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**Immediate Implant Placement and Immediate Loading with Osstem TSIII Implant System and Chair-side Provisional Restoration in Mandibular Anterior Partial Edentulism**

Choon-Mo Yang  
Scientific Poster, Osstem World Meeting 2011

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**Background:**
According to sufficient clinical and scientific studies, immediate implant placement and immediate loading offers a predictable immediate solution to teeth loss. The mandibular anterior region is suitable to get primary stability of inserted implants because of its high quality of alveolar bone. In this clinical case report, after extraction of mandibular anterior teeth, implants are placed immediately and loaded immediately with chair-side provisionalization.

**Study design (Case Report):**
Osstem TSIII Implant, Bone Graft (SureOss™ chip, FDBA), Omni-Vac Shell, Temporary Abutment, Bis-Acryl Provisional Resin, Transfer Abutment.

**Conclusion:** Immediate provisional restoration placed on immediate implants in extraction sockets offers predictable advantages to both patients and practitioners. The primary stability was obtained with Osstem Implant system which has sandblasted and acid-etched rough surface and tapered body design. With help of prosthetic components such as convertible abutments, temporary cylinder and Bis-Acryl provisional resin material, the chair-side provisional restoration accomplished prompt esthetic and functional need and stable bone response around implants.

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**Immediate implant placement and immediate loading with Osstem TSIII SA implant clinical result**

Hyun-Ki Cho  
Scientific Poster, Osstem World Meeting 2011

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**Background:**
It has been suggested previously that immediate implant placement in fresh extraction sockets would be advantageous to preserve alveolar ridge dimensions by reducing post-extraction alveolar ridge resorption, and thus supporting an aesthetic implant restoration. Recent studies referring to the survival rate of implants placed immediately in fresh post-extraction sockets showed similar results to implants placed in healed bone. For successful immediate implant placement, dentists have to know the clear concepts. Therefore, the aim of the present study was to evaluate the effect of the timing of loading on bone healing following immediate placement of Osstem TSIII SA implants into fresh extraction sockets.

**Study design (Case Report):**
Sex : F, Age : 50yr  
C.C : root rests and mobile teeth  
Treatment protocol :  
#15, 13, 12, 11, 21, 22, 23, 34 Tooth extraction  
#36, 45, 46, 11, 12, 13, 16, 21, 22, 23, 25 implant placement  
Temporary 2 implant #16-25, #36-46 crown and bridge

**Conclusions:**
The present study has shown that the osseointegration of implants placed immediately into fresh extraction sockets can be achieved irrespective of the timing of loading. Taking these results together, it is considered that the Osstem TSIII SA implant may lead to prompt bone conduction in the early stage and excellent bone response. Therefore, immediate dental implant placement is reliable treatment and offer benefits to dentists and patients.

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One TSIII implant and two temporary implants were immediately loaded with rigid acrylic provisional fixed partial denture in the maxilla. They had mobility and removed two months later. Second provisional was made with remained implants. Cement retained porcelain fused metal crown and bridges were made finally in both arches.
Immediate Loading of TSIII HA, TSIII SA Implant system

Background:
Restoring the region of missing teeth using implants has become a generalized dental technique. To ensure strong osseointegration between bone and implants, a long healing period is needed for the formation of new bone. Note, however, that restoring the masticatory function fast as a result of improving primary physical stability seems possible through the improvement of implant form and secondary biological stability.

Study design (Case Report):
At the EAO Consensus held in 2006, immediate loading was defined as a technique of connecting the upper structure that occludes within 72 hours of placing implants. Nowadays, the period tends to extend to up to 1 week. Initial stability is important above all for successful immediate loading, and implants should be placed well and in appropriate position and direction to form stabilized prostheses immediately. Primary stability is determined by the bone mass, bone quality, implant forms, and surgical ability of the surgeon. Performing drilling reduced by one stage and slightly short final drilling are recommended, including using implants capable of self-tapping, tapered form, and implants with large diameters to increase the contact levels of bone and implant and improving primary physical stability. To increase secondary biological stability, rough surface where bone response is quick is recommended. The appropriate types seem to be the SA surface (Osstem Implant) accompanied by blasting and acid etching or the HA surface (Osstem Implant) coated with hydroxyapatite. Placing a sufficient number of implants in an appropriate position, reducing the size of the occlusal surface of the initial temporary prostheses and forming a small cusp angle so that lateral pressure is applied minimally, and dispersing occlusal pressure by rigidly splitting all implants if possible seem to be important. As long as the residual teeth around the edentulous jaw are healthy, and if the antagonist tooth is a denture that does not deliver occlusal pressure considerably, the success rate will be higher, and indications can be expanded if auxiliary implants are placed strategically.

The TSIII SA & TSIII HA released by Osstem Implant allow immediate loading to be easier than before with an expanded range of application by improving primary physical stability and secondary biological stability through surface enhancement. Although this assessment is based on short-term, there have been many cases wherein the clinical results were good. Thus, some of them are introduced herein.

Subjective Satisfaction of Clinician and Short-term Clinical Evaluation of Osstem TSIII SA Implant

Young-Kyun Kim, Ji-Hyun Bae
J Korean Clinical Implant 2010;30(7):430-43

Background:
Recently Osstem Inc. released a new product line, TSIII SA, which is processed by sand blasting using alumina and acid-etching. This new implant features a tapered design, with an open thread equipped to top to minimize necrosis of the alveolar bone, while its helix cutting edge allows self-tapping and easy adjustment of the installation direction. The apex is designed to improve probing ability into the bone tissue, and fixing ability on the bottom. The manufacturer explains the benefits of the TSIII SA as follows:

1) Excellent initial stability after loading on bone of poor quality
2) Possibility of early or immediate loading
3) Short time required for the procedure
4) Easy adjustment of cutting ability and depth
5) Easy correction of the installation direction

Therefore, the authors investigated the clinical benefits of this brand-new implant by evaluating the subjective satisfaction of clinicians and the short-term clinical outcome after the installation of TSIII SA implants in 41 medical centers that are actively involved with dental implantation nationwide, and we are reporting the results.

Study design:
A total of 41 dental clinics took part in this study. 51% of the centers used the GS system from Osstem Inc., and 49% used the TSIII SA based on their combined experience of 522 implantations.

(1) Bone quality Bone quality was classified into hard, normal, or soft bone according to the clinician’s personal evaluation.

(2) How easy was it to secure the initial fixation?

(3) How effective was the cutting ability of the implant into the bone tissue?

(4) Clinician’s compliance with the implantation procedure

(5) Failure of the implantation in the early stage and the bone's response

(6) Overall satisfaction with TSIII and other opinions

Results:
In this study, the TSIII SA implant was used in settings with various degrees of bone quality, and the success rate of implantation in the early stage was as high as 99.6%. The TSIII SA implant also showed excellent bone response, and the treatment period - from installation to prosthetic loading - was shortened by an average of 3-4 months. No significant difference was observed in initial fixing force and self-tapping ability, which indicates that the TSIII SA implants are no different to tapered implants in terms of their functionality. The compliance evaluation revealed that most of the clinicians do not follow the procedure as specified by the manufacturers. Notably, a relatively high percentage of clinicians did not use a cortical drill during normal bone implantation due to the change in the design of the TSIII system to a single thread type. However, the use of a cortical drill is recommended because torque implantation can deviate from the proper range in many cases. When a tapered implant is installed without using countersinking or cortical drilling in a cortical bone, the chances of excess torque occurring are higher, which can result in alveolar bone absorption during the healing process.

It is notable that 50% of the clinicians answered that there is no difference between the TSIII SA and previously preferred products in terms of self-tapping ability and initial fixation. The TSIII SA implant showed better results in the stimulation of initial bone conduction and bone response, more clinicians stated that they do not perceive any significant difference between the TSIII SA and previous models in terms of the design; as such, a long-term clinical evaluation of its short history since its commercial release will be necessary.

Conclusions:
1. A total of 522 implants were installed, 99.6% (n=520/522) of which were successful. Most of the clinicians evaluated that the TSIII SA implants exhibited excellent bone response.

2. About 50% of the clinicians answered that there was no significant difference between the TSIII SA and previously preferred products in terms of self-tapping ability and initial fixation.

3. The average treatment period was 3.9 months for the maxillar, and 3.4 months for the mandibular, which suggests that the TSIII SA implants can shorten the treatment period.

4. Overall satisfaction with the TSIII SA was rather high, but approximately 50% of the clinicians answered that there was no difference in terms of the satisfaction they felt with the TSIII SA compared to previously preferred products.
Objective:
The objective of this study was to evaluate the effect of surface roughness and morphology on various physiochemical parameters that are involved with in vitro osteogenesis.

Study design:
To study interactions of osteoblast on different topography surfaces of titanium material through in vitro systems and three kinds of surfaces such as sandblasting with hydroxyapatite powder, anodic oxidation and SA surface (sandblasted with large grit alumina in sizes of 250-500 μm and acid-etched with HCl/H2SO4) were investigated. Using MG-63 cells, we examined the relationship between surface micro-topography and osteogenic activity such as adhesion, proliferation, and ALP activity.

Results:
Using MG-63 cells, we examined the osteogenic activity according to the surface parameters. ALP activity was higher in SA surface despite low cell adhesion. ELISA showed the SA surface enhanced secretion of osteocalcin, osteopontin, TGF-b1, and PGE2 which was known to stimulate the osteogenesis and bone healing process. In semi-quantitative RT-PCR, they exhibited a relatively high expression of osteoblastic differentiation markers.

Conclusions:
These results demonstrate that SA surfaces with HCl/H2SO4 accelerate the in vitro osteogenic potential in MG-63 cells. Therefore SA surfaces may play roles in stimulating the bone formation and ultimately may enhance bone-implant contact.

The Effects of Surface Roughness on the Sandblasted with Large Grit Alumina and Acid Etched Surface Treatment: In Vitro Evaluation

Objective:
The aim of the present study was to evaluate the effect of roughness on the sandblasted with large grit alumina and acid etched surface, which is involved with in vitro osteogenesis.

Study design:
To study the interactions of osteoblast on different surface roughness and micro-topography in in-vitro systems, four kinds of surfaces with different morphology (RBM with Ra 1.5μm and SA with Ra 0.9μm, 1.5μm, 2.8μm individually) were investigated. Four kinds of disks were made by properly changing the blasting and acid-etching process such as the blasting pressure and acid-etching time. Using MG-63 cells, we examined the relationship between the roughness of SA surfaces and osteogenic activity such as ALP activity, ELISA (enzyme-linked immunosorbent assay) and mineralization.

