Osstem Implant System
Documentations Vol.6
Contents

TS SYSTEM
Selected literature of published Journals

■ Clinical Study
Subjective Satisfaction of Clinician and Short-Term Clinical Evaluation of Osstem TSIII SA Implant ......................................................... 10
J Korean Clinical Implant 2010;30(7):430-43
Case Report of Guided Bone Regeneration in Dehiscence-Type Defects Using Hydrophilic Surfaced Implant (TSIII CA) and SMARTbuilder
Scientific Poster, Osstem Meeting 2013 .................................................. 11
Preliminary Clinical Evaluation of Customized Three-Dimensional Pre-formed Titanium Mesh for Localized Alveolar Bone Regeneration ................................................................. 12
Scientific Poster, Osstem Meeting 2013
Preliminary Study for Hydraulic Sinus Membrane Elevation by CAS KIT without Bone Graft
Scientific Poster, Osstem Meeting 2013 ...................................................... 13
Prospective Comparative Study of Tapered Implant with SLA Surface at Maxillary Posterior Area According to Loading Time: 3 and 6 months ................................................................. 14
Scientific Poster, 21st Congress of EAO 2012
Sinus Bone Grafting with Simultaneous Implant Placement in Case of Residual Bone Height Less Than 4 mm Using TSIII SA Implant ............... 15
Scientific Poster, 22nd Congress of EAO 2013
A Case of Rehabilitation of Oral Function with Dental Implants Following Panfacial Bone Fracture ............................................................. 16
Scientific Poster, Osstem Meeting 2013
Full Mouth Rehabilitation Utilizing the CAD/CAM Technology: Surgical Guide for Flapless Surgery, Provisional Restoration and Screw-Retained Fixed Complete Denture ............................ 17
Scientific Poster, 21st Congress of EAO 2012
An Implant-Supported Restoration of a Maxillary Central Incisor Using a Temporary Abutment and a Customized CAD/CAM Titanium Abutment .................................................................. 18
Scientific Poster, 21st Congress of EAO 2012
SmartFit Abutment and Custom Healing Abutment ..................................... 19
Scientific Poster, 21st Congress of EAO 2012
Clinical Comparative Study of Immediate Loading Using Tapered Implant with Hydroxyapatite Coating at the Partial Edentulous Ridge of Posterior Maxilla and Mandible ....................................... 20
Scientific Poster, 21st Congress of EAO 2012

■ Pre-Clinical Study
Effect of Microthreads on Removal Torque and Bone-to-Implant Contact: an Experimental Study in Miniature Pigs ......................................................... 21
J Periodontal Implant Sci 2013;43:41-6
Enhancement of In Vitro Osteogenesis to Chemically Activated CA Surface Compared with SA Surface ................................................................. 22
Scientific Poster, Osstem Meeting 2013
Effect of Photodynamic Therapy on Aggregatibacter Actinomycetemcomitans Attached on Titanium Surfaces ......................................................... 23
Scientific Poster, Osstem Meeting 2013
Evaluation of Biomechanical Effect on Chemically Modified CA Surface in Vivo ......................................................................................... 24
Scientific Poster, 21st Congress of EAO 2012
Biomechanical and Histomorphometrical Evaluation of Bone-Implant Integration at Sand Blasting with Alumina and Acid Etching (SA) Surface ...................................................................... 25
Scientific Poster, 19th Congress of EAO 2010
Experimental Study of Bone Response to Hydroxyapatite Coating Implants: BIC and Removal Torque Test ................................................................. 26
Comparative Study on the Durability of Abutment Post According to Tightening Torque and Cantilever Volume ......................................................... 27
Scientific Poster, Osstem Meeting 2013

■ References............................................................................................................. 28
A Comparison of Implant Stability Quotients Measured Using Magnetic Resonance Frequency Analysis from Two Directions: Prospective Clinical Study During the Initial Healing Period


Non-Submerged Type Implant Stability Analysis During Initial Healing Period by Resonance Frequency Analysis


Evaluation of Peri-Implant Tissue in Nonsubmerged Dental Implants: A Multicenter Retrospective Study


A Randomized Clinical 1-year Trial Comparing Two Types of Non-Submerged Dental Implant


Four-Year Survival Rate of RBM Surface Internal Connection Non-Submerged Implants and the Change of the Peri-Implant Crestal Bone


Influence of Abutment Connections and Plaque Control on the Initial Healing of Prematurely Exposed Implants: An Experimental Study in Dogs

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Peri-Implant Bone Reactions at Delayed and Immediately Loaded Implants: An Experimental Study


Fatigue Characteristics of Five Types of Implant-Abutment Joint Designs

Met Mater Int 2008;14(2):133-8

The Effect of Various Thread Designs on the Initial Stability of Taper Implants


Influence of Premature Exposure of Implants on Early Crestal Bone Loss: An Experimental Study in Dogs


Microleakage of Different Sealing Materials in Acess Holes of Internal Connection Implant Systems


The Effect of Various Thread Designs on the Initial Stability of Taper Implants


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


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References


A Randomized Clinical 1-year Trial Comparing Two Types of Non-Submerged Dental Implant


Four-Year Survival Rate of RBM Surface Internal Connection Non-Submerged Implants and the Change of the Peri-Implant Crestal Bone


References

http://Shetak.com
Objective
Recently Osstem implant 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 on top to minimize necrosis of the alveolar bone, while its helical 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.

Materials & Methods
A total of 41 dental clinics took part in this study. 51% of the centers used the GS system from Osstem implant and 49% used implants from different manufacturers. In total, 522 TSIII SA implants were installed for three months from 31 August to November 2009. Maxillary and mandibular posterior regions were the most frequent areas, and prosthodontic treatments were carried out 3 to 4 months after the installation regardless of the installation region. 262 cases were completed with prosthodontic treatment upon completion of the study with the recovery of the questionnaires. The questionnaire consisted of the following questions. Users from 41 centers completed the questionnaires based on their combined experience of 522 implantations.

(1) Bone 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
(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 not 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 installation can derive from the proper range in many cases. When a tapered implant is installed without using counterdrilling 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 the overall satisfaction survey, while 25% of clinicians responded that they would wait and see before actually purchasing it for clinical application. Although the TSIII SA implant showed better results in the stimulation of initial bone conduction and bone response, most clinicians stated that they do not perceive any significant difference between the TSIII SA and previous models in terms of 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 responses.
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 maxillary, 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.

Case Report of Guided Bone Regeneration in Dehiscence-Type Defects Using Hydrophilic Surfacd Implant (TSIII CA) and SMARTbuilder

Objective
Most recently, Osstem implant introduced a TSIII CA implant, a chemically modified sand-blasted, large grit and acid-etched titanium surface implant, in order to enhance bone regeneration. Given the potential of this implant, we like to report the GBR case in dehiscence-type defects using hydrophilic surfaced implant (TSIII CA) and SMARTbuilder.

Why hydrophilic surface in GBR ?
Three important factors for bone regeneration are space making, presence of blood clot and cells (osteoblasts). The hydrophilic properties of TSIII CA implants surfaces may play an important role in bone clot stabilization and cell (osteoblast) affinity. SMARTbuilder has excellent mechanical properties for stabilization of bone graft materials. Its rigidity prevents contour collapse, its elasticity prevents mucosa compression, and its stability prevents graft displacement. Therefore, an essential prerequisite for bone graft integration, i.e., mechanical graft stability, could be guaranteed by SMARTbuilder.

Study design (Case Report)
- Age / Sex : 55Y / M
- Chief complain : #34, 35, 36 Missing
- Past medical history : N / S
- Past dental history
  - #34 Extraction d / t chronic periodontitis 2 months ago
- Treatment plan
  - #34, 35, 36 implant placement
  - #34 GBR d / t buccal bone defect

Conclusion
Three important factors for bone regeneration are space making, presence of blood clot and cells (osteoblasts). The hydrophilic properties of TSIII CA implants surfaces may play an important role in blood clot stabilization and cell (osteoblast) affinity. SMARTbuilder has excellent mechanical properties for stabilization of bone graft materials. Its rigidity prevents contour collapse, its elasticity prevents mucosa compression, and its stability prevents graft displacement. Therefore, an essential prerequisite for bone graft integration, i.e., mechanical graft stability, could be guaranteed by SMARTbuilder.

Fig. 15-18: Post-operative radiograph & intra-operative view
- Fig. 1-3: Pre-operative radiograph & intra-operative view
- Fig. 4-6: Full thickness mucoperiosteal flap was elevated with crestal incision and buccal bone defect was observed. GBR implant was inserted at #34 extraction socket. Insertion torque was 35Ncm and ISQ value was 71.
Preliminary Clinical Evaluation of Customized Three-Dimensional Pre-formed Titanium Mesh for Localized Alveolar Bone Regeneration

Objective
The purpose of this preliminary study is to evaluate the ability of customized three-dimensional titanium mesh (SMARTbuilder, Osstem, Korea) as a barrier membrane through investigation of clinical implant success rates and complications includingcrestal bone maintenance in application for localized alveolar bone regeneration.

