BIOMATE SWISS SALES KIT







Corporate History

- Biomate Medical Devoces Technology Co., Ltd. was established in 2008.
- Since then, under the guidance of the National Industrial Technology Research Institute, it has been striving to develop the application of PDL laser technology (Precision Dimensions Laser PDL) in implant surface treatment. After spending 4 years, the company's efforts finally completed the development of laser implants in 2012.
- Not only that, but also the continuous development of various product system.
- In addition, the Biomate Implant Institute(Biomate IAI) was established in 2017. Funds are allocated to this institution every year, and then the institution independently carries out three business tasks: a. Conduct academic research with various academic institutions, b Hold dental implant education and c. Sponsor academic forums, etc. https://www.biomate-iai.org/
- At the same time, it is actively applying for various international quality certifications.
- With the recognition of international quality, the business has been actively promoted around the world.
- In 2018, Starumann proposed to Bioomate to authorize the technology of the laser to manufacture in Switzerland, but this proposal was rejected by the board of directors.
- In 2020, a Swiss businessman invested and operated a Swiss company to manufacture implants. He recognized Bioamte Implant System, so he reached an agreement with Bioimate. He and Biomate jointly established BiomateSWISS and registered the brand in the Swiss company.
- It is currently marketed in about 20 countries around the world under the BiomayeSWISS brand.Now we are developing a total new generation, BioiSmart. We are going to launch this SWISS implant in the beginning 2024.
- Meanwhile, we are applying to change the packing from Biomate to BiomateSWISS. Hopefully, this change can be approved by CE on 2023.



Image: Im

bm ISS Biomate implant possesses the patented PDL[™] (Precision Dimension Laser) surface treatment carrying two unique characters:

- First, Biomate patented Precision Dimensional Laser (PDL) creates unique microchannel with micronano complex 3D pore. The microchannel induced the precursor of osteoblast directional moving onto the implant surface, and the micro-nano 3D pore improving the efficiency of osteoblast adherence, proliferation, differentiation, and finally, bone formation.
- Second, the high laser energy created a high oxidized surface which achieved high hemocompatibility offering an environment for fibrin attach then benefit for provisional matrix forming that is important for the early stage.
- Even on the compromised bone ridge, these unique characters still can effectively guide the bone cells to adhere, proliferate and differentiate to accelerate the osseointegration. Hence, the clinic successful rate has been enhanced
- as well as alveolar bone height can maintain for a long time.
- Hence, the clinic successful rate has been enhanced as well as alveolar bone height can maintain for a long time.



> PDL Surface Treatment

Biomate laser surface treatment is a type of hot working technique, which applies high energy density laser (up to 1700 ° C), focusing on the metal surface to fuse and evaporate the surface with the heat. This technique can form unique 3D pores with micro-nano & microchannel texture on implant surface.



https://www.youtube.com/watch?v=RFbGDZkJ_i4





Patented Precision Dimensional Laser (PDL) creates unique microchannel with micro-nano complex 3D pore. The microchannel induced the precursor of osteoblast directional moving onto the implant surface, and the micro-nano 3D pore improving the efficiency of osteoblast adherence, proliferation, differentiation, and finally, bone formation.

10 µm



The micro-nano complex 3D pore & the microchannel











SLA Surface



RBM Surface



PDL Surface



The Best Cleanliness of Implant Surface

Unlike the traditional SLA surface treatment that risk of sand & acidic residue after treatment, PDL surface treatment modifies the fixture surface with laser the does not leave any toxic residue. From our research result, the surface elements contain Ti, N, O, C. We only get TiO2 from the analysis of chemical bond.



Biomate; laser treated; Grade IV pure titanium Contains Ti, N, O, C



> Laser Surface Treatment

No residues of harmful substances on the surface. Because Biomate implant system uses laser for surface treatment, there is no residue from acid and sandblasting processes, and there is no risk of secondary pollution.





The thickness of Oxide layer formed on Biomate fixture.

Laser produces an oxide layer called TiO2, which is formed on the surface of the pure titanium when contacting oxygen. The TiO2 layer with anatase texture can effectively increase the adhesion of protein and decreases the proliferation of fiber tissue. Meanwhile, the TiO2 layer can help to improve the connection between the bone and the implanted material and help to improve the proliferation of hydroxyapatite in SBF.