Results:
MG-63 osteoblast like cells were sensitive to submicron-scale features, which were dependant on blasting intensity and acid etching conditions. The uniformity and density of submicron-scale micropits were enhanced as the SA surface roughness increased. Also, the cell responses such as the ALP activity, mineralization, and osteogenesis related protein were enhanced as the surface roughness and the density of the micro-pit increased.

Conclusions:
Studying the macro and micro-topography of SA surfaces were important variables in determining. The osteoblast response. The ALP activity, mineralization and osteogenesis related protein were enhanced as the roughness and the density of the micro-pit of the SA surface increased.
Objective: The aim of the present study was to evaluate the effect of roughness on the sandblasted with large grit alumina and acid etched surface, which were involved with the in vivo removal torque test.

Study design: Three kinds of implants with different surface topographies were made by properly changing the blasting and acid-etching processes. This involved changing things like the blasting material, media size, blowing pressure, and acid-etching time. In ten micro-pigs, three submerged implants were placed in the tibia. Groups were divided into three groups: RBM (Ra 1.5 μm), Small SA (Ra 1.5 μm) and SA (Ra 2.8 μm). The micro-pigs were sacrificed following 2 and 4 weeks healing period. After 2 and 4 weeks of healing, the micro-pigs were sacrificed and all implants were evaluated by removal torque testing.

Results: There were no statistically significant differences between the groups. The RBM surface and SA with small roughness (Ra 1.5 μm) had relatively similar removal torque values at both 2 weeks and 4 weeks, but the SA surface with higher roughness (Ra 2.8 μm) showed a higher removal torque value than small Ra SA in 4 weeks (p < .05).

Conclusions: The contribution of macro and micro topography to the anchorage of SA implants was determined. For the SA surface treatment, the macro-topography with high surface roughness is more effective in a removal torque test than micro-topography in the acid etching process. The SA implant presented a higher removal torque than the RBM surface.

The Effects of Surface Roughness on the Sandblasted with Large Grit Alumina and Acid Etched Surface Treatment: In Vivo Evaluation

Hong-Young Choi, Jae-June Park, In-Hee Cho, Tae-Gwan Eom
Scientific Poster, Osstem World Meeting 2011

Objective: The implant surface feature and roughness have been proposed as a potential factor affecting bone integration and marginal bone loss. The aim of the present study was to evaluate the difference between SA and RBM surface for osseointegration and marginal bone loss in the mandible of beagle dogs.

Study design: All mandibular premolars and first molars were extracted bilaterally in 10 beagles. After 8 weeks of extraction, 48 implants (22 SA surface implants and 26 RBM surface implants) were implanted in the mandible of beagle dogs. After 12 weeks of healing, the implants were evaluated marginal bone levels, histomorphometric analysis, and removal torque. 36 implants were used for the removal torque test. 12 implants were processed for histomorphometric analysis. For statistical analysis, t-tests were performed (p < .05).

Results: There were no statistically significant differences in relation to histomorphometric evaluations between RBM and SA surfaces. Marginal bone loss was 0.83 ± 0.51 mm (RBM surface) and 0.96 ± 0.43 mm (SA surface). No differences could be observed between the two surfaces of implants. After a 12 weeks healing period, BIC and BA of SA surface were similar to the RBM surface. There were no significant differences in the BIC and BA between the two groups (p > .05). The mean removal torque value was higher for a SA surface (127.2 ± 37.0 Ncm) than for a RBM surface (61.9 ± 34.5 Ncm). The differences between RBM and SA surfaces were significant (p < .001).

Conclusions: It can be concluded that the SA surface was more effective than RBM surface in enhancing the biomechanical interlocking between the new bone and implant.

Biomechanical and Histomorphometrical Evaluation of Bone-Implant Integration at Sand Blasting with Alumina and Acid Etching (SA) Surface

In-Hee Cho, Hong-Young Choi, Woo-Jung Kim, Tae-Gwan Eom
Scientific Poster, 19th Annual Scientific Congress of EAD 2010

Fig. 1. The ground sections illustrate the result of healing (original magnification, x 100).

Fig. 2. Changes in the marginal bone levels of RBM and SA.

Fig. 3. SEM micrographs of titanium implant surfaces (a) RBM surface, (b) SA surface.

Fig. 4. Changes in the marginal bone levels of RBM and SA.
**Objective:**
The objective of this study was to evaluate the early osseointegration of hydroxyapatite (HA) coated implant versus resorbable blast media (RBM) and sand-blasted with alumina and acid etched (SA) surface tapered implants.

**Study design:**
Twelve adult male miniature pigs (Medi Kinetics Micropigs, Medi Kinetics Co., Ltd., Korea) were used in this study. The removal torque of implants placed in the tibia of miniature pigs was measured. For implants placed in the mandible, histomorphometric evaluation was performed for the evaluation of the bone-implant contact (BIC) ratio.

**Results:**
After 4, 8, and 12 weeks, removal torque values were increased. Among the 3 groups, the HA coated group showed the highest value (p < .05). When the HA surface, RBM, and SA surface group were compared at each time point, the HA group showed statistically significantly high removal torque value (RTV) values (p < .05). At 2 weeks, in comparison with RBM, SA showed an 11% increase, and HA showed a 42% increase; nonetheless, they were not statistically significant. At 4 weeks, the BIC ratio of HA was significantly higher than that of SA (p < .05). Nonetheless, RBM and SA were not significantly different (p > .05).

**Conclusions:**
The early osseointegration of HA coated implants was found to be excellent, and HA coated implants will be available in poor quality bone.

**Objective:**
To evaluate the characteristics of the HA (Hydroxyapatite) surface due to the high crystal growth of the TSIII HA implant.

**Study design:**
The TSIII HA implant (∅ 4.0 x 10 mm) by Osstem and TSV HA implant (∅ 4.1 x 10 mm) by Zimmer were used to evaluate solubility. For the solution, 1M Tris buffer with pH 7.4 was used and solubility was evaluated. For the measurement of the eluted calcium, Arsenazo III and Malachite Green were used to produce the color reaction with calcium. Absorbance was measured with Beckman Coulter Spectrophotometer to quantify the reaction.

**Results:**
Based on the result of the evaluation of HA solubility with calcium ion in relation to HA crystallinity, after 4 days in the solution, the high crystalline TSIII HA implant showed similar dissolution results compared to the TSV HA implant. The elution of calcium ion gradually decreased with accordance with the increase of HA crystallinity over the number of days and tests.

**Conclusions:**
The highly crystallized TSIII HA implant has a stable surface coating layer and exhibits safe dissolution characteristics. Thus, it is evaluated as an excellent product that secures long-term safety.
**Architectural Features of the TSIII HA Implant**

June-Cheol Hwang, Hong-Young Choi, Tae-Gwan Eom  
Scientific Poster, Osstem World Meeting 2011

**Objective:**  
The highly crystallized TSIII HA implant was uniquely treated after the hydroxyapatite (HA) coating process. In this study, the structural characteristics of the HA-coated TSIII HA implant were evaluated.

**Study design:**  
The structural characteristics of two products: the Osstem TSIII HA implant (Ø 4.0 x 10mm) and the Zimmer TSV HA implant (Ø 4.1 x 11mm) were compared and examined based on product design, surface image, degree of crystallinity, stability of HA coating layer after implantation in pig bone, tensile bonding strength, and shear bonding strength.

**Results:**  
1) Surface morphology observation:  
In Fig. 1, the typical HA surface with a plasma spray is shown through the SEM image of a TSIII and TSV implant surface.

2) Degree of crystallinity

![Crystallinity](image1)

a) TSIII HA  
b) TSV HA

![Crystallinity Graph](image2)

Crystallinity 68.2%  
Crystallinity 98%

Conclusions:  
The TSIII HA implant displayed excellent initial stability and placement convenience in terms of design in the structural analysis. The quality and performance of this HA coating product are considered equal to the products of renowned manufacturers overseas.

**Results:**  
1) Surface morphology observation:  
In Fig. 1, the typical HA surface with a plasma spray is shown through the SEM image of the TSIII and TSV implant surface.

2) Degree of crystallinity

![Crystallinity](image1)

a) TSIII HA  
b) TSV HA

![Crystallinity Graph](image2)

Crystallinity 68.2%  
Crystallinity 98%

Conclusions:  
The TSIII HA implant displayed excellent initial stability and placement convenience in terms of design in the structural analysis. The quality and performance of this HA coating product are considered equal to the products of renowned manufacturers overseas.

**3) Stability of HA coating layer after implantation**  
The SEM observation result of the HA coating layer was altogether excellent after implanting a TSIII HA and TSV HA implant with the implanted torque of a 35 Ncm in the pig bone.

**TS System References**

**Clinical Study**


**Pre-Clinical Study**

**Biology**


**Pre-Clinical Study**

**Biomechanics**


Comparison of Clinical Outcomes of Sinus Bone Graft with Simultaneous Implant Placement: 4-month and 6-month Final Prosthetic Loading

Objectives:
The aim of this study was to compare the survival rate and surrounding tissue condition of sinus bone grafts with simultaneous implant placement between 4-month and 6-month occlusal loading after implantation.

Study design:
Twenty-seven patients (61 implants) who were treated with sinus bone grafts (sinus lateral approach) and simultaneous Osstem GS II implant placement from July 2007 to June 2008 were included in this study. Of these patients, 14 (31 implants) were in the 4-month loading group, and 13 (30 implants) were in the 6-month loading group. We investigated the implantation type (submerged or nonsubmerged), sinus membrane perforation, type of prosthesis, opposed tooth type, primary and secondary stability of implants, and crestal bone loss around implant and surrounding tissue conditions.

Results:
The amounts of crestal bone-loss at the final recall time (12.56 ± 5.95 mm after loading) of the 4-month and 6-month loading groups were 0.19 ± 0.33 mm and 0.39 ± 0.86 mm, respectively. However, the difference between groups was not statistically significant (P = .211). The width of keratinized mucosa, gingival index, plaque index, and pocket depth of the 4-month and 6-month loading groups were 2.50 ± 1.69 mm and 1.73 ± 1.40 mm (P = .081), 0.72 ± 0.03 and 0.59 ± 0.09 (P = .671), 1.11 ± 0.96 and 0.76 ± 0.79 (P = .226), 3.56 ± 0.94 mm and 3.65 ± 1.06 mm (P = .768), respectively. The primary stabilities of implants in the 4-month and 6-month loading groups were 61.96 ± 12.84 and 56.06 ± 15.55 (P = .120), and the secondary stabilities were 71.85 ± 6.80 and 66.51 ± 11.28 (P = .026), respectively. The secondary stability of the 4-month group was significantly higher than that of the 6-month group. There was no statistical difference (P > .05) between the 4-month and 6-month loading groups regarding the implantation type (submerged or nonsubmerged), sinus membrane perforation, type of prosthesis, or opposed tooth type. In the 4-month and 6-month groups, all of the implants survived until the final recall time.