Materials and Methods
1. Patient selection
In a total of 35 patients, dental implants (TSIII CA, Osstem, Korea) were placed and SMARTbuilder, height, healing abutment or cover cap were applied for bone regeneration simultaneously (Table 1).

2. Surgical technique
Autogenous bone, which was harvested by Autobone Collector (Osstem, Korea) (Fig. 1) and mixed with allograft (Sure-Oss, HansBiomed co., Korea) 1:1 in volumetric ratio, was used as graft material (Fig. 2).

SMARTbuilder was applied as a barrier membrane (Fig. 3). As seen on the Fig. 4, SMARTbuilder provided the space for bone regeneration via investigation of clinical implant success rates and complications including crestal bone maintenance in application for localized alveolar bone regeneration.

Table 1. Overview of patients and surgical records
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Discussion
Several benefits of the use of titanium mesh have been suggested. Titanium mesh provides superior space maintenance, a fundamental prerequisite for any bone regeneration procedure. Furthermore, the pores within the titanium mesh are thought to play a critical role in maintaining a blood supply to a grafted defect.

Previous studies have suggested that a barrier membrane can exclude the ingress of blood supply to a grafted defect, resulting in flap dehiscence and membrane exposure. Furthermore, Expanded polytetrafluoroethylene (ePTFE) membranes must be removed if flap dehiscence and exposure occurs to prevent infection, because in cases this will not heal spontaneously.

Titanium mesh, in contrast, when exposed, might not require immediate removal, because this material does not interfere with the blood flow to the underlying tissues owing to the presence of pores within the mesh. The size of these pores could be a significant factor because small pores could block the integral vascularization process. Another advantage of titanium mesh is that it provides the most extensive space maintenance of all available materials. This results from the great plasticity of the material, which permits bending, contouring, and adaptation of the mesh to any unique bony defect. The result is the establishment of a defined space below the mesh that mimics the shape of the desired alveolar ridge.

Conclusions
SMARTbuilder showed the feasibility as the barrier membrane maximizing the merit of the existing titanium mesh, especially with the ease of application and removal during the augmentation procedures for localized alveolar bone defect.

Preliminary Study for Hydraulic Sinus Membrane Elevation by CAS KIT without Bone Graft

Objective
The purpose of this preliminary study is to investigate the feasibility of no bone graft in maxillary sinus elevation during the implant treatment and to evaluate the amount of bone formation under a sinus membrane covered with and without saline or venous blood as a graft material in limited area of maxillary posterior. Instead of lateral approach, CAS KIT (Osstem, Korea), which is famous for hydraulic sinus membrane elevation via crestal approach, is utilized in this study.

Materials and Methods
In a patient with the posterior maxillary edentulism, the placement of dental implants, hydraulic sinus membrane elevation via crestal approach by CAS KIT, and saline or venous blood filling for space maintenance were performed (Fig. 1). Their residual alveolar bone height (RBH) was over 5 mm and the length of dental implants was selected as near doubled RBH. Periapical and panoramic radiographs, including cone beam computed tomography (CBCT), which were taken preoperatively (T0), and postoperatively 1 month (T1), 6 months (T2), and 12 months (T3), were used to evaluate the bone formation in the maxillary sinus floor.

Fig. 1. Lift membrane using hydraulic lift system

Results
The study population consisted 30 patients, 11 men and 9 women, ranging from 21 to 70 years in age (mean age, 43 years). Sinus lift procedures were performed by CAS KIT with implant placement simultaneously. Saline or venous blood filling for space maintenance were performed in each 10 patients. No significant complications were observed in any of the patients during the healing period, except for physiologic swelling after surgery. In a total 30 implants (TSIII CA, Osstem, Korea), 14 implants were inserted at premolar areas and 11 implants at molar areas. Of these implants, 3 were TSIII CA 4.0Xmm to 10.0 mm, 6 were TSIII CA 4.0Xmm to 5.0 mm, 16 were TSIII CA 4.0Xmm to 7.0 mm, and 3 were TSIII CA 5.0Xmm to 10.0 mm (Table 1).

Table 2. Measurement of average residual alveolar bone height (RBH)
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Conclusions
Maxillary sinus membrane elevation with the simultaneous placement of implants without the use of any additional grafting material resulted in miniscule hard tissue formation around the implants for a follow-up period of up to 12 months. According to our observations, filling of peripheral venous blood instead of a graft material can be a more viable alternative to bone substitutes and solely used in maxillary sinus augmentation filling of saline. New bone formation was verified by the stabilization of the elevated sinus membrane from the tensile effect of placement of dental implants and clot of venous blood without bone graft material. Our preliminary study shows that successful bone formation in sinus floor by hydraulic sinus membrane elevation using CAS KIT without bone graft.

Fig. 2. Schematic drawing showing the measurement of intra-sinus newly formed bone

Fig. 3. Bone regeneration
Objective
The aim of this study was to evaluate prospective clinical results of tapered implants with SLA surface which was installed at maxillary posterior area and loaded 3 months after implant placement.

Materials & Methods
- Subjects
  - From November 2009 through September 2010
  - Implant: TISS SA (Custom, Seoul, Korea)
  - Site: Posterior area, Maxilla
- Group classification: Loading time - Test group (3m), 3 months after placement - Control group (6m), 6 months after placement

Subject Information

Table 1. Patient & Implant Information

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Within this limitation of short-term evaluation, we achieved favorable clinical results as follows that tapered implants with SLA surface can be used as which is placed at maxillary posterior area and followed 3-months loading protocol.

Results

1. Additional Surgical Process

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2. Hard Tissue Evaluation

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<td>0.2 ± 0.3 mm</td>
<td>66</td>
<td>47</td>
</tr>
<tr>
<td>0.2 ± 0.3 mm</td>
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</tr>
</tbody>
</table>

3. Soft Tissue Evaluation

<table>
<thead>
<tr>
<th>AG PI GI</th>
<th>B M D P</th>
</tr>
</thead>
<tbody>
<tr>
<td>3mm</td>
<td>21.1</td>
</tr>
<tr>
<td>6mm</td>
<td>2.8</td>
</tr>
</tbody>
</table>

4. Prosthetic Evaluation

<table>
<thead>
<tr>
<th>Natural width</th>
<th>Implant</th>
<th>Occlusal gap (㎛)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3mm</td>
<td>23</td>
<td>31</td>
</tr>
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<td>6mm</td>
<td>29</td>
<td>32</td>
</tr>
</tbody>
</table>

5. Success rate

<table>
<thead>
<tr>
<th>3m</th>
<th>6m</th>
<th>7m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.1</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Conclusions
Within this limitation of short-term evaluation, we achieved favorable clinical results as follows that tapered implants with SLA surface can be used as which is placed at maxillary posterior area and followed 3-months loading protocol.

<table>
<thead>
<tr>
<th>Test group</th>
<th>Quot of alveolar bone height (mm)</th>
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<tbody>
<tr>
<td>Patient</td>
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</tr>
<tr>
<td>Age</td>
<td>56.5 ± 11.9</td>
</tr>
<tr>
<td>Implant</td>
<td>35</td>
</tr>
</tbody>
</table>

Materials & Methods

- Subjects
  - From November 2009 through September 2010
  - Implant: TISS SA (Custom, Seoul, Korea)
  - Site: Posterior area, Maxilla
- Group classification: Loading time - Test group (3m), 3 months after placement - Control group (6m), 6 months after placement

Subject Information

Table 1. Patient & Implant Information

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Methods

- Hard tissue evaluation:
  - Periapical view (6 months, 12 months after loading)
  - Stability: ISQ (Osteal mentor)
- Soft tissue evaluation:
  - AG (attached gingiva)
  - P (Plaque index)
  - GI (Gingival index)
  - PD (Pocket depth): Buccal (B), Mesial (M), Distal (D), Palatal (P)
- Prosthetic evaluation:
  - Crown - Implant ration (C/I) ratio
  - Opposite occlusal arch status
  - Occlusal gap: Controlled by Shimstock (8 ㎛) articulating paper

So, it is concluded that sinus bone grafting with simultaneous implant placement in case of residual bone height less than 4mm could be considered as a predictable procedure.

Results

1. Additional Surgical Process

<table>
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Materials & Methods

- Subjects
  - From November 2009 through September 2010
  - Implant: TISS SA (Custom, Seoul, Korea)
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- Group classification: Loading time - Test group (3m), 3 months after placement - Control group (6m), 6 months after placement

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So, it is concluded that sinus bone grafting with simultaneous implant placement in case of residual bone height less than 4mm could be considered as a predictable procedure.
A Case of Rehabilitation of Oral Function with Dental Implants Following Panfacial Bone Fracture

Objective
Panfacial fractures involve trauma to mandibular and maxillary bones. It requires a team approach for management and planned treatment plan. A functional and esthetic rehabilitation was successfully accomplished by using a partial removable dental prosthesis in the maxilla and Ramus block bone and allogeic bone graft with dental implants to support fixed dental prosthesis in the mandible.

