	25
Success/failure data at 12 months			
Successful implants	29	99	128
Failed implants	1	1	2
Total implants	30	100	130

ABSTRACT

The aim of the present investigation was to evaluate the clinical and histologic results of a sinus augmentation procedure performed using calcium sulfate as the grafting material. A group of 12 patients (15 sinuses) formed the pilot group. Based on the experience of the pilot group, the technique of calcium sulfate application was modified, and a second group of 45 patients (50 sinuses) was subsequently treated (test group). In the pilot group, a total of 30 implants (Biolock) was placed. In the test group, a total of 100 implants (Biolock and BioHorizons) was placed. The clinical data reported in the present study are related to the 1-year follow-up for both groups. Clinical evaluations, including assessment of implant mobility and probing pocket depth, were recorded on a monthly basis following implant uncovering until final prosthesis placement, and every 6 months thereafter. Radiographs were taken prior to sinus augmentation, monthly until 6 months postoperatively, 9 and 12 months after implantation, and at yearly intervals thereafter. One implant in the pilot group was not integrated at second-stage surgery, and 1 in the test group failed to maintain osseointegration after the abutment connection (at the 1-year evaluation). Based on defined criteria, the overall success rate for the 130 placed implants 1 year postimplantation was 98.5%. Clinical and radiographic evaluation revealed that the augmentation procedure resulted in new tissue formation within the sinuses. The technique used in the test group suggested a slowdown in material resorption and a reduction in graft shrinkage during healing. Bone biopsies were harvested for histologic evaluation. The application of a resorbable barrier membrane to the access window reduced the invagination of soft tissue at that level. The results of this study support the hypothesis that calcium sulfate may be a suitable material for sinus augmentation.

Short dental implants in posterior partial edentulism: A multicenter retrospective 6-year case series study

Misch CE, Steignga J, Barboza E, Misch-Dietsh F, Cianciola LJ, Kazor C.
J Periodontol. 2006 Aug;77(8):1340-1347.

ABSTRACT

Background: Implants <10 mm long in the posterior regions of partial edentulous patients have a higher failure rate in many clinical reports. The purpose of this case series study was to evaluate implant survival when a biomechanical approach was used to decrease stress to the bone-implant interface.

Methods: A retrospective evaluation of 273 consecutive posterior partially edentulous patients treated with 745 implants, 7 or 9 mm long, supporting 338 restorations over a 1- to 5-year period was reviewed from four private offices. Implant survival data were collected relative to stage I to stage II healing, stage II to prosthesis delivery, and prosthesis delivery to as long as 6 years follow-up. A biomechanical approach to decrease stress to the posterior implants included splinting implants together with no cantilever load, restoring the patient with a mutually protected or canine guidance occlusion, and selecting an implant designed to increase bone-implant contact surface area.

Results: Of the 745 implants inserted, there were six surgical failures from stage I to stage II healing to prosthesis delivery. No implants failed after the 338 final implant prostheses were delivered. A 98.9% survival rate was obtained from stage I surgery to prosthetic follow-up.

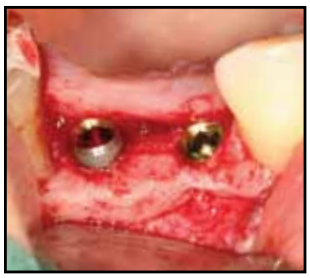
Conclusions: Short-length implants may predictably be used to support fixed restorations in posterior partial edentulism. Methods to decrease biomechanical stress to the bone-implant interface appear appropriate for this treatment.

Implant Design: Thread Pitch. An implant body may be modified to increase functional surface area by varying the thread geometry parameter of thread pitch. Thread pitch is defined as the distance between adjacent threads or the number of threads per unit length in the same axial plane and on the same side of the axis. Restated, a decrease in the distance between threads will increase the number of threads per unit length. For example, the distance between the threads of different manufactured implant bodies ranges from 1.5 to 0.4 mm, with the latter having almost three threads for each thread of the former. The thread distance for the implant in the study presented in this report is 0.76 mm. The greater the number of threads, the greater the surface area, if all other factors are equal. The thread number may be more significant for the shorter implant in the posterior regions of the mouth with reduced bone density. The other implant thread geometry parameter that may also modify the functional surface area is thread depth.