Conclusions:
For the cases in which the residual bone was 3 mm and primary implant stability could be obtained, we conclude that loading is possible 4 months after the sinus bone graft and simultaneous implant placement.

Prospective Study of Tapered RBM Surface Implant Stability in the Maxillary Posterior Area

Objectives:
The purpose of this study was to evaluate the stability of tapered resorbable blasting media (RBM) surface implants in the posterior maxilla.

Study design:
From September 2008 through January 2010, 20 patients (9 male, 11 female) who were treated with tapered GS III implants at Seoul National University Bundang Hospital were identified. Thirty-eight implants (14 premolar and 24 molar) were placed in maxillary posterior areas.

Results:
In this study, 38 taper-shaped implants were placed in 20 patients who were followed up for 1 year. The following conclusions were obtained.
1. Regarding implant stability, the average ISQ value at the time of placement was 63.6 and was 74.4 at the time of the 2nd surgery, which was a significant increase. The cumulative survival rate of 12 months after prosthesis placement was 97.4%, and the success rate was 94.7%.
2. The resorption rate of marginal bones 12 months after prosthesis was an average of 0.19 mm, and stable results were shown. Significant differences according to the diameter and length of implants were not shown.
3. The group that received maxillary sinus bone graft was compared with the group that did not receive the procedure. The ISQ value and the marginal bone resorption rate were not significantly different.

Conclusions:
There was no significant difference in crestal bone loss according to implant diameter or length or sinus bone graft. This study showed the favorable clinical outcome of tapered implants that were placed in the maxillary posterior area.
**A 1-year Prospective Clinical Study of Soft Tissue Conditions and Marginal Bone Changes around Dental Implants after Flapless Implant Surgery**

Seung-Mi Jeong, Byung-Ho Choi, Ji-Hun Kim, Feng Xuan, Du-Hyeong Lee, Chun-Ui Lee  

**Background:**
Despite several reports on the clinical outcomes of flapless implant surgery, limited information exists regarding the clinical conditions after flapless implant surgery.

**Objectives:**
The objective of this study was to evaluate the soft tissue conditions and marginal bone changes around dental implants 1 year after flapless implant surgery.

**Study design:**
For the study, 432 implants were placed in 241 patients by using a flapless 1-stage procedure. In these patients, peri-implant soft tissue conditions and radiographic marginal bone changes were evaluated 1 year after surgery.

**Results:**
None of the implants were lost during follow-up, giving a success rate of 100%. The mean probing depth was 2.1 mm (SD 0.7), and the average bleeding on probing index was 0.1 (SD 0.3). The mean marginal bone loss was 0.3 mm (SD 0.4 mm; range 0.0-1.1 mm). Ten implants exhibited bone loss of >1.0 mm, whereas 125 implants experienced no bone loss at all.

**Conclusions:**
The results of this study demonstrate that flapless implant surgery is a predictable procedure. In addition, it is advantageous for preserving crestal bone and mucosal health surrounding dental implants.

**Fig. 1. Clinical features after punching the soft tissue at the proposed implant sites with a 3-mm soft tissue punch.**

**Fig. 2. Clinical features after healing abutments were connected to the fixtures.**

**Fig. 3. Periapical radiograph taken immediately (A) and 1 year (B) after implant placement.**

| Table 1. Probing depth, gingival index, bleeding on probing index, and crestal bone loss when implants were placed without a flap |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Probing depth (mm) | 2.1 ± 0.7       |               |
| Bleeding on probing index | 0.1 ± 0.3     |               |
| Gingival index | 0.1 ± 0.3       |               |
| Crestal bone loss | 0.3 ± 0.4       |               |

**Fig. 4. Number of implants that exhibited varying amounts of bone loss during the healing period from the time of implant placement to the 1-year follow-up.**

**Table 1. Mean values of width of keratinized mucosa index**

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<thead>
<tr>
<th>Assessment Time</th>
<th>Mean ± SD</th>
<th>% Change from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>2.00 ± 0.63</td>
<td>-</td>
</tr>
<tr>
<td>6th Month</td>
<td>2.17 ± 0.41</td>
<td>-8.5%</td>
</tr>
<tr>
<td>12th Month</td>
<td>2.33 ± 0.52</td>
<td>-16.6%</td>
</tr>
</tbody>
</table>

**Table 2. Mean values of peri-implant probing depth**

<table>
<thead>
<tr>
<th>Assessment Time</th>
<th>Mean ± SD</th>
<th>% Change from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>2.38 ± 0.54</td>
<td>-</td>
</tr>
<tr>
<td>6th Month</td>
<td>2.29 ± 0.33</td>
<td>3.36%</td>
</tr>
<tr>
<td>12th Month</td>
<td>2.08 ± 0.34</td>
<td>12.18%</td>
</tr>
</tbody>
</table>

**A Relaxed Implant Bed: Implants Placed After Two Weeks of Osteotomy with Immediate Loading- A One Year Clinical Trial**

Bansal DJ, Kedige DS, Bansal DA, Anand DS  
Accepted in 2010 J Oral Implantol

**Background:**
A waiting period of two weeks after osteotomy increases the surrounding tissue activity to its maximum level as collagen formation and neangiogenesis represents a relaxed and acceptable implant bed configuration.

**Objectives:**
The aim of the present study was a clinical and radiologic evaluation of early osteotomy with implant placement delayed for two weeks with immediate loading in the anterior and premolar region with minimally invasive approach.

**Study design:**
A total of seven GS II implants (Osstem) were placed in six patients. Osteotomy was done followed by flap closure without the placement of implant. After approximately waiting for a period of two weeks, implant placement was done which were loaded immediately with provisional crown in implant protected occlusion. It was replaced by definitive restoration after 6-8 weeks which was considered as baseline. Implant stability and marginal bone levels were assessed with clinical and radiological parameters at baseline, 6th and 12th month intervals.

**Results:**
None of the implants were found mobile during the one year period. The amount of average mean marginal bone loss was 0.4 mm over the one year follow up period.

**Conclusions:**
The present study, early osteotomy with delayed implant placement showed negligible crestal bone loss with no mobility.

**Table 3. Mean values of marginal bone levels on mesial aspect**

<table>
<thead>
<tr>
<th>Assessment Time</th>
<th>Mean ± SD</th>
<th>% Change from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.36 ± 0.54</td>
<td>-</td>
</tr>
<tr>
<td>6th Month</td>
<td>0.37 ± 0.35</td>
<td>13.86%</td>
</tr>
<tr>
<td>12th Month</td>
<td>0.36 ± 0.41</td>
<td>-13.86%</td>
</tr>
</tbody>
</table>

**Table 4. Mean values of marginal bone levels on distal aspect**

<table>
<thead>
<tr>
<th>Assessment Time</th>
<th>Mean ± SD</th>
<th>% Change from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.54 ± 0.50</td>
<td>-</td>
</tr>
<tr>
<td>6th Month</td>
<td>0.50 ± 0.41</td>
<td>5.05%</td>
</tr>
<tr>
<td>12th Month</td>
<td>0.53 ± 0.42</td>
<td>1.85%</td>
</tr>
</tbody>
</table>
Short-term, Multi-center Prospective Clinical Study of Short Implants Measuring Less than 7mm

Young-Kyun Kim, Yang-Jin Yi, Su-Gwan Kim, Yong-Seok Cho, Choon-Mo Yang, Po-Chin Liang, Yu-Yal Chen, Lee-Long I, Christopher Sim, Winston Tan, Go Wee Ser, Deng Yue, Man Yi, Gong Ping
J Kor Dent Sci 2010;3(1):11-8

Objectives:
This prospective study sought to verify the stability of three types of short implants measuring 7mm or less.

Study design:
Implants measuring 7mm or less were placed in patients at multicenter dental clinics in Korea, China, Taiwan, and Singapore. Initial stability, intraoperative and postoperative complications, crestal bone loss, and survival rate of the implant were prospectively evaluated.

Results:
The primary stability of a 6mm implant was lower than that of a 7mm implant. The marginal bone loss of short implants measuring less than 7mm was minimal. Complications such as wound dehiscence, implant mobility, peri-implant mucositis developed, and these were associated with initial implant failure. The short-term survival rate of 6mm implant was 93.7%, and that of 7mm implant, 96.6%.

Conclusions:
Short implant for the mandible with insufficient height for the residual ridge can be selectively used. Poor primary stability and wound dehiscence can cause osseointegration failure and alveolar bone loss.

Evaluation of Sinus Bone Resorption and Marginal Bone Loss after Sinus Bone Grafting and Implant Placement

Young-Kyun Kim, Pi-Young Yun, Su-Gwan Kim, Burn-Soo Kim, Joo L Ong

Objectives:
The objective of this study was to evaluate the sinus bone graft resorption and marginal bone loss around the implants when allograft and xenograft are used.

Study design:
Sinus bone grafting and implant placement (Osstem, Korea) were performed on 28 patients from September 2003 to January 2006. In group I, a total of 49 implants were placed in 23 maxillary sinus areas of 16 patients together with bone graft using xenograft (Bio-Oss®) and a minimal amount of autogenous bone. In group II, 24 implants were placed in 13 maxillary sinus areas of 12 patients together with bone graft using a minimal amount of autogenous bone and equal amounts of allograft (Regenafon®) and Bio-Oss® in group II.

Results:
Early osseointegration failures of 3 implants in 3 patients (group I: 1 patient, 1 implant; group II: 2 patients, 2 implants) were observed, and revisions were performed for these 3 implant sites, followed by complete prosthodontic treatments. The average height of the remaining alveolar bone before the surgery, immediately after the surgery, and 1 year after the surgery was 4.9 mm, 19.0 mm, and 17.2 mm, respectively, in group I. In group II, the average height of the remaining alveolar bone was 4.0 mm, 19.2 mm, and 17.8 mm before the surgery, immediately after the surgery, and 1 year after the surgery, respectively. The average marginal bone loss 1 year after prosthodontic loading and after 20.8 months’ follow-up was 0.6 mm and 0.7 mm, respectively, in group I. A 93.9% success rate was observed for group I, with 3 implants showing bone resorption of >1.5 mm within 1 year of loading. For group II, the average marginal bone loss 1 year after prosthodontic loading and after 19.7 months’ follow-up was 0.7 mm and 1.0 mm, respectively. An 83.3% success rate was observed for group II, with 4 implants showing bone resorption of >1.5 mm within 1 year of loading.