Study design (Case Report)
1. Sex/Age : Male/31
2. C.C : Panfacial fracture
3. Clinical history : Patient was involved in a motor-cycle collision on September 9, 2011, and pelvic bone fracture, malar and maxillary bones fracture, mandibular symphysis fracture, laceration on tongue and chin. He also had laceration on right nasolabial fold, loss of several teeth, alveolar bone fracture.
4. Missing teeth : #11, 21, 22, 34, 33, 32, 31, 41, 42, 43
5. Treatment plan : Open reduction and internal fixation on fracture site. To get a sufficient depth of bone for the dental implants, we decided to use ramus block bone and allogeic bone graft on maxilla and mandible. We plan to use a partial removable denture for the maxilla and insert the Costem TS system implants in the mandible.
6. Treatment process

Conclusions
This clinical report describes the prosthodontics treatment after the open reduction of a panfacial fracture. After the operation of such complex trauma, the locations of the fractured segments and the occlusion are distorted and present a challenge to us, resulting in problems such as facial deformation, inefficient mastication, and mal-function of the TMJ. In 2013, restoration was completed with final prosthodontics. In upper jaw, we treated the patient with removable partial denture because of the alveolar bone and tissue deficiency.

Full Mouth Rehabilitation Utilizing the CAD/CAM Technology : Surgical Guide for Flapless Surgery, Provisional Restoration and Screw-Retained Fixed Complete Denture

Objective
The ideal treatment planning, accurate placement, and functional restoration of dental implants for the completely edentulous patient can be challenging. Anatomical limitations can make implant location difficult to determine. The use of CT scans and surgical planning software to produce a CAD/CAM surgical guide, as well as the use of a flapless surgical technique, can make implant placement more predictable, safer, and easier for patients. Furthermore, CAD/CAM-guided fabrication of an provisional restoration and screw-retained definitive prosthesis can result in predictable and successful full mouth reconstruction.

Study design (Case Report)
- Immediate Removable Complete Denture
- CAD/CAM Surgical Guide: CostemGuide
- CAD/CAM Provisonal restoration
- Convertible Abutment, Lateral fixation screw
- CAD/CAM Zirconia prosthesis

Conclusions
The advantages of this procedure, for the completely edentulous arch, include (1) shorter surgery times, (2) shorter treatment times, (3) less invasive, flapless surgery and, therefore, less chance of swelling, less pain, and faster healing.
Objective

Maxillary central incisors play a critical role in esthetics. One of the most difficult factors for an esthetic implant restoration is the natural profile of the cervical area in which the tooth emerges from inside the gingiva. Many procedures including bone augmentation and soft tissue graft have been suggested to solve this problem.

More recently, techniques using CAD/CAM customized abutments are drawing attentions as promising solutions.

The author describes a clinical case with a missing upper central tooth restored using an Osstem TS Implant and a customized CAD/CAM (Osstem SmartFit) abutment.

Study design (Case Report)

- Patient age: 28Y, male
- C/C: Teeth fracture due to trauma
- Clinical findings
  - Crown fracture of maxillary anterior teeth
  - Root fracture of Lt. central incisor
  - Apical radiolucency and fistula

Provisional Restoration

A provisional restoration supported by a temporary abutment was placed 10 weeks after implant placement.

Final Restoration

A metal-ceramic restoration was fabricated on a stone cast taken directly using silicone rubber impression material.

Conclusions

Customized CAD/CAM abutment system (Osstem SmartFit Abutment) is a promising technique to overcome many shortcomings of conventional readymade abutments or manual milling abutments.

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Objective

The latest CAD/CAM technology for patient-specific abutments is now gaining ground on the Korean dental market. Many implant companies are introducing CAD/CAM solution for customized abutment. With CAD/CAM abutments, the clinician can use high-quality, customized abutments with less time and effort. Fixture placement in undesirable conditions must be overcome with restorative procedures. Usually, in such cases, cast-gold UCLA abutments have been used to make customized abutments.

Note, however, that cast-gold UCLA abutments have limitations such as increased expenses, casting defects, variable quality depending on the technician’s experience, and biocompatibility. These limitations will be overcome with SmartFit abutments for Osstem implants to which CAD/CAM technology was applied.

Moreover, clinicians can control the emergence profile and subgingival contour of implant prostheses with customizable healing abutment. Custom healing abutment can be a new option for successful implant prosthetics.

In this poster, I would like to introduce two clinical cases of patient-specific SmartFit abutment and Custom healing abutment.

Study design (Case Report)

SmartFit Abutment and Custom Healing Abutment

- Patient-specific SmartFit abutment was manufactured by milling process in the Osstem CAD/CAM Center. By using the transfer jig, delivered abutment was positioned on the working model and checked. Then provisional restoration was made on the model.

Conclusions

SmartFit abutment with Custom healing abutment provides an anatomically optimal emergence profile for implant prosthesis, maximizing long-term aesthetics and function. As the biggest advantages of SmartFit abutment, it overcomes the limitations of stock abutment and is a useful adjunctive tool for producing restorations that approximate natural teeth in various bad conditions.

With Custom healing abutment and SmartFit abutment for Osstem implant systems, clinicians can improve profitability by eliminating time and cost that have been spent on making cast-gold UCLA abutments.

Furthermore, they provide patients with patient-specific, customized, well-fitting abutment and brings about win-win results for both clinicians and patients.
Effect of Microthreads on Removal Torque and Bone-to-Implant Contact: an Experimental Study in Miniature Pigs

Objective
The objective of this study was to evaluate the effect of microthreads on removal torque and bone-to-implant contact (BIC).

Materials & Methods
Twelve miniature pigs for each experiment, a total of 24 animals, were used. In the removal torque analysis, each animal received 2 types of implants in each tibia, which were treated with sandblasting and acid etching but with or without microthreads at the marginal portion. The animals were sacrificed after 4, 8, or 12 weeks of healing. Each subgroup consisted of 4 animals, and the tibias were extracted and removal torque was measured. In the BIC analysis, each animal received 3 types of implants. Two types of implants were used for the removal torque test and another type of implant served as the control. The BIC experiment was conducted in the mandible of the animals. The P1-M1 teeth were extracted, and after a 4-month healing period, 3 each of the 2 types of implants were placed, with one type on each side of the mandible, for a total of 6 implants per animal. The animals were sacrificed after a 2-, 4-, or 8-week healing period. Each subgroup consisted of 4 animals. The mandibles were extracted, specimens were processed, and BIC was analyzed.

Results
No significant difference in removal torque value or BIC was found between implants with and without microthreads. The removal torque value increased between 4 and 8 weeks of healing for both types of implants, but there was no significant difference between 8 and 12 weeks. The percentage of BIC increased between 2 and 4 weeks for all types of implants, but there was no significant difference between 4 and 8 weeks.

Conclusions
The existence of microthreads was not a significant factor in mechanical and histological stability.

Clinical Comparative Study of Immediate Loading Using Tapered Implant with Hydroxyapatite Coating at the Partial Edentulous Ridge of Posterior Maxilla and Mandible

Objective
The aim of this study is to compare the clinical outcome after the immediate loading of two types of implants with a hydroxyapatite coat for patients with missing molar teeth.

Materials & Methods
* Subject:
- Group I: Osteos TSI HA (Male 12, Female: 15, Total: 27)
- Group II: Zimmer (Male 18, Female: 5, Total: 23)
- Group I and group II were assigned randomly and operator was informed about the study group the day of operation
- Patients who undertook loading within 48 hours of implant installation were included in this study

* Implant distribution:
- Group I: maxilla 22, mandible 32, total: 54
- Group II: maxilla 24, mandible 22, total: 46

* Average Age:
- Group I: 51.40 (11.30) years
- Group II: 49.73 (14.29) years

* Evaluation factor:
- Marginal bone loss: 1 year after loading
- Soft tissue condition around implant
- Primary and 2nd implant stability (Ostell Mentor device)

* An Independent T test was conducted to determine the statistical significance (SPSS program, P-value <0.05).

Results
1. There were no implant failures in both group and survival rate was 100% 12 month after immediate loading. The number of cases showing the bone loss more than 1 mm was 3 in group I, 5 in group II. Implant success rate of group I was 94.4%, group II 89.1%.

2. Mean marginal bone loss was 0.06 mm in group I, 0.44 mm in group II after 1 year. Marginal bone loss of group I was significantly lower than group II (P < 0.05).

Table 1. Comparison of marginal bone loss between groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Bone Loss (mm)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>0.06</td>
<td>0.01</td>
</tr>
<tr>
<td>Group II</td>
<td>0.44</td>
<td>0.02</td>
</tr>
</tbody>
</table>

3. There were no significant differences in peri-implant indices such calculus, pocket depth, and width of nonkeratinized mucosa of both groups except plaque index. Peri-implant tissue condition was stable in both groups.