Top of groove (ridge area): 110nm Bottom of groove: 45nm



Comparison of Implant Surface Treatments

Brand	Nobel	Straumann	3i	Astra	Zimmer	BiomateSWISS
Technology	Anodizing (<u>TiUnite</u>)	SLA (SLActive)	Nanotechnology & Coating (Nanotite)	Sandblasting (OsseoSpeed)	Sandblasting with HA (MTX)	Laser (PDL)
Desciption	The poruous oixde layer is formed on the pure titanium implant by anodizing reaction. The thickness gradually is increased from 1~2 um at the top to 7~10 um at the root.	On the basis of the original SLA, the treatment of hydrophilic functional groups is added.	By using nanotechnology to micronized calcium phosphate, the coating is deposited on the double etched surface.	Titanium oxide particle sandblasting and Fluoride bioactive modification.	Sandblasting with HA, followed by non-etching acid and deionized water to remove residual blasting material.	A laser beam with high power and intensity is focused on the implant surface and melts the surface. The implant will rotate 360 degrees for comprehensive surface treatment and form multichannel and regular 3D porous structures on the implant surface.
Photos						20 µm



Comparison of Laser Treated Implants

Brand	Switzerland: Biomate	Italy: Geass	Italy: Leader-Tixos	USA: Biohorizons-Laser Lock	Sweden: Brånemark Integration	Korea-CSM
Product Photo		And and a second second				
Surface Image		B		$\left \begin{array}{c} \hline \\ \hline $		
Titanium	IV	IV	v	v	IV	IV
Laser with	Pure Laser	Pure Laser	Laser Sintering	Laser with RBM	Pure Laser	Laser with RBM
Residue	NONE	NONE	NONE	YES	NONE	YES
Available	Available in the market	Available in the market	Available in the market	Available in the market	Out of Market	Out of Market
in the	(Main Product)	(Main Product)				
market						
Product	PDL laser creates a whole	The laser removes the titanium	TiO2 particles are sintered	Biohorizons Laser Lock implant only	The roughness of BioHelix implant	These porous structures are
Future	implant surface with the micro	through sublimation moving along	onto titanium surface with	lasers on collar part of implant to	surface texture is on the bottom of	about 20-40 "4 m in size. Regular
	channel and with structure of	the surface of the implant and	focused laser. There is a	optimize the growth of gingival	the threads. The original machined	honey comb appearance has a
	micro-nano pore. This	creating thousands of micrometrical	micro-nano structure.	tissue. The body is processed with	surface is on the thread flanks and	micropore of 10-12 µm interval
	surface structure makes this	pores regularly distributed and the		RBM.	tips. It totally avoids the residual	and shows small pits with
	implant have 7 advantages to	same shape and size.			risk.	diameters of +/• 25 µ m an
	promote the osseointegration.					depth of 20 µm
Weakness	NONE	There is no micro-nano structure.	Titanium powder is sintered	The surface of body is made by RBM.	Limit to the technology, it can't	Laser on RBM treated surface.
		The structure although causes biofilm	by laser beam. The thread	It still has the residue risk. The laser	make the whole implant be lasered.	Because of RBM, it gets the
		reduction, but its osseointegration	can't afford the power of	makes the surface a channel but	Therefore, the bottom of thread has	residue. The thickness of implant
		would not be fast up.	laser; hence, it is easy to be	without a micro-nano structure.	micro and nano structure but the	wall is not strong enough;
			flatten.		other area only is machined.	hence, it is easily broken

SWISS

The Assets of Biomate Laser Surface Treatment

Phase	Description	Picture
Osseointegration	The complex micro-nano 3D pores of BIOMATE-PLUS fixture surface can effectively help to: • Optimize the adhesion and growth of osteocytes • Accelerate the healing of wound • Improve osseointegration	SEN15000 18 T A 18
Contact Area	PDL [®] (Precision Dimensions Laser) Surface Treatment applies precise parametric design and through high efficacy laser luminous energy to strike qualitative micro-nano, complex 3D texture that help increase the contact surface area of the bone and fixture, optimizes the effect of cell proliferation and osseointegration.	
Cell Adhesion	The nano structure surface of multiple micro channel created by PDL [®] technique can help the adhesion of hydrophilic protein like cells, fibrin and so on. There is special metal solution and molecular arrangement in the micro-nano pore. When osteocyte enters the pore, it can stably adhere to the nano structure, plus with the special pore size of Biomate which can accelerate the cells extension and differential, it can significantly improve the osseointegration (the red arrow in the picture shows the cell. SEM report shows the PDL [®] treated surface is highly suitable for the growth of osteocytes).	54400 15 GkV 10 Omm x3 @bk 5E
Hemocompatibility	Proven by experiment, the complex micro-nano texture of BIOMATE-PLUS fixture surface has the best hemocompatibility, which absorbs blood rapidly to the fixture surface during implantation. This feature can effectively accelerate bone regeneration and osseointegration.	0° 1.5mm
Cleanliness	Unlike the traditional SLA surface treatment that risk of sand & acidic residue after treatment, PDL [®] surface treatment modifies the fixture surface with laser that does not leave any toxic residue.	Surface Elements: Ti, N, O, C Analysis of Chemical Bond: TiO2 Evidence shows there is no residual on surface. The surface is fully clean.