The influence of soft tissue thickness on crestal bone changes around implants: a 1-year prospective controlled clinical trial

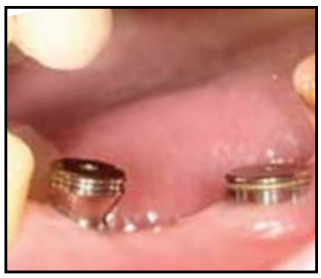
Linkevicius T, Apse P, Grybauskas S, Puisys A.

Int J Oral Maxillofac Implants. 2009 Jul-Aug, 24(4): 712-9.



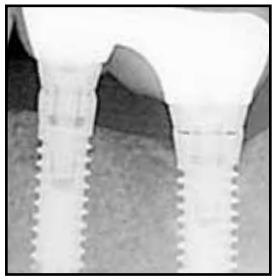
Implants placed 2mm supracrestal & crestal.

Mucosal thickness measured at time of implant placement prior to lingual flap elevation.

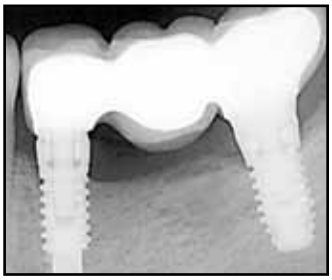


Healed tissues around implants.

Implants in thick tissue at placement.



Implants in thick tissue at 1 year.



Implants in thin tissue at 1 year.

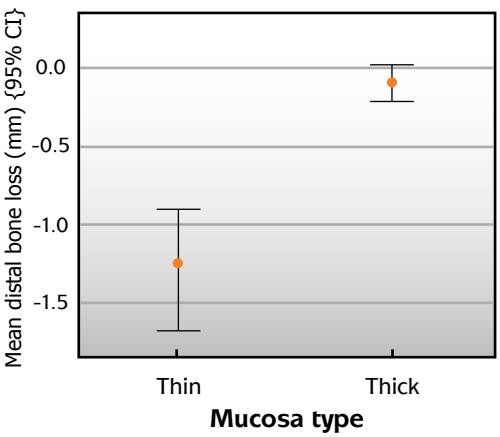
ABSTRACT

Purpose: The aim of this clinical trial was to evaluate the influence of gingival tissue thickness on crestal bone loss around dental implants after a 1-year follow-up.

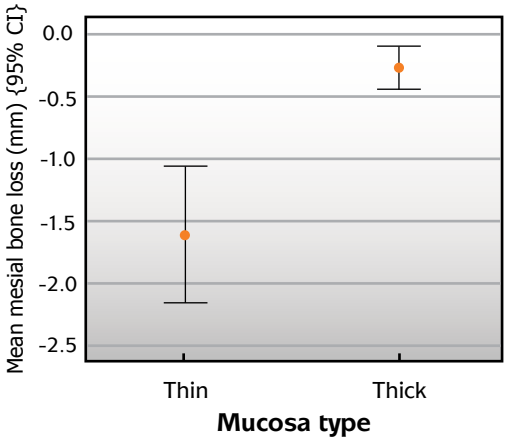
Materials and Methods: Forty-six implants (23 test and 23 control) were placed in 19 patients. The test implants were placed 2mm subcrestally, whereas the control implants were positioned at bone level. Before implant placement, the tissue thickness at implant sites was measured with a periodontal probe. After healing, metal-ceramic cement-retained prostheses were constructed. According to tissue thickness, the test implants were divided into A (thin) and B (thick) groups. Intraoral radiographs were performed and crestal bone changes were measured at implant placement and after 1 year.

Results: Mean bone loss around the test implants in group A (thin mucosa) was 1.61 ± 0.24mm (SE; range, 0.9 to 3.3mm) on the mesial and 1.28 ± 0.167mm (range, 0.8 to 2.1mm) on the distal. Mean bone loss in test group B (thick mucosa) implants was 0.26 ± 0.08 mm (range, 0.2 to 0.9 mm) on the mesial aspect and 0.09 ± 0.05 mm (range, 0.2 to 0.6 mm) on the distal aspect. Mean bone loss around control implants was 1.8 ± 0.164 mm (range, 0.6 to 4.0 mm) and 1.87 ± 0.166 mm (range, 0.0 to 4.1mm) on the mesial and distal aspects, respectively. Analysis of variance revealed a significant difference in terms of bone loss between test A (thin) and B (thick) groups on both the mesial and distal.