Table 2. Comparison of Peri-implant index between groups

<table>
<thead>
<tr>
<th>Group</th>
<th>PI</th>
<th>CI</th>
<th>PD(D)</th>
<th>PD(M)</th>
<th>PD(L)</th>
<th>PD(B)</th>
<th>SBI</th>
<th>CI</th>
<th>PD(D)</th>
<th>PD(M)</th>
<th>PD(L)</th>
<th>PD(B)</th>
<th>Attached gingiva(L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>0.03</td>
<td>0.02</td>
<td>3.41</td>
<td>3.54</td>
<td>3.13</td>
<td>3.09</td>
<td>0.25</td>
<td>0.02</td>
<td>3.41</td>
<td>3.54</td>
<td>3.13</td>
<td>3.09</td>
<td>0.25</td>
</tr>
<tr>
<td>Group II</td>
<td>0.08</td>
<td>0.04</td>
<td>3.56</td>
<td>3.68</td>
<td>3.13</td>
<td>3.28</td>
<td>0.22</td>
<td>0.03</td>
<td>3.56</td>
<td>3.68</td>
<td>3.13</td>
<td>3.28</td>
<td>0.22</td>
</tr>
</tbody>
</table>

4. As implant primary and 2nd stability, there was no significant differences between two groups (P > 0.05). And also there was no significant differences when comparing the each arch between groups (P > 0.05).

Table 3. Comparison of ISQ between Group I and Group II

<table>
<thead>
<tr>
<th>Group</th>
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</tr>
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<tbody>
<tr>
<td>Group I</td>
<td>77.6746</td>
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<td>Group II</td>
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5. There were no significant differences in microthreads on removal torque and bone-to-implant contact (BIC).

Table 4. Comparison of ISQ between Group I and Group II

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6. The existence of microthreads was not a significant factor in mechanical and histological stability.

Conclusions
The marginal bone loss of implant after immediate loading of two types of study implants with hydroxyapatite coat in patients with missing molar tooth was insignificant. And TSI HA implant showed more stable result on the aspect of marginal bone status around implant after immediate loading.

Table 5. Comparison of ISQ between Group I and Group II

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Fig. 1. Design of implants used in the experiment.

Fig. 2. Cross section of implant in mandible. A) Implant group A. B) Implant Group B. C) Large magnification of the marginal portion where the BIC measurement was performed.

Fig. 3. Mean and standard deviation of removal torque(Ncm) at each healing period. Group A Group B Group C

Fig. 4. Mean and standard deviation of BIC(%) at each healing period. Group A Group B Group C
Enhancement of in Vitro Osteogenesis to Chemically Activated CA Surface Compared with SA Surface

Objective
The aim of study was to evaluate the effect of chemically surface modification with hydrophilicity on various physiochemical parameters which involved in vitro osteogenesis.

Materials & Methods
1. Preparation of titanium disks
Two types of commercially pure titanium (Grade 3) disks with 12 mm in diameter and 1 mm in thickness were prepared.
1) SA surface: Hydrophobic surface by Sandblasting with Al2O3 and acid etching with HCl/H2SO4.
2) CA surface: Super-hydrophilic SA by reducing atmospheric carbon contamination and storing in a solution of calcium.

2. Surface characterization and in-vitro evaluation
After surface treatment, we verified the surface topography, chemical composition and blood-wettability between two surfaces by SEM, EDS, contact angle measurement. The biological efficiency of chemically activated surface is evaluated by various in-vitro tests such as protein adsorption, platelet activity, osteoblastic cell behavior.

Conclusions
In this study, we verified the chemistry and wettability of titanium surface were important variables in determining protein and osteoblastic cell response. Albumin adsorption, platelet adsorption and activation on chemically activated CA surface was dramatically enhanced compared with hydrophobic SA surface. Also, these super-hydrophilic CA surface showed higher osteoblastic response such as cell adhesion, proliferation, ALP activity, mineralization. Therefore, chemically activated and hydrophilic CA surface may play roles in stimulating the bone formation and ultimately enhanced bone-implant contact compared with hydrophobic SA surface.

Results
1. Protein and platelet response on CA is much higher than SA

2. Hydrophilic CA surface enhances the cell spreading behavior.

3. Hydrophilic CA surface accelerate ALP activity and Mineralization

Effect of Photodynamic Therapy on Aggregatibacter Actinomycetemcomitans Attached on Titanium Surfaces

Objective
Peri-implantitis is an inflammatory process affecting the tissues around an osseointegrated implant. As the need of finding more safe and proper treatment for peri-implantitis arose, more attention is focused on noninvasive photodynamic therapy (PDT) in the treatment of peri-implantitis. The purpose of this study is to assess the efficacy of PDT using erythrosine and green color light emitting diode (LED) light source to the biofilm of Aggregatibacter actinomycetemcomitans attached on resorbable blasted media (RBM) and sand blasted, large grit, acid etched (SLA) titanium surface in vitro.

Materials & Methods
A. actinomycetemcomitans ATCC 33384 was cultivated in trypticase soy broth under anaerobic conditions for 72 hours. After incubating, all disks were rinsed twice with phosphate buffered saline (PBS). RBM and SLA surface of disks were examined by scanning electron microscope (SEM, x 10,000, x 30,000) used to examine the bacteria attached on titanium disks. RBM and SLA disks were subdivided into four groups including one control group and three test groups (E0, E30, E60) for PDT examination for each group.

Imidation source is light emitting diode (Photron Co. Ltd., Seoul, Korea) with a spectrum of emission ranging from 520 – 530 nm for 30 seconds (150 mW/cm2, 45 J/cm2). As photosensitizer, 500 μL of 20 μM of erythrosine was used for 60 seconds. The disks were put into test tube and agitated with PBS and glass bead for 60 seconds. After agitating, 200 μL of solution with detached bacteria was spread directly on brucella blood agar plates. The plates were incubated in anaerobic conditions on brucella blood agar plates for 72 hours at 37°C. Survival rate of bacteria was determined by counting the colony forming units (CFU) after incubation. Additionally, a time-resolved fluorescence confocal microscope was used to observe the distribution of live/dead microorganisms on disk surface.

Results

Conclusions
Our results demonstrate that association of erythrosine and a green LED, with wavelength 520 – 530 nm, light intensity 150 mW/cm2, 45 J/cm2 was effective in reducing the viability of A. actinomycetemcomitans attached to RBM and SLA titanium surfaces in vitro.
**Evaluation of Biomechanical Effect on Chemically Modified CA Surface in Vivo**

**Objective**
The aim of the study was to evaluate the effect of chemically modified hydrophilic CA surface compared with conventional SA surface in various animals.

**Materials & Methods**
A total of 20 implants were divided into two groups. Group 1, implants treated with SA were used as control group. Group 2 retained chemically modified hydrophilic CA surface. All implants were placed in the tibiae of 3 female New Zealand white rabbits and in the mandible of 2 male miniature pigs. Removal torque was measured 16 days after placement.

**Results**
In tibiae of rabbits, group 1 had a mean removal torque of 50 Ncm versus 72 Ncm for group 2 after 16 days of healing time. In mandible of miniature pig, group 1 had a mean removal torque of 68 Ncm versus 75 Ncm for group 2 after 2 weeks of healing time. Group 2 was measured more stable anchorage than group 1 in both animals.

**Conclusions**
It is concluded that modified hydrophilic CA surfaces were more effective for biomechanical properties of bone-implant contact from conventional SA surface in rabbits and miniature pigs.

---

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

**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.

**Materials & Methods**
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 ± 57.0 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.
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.

Materials & Methods
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 significant high removal torque value (FIV) 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). At 8 weeks, the BIC of HA was shown to be significantly higher than RBM or SA (p < .05). Nonetheless, RBM and SA were not statistically 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.

Comparative Study on the Durability of Abutment Post According to Tightening Torque and Cantilever Volume

Objective
This study sought to do a comparative evaluation of the abutment post’s fatigue life experimentally according to the tightening torque and cantilever volume, thereby emphasizing the importance of tightening torque specified by the manufacturer and suggesting a guide to designing prosthesis with excellent long-term stability so that it can be applied correctly to actual clinical cases.

Materials & Methods
1. Materials
   1) Specification
   2) Test group VS. control group

2. Test equipments
   1) Fatigue tester: Instron 8841
   2) Torque Gage: Mark-10’s MGT12

3. Methods

Conclusions
As can be seen from the comparative test of fatigue life according to the tightening torque and cantilever volume, connecting with torque beyond or below the manufacturer-specified value shortens the fatigue life, requiring periodic checks of instruments as well as caution during actual use. Moreover, since greater cantilever volume results in shorter fatigue life, occlusal prosthesis should be considered from the future’s procedure level. Occclusal strength and antagonist tooth should also be considered when manufacturing the prosthesis to produce one with outstanding fatigue fracture performance.
Clinical Study

3. Yong-Jin Kim, Young-Jin Park, Kyung-Tae Park. Case report of Guided Bone regeneration in dehiscence-type defects using hydrophilic surfaced implant(TSIII CA) and SMARTBuilder. Scientific Poster, Osstem Meeting 2013
6. Kyo-Jin Ahn, Young-Kyun Kim. Prospective comparative study of tapered implant with SLA surface at maxillary posterior area according to loading time: 3 and 6 months. Scientific Poster, 21st Congress of EAO 2013
7. Yong-Jin Kim, Young-Kyun Kim, Kyung-Tae Park. Sinus bone grafting with simultaneous implant placement in case of residual bone height less than 4mm using TSIII SA implant. Scientific Poster, 22nd Congress of EAO 2013
9. Kwang-Haeun Han, Min-Suk Heo. Vertical ridge augmentation with SMARTBuilder in poor bone condition. Scientific Poster, Osstem Meeting 2013
22. Ki-Seong Kim. SmartFit Abutment and Smart Healing Abutment. Scientific Poster, 21st Congress of EAO 2012