Conclusions:
Based on the observations in this study, it was concluded that mixed grafting with demineralized bone matrix for maxillary sinus bone grafting has no significant short-term merit regarding bone healing and stability of implants compared with anorganic bovine bone alone.
Evaluation of Peri-implant Tissue Response according to the Presence of Keratinized Mucosa

Bum-Soo Kim, Young-Kyun Kim, Pi-Young Yun, Yang-Jin Yi, Hye-Jeong Lee, Su-Gwan Kim, Jun-Sik Son

Objectives:
The purpose of this study was to evaluate the responses of peri-implant tissue in the presence of keratinized mucosa.

Study design:
A total of 276 implants were placed in 100 patients. From the time of implant placement, the average follow-up observation period was 13 months. The width of keratinized mucosa was measured and evaluated through the gingival inflammation index (GI), plaque index (PI), the pocket depth, mucosal recession, and marginal bone resorption.

Results:
The GI, PI, and pocket depth in the presence or absence of the keratinized gingiva did not show statistically significant differences. However, mucosal recession and marginal bone resorption experienced statistically significant increases in the group of deficient keratinized mucosa. Based on implant surface treatments, the width of keratinized gingiva and crestal bone loss did not show a significant difference.

Conclusions:
In cases with insufficient keratinized gingiva in the vicinity of implants, the insufficiency does not necessarily mediate adverse effects on the hygiene management and soft tissue health condition. Nonetheless, the risk of the increase of gingival recession and the crestal bone loss is present. Therefore, it is thought that from the aspect of long-term maintenance and management, as well as for the area requiring esthetics, the presence of an appropriate amount of keratinized gingiva is required.

Table 1. Width of keratinized mucosa according to implant systems

<table>
<thead>
<tr>
<th>Implant system</th>
<th>SLM</th>
<th>SLA</th>
<th>Anodizing</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of DKM (mm)</td>
<td>0.64 ± 0.48</td>
<td>0.70 ± 0.50</td>
<td>0.56 ± 0.51</td>
<td>.157</td>
</tr>
<tr>
<td>Width of SLM (mm)</td>
<td>0.38 ± 0.18</td>
<td>0.46 ± 0.29</td>
<td>0.39 ± 0.18</td>
<td>.611</td>
</tr>
</tbody>
</table>

Table 2. Crestal bone loss according to implant systems

<table>
<thead>
<tr>
<th>Implant system</th>
<th>Bone loss (mm)</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implantium</td>
<td>0.64 ± 0.63</td>
<td>.36</td>
</tr>
<tr>
<td>TiUnite</td>
<td>0.44 ± 0.72</td>
<td></td>
</tr>
<tr>
<td>GS II</td>
<td>0.39 ± 0.71</td>
<td></td>
</tr>
<tr>
<td>US II</td>
<td>0.60 ± 0.64</td>
<td></td>
</tr>
</tbody>
</table>

Morphogenesis of the Peri-implant Mucosa: A Comparison between Flap and Flapless Procedures in the Canine Mandible

Tae-Min You, Byung-Ho Choi, Jingzu Li, Feng Xuan, Seung-Mi Jeong, Sun-Ok Jang

Objectives:
Although it has been shown that the exclusion of the mucoperiosteal flap can prevent postoperative bone resorption associated with flap elevation, there have been only a few studies on the peri-implant mucosa following flapless implant surgery. The purpose of this study was to compare the morphogenesis of the peri-implant mucosa between flap and flapless implant surgeries by using a canine mandible model.

Study design:
In six mongrel dogs, bilateral edentulated flat alveolar ridges were created in the mandible. After 3 months of healing, 2 implants were placed in each side by either the flap or the flapless procedure. Three months after implant insertion, the peri-implant mucosa was evaluated by using clinical, radiologic, and histometric parameters, which included the gingival index, bleeding on probing, probing pocket depth, marginal bone loss, and the vertical dimension of the peri-implant tissues.

Results:
The height of the mucosa, length of the junctional epithelium, gingival index, bleeding on probing, probing depth, and marginal bone loss were all significantly greater in the dogs that had the flap procedure than in those that had the flapless procedure (p < .05).

Conclusion:
These results indicate that gingival inflammation, the height of junctional epithelium, and bone loss around nonsubmerged implants can be reduced when implants are placed without flap elevation.

Table 1. Parameters of probing depth, gingival index and bleeding on probing around implants when placed with or without a flap

<table>
<thead>
<tr>
<th>Flap group</th>
<th>Flapless group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probing depth (mm)</td>
<td>1.7 ± 0.5</td>
<td>1.0 ± 0.3</td>
</tr>
<tr>
<td>Gingival index</td>
<td>1.6 ± 0.5</td>
<td>0.0 ± 0.2</td>
</tr>
<tr>
<td>Bleeding on probing</td>
<td>0.7 ± 0.4</td>
<td>0.0 ± 0.2</td>
</tr>
</tbody>
</table>

Table 2. Results of the histometric measurements in both the flap and flapless groups

<table>
<thead>
<tr>
<th>PM-B (mm)</th>
<th>PM-AE (mm)</th>
<th>AE-B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap group</td>
<td>Flapless group</td>
<td>P-value</td>
</tr>
<tr>
<td>Implantium</td>
<td>3.5 ± 0.8</td>
<td>2.2 ± 0.2</td>
</tr>
<tr>
<td>TiUnite</td>
<td>2.2 ± 0.3</td>
<td>1.2 ± 0.3</td>
</tr>
<tr>
<td>GS II</td>
<td>1.3 ± 0.2</td>
<td>1.0 ± 0.2</td>
</tr>
</tbody>
</table>

PM: marginal position of the peri-implant mucosa; AE, apical termination of the junctional epithelium; AE-B, marginal level of bone-to-implant contact.
Introduction:
This study evaluated the fatigue limit of five implant-abutment combinations (Osstem Implant Co. Korea). The fatigue tests were performed to evaluate the impact of fatigue on the effectiveness of dental implant-abutment assemblies with different joint designs and with different abutment materials, with a special emphasis on the pattern of the dental implant fixture and the abutment, as well as the effect of the abutment material on the stability of the joint area.

Materials and methods:
Each implant-abutment system (EXTNTS: US II-TiN Coated, EXANTS: US III-Safe, EXZRTS: BioTapered Double Thread-ZirAce, INTIWS: GS II-GS Transfer, INTICS: SS I-Solid) was subjected to fatigue testing. A cyclic compression load was applied at loading cycles of 10 Hz using a hydraulic dynamic testing machine (Model 8516, Instron, USA).

Results & Conclusions:
The mean static strength of the EXZRTS group was largest at 1772.2 N and that of the INTIWS group was smallest at 893.8 N. The fatigue limit was described as the load applied at 5 × 10^6 cycles. The fatigue limit that guarantees a 5 × 10^6 cycle life according to the condition established by the ISO/FDIS 14801:2003(E) in all experiment groups was shown to be 300~800 N. The fatigue fracture of the zirconia abutment was initiated in the margin with a subsequent unstable fracture.

Fatigue Characteristics of Five Types of Implant-Abutment Joint Designs
Il-Song Park, Sang-Yong Won, Tae-Sung Bae, Kwang-Yeob Song, Charn-Woon Park, Tae-Gwan Eom, Chang-Mo Jeong

Objective:
Several studies have reported on spontaneous early exposure of submerged implants, suggesting that exposed implants have greater bone loss than nonexposed implants. The purpose of this study was to compare the effects of implant-abutment connections and partial implant exposure on crestal bone loss around submerged implants.

Study design:
Bilateral, resected, flat alveolar ridges were created in the mandible of 6 mongrel dogs. After 3 months of healing, 2 fixtures were placed on each side of the mandible following a commonly accepted 2-stage surgical protocol. The fixtures on each side were randomly assigned to 1 of 2 procedures. In the first, a cover screw was connected to the fixture, and the incised gingiva was partially removed to expose the cover screw (partially exposed group). In the second, a healing abutment was connected to the fixture so that the coronal portion of the abutment remained exposed to the oral cavity (abutment-connected group). After 8 weeks, micro-computed tomography (micro-CT) at the implantation site was performed to measure the bone height in the peri-implant bone. Data were analyzed by Wilcoxon’s signed rank test.

Results:
The average bone height was greater for the abutment-connected fixture (9.8 ± 0.5 mm) than for the partially exposed fixture (9.3 ± 0.5 mm; p < .05).

Conclusion:
These results suggest that when implant exposure is detected, the placement of healing abutments may help limit bone loss around the submerged implants.

### Influence of Premature Exposure of Implants on Early Crestal Bone Loss: An Experimental Study in Dogs
Je-Hyeon Yoo, Byeong-Ho Choi, Jingyu Li, Han-Sung Kim, Chang-Yong Ki, Feng Xuan, Seung-Mi Jeong

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Je-Hyeon Yoo, Byeong-Ho Choi, Jingyu Li, Han-Sung Kim, Chang-Yong Ki, Feng Xuan, Seung-Mi Jeong
Statement of problem:
Primary stability at the time of implant placement is related to the level of primary bone contact. The level of bone contact with implant is affected by thread design, surgical procedure and bone quality, etc.

Purpose:
The aim of this study was to compare the initial stability of the various taper implants according to the thread designs, half of which were engaged to inferior cortical wall of type IV bone (Group 1) and the rest of which were not engaged to inferior cortical wall (Group 2) by measuring the implant stability quotient (ISQ) and the removal torque value (RTV).

Material & Methods:
In this study, 6 different implant fixtures with 10 mm length were installed. In order to simulate the sinus inferior wall of type IV bone, one side cortical bone of swine rib was removed. 6 different implants were installed in the same bone block following manufacturer’s recommended procedures. Total 10 bone blocks were made for each group. The height of Group 1 bone block was 10 mm for engagement and that of group 2 was 13 mm. The initial stability was measured with ISQ value using Osstell Mentor® and with removal torque using MGT50 torque gauge.

Results:
In this study, we found the following results. 1. In Group 1 with fixtures engaged to the inferior cortical wall, there was no significant difference in RTV and ISQ value among the 6 types of implants. 2. In Group 2 with fixtures not engaged to the inferior cortical wall, there was significant difference in RTV and ISQ value among the 6 types of implants (p < .05). There was significant difference in RTV and ISQ value according to whether fixtures were engaged to the inferior cortical wall or not (p < .05). 4. Under-drilling made RTV and ISQ value increase significantly in the NT implants which had lower RTV and ISQ value in Group 2 (p < .05).

Conclusions:
Without being engaged to the inferior cortical wall fixtures had initial stability affected by implant types. Also in poor quality bone, under-drilling improved initial stability.