Conclusion: Initial gingival tissue thickness at the crest may be considered as a significant influence on marginal bone stability around implants. If the tissue thickness is 2.0mm or less, crestal bone loss up to 1.45mm may occur, despite a supracrestal position of the implant-abutment interface.



Mean distal bone loss around supracrestally-placed implants



Mean mesial bone loss around supracrestally-placed implants

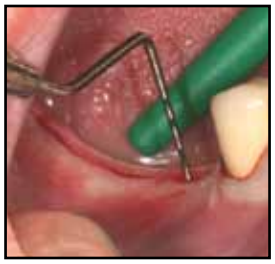
Influence of thin mucosal tissues on crestal bone stability around implants with platform switching: a 1-year pilot study

Linkevicius T, Apse P, Grybauskas S, Puisys A.

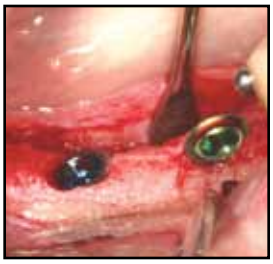
J Oral Maxillofac Surg. 2010 Sep; 68(9): 2272-7.

Prevail platform-switched implant (Biomet 3i)

BioHorizons Internal implant (RBT surface)

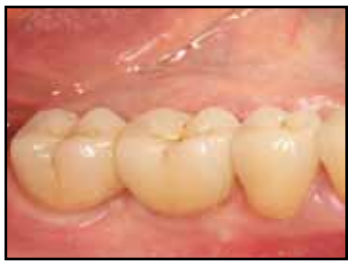


Measurement of mucosal tissue thickness before implant placement.

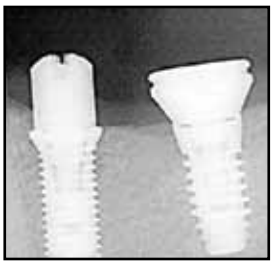


Crestal placement of Biomet 3i (left) and BioHorizons (right)

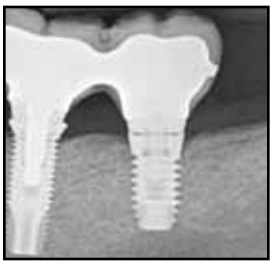
Healing abutments placed on implants.



Splinted metal-ceramic restoration.



Bone level at implant placement.



Bone level at 1 year.

ABSTRACT

Purpose: The aim of this pilot study was to determine what effect thin mucosal tissues can have on crestal bone stability around implants with platform switching.

Materials and Methods: Twelve 2-piece implants, consisting of 6 implants with horizontally matching implant-abutment connection (control) and 6 implants with platform switching (test) were placed in four patients. The mean age of the patients was 43 years (range, 37 to 56 yrs). Mucosal tissue thickness at implant sites was measured to be 2mm or less. Implants were restored with 5 splinted crowns and single 3-unit fixed partial denture. Intraoral radiographs were obtained and crestal bone changes were measured at implant placement and after a 1-year follow up post-treatment. The statistical significance level was set to *P* less than .05.

Results: Bone loss around the test implants was 1.81 ± 0.39mm on the mesial side and 1.70 ± 0.35mm on the distal aspect. Control implants overcame marginal bone resorption equaling 1.60 ± 0.46mm on the mesial side and 1.76 ± 0.45mm on the distal measurement. No statistically significant difference was found between control and test implants either mesially ($F_{[1,10]} = 0.746$; $P = .408$) or distally ($F_{[1,10]} = 0.080$; $P = .783$).

Conclusion: Within the limitations of this pilot study it can be concluded that implants with platform switching did not preserve crestal bone better in comparison with implants with traditional implant-abutment connection if, at the time of implant placement, thin mucosal tissues were present.

References

1. Posterior Implant Single-tooth Replacement and Status of Adjacent Teeth during a 10-year Period: A Retrospective Report
Misch CE, Misch-Dietsh F, Silc J, Barboza E, Cianciola EJ, Kazor C. J Periodontol. 2008 Dec;79(12):2378-2382.

2. A Bone-Quality Based Implant System: First Year Prosthetic Loading
Misch CE, Dietsh-Misch F, Hoar J, Beck G, Hazen R, Misch CM. J Oral Implantol. 1999;25(3):185-197.