Pre-Clinical Study

Biology

2. Hong-Young Choi, Jae-Jae Park, Su-Kyung Kim, Tae-Gwan Eom. Enhancement of in vitro osteogenesis to chemically activated CA surface compared with SA surface. Scientific Poster, Osstem Meeting 2013
3. Eul-Rak Song, Kyung-Won Cho, In-Kwan Lee, Heung-Sik Um, Beom-Seok Chang, Si-Young Lee. Effect of photodynamic therapy on aggregegbacter actinomycetemcomitans attached on titanium surfaces. Scientific Poster, Osstem Meeting 2013
5. Hee-Jin Gu, Su-Kyung Kim, Hong-Young Choi, Myung-Duk Kim, Yong-Seok Cho, Tae-Gwan Eom. Evaluation of biomechanical effect on chemically modified Ca SA surface in vivo. Scientific Poster, 21st Congress of EAO 2012

Biomechanics

1. Jae-Chan Heo, Jae-Ho Ryu, Jung-Hwa Oh, Tae-Hyung Kim, Tae-Gwan Eom. Comparative study on the durability of abutment post according to tightening torque and cantilever volume. Scientific Poster, Osstem Meeting 2013
A Multicenter Prospective Study in Type IV Bone of a Single Type of Implant

Objective
To analyze the success and survival rates of the Osstem GSII (Osstem, Seoul, Korea) implant in type IV bone.

Materials & Methods
A prospective, multicenter (5 centers) study was conducted by examining the relationship between implant success and survival rates, and several patient and surgical parameters. The implants were placed in 82 patients who visited several nationwide dental hospitals and clinics between 2007 and 2008, followed by clinical and radiographic analyses.

Table 1. General Conditions and Smoking Habit
<table>
<thead>
<tr>
<th>Diabetes mellitus</th>
<th>Cardiovascular disease</th>
<th>Hypertension</th>
<th>Liver disease</th>
<th>Smoking habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>13</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2. Distribution of Implants by Length and Diameter

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Length (mm)</th>
<th>No. of Implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>3.5</td>
<td>4</td>
</tr>
<tr>
<td>4.0</td>
<td>4.0</td>
<td>9</td>
</tr>
<tr>
<td>4.5</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>5.0</td>
<td>5.0</td>
<td>1</td>
</tr>
<tr>
<td>5.5</td>
<td>5.5</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td>18</td>
</tr>
</tbody>
</table>

Table 5. 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>3</td>
</tr>
<tr>
<td>0-0.9</td>
<td>4</td>
</tr>
<tr>
<td>1.0-2.0</td>
<td>6</td>
</tr>
<tr>
<td>≥2.0</td>
<td>6</td>
</tr>
</tbody>
</table>

Results
In type IV bone, the implant success and survival rates were 93.23% and 96.83%, respectively. The maxillary premolar and mandibular anterior tooth areas showed success rates of 100%. The most widely used implant diameter and length was 5.0 and 13 mm, respectively, but the diameter and length had no effect on success rates. However, success rates appeared to decrease with age.

Conclusions
The results indicated that the Osstem GSII implant is highly effective in poor-quality type IV bone.

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

Objective
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.

Materials & Methods
Twenty-seven patients (61 implants) who were treated with sinus bone grafts (sinus lateral approach) and simultaneous Osstem GSII 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.

Table 1. Condition of the adjacent tissue around the implants

<table>
<thead>
<tr>
<th>Index</th>
<th>Occlusal loading 4 months</th>
<th>Occlusal loading 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRESTAL BONE LOSS (mm)</td>
<td>0.30 ± 0.33</td>
<td>0.39 ± 0.36</td>
</tr>
<tr>
<td>WIDTH OF KERATINIZED MUCOSA (mm)</td>
<td>2.50 ± 1.69</td>
<td>1.73 ± 1.40</td>
</tr>
<tr>
<td>PLAQUE INDEX</td>
<td>0.74 ± 0.89</td>
<td>0.76 ± 0.79</td>
</tr>
<tr>
<td>GINGIVAL INDEX</td>
<td>0.73 ± 0.83</td>
<td>0.79 ± 0.69</td>
</tr>
<tr>
<td>PROBING POCKET DEPTH (mm)</td>
<td>3.56 ± 0.98</td>
<td>3.65 ± 1.06</td>
</tr>
</tbody>
</table>

Table 2. Residual bone height (mm)

<table>
<thead>
<tr>
<th>Index</th>
<th>Occlusal loading 4 months</th>
<th>Occlusal loading 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEFORE OPERATION</td>
<td>5.36 ± 1.95</td>
<td>4.52 ± 1.71</td>
</tr>
<tr>
<td>IMMEDIATELY AFTER</td>
<td>17.26 ± 3.22</td>
<td>16.64 ± 1.87</td>
</tr>
<tr>
<td>1 YEAR AFTER</td>
<td>15.35 ± 3.05</td>
<td>15.45 ± 2.29</td>
</tr>
</tbody>
</table>

Table 3. Primary and secondary stability (implant stability quotient) of implants

<table>
<thead>
<tr>
<th>Index</th>
<th>Occlusal loading 4 months</th>
<th>Occlusal loading 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY</td>
<td>61.96 ± 12.84</td>
<td>56.08 ± 15.55</td>
</tr>
<tr>
<td>SECONDARY</td>
<td>71.85 ± 6.80</td>
<td>60.51 ± 11.28</td>
</tr>
</tbody>
</table>

Results
The amounts of crestal bone-loss at the final recall time (12.56 ± 5.96 mm after loading) of the 4-month and 6-month loading groups were 0.19 ± 0.33 mm and 0.29 ± 0.36 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 ± 0.83 and 0.59 ± 0.69 (P=.671), 1.11 ± 0.98 and 0.76 ± 0.79 (P=.226), 3.56 ± 0.98 mm and 3.65 ± 1.06 mm (P=.758), respectively. The primary stabilities of implants in the 4-month and 6-month loading groups were 61.96 ± 12.84 and 56.08 ± 15.55 (P=.120), and the secondary stabilities were 71.85 ± 6.80 and 60.51 ± 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.
A 1-Year Prospective Clinical Study of Soft Tissue Conditions and Marginal Bone Changes Around Dental Implants After Flapless Implant Surgery

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

Materials & Methods
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.

Table 1. ISQ (Implant stability quotient) value change

<table>
<thead>
<tr>
<th>Time</th>
<th>With sinus graft (N=14)</th>
<th>Without sinus graft (N=24)</th>
<th>t&lt;sup&gt;*&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; op</td>
<td>63.6 ± 14.1</td>
<td>74.4 ± 7.2</td>
<td>.000</td>
</tr>
</tbody>
</table>

P was calculated using paired T-test.

*Indicates statistically significant difference (p<.05)

Table 2. CBL (crestal bone loss) according to time

<table>
<thead>
<tr>
<th>Time</th>
<th>CBL (mm)</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; op</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
<th>t&lt;sup&gt;*&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>0.09 ± 0.26</td>
<td>.043</td>
<td>.53</td>
<td>.89</td>
<td>.84</td>
<td>.565</td>
</tr>
<tr>
<td>Wide</td>
<td>0.09 ± 0.26</td>
<td>.043</td>
<td>.53</td>
<td>.89</td>
<td>.84</td>
<td>.565</td>
</tr>
</tbody>
</table>

P was calculated using repeated measures ANOVA.

*Indicates statistically significant difference (p<.05)

Table 3. Implant survival rate of GSIII implants

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Fail</th>
<th>Survival rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinus graft</td>
<td>37</td>
<td>1</td>
<td>97.4%</td>
</tr>
</tbody>
</table>

Table 4. CBL (crestal bone loss) according to time

<table>
<thead>
<tr>
<th>Diameter</th>
<th>CBL (mm)</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; op</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
<th>t&lt;sup&gt;*&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>0.09 ± 0.26</td>
<td>.043</td>
<td>.53</td>
<td>.89</td>
<td>.84</td>
<td>.565</td>
</tr>
<tr>
<td>Wide</td>
<td>0.09 ± 0.26</td>
<td>.043</td>
<td>.53</td>
<td>.89</td>
<td>.84</td>
<td>.565</td>
</tr>
</tbody>
</table>

P was calculated using repeated measures ANOVA.

*Indicates statistically significant difference (p<.05)

Table 5. Comparison between implants with and without sinus grafts

<table>
<thead>
<tr>
<th>Time</th>
<th>With sinus graft (N=14)</th>
<th>Without sinus graft (N=24)</th>
<th>t&lt;sup&gt;*&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; op</td>
<td>67.6 ± 7.4</td>
<td>62.5 ± 15.7</td>
<td>.501</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; op</td>
<td>75.3 ± 6.6</td>
<td>74.0 ± 7.4</td>
<td>.831</td>
</tr>
<tr>
<td>3M</td>
<td>0.01 ± 0.03</td>
<td>0.11 ± 0.27</td>
<td>.314</td>
</tr>
<tr>
<td>6M</td>
<td>0.02 ± 0.13</td>
<td>0.23 ± 0.53</td>
<td>.361</td>
</tr>
</tbody>
</table>

P was calculated using Mann-Whitney U-test.