Effect of Various Thread Designs on the Initial Stability of Taper Implants
Ju-Hee Park, Yiung-Jun Lim, Myung-Joo Kim, Ho-Beom Kwon

Effect of Casting Procedure on Screw Loosening of UCLA Abutment in Two Implant-Abutment Connection Systems
Chun-Yeo Ha, Chang-Whe Kim, Young-Jun Lim, Myung-Joo Kim
J Kor Acad Prosthodont 2008;46(3):246-54
**Influence of Tightening Torque on Implant-Abutment Screw Joint Stability**

Hyun-Mo Shin, Chang-Mo Jeong, Young-Chan Jeon, Mi-Heong Yun, Ji-Hoon Yoon

*J Kor Acad Prosthodont 2008;40(4):396-408*

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**Statement of problem:**
Within the elastic limit of the screw, the greater the preload, the tighter and more secure the screw joint. However, additional tensile forces can incur plastic deformation of the abutment screw when functional loads are superimposed on preload stresses, and they can elicit the loosening or fracture of the abutment screw. Therefore, it is necessary to find the optimum preload that will maximize fatigue life and simultaneously offer a reasonable degree of protection against loosening. Another critical factor in addition to the applied torque which can affect the amount of preload is the joint connection type between implant and abutment.

**Purpose:**
The purpose of this study was to evaluate the influence of tightening torque on the implant-abutment screw joint stability.

**Material & Methods:**
Respectively, three different amount of tightening torque (20, 30, and 40 Ncm) were applied to implant systems with 3 different joint connections, one external butt joint and two internal cones. The initial removal torque value and the postload (cycling load up to 100,000 cycles) removal torque value of the abutment screw were measured with digital torque gauge. Then rate of the initial and the postload removal torque losses were calculated for the comparison of the effect of tightening torques and joint connection types between implant and abutment on the joint stability.

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**Results & Conclusions:**
1. Increase in tightening torque value resulted in significant increase in initial and postload removal torque value in all implant systems (p < .05).
2. Initial removal torque loss rates in SS II system were not significantly different when three different tightening torque values were applied (p > .05), however GS II and US II systems exhibited significantly lower loss rates with 40 Ncm torque value than with 20 Ncm (p < .05).
3. In all implant systems, postload removal torque loss rates were lowest when the torque value of 30 Ncm was applied (p < .05).
4. Postload tightening torque loss rates tended to increase in order of SS II, GS II and US II system.
5. There was no correlation between initial removal torque value and postload removal torque loss rate (p > .05).

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**GS System References**

**Clinical Study**


Acad Stomatog Func Occlusion 2007;23(4).


Objectives:
Given that the orientation of the transducer (mesiodistal or buccolingual) affects the data obtained from a piezoelectric resonance frequency analysis (RFA), this study evaluated whether it is necessary to use measurements taken in two different directions (mesiodistal and buccolingual) when using magnetic RFA to assess changes in the stiffness of dental implants.

Study design:
A prospective clinical trial was completed, in a total of 53 patients, on 71 non-submerged dental implants that were inserted to replace the unilateral loss of mandibular molars. All of the implants were of the same diameter (4.1 mm), length (110 mm), and collar height (2.8 mm). The implant stability quotient (ISQ) was measured during the surgical procedure, and at 4 and 10 weeks after surgery. Measurements were taken twice in each direction: in the buccolingual direction from the bucal side and in the mesiodistal direction from the mesial side. The average of two measurements in each direction was regarded as the representative ISQ of that direction. The higher and lower values of the two ISQs (buccolingual and mesiodistal) were also classified separately. In addition, the variation in ISQ was quantified by subtracting the lower value from the higher value, and the implants were classified into two groups according to this variation: one with ISQ variation of 3 or more and the other with a variation of <3.

Results:
There were no differences between the two ISQs when measured from different directions, but there were significant differences between the higher and lower values of the ISQs at each measurement point. A significant difference was also observed between the two ISQ variation groups in the pattern of change of the lower value for the period from immediately after surgery to 10 weeks after surgery.

Conclusions:
Acquisition of two directional measurements and classification of the higher and lower values of the two directional ISQs may allow clinicians to detect patterns of change in ISQ that would not be identified if only one directional measurement was made.
Evaluation of Peri-implant Tissue in Nonsubmerged Dental Implants: a Multicenter Retrospective Study

Young-Kyun Kim, Su-Gwan Kim, Hee-Kyun Oh, Yong-Geun Choi, Yong-Seok Cho, Young-Hak Oh, Jun-Sik Son

Objectives:
The objective of this study was to evaluate the peri-implant’s hard and soft tissue response associated with the 1-stage, nonsubmerged, endosseous dental implant.

Study design:
A multicenter retrospective clinical evaluation was performed on 339 nonsubmerged implants placed in 108 patients at 5 clinical centers between January 2003 and December 2007.

Results:
After a mean follow-up period of 30 months, the mean crestal bone resorption in 339 implants was 0.43 mm. The survival and success rates were observed to be 99.1% and 95.1%, respectively. The mean calculus, inflammatory, and plaque indices were 0.13, 0.37, and 0.73, respectively, and the mean width of buccal keratinized mucosa was observed to be 2.43 mm.

Conclusions:
The short- to intermediate-term evaluation of the 1-stage, nonsubmerged, endosseous implant yields relatively high survival and success rates.

<table>
<thead>
<tr>
<th>Bone resorption</th>
<th>No. of implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>198</td>
</tr>
<tr>
<td>0.1–0.5 mm</td>
<td>10</td>
</tr>
<tr>
<td>0.6–1.0 mm</td>
<td>81</td>
</tr>
<tr>
<td>1.1–2.0 mm</td>
<td>7</td>
</tr>
<tr>
<td>≥2.0 mm</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>304</td>
</tr>
</tbody>
</table>

*Not specified for 35 implants.

Table 1. Crestal bone resorption

<table>
<thead>
<tr>
<th>Year</th>
<th>No. implants at start of year</th>
<th>No. implants survival at follow-up</th>
<th>Failures</th>
<th>Survival, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>339</td>
<td>336</td>
<td>3</td>
<td>99.1</td>
</tr>
<tr>
<td>2</td>
<td>336</td>
<td>336</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>336</td>
<td>336</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

Fig. 1. Periapical radiograph taken immediately after implant placement. In the #36 area, an implant, 4.8 mm in diameter and 10 mm in length, was placed. The crestal bone level in the vicinity of implant was considered as the baseline.

Fig. 2. Periapical radiograph taken 1 year after implant placement. Based on the baseline, the crestal bone level on the radiograph taken immediately after surgery, from mesial side (a) and distal side (b), the vertical length to the first implant bone contact area was measured. The distance was converted to millimeters, and the average was obtained. In this case, a=8.8 mm and b=1.2 mm, and after 1 year, the mean amount of crestal bone resorption was 1.2 mm.

A Randomized Clinical One-year Trial Comparing Two Types of Non-submerged Dental Implant

JongChul Park, Seung-Ryong Ha, Soung-Min Kim, Myung-Jin Kim, Jai-Bong Lee, Jong-Ho Lee
Accepted in 2009 for Publication in Clin Oral Impl Res

Objectives:
This study compared the implant stability and clinical outcomes obtained with two types of non-submerged dental implant that have different thread designs and surface treatments.

Materials & Methods:
A randomized clinical trial with one year of follow-up was performed on 56 participants with 75 implants (control group, 36 implants in 28 subjects; experimental group, 39 implants in 28 subjects). The experimental group received the Osstem SS II Implant system; the control group received the Standard Straumann Dental Implant System. The diameter and length of the fixture were uniform at 4.1 mm and 10 mm and all the implants restored the mesiodistal and buccal-lingual dimensions. Periapical radiographs were taken immediately after surgery, and at 10 weeks and one year after surgery.

Results:
This study showed statistically significant differences between the two groups in peak insertion torque (p = .009) and ISQ (p = .003) but not in PTV (p = .097) at surgery. In contrast, there was no statistically significant difference in the pattern of change of ISQ during the 10 weeks after surgery (p = .339). For marginal bone loss, no significant difference was observed between the control and experimental groups before functional loading (p = .824), but after one year of follow-up, a borderline difference was noted (p = .048).

Conclusions:
The success rate after one year of follow-up was 100% for both systems of implant, despite there being significant difference in implant stability during surgery. There was a borderline difference in marginal bone loss after one year of follow-up.

Table 1. Comparison of marginal bone loss between the two implants

<table>
<thead>
<tr>
<th>Duration after surgery</th>
<th>Type of implant</th>
<th>Standard Straumann Dental implant system</th>
<th>Osstem SS II Implant system</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Proximal</td>
<td>0.96 ± 0.66</td>
<td>0.90 ± 0.49</td>
<td>.73</td>
</tr>
<tr>
<td>1</td>
<td>Distant</td>
<td>0.63 ± 0.44</td>
<td>0.45 ± 0.51</td>
<td>.12</td>
</tr>
<tr>
<td></td>
<td>Avg</td>
<td>0.79 ± 0.51</td>
<td>0.67 ± 0.43</td>
<td>.824</td>
</tr>
<tr>
<td>One year follow-up</td>
<td>Proximal</td>
<td>1.21 ± 0.57</td>
<td>0.92 ± 0.68</td>
<td>.095</td>
</tr>
<tr>
<td></td>
<td>Distant</td>
<td>0.93 ± 0.39</td>
<td>0.65 ± 0.37</td>
<td>.013</td>
</tr>
<tr>
<td></td>
<td>Avg</td>
<td>1.07 ± 0.46</td>
<td>0.70 ± 0.42</td>
<td>.048</td>
</tr>
</tbody>
</table>

*The p values were calculated using Mann-Whitney test.
†Also refer to the radiographic measurement area for calculation of marginal bone loss.
‡Avg means the average value of proximal and distal bone loss.
Implant-supported fixed and removable prostheses provide a proper treatment modality with reliable success. The SS II implants is a one-stage nonsubmerged threaded titanium implants with Resorbable Blasting Media (RBM) surface developed by Osstem company (Seoul, Korea) in October of 2002.

This study is to evaluate the survival rate of the SS II implants for 4 years using radiographic parameters and to review the retrieved implants by the cytotoxicity tests.

Since September 2003, 439 SS II implants had been used for 173 patients at Ewha Women University Medical Center in Korea. Patients consisted of 91 females (52.6%) and 82 males (47.4%). The patients' mean age was 42 ± 16 years, ranging from 21 to 83 years. The follow-up period ranged from 9 to 46 months (mean F/U 24.2 ± 10.2 months).