3. A Prospective Multi-Center Clinical Investigation of a Bone Quality-Based Dental Implant System
Kline R, Hoar JE, Beck GH, Hazen R, Resnik RR, Crawford EA. Implant Dent. 2002;11(3):224-234. April 30-May 4, 1997. New Orleans, LA.

4. Initial clinical efficacy of 3-mm implants immediately placed into function in conditions of limited spacing
Reddy MS, O'Neal SJ, Haigh S, Aponte-Wesson R, Geurs NC. Int J Oral Maxillofac Implants. 2008 Mar-Apr;23(2):281-288.

5. Immediate functional and non-functional loading of dental implants: A 2- to 60-month follow-up study of 646 titanium implants
Degidi M, Piattelli A.J Periodontol. 2003 Feb;74(2):225-241.

6. Five-Year Prospective Study of Immediate/Early Loading of Fixed Prostheses in Completely Edentulous Jaws with a Bone Quality-Based Implant System
Misch CE, Degidi M.Clin Implant Dent Relat Res. 2003 May;5(1):17-28.

7. Comparative Analysis of Immediate Functional Loading and Immediate Nonfunctional Loading to Traditional Healing Periods: A 5-Year Follow-Up of 550 Dental Implants
Degidi M, Iezzi G, Perrotti V, Piattelli A.Clin Implant Dent Relat Res. 2008 Sep;9.

8. Endosteal Implants in the Edentulous Posterior Maxilla: Rationale and Clinical Report
Misch CE, Poitras Y, Dietsh-Misch F. Oral Health. 2000 Aug;8:7-16.

9. Augmentation of the Maxillary Sinus with Calcium Sulfate: One-Year Clinical Report from a Prospective, Longitudinal Study
De Leonardis D, Pecora GE. Int J Oral and Maxillofac Implants. 1999 Nov-Dec;14(6):869-878.

10. Short Dental Implants in Posterior Partial Edentulism: A Multicenter Retrospective 6-year Case Series Study.
Misch CE, Steignga J, Barboza E, Misch-Dietsh F, Cianciola LJ, Kazor C. J Periodontol. 2006 Aug;77(8):1340-1347.

11. Influence of Hex Geometry and Prosthetic Table Width on Static and Fatigue Strength of Dental Implants
Boggan RS, Strong JT, Misch CE, Bidez MW. J Prosthet Dent. 1999 Oct;82(4):436-440.

12. The impact of loads on standard diameter, small diameter and mini implants: A comparative laboratory study
Allum SR, Tomlinson RA, Joshi R. Clin. Oral Impl. Res. 2008 May;19(6):553-559.

13. Histomorphometric Analysis of the Bone-Implant Contact Obtained with 4 Different Implant Surface Treatments Placed Side by Side in the Dog Mandible
Novaes AB Jr, Souza SL, de Oliveria PT, Souza AM. Int J Oral and Maxillofac Implants. 2002 May-Jun;17(3):377-383.

14. Effects of implant thread geometry on percentage of osseointegration and resistance to reverse torque in the tibia of rabbits
Steigenga J, Al-Shammari K, Misch C, Nociti Jr. FH, Wang H-L. J Periodontol. 2004;75(9):1233-1241.

15. Histologic and histomorphometric findings from retrieved, immediately occlusally loaded implants in humans
Romanos GE, Testori T, Degidi M, Piattelli A. J Periodontol. 2005 Nov;76(11):1823-1832.

16. Short-term Success of Osseointegrated Dental Implants in HIV-positive Individuals: A Prospective Study
Stevenson GC, Riano PC, Moretti AJ, Nichols CM, Engelmeier RL, Flaitz CM. J Contemp Dent Pract. 2007 Jan;(8)1:1-10.

17. Retrospective Multicenter Analysis of Immediate Provisionalization Using One-Piece Narrow-Diameter (3.0-mm) Implants
Dong-Seok Sohn, Min-Su Bae, Jeong-Uk Heo, Jun-Sub Park, Sun-Hae Yea, Georgios E. Romanos
Int J Oral Maxillofac Implants. 2011 Jan-Feb, 26(1): 163-8.