*Indicates statistically significant difference (p<.05)

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 average gingival index score was 0.1 (SD 0.3), and 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.
A Relaxed Implant Bed: Implants Placed After Two Weeks of Osteotomy with Immediate Loading: A One Year Clinical Trial

Objective
A waiting period of two weeks after osteotomy increases the surrounding tissue activity to its maximum level as collagen formation and neoangiogenesis represents a relaxed and acceptable implant bed configuration. The aim of the present study was a clinical and radiological evaluation of early osteotomy with implant placement delayed for two weeks with immediate loading in the anterior and premolar region with minimally invasive approach.

Materials & Methods
A total of seven GSII 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
In the present study, early osteotomy with delayed implant placement showed negligible crestal bone loss with no mobility.

Table 1. Mean values of width of keratinized mucosa index

<table>
<thead>
<tr>
<th>Assessment Time</th>
<th>Mean ± SD</th>
<th>% Change from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>2.00 ± 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>-16.9%</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>

Table 3. Mean values of marginal bone loss 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 ± 0.36</td>
<td>13.66%</td>
</tr>
<tr>
<td>12th Month</td>
<td>0.36 ± 0.41</td>
<td>-13.66%</td>
</tr>
</tbody>
</table>

Table 4. Mean values of marginal bone loss 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>5.53%</td>
</tr>
<tr>
<td>12th Month</td>
<td>0.53 ± 0.42</td>
<td>1.85%</td>
</tr>
</tbody>
</table>

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

Objective
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.

Materials & Methods
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 (Regenaform®) 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 prosthetic 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 prosthetic loading and after 20.8 months’ follow-up was 0.6 mm and 0.7 mm, respectively, in group I. A 90.9% 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 prosthetic 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.

Table 1. Marginal bone loss (mm) around the implants

<table>
<thead>
<tr>
<th>No. of implants</th>
<th>1 yr loading</th>
<th>Final F/U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>49</td>
<td>0.63 ± 0.51</td>
</tr>
<tr>
<td>Group II</td>
<td>24</td>
<td>0.69 ± 0.48</td>
</tr>
</tbody>
</table>

F/U, Follow-up.

*P = .649.
**P = .148.
*P = .255.
§P = .153 (between delayed and simultaneous placement in each group).

Table 2. Comparison in terms of marginal bone loss (mm) 1 year and final follow up after the completion of the upper prosthesis

<table>
<thead>
<tr>
<th>No. of implants</th>
<th>1 yr loading</th>
<th>Final F/U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Delayed placement</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Simultaneous placement</td>
<td>30</td>
</tr>
<tr>
<td>Group II</td>
<td>Delayed placement</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Simultaneous placement</td>
<td>14</td>
</tr>
</tbody>
</table>

F/U, Follow-up.

*P = .649.
**P = .148.
§P = .153.
Evaluation of Peri-implant Tissue Response According to the Presence of Keratinized Mucosa

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

Materials & Methods
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 compared and evaluated through the gingival inflammation index (GII), 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>Width of DKM (mm)</th>
<th>Width of SKM (mm)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBM</td>
<td>0.64 ± 0.49</td>
<td>3.26 ± 1.26</td>
<td>0.157</td>
</tr>
<tr>
<td>SLA</td>
<td>0.40 ± 0.50</td>
<td>3.05 ± 1.29</td>
<td>0.56 ± 1.18</td>
</tr>
<tr>
<td>Anodizing</td>
<td>0.40 ± 0.50</td>
<td>3.19 ± 1.18</td>
<td>.157</td>
</tr>
</tbody>
</table>

DKM, insufficient keratinized mucosa, width 2 mm
SKM, sufficient keratinized mucosa, width 2 mm
RBM, Resorbable blasting media (Osstem USII/GSII)
SLA, sandblasted large grit and acid-etched (Dentium Implantium)
Anodizing, Nobel Biocare TiUnite
other abbreviations as in

Table 2. Crestal bone loss according to implant system

<table>
<thead>
<tr>
<th>Implant system</th>
<th>Bone loss (mm)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impantium</td>
<td>0.54 ± 0.63</td>
<td>.36</td>
</tr>
<tr>
<td>TUniti</td>
<td>0.44 ± 0.72</td>
<td>.56</td>
</tr>
<tr>
<td>GSI</td>
<td>0.59 ± 0.71</td>
<td>.56</td>
</tr>
<tr>
<td>LSU</td>
<td>0.60 ± 0.64</td>
<td>.56</td>
</tr>
</tbody>
</table>

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

Objective
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.

Materials & Methods
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).

Conclusions
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>Group</th>
<th>Probing depth (mm)</th>
<th>Gingival index</th>
<th>Bleeding on probing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap group</td>
<td>1.7 ± 0.3</td>
<td>0.9 ± 0.3</td>
<td>0.7 ± 0.4</td>
</tr>
<tr>
<td>Flapless group</td>
<td>1.0 ± 0.3</td>
<td>0.9 ± 0.3</td>
<td>0.7 ± 0.4</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Group</th>
<th>PM-B (mm)</th>
<th>PM-aJE (mm)</th>
<th>aJE-B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flap group</td>
<td>3.5 ± 0.8</td>
<td>2.2 ± 0.2</td>
<td>1.3 ± 0.2</td>
</tr>
<tr>
<td>Flapless group</td>
<td>3.3 ± 0.3</td>
<td>2.3 ± 0.3</td>
<td>0.9 ± 0.3</td>
</tr>
</tbody>
</table>

PM, marginal position of the peri-implant mucosa; B, marginal level of bone-to-implant contact; aJE, apical termination of the junctional epithelium.
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.

Materials & Methods
Bilateral, edentulated, 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 implant. 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.

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).

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

Microleakage of Different Sealing Materials in Acess Holes of Internal Connection Implant Systems

Objective
The purpose of this study was to evaluate the levels of microleakage through the access holes of screw-retained implant prostheses sealed with different materials.

Materials & Methods
An implant with an internal hexagonal configuration was connected to a temporary abutment with an acrylic resin crown. The apical 6.5 mm of the access hole was filled with 1 of the following materials: cotton pellet, silicone sealing material, vinyl polysiloxane, or gutta-percha. The remaining coronal 3 mm was sealed with composite resin. Cyclic loading with 21 N at 1 Hz was applied 16,000 times to the specimens in 0.5% basic fuchsin solution according to the long axis of the tooth. Basic fuchsin dye which penetrated into the internal wall of the abutment through the access hole was dissolved with methyl alcohol. Then the absorbance was measured by a spectrophotometer at 540 nm to evaluate the degree of microleakage. The results were statistically analyzed with 1-way ANOVA and the Tukey HSD test.

Results
From greatest to least, the levels of microleakage were in the following order: cotton pellet, silicone sealing material, vinyl polysiloxane, and gutta-percha. The microleakage associated with gutta-percha was not significantly different from that of vinyl polysiloxane.

Conclusions
When sealing the access holes of screw-retained implant prostheses, gutta-percha or vinyl polysiloxane would help reduce microleakage.
Fatigue Characteristics of Five Types of Implant-Abutment Joint Designs

Objective
This study evaluated the fatigue limit of five implant-abutment combinations (Osstem Implant, 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 & Methods
Each implant-abutment system (EXTNTS: USII-TiN Coated, EXANTS: USIII-Safe, EXZRTS: BioTapered Double Thread-ZirAce, INTIWS: GSII-GS Transfer, INTICS: SSI-Solid) was tightened with a closing torque of 32 Ncm. The test specimen was loaded at an incline of 30 degrees toward the loading direction after fixing it 11 mm away from the fixed point. A cyclic compression load was applied at loading cycles of 10 Hz using a hydraulic dynamic testing machine (Model 8516, Instron, USA).

Table 1. Implant systems used in this study

<table>
<thead>
<tr>
<th>Group</th>
<th>Fixture</th>
<th>Abutment</th>
<th>Screw</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTNTS</td>
<td>USII (US2R413)</td>
<td>TiN Coated (CAR535C)</td>
<td>ASR200</td>
</tr>
<tr>
<td>EXANTS</td>
<td>USIII (US3R413)</td>
<td>Safe (SFAR542C)</td>
<td>SFSR2</td>
</tr>
<tr>
<td>EXZRTS</td>
<td>BioTapered Double Thread (BDT413)</td>
<td>ZioCera (ZAR535)</td>
<td>ASR200</td>
</tr>
<tr>
<td>INTIWS</td>
<td>GSII (GS2R4013)</td>
<td>GS Transfer (GSTA5430S)</td>
<td>GSASR</td>
</tr>
<tr>
<td>INTICS</td>
<td>SSI (SSI1813)</td>
<td>Solid (SSS485)</td>
<td>-</td>
</tr>
</tbody>
</table>

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. Turkey analysis showed that the group with the abutment joint with the external hexagonal structure pattern had a significantly higher mean static strength than the group with the internal hexagonal structure pattern (p < .05). 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 limit that was compared with the static strength was found to be relatively high in the cases with a tapered shape than an external hexagonal shape. In the cases where the shape of the screw joint was an external hexagonal structure, the fatigue limit was relatively higher in cases using the zirconia abutment than the titanium abutment. The fatigue fracture of the zirconia abutment was initiated in the margin with a subsequent sudden unstable fracture.