> PDL Surface Treatment

PDL (Precision Dimensions Laser)

high efficacy laser luminous energy

qualitative micro-nano and complex 3D pores

increase the contact surface area of the bone and fixture

optimizing the effect of cell proliferation and osseointegration











A RESCUE IMPLANT

ORIGINAL SWISS

The laser surface treatment creates a very unique surface-MicroChannel, Nanostructure & 3D pore, which could promote the followings futures:

These features could make **BiomateSWISS** implant as a rescue implant to satisfy doctors' requests for:

- One Day Implant surgery -Immediate **Replacement and Immediate Loading Surgery**
- Narrow Defect Bone GBR Implant Surgery
- Implant Surgery for low dentistry (Aged people) and light inflation bone
- Minimally Invasive Surgery
- Full Mouth Reconstruction Surgery- All-On-Four Surgery
- Digital Implant Surgery-CAD/CAM and Surgery Guide



- The proteins adhesion which accelerates early bone healing
- Osteoblast cells adhesion
- The induction of angiogenesis
- The initial calcification
- The exchange of nutrients
- Stabilizing surface bone structure
- Inhibition of dental biofilm formation

Biomate SWISS Implant Technology

Biomate implant uses laser technology to create a very unique surface-MicroChannel & 3D pore, which could promote the followings:

- 1. the proteins adhesion which accelerate early bone healing
- 2. osteoblast cells adhesion
- 3. the induction of angiogenesis
- 4. the initial calcification
- 5. the exchange of nutrients
- 6. Stabilizing surface bone structure
- 7. Inhibition of dental biofilm

formation

Professional Precise Perfect Drive You to the Unlimited Imagination

PDL The Hub of Bone Healing

The 7 Advantages for Biomate PDL

The Proteins Adhesion Which Accelerate Early Bone Healing Osteoblast Cells Adhesion The Induction of Angiogenesis The Initial Calcification The Exchange of Nutrients Stabilizing Surface Bone Structure Inhibition of Dental Biofilm Formation

Biomate

Biomate

Biomate Implant System is a totally different implant system from the others.

- 1. Bio-mimic implant
- 2. Self-existing bacteria inhibition implant
- 3. Rescue implant

Biomate

The World's First Implant Approved For The Cleanest Surface With 3D-nanostructure & Microchannel

Biomate Implant System is a totally different implant system from the others.

A Bio-mimic implant

A Self-existing bacteria inhibition implant A Rescue implant



> A Rescue implant

Biomate Implant system is a rescue implant to satisfy doctor's requests for all clinic conditions especially the followings:

- 1. One Day Implant -Immediate Replacement and Immediate Loading Surgery
- 2. Narrow Defect Bone GBR Implant Surgery
- 3. Implant Surgery for low dentistry (Aged people) and inflation bone
- 4. Minimally Invasive Surgery
- 5. Full Mouth Reconstruction Surgery- All-On-Four Surgery
- 6. Digital Implant Surgery-CAD/CAM and Surgery Guide



The Minimally Invasive Laser Gum Disease Treatment



All On Four surgery



Delayed implant placement & horizontal GBR using Bone Graft and Membrane



> A Self-existing bacteria inhibition implant

The research of biofilm research was conducted by Oral Microbiology and Biomaterials Laboratory, Department of Biomedical, Surgical, and Dental Sciences, University of Milan, Italy by Andrei C. IONESCU and Eugenio BRAMBILLA. Dr. Andrei Ionesecu presented his findings confirmed that the formation of Biofilm has nothing to do with the surface roughness, hemophilicity or the purity of titanium, the only thing related is the surface structure. Because the surface roughness of Biomate is high, but because the surface structure of Biomate is different from other implants, the ability of Biomate implant to inhibit the formation of Biofilm is much greater than that of other implants (including the implants on the laser surface of course).





A Bio-mimic implant

The PDL treated titanium surface shows higher affinity for periodontal stromal cells and induce better peri-implant angiogenesis ex vivo. The unique "angiophilic" surface treatment developed by Biomate Swiss may provide better peri-implant treatment outcome for aging population.

PDLaser treated implant reveals more MSCs attachment and more angiogenesis (tubing formation) in comparison with polished implant.







Similar vascular structures can be seen in the Basal Layer near the implant surface as indicated by the arrows



> The fastest initial calcification

The research demonstrate that the laser treated implant can get the fastest initial calcification.





> THE FASTER BONE HEALING

Prof. Dr. Amr from Cairo University, Egypt presents his research, "Implant Stability Changes for PDL Versus SLA Treated Surfaces in Immediate Extraction Cases: A Randomized Controlled Clinical Trial." He finds that:

1. Laser treatment of the implant surface seems to be a promising approach to promote faster bone healing,

2 PDL implant maintained higher implant stability levels in immediate implants compared to SLA, and PDL implant can be a game changer in immediate extraction sockets.