The results are as follows:
1. Of 439 implants, 17 implants were removed and 4-year cumulative survival rate was 96.1%.
2. 82.3% of 17 failed implants were founded during healing phase, and 94.1% of failed fixtures were removed within 5 months after implantation.
3. Crestal bone around the implants was resorbed to 1 mm in 89.0%, to 1-2 mm loss of the marginal bone in 8.3%, and the bone loss over 2 mm was occured in 2.7%.
4. Microscopic examination of the retrieved implants disclosed Grade 0 cytotoxicity in 4 and Grade 1 cytotoxicity in 2 of 6 groups divided according to lot numbers. Inhibition rate with optical density was acceptable as low as ISO standard.

Background:
Spontaneous early implant exposure is believed to be harmful, resulting in early crestal bone loss around submerged implants. The purpose of this study was to examine the influence of abutment connections and plaque control on the initial healing of prematurely exposed implants in the canine mandible.

Material & Methods:
Bilateral, edentulated, flat alveolar ridges were created in the mandible of 10 mongrel dogs. After 3 months of healing, two implants were placed on each side of the mandible following a commonly used two-stage surgical protocol. Implants on each side were randomly assigned to one of two procedures: 1) connection of a cover screw to the implant and removal of the gingiva to expose the cover screw, and 2) connection of a healing abutment to the implant so that the coronal portion of the abutment remained exposed to the oral cavity. In five dogs (plaque control group), meticulous plaque control was performed. In the other five dogs (no-plaque control group), plaque was allowed to accumulate. At 8 weeks post-implantation, microcomputed tomography was performed at the implantation site to measure bone height in the peri-implant bone.

Results:
The plaque control group had greater vertical alveolar ridge height (9.7 ± 0.5 mm) than the group without plaque control (7.4 ± 0.7 mm; p < .05). In the plaque control group, the average bone height was greater with the abutment-connected implant (10.1 ± 0.5 mm) than with the partially exposed implant (9.3 ± 0.5 mm; p < .05). In the group without plaque control, the average bone height was greater with the partially exposed implant (8.2 ± 0.6 mm) than with the abutment-connected implant (8.5 ± 0.7 mm; p < .05).

Conclusion:
These results suggest that the placement of healing abutments and meticulous plaque control may limit bone loss around submerged implants when implants are partially exposed.
Peri-implant Bone Reactions at Delayed and Immediately Loaded Implants: An Experimental Study

Seo-Hoon Kim, Byung-Ho Choi, Jingxu Li, Han-Sung Kim, Chang-Yong Ko, Seung-Mi Jeong, Feng Xuan, Seoung-Ho Lee

Objective:
The aim of this study was to compare the peri-implant bone reactions of implants subjected to immediate loading with those subjected to delayed loading.

Study design:
In 6 mongrel dogs, bilateral edentulated flat alveolar ridges were created in the mandible. After 3 months of healing, 1 implant was placed in each side. On one side of the mandible, the implant was loaded immediately with a force of 20 N that was applied at a 120° angle from the tooth’s longitudinal axis at the labial surface of the crown for 1,800 cycles per day for 10 weeks. On the opposite side, after a delay of 3 months to allow osseointegration to take place, the implant was loaded with the same force used for the immediately loaded implant. Ten weeks after loading, microcomputed tomography at the implantation site was performed. Osseointegration was calculated as the percentage of implant surface in contact with bone. Bone height was measured in the peri-implant bone.

Results:
The mean osseointegration was greater for the delayed-loading implants than for the immediately loaded implants (60.9%, p < .05). The mean peri-implant bone height was greater (10.6 mm) than for the immediately loaded implants (9.6 mm, p < .05).

Conclusion:
The results indicate that when implants are immediately loaded, the immediate loading may decrease both osseointegration of dental implants and bone height.

<table>
<thead>
<tr>
<th>Bone-implant contact (%)</th>
<th>Delayed</th>
<th>P-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone height (mm)</td>
<td>Delayed</td>
<td>P-values</td>
</tr>
</tbody>
</table>

Fig. 1. Three-dimensional micro-CT showing the bone (yellow) and the bone-to-implant contact area (red) around the implants (gray).
A: immediately loaded implant; B: delayed loading implant. Buccal, buccal side of the alveolus; Lingual, lingual side of the alveolus.

Flapless Implant Surgery: An Experimental Study

Seung-Mi Jeong, Byung-Ho Choi, Jingxu Li, Han-Sung Kim, Chang-Yong Ko, Jae-Hyung Jung, Hyeon-Jung Lee, Seoung-Ho Lee, Wilfried Engelke

Objective:
The purpose of this study was to examine the effect of flapless implant surgery on crestal bone loss and osseointegration in a canine mandible model.

Study design:
In 6 mongrel dogs, bilateral, edentulated, flat alveolar ridges were created in the mandible. After 3 months of healing, 2 implants in each side were placed by either flap or flapless procedures. After a healing period of 8 weeks, microcomputed tomography at the implantation site was performed. Osseointegration was calculated as the percentage of implant surface in contact with bone. Additionally, bone height was measured in the peri-implant bone.

Results:
The mean osseointegration was greater (65.5%) for the delayed-loading implants than for the immediately loaded implants (60.9%) (p < .05). The mean peri-implant bone height was greater at flapless sites (10.1 mm) than at sites with flaps (9.0 mm) (p < .05).

Conclusion:
Flapless surgery can achieve results superior to surgery with reflected flaps. The specific improvements of this technique include enhanced osseointegration of dental implants and increased bone height.

| Bone-implant contact (%) | Delayed | P-values |
| Bone height (mm)        | Delayed | P-values |

Fig. 1. Clinical feature after implant placement.
A: Flapless surgery; B: Flap surgery.
The Effect of Internal Implant-Abutment Connection and Diameter on Screw Loosening

Statement of problem:
One of the common problems of dental implant prostheses is the loosening of the screw that connects each component, and this problem is more common in single implant-supported prostheses with external connection and in molars.

Purpose:
The purposes of this study were:
(1) to compare the initial abutment screw torque values of the six different implant-abutment interface designs, (2) to compare the detorque values of the six different implant-abutment interface designs after cyclic loading, (3) to compare the detorque values of regular and wide diameter implants and (4) to compare the initial detorque values with the detorque values after cyclic loading.

Material & Methods:
Six different implant-abutment connection systems were used. The cement retained abutment and titanium screws of each system were assembled and tightened to 32 Ncm with digital torque gauge. After 10 minutes, initial detorque values were measured. The custom titanium crowns were cemented temporarily and a cyclic sine curve load (20 to 320 N, 14 Hz) was applied. The detorque values were measured after cyclic loading of one million times by loading machine. One-way ANOVA test, scheffe’s test and Mann-Whitney U test were used.

Results & Conclusions:
The results were as follows:
1. The initial detorque values of six different implant-abutment connections were not significantly different (p > .05).
2. The detorque values after one million dynamic cyclic loading were significantly different (p < .05).
3. The SS II regular and wide implant both recorded the higher detorque values than other groups after cyclic loading.
4. Of the wide initial detorque values of Avana Self Tapping Implant, MIS and Tapered Screw and the detorque values of MIS Implant after cyclic loading were higher than their regular counterparts (p < .05).
5. After cyclic loading, SS II regular and wide implants showed higher detorque values than before (p < .05).

SS System References

Clinical Study

Pre-Clinical Study


11. Chung-Yeon Ha, Chang-Whe Kim, Young-Jun Lim, Myung-Soon Kang, Jong-Min Kim. Effects of Pre-Clinical Study

**Success Rate and Marginal Bone Loss of Osstem USII plus Implants; Short term Clinical Study**

Sun-Keun Kim, Jee-Hwan Kim, Keun-Woo Lee, Kyoo-Sung Cho, Dong-Hoo Han
J Korean Acad Prosthodont 2011;49(3):206-13

**Objectives:**
The aim of this study was to evaluate the clinical value of Osstem USII plus system implants. Clinical and radiographic analysis was done for 88 implants placed and functionally loaded for a 12 month period at the Yonsei University Dental Hospital.

**Study design:**
Based on the patient’s medical records, clinical factors and their effects on implant marginal bone resorption, distribution and survival rate were analyzed. The marginal bone loss was evaluated at implant placement and during a 6 to 12 months functional loading period. The independent sample t-test was used to evaluate the interrelationship between the factors (p<0.05), and one way repeated measures ANOVA was used to compare the amount of marginal bone resorption.

**Results:**
The cumulative survival rate for 88 implants was 100%. The marginal bone resorption from implant placement to prosthetic delivery was 0.24 mm and the average marginal bone resorption from prosthetic delivery to 12 months of functional loading was 0.19 mm. The total average bone resorption from implant placement to 12 months of functional loading was 0.43 mm. There were no statistically significant differences in the amount of marginal bone resorption when implants were placed in the maxilla or the mandible (p>0.05), however, implants placed in the posterior areas showed significantly more marginal bone loss than those placed in the anterior areas (p<0.05).

**Conclusions:**
Based on these results, the short term clinical success rate of RNB surface treated external connection domestic implants showed satisfactory results and the marginal bone loss was in accord with the success criteria of dental implants.

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**The Study of Bone Density Assessment on Dental Implant Sites**

Su-Won Park, Soo-Mi Jiang, Byoung-Hwan Choi, Han-Na Son, Bong-chan Park, Chang-Hwan Kim, Jang-Ho Son, Lei-Yong Sung, Ji-Ho Lee, Yeong-Choul Cho

**Objectives:**
Bone density is one of the important factors for the long term success of endosseous implants. The bone density varies from site to site and from patient to patient. A preoperative evaluation of the bone density is quite useful for oral surgeons planning dental implantation. More accurate information on the bone density will help surgeons identify suitable implant sites, thereby increase the success rate of dental implantation. This study examined the correlation between the bone density measured preoperatively by computed tomography (CT) and the implant primary stability measured by resonance frequency analysis. Furthermore, the effects of the implant sites, gender, age and generalized systemic disorder patients on the bone density and primary implant stability were examined.

**Study design:**
One hundred and fourteen patients were selected. None of the patients had undergone a tooth extraction or bone graft history in the previous year. Preoperatively, the patients underwent CT scanning to evaluate the Hounsfield unit (HU), and resonance frequency analysis (RFA) was used to evaluate the implant primary stability at the time of implant installation. All implants were 4.0 mm diameter and 11.5 mm length US II. All patients were recorded and the HU and implant stability quotient (ISQ) value were evaluated according to the sites, gender and age.