The Effect of Various Thread Designs on the Initial Stability of Taper Implants

Objective
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. 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.
Pre-Clinical Study

5. Je-Hyeon Yoo, Bae-Gyu-Io, Ji-Hoon Yoon. The Influence of Diameter and Length on Initial Stability in Implant with Similar Surface Area : An Experimental Study. Scientific Poster, J Kor Acad Prosthodont 2008 Conference

Pre-Clinical Study


GS SYSTEM References

http://gsystem.com
Objective
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.

Materials & Methods
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 (10 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 buccal 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 calculated 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 were made.

Table 1. The change in implant stability quotient (ISQ) discrepancy measured from two different directions at each measurement time point

<table>
<thead>
<tr>
<th>Diameter</th>
<th>ISQ discrepancy* (mean ± SD)</th>
<th>P-value **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straumann (N=25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During surgery</td>
<td>1.1 ± 2.77</td>
<td>0.16</td>
</tr>
<tr>
<td>Allograft-operative week 10</td>
<td>0.42 ± 1.49</td>
<td></td>
</tr>
<tr>
<td>Osstem SSII (N=28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During surgery</td>
<td>0.36 ± 3.6</td>
<td>0.317</td>
</tr>
<tr>
<td>Allograft-operative week 10</td>
<td>-0.14 ± 1.54</td>
<td></td>
</tr>
</tbody>
</table>

* ISQ discrepancies were calculated by subtracting the ISQ obtained from the four measurements from surgery in 10 weeks after surgery. ** P-values were calculated for differences between two time points (during surgery and at postoperative week 10) using a Wilcoxon’s signed-ranks test.

Non-Submerged Type Implant Stability Analysis During Initial Healing Period by Resonance Frequency Analysis

Objective
The purpose of the present study was to analyze the implant stability quotient (ISQ) values for Korean non-submerged type implants and determine the factors that affect implant stability.

Materials & Methods
A total of 49 Korean non-submerged type implants were installed in 24 patients, and their stability was measured by resonance frequency analysis (RFA) at the time of surgery, and 1, 2, 3, 4, 8, 12 weeks postoperatively. The data for implant site, age, sex, implant length and diameter, graft performing, bone type, and insertion torque were analyzed.

Results
The lowest mean stability measurement was at 3 weeks. There was significant difference between implant placement and 12 weeks. There was significant difference between implant placement and 12 weeks in diameters of 4.1 mm and 4.8 mm. Also, there were significant differences between diameters of 4.1 mm and 4.8 mm at implant placement and 12 weeks after surgery. This result suggests that the factor related to implant diameter may affect the level of implant stability. No statistically significant relationship was found between the resonance frequency analysis and the variables of maxilla/mandible, sex, anterior/posterior, implant length, age of patient, graft performing, bone type, insertion torque during initial healing period.

Conclusions
These findings suggest that the factor related to implant diameter may affect the variance of implant stability, and ISQ value of implant was stable enough for proved stability level during initial healing period.

Table 1. Statistical Rate of Change Data for ISQ Values for Different Variables

<table>
<thead>
<tr>
<th>Diameter</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla/Mandible</td>
<td>0.6141 &gt; 0.05</td>
</tr>
<tr>
<td>Sex</td>
<td>0.9616 &gt; 0.05</td>
</tr>
<tr>
<td>Anterior/Posterior</td>
<td>0.8406 &gt; 0.05</td>
</tr>
<tr>
<td>Length</td>
<td>0.6317 &gt; 0.05</td>
</tr>
<tr>
<td>Diameter</td>
<td>0.3929 &gt; 0.05</td>
</tr>
<tr>
<td>Age</td>
<td>0.3636 &gt; 0.05</td>
</tr>
<tr>
<td>Graft</td>
<td>0.3635 &gt; 0.05</td>
</tr>
<tr>
<td>Bone type</td>
<td>0.8354 &gt; 0.05</td>
</tr>
<tr>
<td>Insertion torque</td>
<td>0.0875 &gt; 0.05</td>
</tr>
</tbody>
</table>

* Statistically significant effective factor for rate of change between surgery and 3 months (P < 0.05)
**Evaluation of Peri-Implant Tissue in Nonsubmerged Dental Implants: A Multicenter Retrospective Study**

**Objective**
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.

**Materials & Methods**
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>Type of Implant</th>
<th>Duration</th>
<th>Area</th>
<th>N</th>
<th>Mean ± SD (mm)</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Straumann Dental Implant System</td>
<td>None</td>
<td>25</td>
<td>0.79 ± 0.49</td>
<td>0.273</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>None</td>
<td>25</td>
<td>0.60 ± 0.45</td>
<td>0.114</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>0.1~0.5 mm</td>
<td>25</td>
<td>0.67 ± 0.43</td>
<td>0.824</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>0.6~1.0 mm</td>
<td>25</td>
<td>0.86 ± 0.51</td>
<td>0.060</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>1.1~2.0 mm</td>
<td>25</td>
<td>0.93 ± 0.59</td>
<td>0.131</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>&gt;2.0 mm</td>
<td>25</td>
<td>1.37 ± 0.48</td>
<td>0.045</td>
<td></td>
</tr>
</tbody>
</table>

* Results were calculated using Student’s t-test.

**A Randomized Clinical 1-year Trial Comparing Two Types of Non-Submerged Dental Implant**

**Objective**
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 SSLI 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 unilateral loss of one or two molars from the mandible. To compare implant stability, the peak insertion torque, implant stability quotient (ISQ), and peritests value (PTV) were evaluated during surgery, and at 4 and 10 weeks after surgery. To compare marginal bone loss, standard periapical radiographs were obtained during 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 = .297) at surgery. In contrast, there was no statistically significant difference in the pattern of change of ISQ during the 10 weeks after surgery (p = .399). For marginal bone loss, no significant difference was observed between the control and experimental groups before functional loading (p = .624), but after one year of follow-up, a borderline difference was noted (p = .046).

**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>
<thead>
<tr>
<th>Type of Implant</th>
<th>Duration</th>
<th>Area</th>
<th>N</th>
<th>Mean ± SD (mm)</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Straumann Dental Implant System</td>
<td>None</td>
<td>25</td>
<td>0.79 ± 0.49</td>
<td>0.273</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>None</td>
<td>25</td>
<td>0.60 ± 0.45</td>
<td>0.114</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>0.1~0.5 mm</td>
<td>25</td>
<td>0.67 ± 0.43</td>
<td>0.824</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>0.6~1.0 mm</td>
<td>25</td>
<td>0.86 ± 0.51</td>
<td>0.060</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>1.1~2.0 mm</td>
<td>25</td>
<td>0.93 ± 0.59</td>
<td>0.131</td>
<td></td>
</tr>
<tr>
<td>Osstem SSLI Implant System</td>
<td>&gt;2.0 mm</td>
<td>25</td>
<td>1.37 ± 0.48</td>
<td>0.045</td>
<td></td>
</tr>
</tbody>
</table>

* Results were calculated using Student’s t-test.

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

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of patients</th>
<th>Mean ± SD (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25</td>
<td>0.79 ± 0.49</td>
</tr>
<tr>
<td>Experimental</td>
<td>25</td>
<td>0.60 ± 0.45</td>
</tr>
<tr>
<td>Area 1</td>
<td>25</td>
<td>0.67 ± 0.43</td>
</tr>
<tr>
<td>Area 2</td>
<td>25</td>
<td>0.86 ± 0.51</td>
</tr>
<tr>
<td>Area 3</td>
<td>25</td>
<td>0.93 ± 0.59</td>
</tr>
<tr>
<td>Area 4</td>
<td>25</td>
<td>1.37 ± 0.48</td>
</tr>
</tbody>
</table>

* Results were calculated using Student’s t-test.

**Table 2. Implant failure and survival by year**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of implants at start of year</th>
<th>No. of implants surviving 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 and added by referring to the magnification rate 2.8 mm pitch, and the average was obtained. In this case, a=0.8 mm and b=1.2 mm, and after 1 year, the mean amount of crestal bone resorption was 1.2 mm.
Implant-supported fixed and removable prostheses provide a proper treatment modality with reliable success. The SSII implants are a one-stage nonsubmerged threaded titanium implants with Resorbable Blasting Media (RBM) surface developed by Osstem implant (Seoul, Korea) in October of 2002.

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

Since September 2003, 439 SSII 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 found 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 occurred 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.

**Objective**
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 (9.2 ± 0.6 mm) than with the abutment-connected implant (8.5 ± 0.7 mm; p < .05).

**Conclusions**
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

**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.

**Materials & Methods**
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 20N 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, microscopic computed 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 (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 (10.6 mm) for the delayed-loading implants than for the immediately loaded implants (9.6 mm; p < .05).

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

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### Flapless Implant Surgery: An Experimental Study

**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.

**Materials & Methods**
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, microcomputerized tomography at the implantation site was performed. Osseointegration was calculated as percentage of implant surface in contact with bone. Additionally, bone height was measured in the peri-implant bone.