Effect of time in PDL group

		RFA laser treated implant (n=18)						
	At insertion	After 2 weeks	After 4 weeks	After 6 weeks	After 8 weeks	After 12 weeks		
Mean ± SD	61.96±10.04	59.55±6.93	58.48±6.19	62.83±5.94	64.55±5.93	72.65±7.38		
Min-Max	47-76	47.75-69	50.25-68.	50.25-71.5	54.25-72.5	58-80		
ÁNOVÁ test		F=18			150.001°			
P1	-	0.281	0.105	0.648	0.167	≤0.001*		
P2	-	-	0.606	0.095	0.019*	≤0.001*		
P3	-	-	-	≤0.001*	≤0.001*	≤0.001*		
P4	-	-	-	-	0.002*	≤0.001*		
P5	-	-	-	-	-	≤0.001*		

Effect of time in SLA group

		RAF SLA treated implant (n=14)					
	At insertion	After 2 weeks	After 4 weeks	After 6 weeks	After 8 weeks	After 12 weeks	
Mean ± SD Min-Max	61.48±10.96 48.5-77.5	54.303±8.09 36.25-61.50	54.14±7.55 42.7-65.7	61.03±7.26 54-73.5	63.52±8.68 53.25-77.2	70.35±5.71 60-77.5	
ANOVA test			F=14.51, p≤0	.001*			
P1	-	0.116	0.002*	0.755	0.296	0.002*	
P2	-	-	0.959	0.057	0.012*	≤0.001*	
P3	-		-	≤0.001*	≤0.001*	≤0.001*	
P4	-	-	-	-	0.012*	≤0.001*	
P5	-	-	-	-	-	≤0.001*	







> High Hemocompatibility & High Efficiency of Osteoblast Adherence

Best osseointegration and the shortest healing time

*We have measured the thickness of oxygen layers. Top of groove (ridge area): 110nm, Bottom of groove: 45nm. Studies show that the oxide layer on the titanium surface can optimize the adhesion and regeneration of blood and osteocytes.

*The microchannel induced the precursor of osteoblast directional moving onto the implant surface, and the micro-nano 3D pore improving the efficiency of osteoblast adherence, proliferation, differentiation, and finally, bone formation.



The high laser energy created a high oxidized surface which achieved high hemocompatibility offering an environment for fibrin attach then benefit for provisional matrix forming that is important for the early stage.

SLA Surface Treatment



Biomate PDL Laser Surface Treatment



Biomate Laser technique can create the micro- nano structure surface on multiple micro channel, which can help the adhesion of hydrophilic protein like cells, fibrin and so on.



Comparison among Machined, SLA and Laser surface treatment

MG-63 osteoblast-like cell morphologies after 5 days of culture on (a) polished titanium (P-Ti), (b) sandblasted and acid-etched (SLA)-Ti, and (c) laser-treated (L50)-Ti surfaces. Inserted images reveal morphologies at a higher magnification



> The Trapezoid Thread

Based on the following six reasons, the trapezoid thread would be the best implant thread design



A. Withstand the high energy of laser: PDL laser is up to 1700. Triangular design can't afford the high energy. Only Biomate Trapezoid thread would withstand the high energy

- B. Resist to micromovement
- C. Disperse the stress surrounding thread
- D. The highest BIC (bone-to-implant contact)
- E. The asymmetrical trapezoid thread design makes implant easy in and hard out.

F. When do All on Four implant, the angle of the thread will further increase the stability of the implant.





\succ The Thread Angle is 15° -25°

This trapezoidal thread is designed as a lower angle of 25 degrees and an upper angle of 15 degrees, which becomes our current asymmetric trapezoidal thread.

1. According to the SKTII patented screw design, which comes from Chinda's parent company, Chinda, and the long-term experience in the screw industry, the total upper and lower angle of 40 degrees is the sharpest cutting design. If 40 degrees is divided into the upper end and the lower end of the thread, the angle is divided into half, which becomes 20 degrees and 20 degrees.

However, in terms of thread cutting design, 20 degrees and 20 degrees are too average. An asymmetric angle could produce a cutting force like a lancet. Therefore, it is generally divided 40 degrees into a lower angle of 25 degrees and an upper angle of 15 degrees, and then it can produce the effect that it is easy to attack and not easy to spin out.

2. The above descriptions are still described in terms of the concept of industrial screw V-threads, but at the beginning, because we were designing dental artificial roots instead of industrial screws, the V-threads might be too sharp to hurt bones (Animal study by Taipei Medical University in Taiwan has approved this point), so the tip of the V-line thread was cut and became a trapezoidal thread. This trapezoidal thread is designed as a lower angle of 25 degrees and an upper angle of 15 degrees, which becomes our current asymmetric trapezoidal thread.