**Results:**
The highest HU values were found in the mandibular anterior site (827.6 ± 151.4), followed by the mandibular premolar site (753.8 ± 171.2), maxillary anterior site (726.3 ± 154.4), maxillary premolar site (656.7 ± 173.8) and maxillary molar site (621.5 ± 164.9). The ISQ value was the highest in the mandibular premolar site (81.5 ± 2.4) followed by the mandibular molar site (80.0 ± 5.7), maxillary anterior site (77.4 ± 4.1), mandibular anterior site (76.4 ± 11.9), maxillary premolar site (74.2 ± 14.3) and maxillary molar site (73.7 ± 7.4). The mean HU and ISQ value were similar in females and males. (HU: p=0.331, ISQ: p=0.595) No significant difference was also found in the age group respectively. However, the correlation coefficients between the variables showed a closed correlation between the HU and ISQ value.

**Conclusions:**
Based on these results, the short term clinical examination of these results showed close correlation between the bone density (HU) and primary stability value (ISQ) at the time of implant installation (Correlation coefficient=0.47, p<0.05). These results strengthen the hypothesis that it might be possible to predict and quantify the initial implant stability and bone density from a presurgical CT diagnosis.

---

**Tables:**

**Table 1. Distribution of implants by bone resorption**

<table>
<thead>
<tr>
<th>Amount of bone resorption (mm)</th>
<th>Number of implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.2</td>
<td>40</td>
</tr>
<tr>
<td>0.3</td>
<td>10</td>
</tr>
<tr>
<td>0.4</td>
<td>3</td>
</tr>
<tr>
<td>0.5</td>
<td>9</td>
</tr>
<tr>
<td>0.6</td>
<td>5</td>
</tr>
<tr>
<td>0.7</td>
<td>3</td>
</tr>
<tr>
<td>0.8</td>
<td>2</td>
</tr>
<tr>
<td>0.9</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1.2</td>
<td>7</td>
</tr>
<tr>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

**Table 2. Distribution of implants by bone resorption**

<table>
<thead>
<tr>
<th>Marginal bone resorption (mm)</th>
<th>Normal</th>
<th>Dental</th>
<th>Total</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 ± 0.48</td>
<td>40</td>
<td>0</td>
<td>40</td>
<td>0.58</td>
</tr>
<tr>
<td>0.34 ± 0.41</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>0.99</td>
</tr>
<tr>
<td>0.43 ± 0.40</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>0.53 ± 0.53</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>0.99</td>
</tr>
<tr>
<td>0.63 ± 0.56</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1.00</td>
</tr>
<tr>
<td>0.73 ± 0.56</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1.00</td>
</tr>
<tr>
<td>0.83 ± 0.67</td>
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<td>2</td>
<td>2</td>
<td>0.99</td>
</tr>
<tr>
<td>0.93 ± 0.71</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>1.03 ± 0.81</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1.00</td>
</tr>
<tr>
<td>1.13 ± 0.93</td>
<td>0</td>
<td>7</td>
<td>7</td>
<td>1.00</td>
</tr>
<tr>
<td>1.23 ± 1.06</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1.00</td>
</tr>
<tr>
<td>1.33 ± 1.20</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Table 1. Results of ANOVA for Hounsfield unit (HU) and implant**

<table>
<thead>
<tr>
<th>Zone</th>
<th>HU</th>
<th>ISQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>723.6</td>
<td>74.4</td>
</tr>
<tr>
<td>Zone 2</td>
<td>656.7</td>
<td>74.2</td>
</tr>
<tr>
<td>Zone 3</td>
<td>615.6</td>
<td>73.7</td>
</tr>
<tr>
<td>Zone 4</td>
<td>876.7</td>
<td>76.4</td>
</tr>
<tr>
<td>Zone 5</td>
<td>738.6</td>
<td>81.5</td>
</tr>
<tr>
<td>Zone 6</td>
<td>797.7</td>
<td>80.0</td>
</tr>
</tbody>
</table>

**Table 2. Partial correlation coefficients between the variables**

<table>
<thead>
<tr>
<th>X variable</th>
<th>HU</th>
<th>ISQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISQ</td>
<td>0.499</td>
<td>0.9</td>
</tr>
<tr>
<td>p value</td>
<td>0.001</td>
<td>0.001</td>
</tr>
</tbody>
</table>

(NS: number of patients, Zone 1: maxillary anterior, Zone 2: maxillary premolar, Zone 3: maxillary molar, Zone 4: mandibular anterior, Zone 5: mandibular premolar, Zone 6: mandibular molar, *: p value was taken by ANOVA)
Purpose:
The aim of this study was to evaluate the clinical results of implants which were installed with maxillary sinus elevation by lateral window technique.

Materials and Methods:
We performed the maxillary sinus elevation by lateral window technique to 87 patients who visited Dept. of Oral & Maxillofacial Surgery, Chonnam National University Hospital from January, 2003 to January, 2007. When the residual bone height was from 3 mm to 7 mm, the sinus elevation and simultaneous implant installation was mostly performed. When the residual bone height was less than 3 mm, the sinus elevation was performed and the delayed implant installation was done after 5 or 6 months. No artificial membranes were used for coverage of the lateral bony window site and freeze dried fibrin sealant was applied to the grafted bone. The mean follow-up period was 28.5 months (ranged from 10 months to 48 months).

Results:
1. Unilateral sinus elevations were performed in 51 patients and bilateral sinus elevations were performed in 36 patients. And the total number of sinus elevation procedure was 123 cases.
2. The sinus elevation and simultaneous implant installation was performed in 89 sinuses and 249 implants were installed. The sinus elevation and delayed implant installation was performed in 44 sinuses and 141 implants were installed. The total number of implants were 390 in 133 sinuses. The average healing period after sinus elevations was 6.1 months in delayed implant installation.
3. Only autogenous bone, autogenous bone mixing with allografts or autogenous bone mixing with xenografts were used as graft materials.
4. The average period from first surgery to second surgery was about 7.2 months.
5. Some patients complications, such as perforation of sinus membrane, swelling, infection and exposure of cover screw. Two implants were removed in the infected sinus.
6. The survival rate of implants with maxillary sinus elevation by lateral window technique was 99.5% and the success rate of implants was 95.1%.

Conclusions:
These results indicated that the implants which were installed with maxillary sinus elevation by lateral window technique showed high survival and success rate.

A Retrospective Evaluation of Implant Installation with Maxillary Sinus Augmentation by Lateral Window Technique

Se-Il Ki, Min-Gi Yu, Young-Joon Kim, Min-Suk Kook, Hong-Ju Park, Uttom Kumar Shet, Hee-Kyun Oh

Purpose:
The purpose of this study is to evaluate the success rate of the Osstem US II(Seoul, Korea) placed in the edentulous area of type 4 bone quality.

Materials and Methods:
178 US II implants that had been inserted between 1997 and 2005 were followed up for mean 29.4 months. With medical records and radiographs we analyse the distribution of patients’ age and gender, position of implant, the kind of surgical technique, the type of prostheses, amount of bone resorption survival rate and success rate of implants. From these analysis we got the following results.

In the distribution of implants by site, 167 implants were placed on maxilla and only 11 implants on mandible. And the resorption of crestal bone more than 1mm was measured at only 5 implants. The mean plaque, gingival inflammatory and calculus index were measured 0.56, 0.31, 0.01. The survival rate was 100% and success rate was 98.8% during 29.4 months of mean following up period.

As a result, we got the excellent clinical results of US II implant system at bone quality of type 4.

Multicenter Retrospective Clinical Study of Osstem US II Implant System in Type IV Bone

Su-Gwan Kim, Chul-Min Park, Young-Kyun Kim, Hee-Kyun Oh, Gab-Lim Cho, Young Hak Oh
J Korean Implantology(KAOMI) 2007;11(3):22-29

Table 1. Distribution of operation methods

<table>
<thead>
<tr>
<th>Operation method</th>
<th>No. of implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional method</td>
<td>114</td>
</tr>
<tr>
<td>SL via lateral window</td>
<td>114</td>
</tr>
<tr>
<td>SL via osteotome technique</td>
<td>9</td>
</tr>
<tr>
<td>GBR</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Distribution of implants by type of prostheses

<table>
<thead>
<tr>
<th>Prosthesis</th>
<th>No. of implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>3</td>
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<tr>
<td>Fixed partial</td>
<td>136</td>
</tr>
<tr>
<td>Fixed complete</td>
<td>33</td>
</tr>
<tr>
<td>Others</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3. Distribution of implants by bone resorption

<table>
<thead>
<tr>
<th>Amount of bone resorption (mm)</th>
<th>No. of implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>140</td>
</tr>
<tr>
<td>0.0–0.9</td>
<td>2</td>
</tr>
<tr>
<td>1.0–2.0</td>
<td>5</td>
</tr>
<tr>
<td>&gt;2.0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1. Survival rates of simultaneously installed implants

<table>
<thead>
<tr>
<th>Residual bone height (mm)</th>
<th>No. of implant</th>
<th>No. of delayed implant</th>
<th>Survival rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;7</td>
<td>138</td>
<td>2</td>
<td>98.1</td>
</tr>
<tr>
<td>7–3</td>
<td>152</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>&lt;3</td>
<td>11</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>249</td>
<td>2</td>
<td>99.2</td>
</tr>
</tbody>
</table>

Table 2. Survival rates of delayed installed implants

<table>
<thead>
<tr>
<th>Residual bone height (mm)</th>
<th>No. of implant</th>
<th>No. of delayed implant</th>
<th>Survival rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;7</td>
<td>9</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>7–3</td>
<td>48</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>&lt;3</td>
<td>84</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>141</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
In this study, we analyzed data for edentulous patients from multiple centers after installation of the Osstem US II system in a retrospective study of patient gender, age, implant area, additional surgery, type of prosthesis, and the implant survival and success rates. We then analyzed the success rate after prosthetic restoration using implants in completely edentulous patients to validate the usefulness of the US II system.

Between 1997 and 2005, of the patients who visited regional dental clinics and private clinics nationwide (Department of Oral and Maxillofacial Surgery, Chosun University Dental College; Department of Oral and Maxillofacial Surgery and dental clinics, Seoul National University Bundang Hospital; Department of Oral and Maxillofacial Surgery, Chonnam University Dental School; dental clinics, Daedong Hospital; All Dental Private Office) and underwent the Osstem US II system implant procedure, our multicenter retrospective study examined 44 completely edentulous patients (mean age 63.3 years) who received 276 implants. The following results were obtained.

1. Eight of the 44 patients had systemic diseases, including 3 patients with diabetes, 2 patients with cardiovascular disease, and 1 patient each with cerebral infarction, hypertension, bronchial asthma, and Parkinson’s disease.