Direct Offices

BioHorizons USA
888-246-8338 or
205-967-7880

BioHorizons Canada
866-468-8338

BioHorizons Spain
+34 91 713 10 84

BioHorizons UK
+44 (0)1344 752560

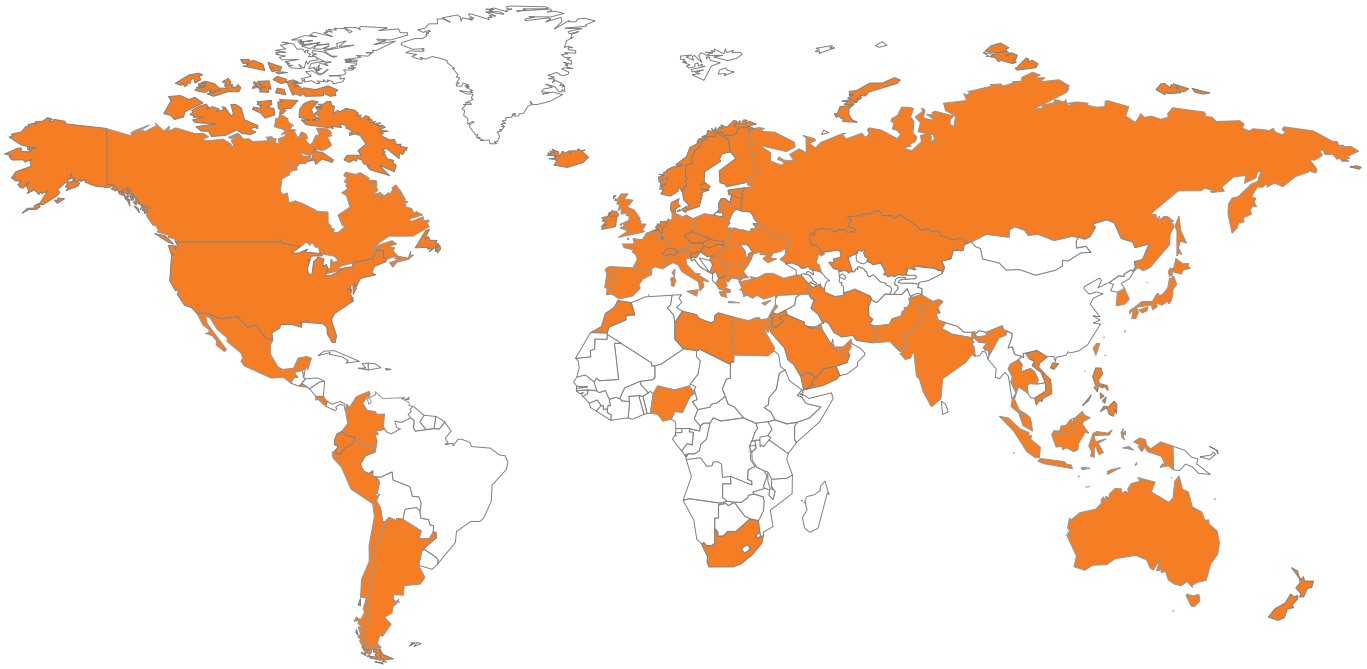
BioHorizons Germany
+49 761-556328-0

BioHorizons Australia
+61 2 8399 1520

BioHorizons Chile
+56 2 361 9519

Distributors

For contact information in our 85 markets, visit www.biohorizons.com



BioHorizons®, Laser-Lok®, MinerOss®, Autotac® and Mem-Lok® are registered trademarks of BioHorizons IPH, Inc. Zimmer® and Screw-Vent® are registered trademarks of Zimmer, Inc. Grafton® DBM and LADDEC® are registered trademarks of Osteotech, Inc. AlloDerm® and AlloDerm GBR® are registered trademarks of LifeCell™ Corporation. Spiralock® is a registered trademark of Spiralock Corporation. Locator is a registered trademark of Zest Anchors, Inc. Delrin® is a registered trademark of E.I. du Pont de Nemours and Company. Pomalux® is a registered trademark of Westlake Plastics Co. Mem-Lok® is manufactured by Collagen Matrix, Inc.

Not all products shown or described in this literature are available in all countries. As applicable, BioHorizons products are cleared for sale in the European Union under the EU Medical Device Directive 93/42/EEC and the tissues and cells Directive 2004/23/EC. We are proud to be registered to ISO 13485:2003, the international quality management system standard for medical devices, which supports and maintains our product licences with Health Canada and in other markets around the globe. Original language is English. © 2012 BioHorizons IPH, Inc. All Rights Reserved.

shop online at

www.biohorizons.com

ML0130

REV C JAN 2012