3. There is also a so-called "mechanical tooth" in the screw industry. Its teeth are parallel, and its speed will be slower. When it is locked in, the cutting force is not so high and the force is relatively low. This kind of mechanical tooth is what we call trapezoidal thread. This trapezoidal thread can withstand the high energy of the laser at 1700 degrees Celsius, and there is no need to worry about the tip of the thread being flattened by the laser (V-threads are not suitable for the high energy of the laser because the tip of thread will be flattened). Finally, Biomate implant design the thread as the asymmetric trapezoidal thread.

4. Physicians often tell us that the trapezoidal thread of Biomate implant is more difficult to lock in than the selftapping thread (V thread). This is because the requirements of Biomate implant are different from other implants. The trapezoidal thread has a stronger ability to resist micro-movement and disperse stress than the V-shaped thread, and the BIC value is also the highest among all implants.





Thread distance is 0.8mm and depth as 0.3mm

Animal experiment was conducted by Taipei Medical University confirmed that the best osseointegration was obtained when using trapezoidal threads with a pitch of 0.8 mm, compared to other thread designs.

In the Masson Goldner staining of the present study, trapezoidal threads with an 8 mm pitch at 16 weeks showed more mature lamellar bone in bone tissue. The bone tissue in the trapezoidal thread with 8 mm pitch has faster bone formation, faster maturation, and better calcification.

At the same time, it is also found that although the square thread has the best effect in resisting micromovement, it is inconvenient in operation due to the relationship of the thread flank angle. In addition, other studies have also confirmed that although the V-shaped thread with cutting force is convenient to operate, when the implant is stressed, the edge of the thread is prone to stress concentration and cause bone resorption.

Therefore, this animal experiment confirmed that the trapezoidal thread can provide a wedge force that is closer to the V-shaped thread than the square thread when implanting surgery in the bone to help the operation, and at the same time, it can also achieve the effect of osseointegration faster.

Reference: Influence of Thread Design on Dental Implant Osseointegration Assayed Using the Lan-Yu Mini-Pig Model, Shih-Kang Chien, Shui-Sang Hsue, Chih-Shing Lin, Tzong-Fu Kuo, Duen-Jeng Wang, Jen-Chang Yang & Sheng-Yang Lee, Journal of Medical and Biological Engineering volume 37, pages627–638 (2017)





> Comparison among the branded implant

From the comparison of BIC branded implants in the market, the trapezoidal thread has been confirmed, having the highest BIC value.

Items	Brand name	thread design	implant design	BIC value (implant size 4*12)	data sources
1	Straumann ITI	Triangular (V shape)		(Implant size 4*12) 161.5mm	
2	Nobel Biocare	Serrated (Buttress)		(Implant size 4*12) 167.1mm	Contemporary Implant
3	Biomet 3i	Triangular (V shape)		(Implant size 4*11.5) 186.2	Dentistry, 3rd Edition, Carl E. Misch, Mosby Page 241
4	Biohorizons	Rectangle (Square)		(Implant size 4*12) 206.5mm	
5	BiomateSWISS	Trapezoid		(Implant size 4*12) 237.45mm	BiomateSWISS R&D laboratory



Boimate Plus get 0.7mm machine side under the platform switch



1. Our 0.7mm is embedded in the bone, which will not affect the osseointegration. In the current market, many implants have the metal collar design. Based on the results of academic researches, there are no doubt about the osseointegration on this area. If osseointegration is concerned, the machine surface can be left in the soft tissue layer to increase the thickness of soft tissue. One of the most important points for our design is to prevent future peri-implantitis. The research demonstrates that Machine surface get less biofilm than Polished surface.



2. Because of force considerations. 0.7mm is the widest part of the Morse taper, and it is also the stress concentration area of the implant. There is a concern of cracking on the surface of the laser. Therefore, in order to consider the thickness of the implant wall, no laser is used in this place. Physicians who do not like to use bone level at present are considering that the implant wall is too thin or the screws are too thin. Therefore, the second focus of our design is to solve the problem of the force of the wall thickness.





Reference

1. Andrei C. IONESCU & Eugenio BRAMBILLA, Laser microtexturing of titanium surfaces for reduced oral biofilm formation, microorganisms 2022

2. Mara Di Giulio, Luigina Cellini, Tonino Traini, Bruna Sinjari, Sergio Caputi, Antonia Nostro &Prof. Luigina Cellini, Porphyromonas gingivalis biofilm formation in different titanium surfaces, an in vitro study, Clinical Oral Implants Research







> Abutments CAD-CAM & Digital





> Abutments CAD-CAM & Digital





> Abutments CAD-CAM & Digital









Digital Implant Solution

"All Products We Can Offer"



Implant System

Surgical Guide/KIT



CBCT



Collagen Bone Graft



Intraoral Scanner



Implant Planning



3D Printer



Milling Machine





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Patient Satisfaction





How to use Biomate Implant Correctly

Biomate implants are designed to provide a better environment for bone healing. From surface treatment to thread design, there are many differences from traditional implants.