2. The oral hygiene of the 44 patients was classified as good in 36 patients, somewhat poor in 7 patients, moderately poor in 1 patient, and very poor in 0 patients.

3. Of the implants installed, 80 were 20 mm long, 65 were 11.5 mm long, 64 were 13 mm long, and 37 were 15 mm long; 175, 52, and 23 implants had diameters of 4.0, 3.75, and 3.3 mm, respectively.

4. When opposing teeth were encountered, 60 were natural teeth, 13 were porcelain, 40 had gold crowns, 7 were resin teeth, 90 were total dentures, and 66 were implant-repaired opposing teeth.

5. After implant installation, no bone resorption of the alveolar crest occurred in 181 cases, and more than 1 mm of bone loss took place in 44 cases.

6. The mean calculus index for the soft tissues near the implants in 215 cases was 0.11, and the gum inflammation index assessed in 226 cases averaged 0.34. The plaque index measured in 225 cases averaged 0.55, and the width of the attached gingiva measured in 222 cases averaged 2.05 mm.

7. For implant surgery, no additional surgery was performed in 161 cases (58.3%); maxillary sinus elevation via a lateral window was performed in 45 cases (16.3%); guided bone regeneration (GBR) was performed in 42 cases (15.2%); simultaneous maxillary sinus elevation and GBR were performed in 6 cases (2.1%); and veneer grafting was performed in 10 cases (3.6%).

8. According to the implant method, two implants installed with sinus lifting via a lateral window failed, for a survival rate of 95.55% (43/45). Temporary complications developed with the other procedures, but were resolved in all cases, giving good results.

9. Of the 276 implants installed, two failed and were removed for a final survival rate of 99.27%.

Purpose:
To evaluate long-term follow-up clinical performance of dental implants in use in South Korean populations.

Materials and Methods:
A retrospective multicenter cohort study design was used to collect long-term follow-up clinical data from dental records of 224 patients treated with 767 2-stage endosseous implants at Ajou University Medical Center and Bundang Jesaeng Hospital in South Korea from June 1996 through December 2003. Exposure variables such as gender, systemic disease, location, implant length, implant diameter, prosthesis type, opposing occlusion type, and date of implant placement were collected. Outcome variables such as date of implant failure were measured.

Results:
Patient ages ranged from 17 to 71.7 years old (mean age, 45.6 years old). Implants were more frequently placed in men than in women (61% versus 39%, or 471 men versus 296 women). Systemic disease was described by 9% of the patients. All implants had hydroxyapatite-blasted surfaces. Most of the implants were 3.75 mm in diameter. Implant lengths 10 mm, 11.5 mm, 13 mm, and 15 mm were used most often. Differences of implant survival among different implant locations were observed. Implants were used to support fixed partial dentures for the majority of the restorations. The opposing dentition was natural teeth for about 50% of the implants. A survival rate of 97.9% (751 of 767) was observed after 4.5 years (mean, 1.95 ± 1.2 years).

Conclusions:
Clinical performance of 2-stage dental implants demonstrated a high level of predictability. The results achieved with a South Korean population did not differ from results achieved with diverse ethnic groups (Cohort Study).
Background:
This study investigated the bone growth pattern in surgically created coronal defects with various depths around implants in dogs.

Materials and Methods:
Four mongrel dogs were used. All mandibular premolars were extracted under general anesthesia and left to heal for 2 months. After osteotomy, bony defects were prepared in test sites, using a stepped drill with a diameter of 6.3 mm and two depths: 2.5 mm (test sites 1 [T1]) and 5.0 mm (test sites 2 [T2]). In the control sites, the implants were placed after osteotomy without any coronal defects. T1, T2, and control sites were prepared in the right and left sides of the mandible. Six implants, 3.3 mm in diameter and 10 mm in length, were placed in each dog; the implants were submerged completely. Two dogs were sacrificed 8 weeks after surgery, and the other two dogs were sacrificed 12 weeks after surgery. The stability of all implants was measured with a resonance frequency analyzer before placement and after sacrifice. All sites were block-dissected for ground sectioning and histologic examination.

Results:
After 12 weeks of healing, only T2 were not filled fully with bone. At week 8, the mean bone-to-implant contact (BIC) was 47.7 ± 14.7%, 43.6 ± 19.0%, and 22.2 ± 14.7% in control, T1 (2.5 mm) and T2 (5.0 mm), respectively. At week 12, the mean BIC was 56.7 ± 17.0% and 35.1 ± 5.6% in control and T2, respectively. The BIC was significant at sites with a greater defect depth. Similar stability was noted in all specimens after 8 and 12 weeks of healing.

Conclusions:
Bone healing between an implant and marginal bone was compromised at sites with a deeper defect when the width of the bone defect was 1.5 mm.
Purpose:
Excessive heat at the implant-bone interface may compromise osseointegration. This study examined heat generated at the implant surface during preparation of zirconia/alumina complex abutment in vitro.

Material and Methods:
Sixty zirconia/alumina complex abutments (ZioCera, OSSSTEM, Seoul, Korea) were randomized to twelve experiment groups. The abutments were connected to implant (US II, OSSSTEM, Seoul, Korea) and were embedded in an acrylic-resin block in a 37°C water bath. Abutments were reduced horizontally 1mm height over a period of 1 minute with highspeed handpiece and polished for 30 seconds with lowspeed handpiece “with air/water coolant” and “without coolant.”

Temperatures were recorded via thermocouples at the cervical, middle, and apical part of the implant surface. The Mann-Whitney rank-sum test was used to assess the statistical significance of difference of temperature between with coolant and without coolant.

Results:
1mm reduction with highspeed handpiece without coolant resulted in maximum temperature of 41.22°C at the cervical of implant. 3 of 4 temperatures more than 40°C were observed at the cervical part of implant with highspeed handpiece without coolant. Temperature difference between “with coolant” and “without coolant” during both lowspeed polishing and highspeed polishing was statistically significant at the cervical of implant (p < 0.05). In contrast, temperature difference between “with coolant” and “without coolant” during both lowspeed polishing and highspeed polishing was not statistically significant at the middle and apical part of implant (p > 0.05).

Conclusions:
Preparation of zirconia/alumina complex abutment caused an increase in temperature within the implant but this temperature increase did not reach critical levels described in implant literature.

Table 1. Temperatures at each location of implant during preparation of five abutments using each handpiece type accompanied with coolant and without coolant

| Group | Experiment | Abutment | Abut. screw | Location | Colorant | Mean temperature (°C) | SD | Statistical significance
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pre-Clinical Study</td>
<td>3i</td>
<td>FULL OSSEOTITE Implant</td>
<td>Cervical</td>
<td>Yes</td>
<td>37.30</td>
<td>0.039</td>
<td>0.009</td>
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<tr>
<td>B</td>
<td>Pre-Clinical Study</td>
<td>Nobelbiocare, Branemark System Mk III Groovy RPI</td>
<td>PK98259 (National Instrument)</td>
<td>Cervical</td>
<td>No</td>
<td>37.24</td>
<td>0.043</td>
<td>0.754</td>
</tr>
<tr>
<td>C</td>
<td>Pre-Clinical Study</td>
<td>Neobiotec, SinusQuick TMEB External Gold</td>
<td>Tissue</td>
<td>Middle</td>
<td>No</td>
<td>37.36</td>
<td>0.042</td>
<td>0.874</td>
</tr>
<tr>
<td>D</td>
<td>Pre-Clinical Study</td>
<td>SinusQuick TMEB External Gold</td>
<td>Tissue</td>
<td>Apical</td>
<td>No</td>
<td>37.27</td>
<td>0.031</td>
<td>0.892</td>
</tr>
</tbody>
</table>

Conclusions:
Preparation of zirconia/alumina complex abutment caused an increase in temperature within the implant but this temperature increase did not reach critical levels described in implant literature.
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Objectives: Mini-implant system is applicable to areas of narrow space and area requiring temporary loading support. The purpose of this study was to evaluate the clinical outcome of a mini-implant system as well as the application of mini-implant system in the dental clinical field.

Study design: The patients who had been operated from Jan 2007 to Dec 2007 in the four dental facility including Seoul National University Bundang Hospital were enrolled. To evaluate the factors associated with the clinical outcome, the patients were classified according to gender, age, area of surgery, type of implant, diameter and length of the implant, and the purpose of the mini-implant system application.

Results: From 147 implants, only three implants failed, one of them was for temporary loading. There were no serious surgical or prosthetic complications in this study.

Conclusions: An analysis of the preliminary data revealed a satisfactory clinical outcome. However, more long-term evaluation of narrow ridge type as well as the patient’s satisfaction on the use of a provisional type mini-implant system is needed.

Table 1. Patients’ characteristics (n=69)

<table>
<thead>
<tr>
<th>Variables</th>
<th>The number of cases (Implants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
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</tr>
<tr>
<td>0-19</td>
<td>1 (4)</td>
</tr>
<tr>
<td>20-29</td>
<td>4 (4)</td>
</tr>
<tr>
<td>30-39</td>
<td>7 (11)</td>
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<tr>
<td>40-49</td>
<td>9 (25)</td>
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<tr>
<td>50-59</td>
<td>23 (36)</td>
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<tr>
<td>60-69</td>
<td>18 (51)</td>
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<tr>
<td>70-79</td>
<td>7 (19)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39 (57)</td>
</tr>
<tr>
<td>Female</td>
<td>30 (74)</td>
</tr>
<tr>
<td>Medical history</td>
<td></td>
</tr>
<tr>
<td>Healthy</td>
<td>48 (69)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10 (15)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>8 (15)</td>
</tr>
<tr>
<td>Cerebrovascular attack history</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Asthma 2 (6)</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Alcoholism 2 (3)</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>56 (128)</td>
</tr>
<tr>
<td>Yes</td>
<td>13 (26)</td>
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<tr>
<td>Results</td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>66 (146)</td>
</tr>
<tr>
<td>Failure</td>
<td>3 (6)</td>
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<tr>
<td>Complications</td>
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<tr>
<td>Osseointegration failure</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Infection</td>
<td>3 (6)</td>
</tr>
</tbody>
</table>
MS System References

Clinical Study


The “OSSTEM IMPLANT Research Project” for the promotion of implantology may support clinical and laboratory research at the discretion of its research committee.

Further information concerning conditions can be obtained from the following address:

Clinical Oriented Research Team for Implantology
Implant R&D Center of OSSTEM IMPLANT Co., Ltd.
#38-44, Geoje 3-dong, Yeonje-gu, Busan, Korea. Zip. 611-801
Tel. 82-70-7016-4745
Fax. 82-70-4394-0404
project@osstem.com
http://www.osstem.com