Therefore, in order to achieve the purpose of improving bone healing, we will have a brief introduction about Biomate implant, otherwise we might not have proper bone healing, further, even cause more serious bone resorption in the early healing period.











IIImplant Futures



PDL=Precision Dimension Laser





Laser modified micro- and nano-structured surface

- Laser is an emerging field for use as a micromachining tool to produce a 3-D structure at micrometer and nanometer level. The technique is a method of choice for complex surface geometries. The technique generates short pulses of light of single wavelength, providing
- energy focused on one spot. It is rapid, extremely clean, and suitable for the selective modification of surfaces and allows the generation of complex microstructures/ features with high resolution. These advantages make the technique interesting for geometrically complex biomedical implants.

Contemporary Implant Dentistry, 3rd Edition, Carl E. Misch, Mosby Page 27



I. Cleanliness Of The Implant

No residues of harmful substances on the surface. It is the cleanest implant surface in the world

Because Biomate implant system uses laser for surface treatment, there is no residue from acid and sandblasting processes, and there is no risk of secondary pollution.



II. Laser Treated Surface structure

The structure of the surface is enhancing osseointegration

Because of the multi-channel on the surface of the implant, the cells can be guided to the implant, especially when the bone condition is worse, you can implant boldly. Just follow our implant protocol, and the bone cells will quickly climb onto the implant. The implant body, due to the special surface structure -3D microchannel with nanostructure, will form impressive osseointegration.



with a micro-nano complex 3D pore. The microchannel induced the precursor of osteoblast directional moving onto the implant surface, and the micro-nano 3D pore improved the efficiency of osteoblast adherence, proliferation, differentiation, and finally, bone formation. This structure increases the contact surface area of the bone and fixture and optimizes the effect of cell proliferation and osseointegration. Taipei Medical University conducted this study.

First, Biomate patented Precision Dimensional Laser (PDL) creates a unique microchannel

MG-63 osteoblast-like cell morphologies after 5 days of culture on (a) polished titanium (P-Ti), (b) sandblasted and acid-etched (SLA)-Ti, and (c) laser-treated (L50)-Ti surfaces. Inserted images reveal morphologies at a higher magnification



III. Laser Treated Surface Structure

The surface structure is sturdy

Because the laser is used for surface treatment to form a compact and dense structure with multi-channel and 3D composite holes, there is no need to worry about peeling and destruction of the Biomate implant surface structure if repeated implantation and removal.



The chipping also can be found in flat area which disrupts the continuity of the pattern and the titanium surface seems a little bit more flattening.

At 2000x magnification, the spikes were compressed into flat area.



At 500x magnification, the pit, pore and elevation are found at the top of thread.

According to a pilot study conducted by Mahidol University, Biomate plus presented only few damages over the implant. The damage could be found as chipping, pit, and flattening. SLA implant presented pit, flattening, and fuse surface in larger amount compare to Biomate Plus. The defect could be easily found especially in apical thread corresponding to self-tapping design. Biomate plus surface did not present the sharp asperities in micro level, therefore this might be the reason why it had minimal surface alteration and more durable properties. Therefore, the macro-nano roughness is not easy to be damaged at the high torque force. It demonstrates that the constructure of surface is very firm.



IV. Thread Design Don't think to use the implant itself to tap the implant

Due to the high temperature of the laser and the demand for All on Four, we made an asymmetric trapezoidal thread design for Biomate implants. Compared with Korean factory or most of the triangular thread design, the cutting force of Biomate implants is relatively weak.

Therefore, do not think that you can use the implant itself to tap the implant itself and use excessive torque on Biomate implants, this will only put too much stress on the implants, causing subsequent bone loss (Bone Loss)





Trapezoid Thread Design

- The lower part of the thread carries a larger angle of 25 degree allowing easier insertion of implant.
- The upper part carries a smaller angle of 15 degree preventing implant from dislodging.
- The space between the threads also forms an asymmetric trapezoid shape with a 0.3mm depth and 0.8mm apart. During the insertion of implant, the lower slope of this asymmetric trapezoid space (the upper part of the thread) squeezing the bone upward and compacting the bone into the space.
- The asymmetric trapezoid also benefits the laser processing on implant surface which providing good environment for optimal bone



Conclusion

- 1. Minimum stress from Mises has been concentrated by Trapezoidal, which is favorable for the preservation of the bone.
- 2. Trapezoidal Thread which is not introduced so much in dental implant type shows good performance with its large bone implant contact, stress distribution and bone preservation.
- 3. The maximum stress of implants and the minimum stress of the Trabecular bone were observed. The interface stress distribution depends heavily on the implant structure.
- 4. The Maximum stress on Implants found on V-Thread design. Whereas as the minimum for Implant exists on trapezoidal thread.
- 5. The cortical bone showed maximum stress in comparison to the Spongy bone in both cases for the Implant and for the Interface.
- 6. An optimum state of osseointegration between the cortical bone, cancellous bone and implant in the model was assumed which is not clinically present.
- 7. As the maximum stresses found around the neck of the Implant, The implant's neck needs to be strong enough. It may have an impact on implantation integrity if the Implant is not solid in this region.



	4		
Table 11-4	Surfac Design	e Area of In ns (4 mm in	nplant Diameter)
IMPLANT T	YPE	IMPLANT SIZE	SQUARE MILLIMETERS
BioHorizons (i	internal)	4 × 12 D3	206.5
BioHorizons (external)		4 × 12 D3	214.9
31		4 × 13	210.4
31		4 × 11.5	182.6
Replace Selec	t	4 × 12	167.1
ITI Staumann		4 × 12	161.3

Biomate plus implant 4x12mm







V. Initial Stability

The initial stability is important, however, Blood Supply is VITAL

Biomate implant system do not need to emphasize the initial stability, you just need to follow our protocol and then place the implant in the right. The osseointegration will be completed in the shortest time.

Don't think that the implant must be install tightly. This is just to make the implant too stressful and cause bone loss easily. Blood supply is the crucial.



A preliminary study at the master program of oral implantology Cairo University conducted by Refky A, and Elkhadem A and presented on Bangkok International Dental Implant Symposium 2019, "The impact of PDL versus RBM implant surface treatment on implant stability during healing: A preliminary clinical study Aim: Compare changes in ISQ values of PDL versus RBM surfaces during the healing period." This study finds that: Conventional sandblasted implant surfaces show implant stability dip from week 2-6 while PDL implants show gradual increase instability throughout the healing phase. Please refer to the <u>attached studies</u>.





The dentist may believe a protocol for immediate load is to tighten the implant within the bone to 45 to 60 N-cm. Although this concept helps ensure that the implant has rigid fixation and is in good-quality bone, the additional torque used to secure or evaluate fixation of an implant in bone actually may increase the strain at the interface and therefore increase the amount of remodeling, which decreases the strength of the bone-implant interface. Therefore it is prudent to minimize factors related to thermal injury and surgical trauma when considering immediate load to the implant interface.

ontemporary Implant Dentistry, 3rd Edition, Carl E. Misch, Mosby Page 804



VI. Inhibit the biofilm formation

Laser-treated surfaces showed the lowest biofilm formation

Biomate implant is the implant with the laser treated surface, which shows that bacteria don't like. This surface is effective in reducing biofilm formation.





V. Inhibit the biofilm formation

Bacteria are difficult to grow within the pit of laser treated surface

Once the biomate got infected, don't worry that it is not easy to clean up due to the rough topography of laser treated surface. Please treat it with photodynamic protocol(Methylene blue-mediated aPDT) or Er:YAG Laser, and Biomate implants can form good osseointegration again.



VI. Conclusion

- 1. Initial stability is important, however, Blood Supply is VITAL.
- 2. Don't think to use the implant itself to tap during implant insertion.
- 3. The surface structure is very sturdy.
- 4. The laser surface topography can enhance osseointegration.
- 5. No residual harmful substances on the surface. It is the cleanest implant surface in the world.
- 6. Bacteria are difficult grow on the surface.
- 7. Laser-treated surfaces showed the lowest biofilm formation.

Laser-treated surfaces showed the lowest biofilm formation

Biomate implant is the implant with the laser treated surface, which shows that bacteria don't like. This surface is effective in reducing biofilm formation.



D6 Academic Activities

bm ISS

> Biomate IAI (Implant Academy Institute)

https://www.biomate-iai.org/



Biomate SWISS



Research Works

No	year	Country	University	Article	Researcher	Completion Date	Link	Published / Presented
1	2017	Taiwan	National Chung Hsing University	Study on Physical structure of Laser Surface	Prof. Dr. Fuh- Sheng Shieu (Jefferson)	February in 2017	https://drive.google.com/drive/folders/1BmM ZUzoF-clxj3RMJU0kMyqc4AsR2px_	Presented on Biomate International Symposium of Dental Implant 2018 Published on International Dtnal Material Congress, November 4-5, 2022, Taipei
2	2017	Taiwan	National Yang- Ming University.	Study on the initial bone cell response to laser-treated titanium surface	Her-Hsiung Huang	July in 2017	https://drive.google.com/drive/folders/1uF9T1 MfX-3RGRsZFUDwD1IV_FqBZZVX0	Presented on Biomate International Symposium of Dental Implant 2018
3	2018	Taiwan	National Yang- Ming University.	Study on the bone cell mineralization of laser-treated titanium surface	Her-Hsiung Huang	July in 2018	https://drive.google.com/drive/folders/1JuPAi p-BwQZz4JvcOo7MF1vEI2pgHs1j	Presented on Biomate International Symposium of Dental Implant 2018
4	2018	Taiwan	Chung Shan Medical University	Evaluating Bacterial Adhesion & Decontaminating methods of LMS (Laser Micro-textured Surfaces) and SLA Implant	Prof. Dr. Chun- Cheng Chen	November in 2018	https://drive.google.com/drive/folders/1U1n5a O6cbsUk9KFAY1pD6fAjuNwWL29Z	Presented on Bangkok International Symposiu of Implant Dentistry November 27-28,2019
5	2018	Egypt	Cairo University	The impact of PDL versus RBM implant surface treatment on implant stability during healing: A preliminary clinical study	Prof. Dr. Amr Hosny Elkhadem	November in 2018	https://drive.google.com/drive/folders/1wWm xfDWD20IbMJQUnxaTLYLnWCu8txAf	Presented on Bangkok International Symposiu of Implant Dentistry November 27-28,2019
6	2018	Thailand	Mahidol University	The surface topography, composition and osteoblast adhesion of commercially available laser-treated titanium implants	Prof. Dr. Natthamet Wongsirichat/ Lee Kian Khoo	October in 2018	https://drive.google.com/drive/folders/1Enc5 WLjekhZnNCReK6TvcQ7nXMyolkih	Published on The Open Dentistry Journal, 2020, Volume 14
7	2019	Thailand	Mahidol University	Topography analysis and surface alteration after insertion of laser surface treated implant: a preliminary study	Prof. Dr. Natthamet Wongsirichat/ Sakanus Vijintanawan	September in 2019	https://drive.google.com/drive/folders/1q0GT T8fo0GmX1Vd8hWaSxIids21L2IPw	Published on M Dent J 2020; 40 (2) : 95-106

Research Works

No	year	Country	University	Article	Researcher	Completion Date	Link	Published / Presented
8	2019	Italy	University of Milan, Italy	Laser microtexturing of titanium implant surfaces to reduce oral biofilm formation	Prof. Eugenio Brambilla/Prof. Andrei Ionescu	December in 2020	https://drive.google.com/drive/folders/1LrAYbCG WCXyaC0w4f25C_wtDwYFQ8uiS	Willl published on microorganisms
9	2020	Egypt	Cairo University	Primary Implant Stability of Laser Surface Treated versus Sand Blasted/Acid Etched Surface Treated Implants in Fresh Extraction Sockets. A randomized Clinical Trial	Prof. Dr. Amr Hosny Elkhadem	December in 2020	https://drive.google.com/drive/folders/1cvCRHhV Fjq8Eh88H5u4Xb9UhW6DKNGXp	Presented Biomate International Symposium of Dental Implant 2021. Posted on Implant Stability Changes For PDL Versus SLA Treated Surfaces In Immediate Extraction Cases
10	2021	Malaysia	University of Malaya	Identification of biological responses as a causal link for the increased peri-implantitis in patients with history of periodontitis	Prof. Dr. Eshamsul Sulaiman/Dr. Husna Perio	June in 2023	https://drive.google.com/drive/folders/1kSFxwiljf LqrDUzUoEe3jZjL_7j8DC57	Not yet
11	2021	Taiwan	Taiwan University	The effects of precision dimensional laser-treated titanium surface on the potential of osseointegration	Prof. Dr. Hsin-Han Hou	July in 2022	https://drive.google.com/drive/folders/1B7aZ3tmN 1sFftglusJCrvkRZJc1bXrX9	Not yet
12	2022	Lithuania	Vilnius University	Effect of implant placement depth on peri-implant tissues in immediate implant placement	Prof. Dr.Tomas Linkevicius	February in 2023	https://docs.google.com/document/d/18aW_elMia HZYXc9K3jWPggFoatVJs2sy/edit	Not yet
13	2022	Egypt	Al-Azhar University	Evaluation of vestibular socket therapy using xenograft with and without platelet rich fibrin for managing type II extraction sockets for immediate implant placement in the esthetic zone.	Dr. Eltoukhy	in progress	https://docs.google.com/document/d/1XcYA5n6O EwAK8scpnrIkBFyuco_s3HR1/edit	Not yet
14	2022	Thailand	Walailak University	Healing Abutment Distortion in Implant Prostheses: An InVitro Study	Prof.Dr.Natthamet	March in 2022	https://drive.google.com/drive/folders/1VllbD0tpe YyNWryeMGIHs2V1ciOBHLM-	Published on J. Funct. Biomater. 2022, 13, 85.
15	2022	Thailand	Srinakharinwirot University	The assessment fixture distortion subsequently installation	Prof.Dr.Natthamet	in progress	https://drive.google.com/drive/folders/1m3nDau97 o6B-ZNu0Bd8cUIgqg7d_vTwz	Not yet