**Results**
The mean osseointegration was greater at flapless sites (70.4%) than at sites with flaps (59.5%) (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).

**Conclusions**
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.
The Effect of Internal Implant-Abutment Connection and Diameter on Screw Loosening

Chun-Yeo Ha, Chang-Whe Kim, Young-Jun Lim, Kyung-Soo Jang
J Kor Acad Prosthodont 2005;43(3):379-92

Objective
One of the common problems of dental implant prosthesis 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 metals. The purposes of this study were:
1. To compare the initial abutment screw detorque 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 screw 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 crown were cemented temporarily and a cyclic sine curve load (0 to 300 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 SSII regular and wide implant both recorded the higher detorque values than other groups after cyclic loading (p < .05).
4. Of the wide the 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, SSII regular and wide implants showed higher detorque values than before (p < .05).

Table 1. List of Components

<table>
<thead>
<tr>
<th>Group</th>
<th>Brand name</th>
<th>Types of cemented abutments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ext(R)</td>
<td>Osstem-USB Implant</td>
<td>Hexed, collar 1mm, height 5.5mm</td>
</tr>
<tr>
<td>Ext(W)</td>
<td>Osstem-USB Implant</td>
<td>Hexed, collar 1mm, height 5.5mm</td>
</tr>
<tr>
<td>Int(R)</td>
<td>Osstem SSIII Implant</td>
<td>non-coll, height 5.5mm</td>
</tr>
<tr>
<td>Int(W)</td>
<td>Osstem SSIII Implant</td>
<td>non-coll, height 5.5mm</td>
</tr>
<tr>
<td>Int2(R)</td>
<td>Camlog D3</td>
<td>trivam, gingival collar 1.5mm</td>
</tr>
<tr>
<td>Int2(W)</td>
<td>Camlog D3</td>
<td>trivam, gingival collar 1.5mm</td>
</tr>
<tr>
<td>Int3(R)</td>
<td>Implantium</td>
<td>non-hex, gingival collar 1.0mm</td>
</tr>
<tr>
<td>Int3(W)</td>
<td>Implantium</td>
<td>non-hex, gingival collar 1.0mm</td>
</tr>
<tr>
<td>Int4(R)</td>
<td>MIS</td>
<td>hexed, gingival collar 2.0mm</td>
</tr>
<tr>
<td>Ext(R)</td>
<td>MIS</td>
<td>hexed, gingival collar 2.0mm</td>
</tr>
<tr>
<td>Int5(R)</td>
<td>Deposed Screw Vent</td>
<td>hexed, 5.5mmwide profile</td>
</tr>
<tr>
<td>Ext(W)</td>
<td>Deposed Screw Vent</td>
<td>hexed, 5.5mmwide profile</td>
</tr>
</tbody>
</table>

Fig. 1. Regular diameter implants, abutments, abutment screws and titanium crowns.
Fig. 2. Wide diameter implants, abutments, abutment screws and titanium screws.
Fig. 3. Mean initial detorque values.
Fig. 4. Mean detorque values after cyclic loading.
Fig. 5. Mean detorque values of regular diameter implants.
Fig. 6. Mean detorque values of wide diameter implants.

SS SYSTEM References

Clinical Study
Pre-Clinical Study

Biology

   Pre-Clinical Study


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Success Rate and Marginal Bone Loss of Osstem USII Plus Implants: Short Term Clinical Study

Objective
The aim of this study was to evaluate the clinical value of Osstem USII Plus system implants. Clinical and radiographic data were analyzed for 88 implants placed and functionally loaded for a 12 month period at the Yonsei University Dental Hospital.

Materials & Methods
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 implant placement 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 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 RBM surface treated external connection domestic implants showed satisfactory results and the marginal bone loss was in accord with the success criteria of dental implants.

Materials & Methods
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 USII. All patients were recorded and the HU and implant stability quotient (ISQ) value were evaluated according to the sites, gender, and generalized systemic disorder patients on the bone density and primary implant stability were examined.

Results
The bone density varies from site to site and from patient to patient. A correlation with gender, age and generalized systemic disorder patients on the bone density and primary implant stability were examined.

Conclusions
Based on these results, the short term clinical success rate of RBM surface treated external connection domestic implants showed satisfactory results and the marginal bone loss was in accord with the success criteria of dental implants.
A Retrospective Evaluation of Implant Installation with Maxillary Sinus Augmentation by Lateral Window Technique

Objective
The aim of this study was to evaluate the clinical results of implants which were installed with maxillary sinus elevation by using lateral window technique.

Materials & 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 ilorin 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 rates.

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

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

178 USII implants that had been inserted between 1997 and 2005 were followed up for mean 29.4 months. With medical records and radiographs we analysis 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 USII implant system at bone quality of type 4.
In this study, we analyzed data for edentulous patients from multiple centers after installation of the Osstem USII 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 USII 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 USII 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, 2 patients with cardiovascular disease, and 1 patient each with cerebral infarction, hypertension, bronchial asthma, and Parkinson’s disease.

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 2.06 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 (0.6%).

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%.

In this study, we analyzed data for edentulous patients from multiple centers after installation of the Osstem USII 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 USII system.

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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.
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.

Materials & Methods
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 a 2 and 4 week 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).

Conclusion
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

Objective
This study investigated the bone growth pattern in surgically created coronal defects with various depths around implants in dogs.

Materials & Methods
Four mongrel dogs were used. All mandibular premolars were extracted under general anesthesia and left to heal for 2 months. After ostectomy, 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 ostectomy 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 after 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% for control, 43.6% for T1, and 22.2% for T2. At week 12, the control BIC was 56.7% and the 2.5 mm defect had a greater BIC (58.8%). However, in the 0.5 mm defect, the BIC was 35.1%. At insertion, stability was reduced 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.
**Objective**
The present study was performed to evaluate the effect of surface treatment of the cervical area of implant on bone regeneration in fresh extraction socket following implant installation.

**Materials & Methods**
The four minipigs, 18 months old and 30 kg weighted, were used. Four premolars of the left side of both the mandible and maxilla were extracted. ∅3.3 mm and 11.5 mm long USII Plus implants (Osstem Implant, Korea) with resorbable blasting media (RBM) treated surface and USII implants (Osstem Implant, Korea) with machined surface at the top and RBM surface at lower portion were installed in the socket. Stability of the implant was measured with Ostell[TM] (Model 6 Resonance Frequency Analyser: Integration Diagnostics Ltd., Sweden). After 2 months of healing, the procedures and measurement of implant stability were repeated in the right side by same method of left side. At four months after first experiment, the animals were sacrificed after measurement of stability of all implants, and biopsies were obtained.

**Results**
Well healed soft tissue and no mobility of the implants were observed in both groups. Histologically satisfactory osseointegration of implants was observed with RBM surface, and no foreign body reaction as well as inflammatory infiltration around implant were found. Furthermore, substantial bone formation and high degree of osseointegration were exhibited at the marginal defects around the cervical area of USII Plus implants. However, healing of USII implants was characterized by the incomplete bone substitution and the presence of the connective tissue zone between the implant and newly formed bone. The distance between the implant platform (P) and the most coronal level of bone-to-implant contact (B) after 2 months of healing was 2.68 ± 0.11 mm at USII implants group and 1.80 ± 0.13 mm at USII Plus implant group. The P-B distance after 4 months of healing was 2.29 ± 0.13 mm at USII implants group and 1.25 ± 0.10 mm at USII plus implants group. The difference between both groups regarding the length of P-B distance was statistically significant (p < 0.05). Concerning the resonance frequency analysis (RFA) value, the stability of USII Plus implants group showed relatively higher RFA value than USII implants group.

**Conclusions**
The current results suggest that implants with rough surface at the cervical area have an advantage in process of bone regeneration on defect around implant placed in a fresh extraction socket.

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**Comparison of Push-in Versus Pull-out Tests on Bone-Implant Interfaces of Rabbit Tibia Dental Implant Healing Model**

**Objective**
This study aimed to investigate whether push-in and pull-out tests measure mechanical properties of the bone-implant interface differently, and which test is more sensitive to changes over the healing period.

**Materials & Methods**
Two identical self-threading dental implants (∅3.3 x 8.5 mm) were placed in medial surface of the proximal condyles of left and right tibias of 20 rabbits (40 implants total). Five rabbits each were sacrificed after 1, 4, 8, and 12 weeks of healing. Pull-in test was performed on one side’s tibia implant and pull-out on the other side’s implant, at a rate of 6 mm/min. Primary and secondary implant stabilities and tibia weight were measured on all implants.

**Results**
The push-in test generated significantly higher failure load (p = .0001; 530 N vs 279 N), lower displacement at failure (p = .0003; 0.436 mm vs 0.680 mm), and higher interface stiffness (p < .0001; 1,641 N/mm vs 619 N/mm) than pull-out test. Failure load, stiffness, and secondary implant stability were significantly higher for longer compared with shorter healing periods, while displacement, tibia weight, and primary stability were not. Failure load and stiffness differed significantly for four healing times for the push-in but not pull-out test. Failure load was significantly correlated with secondary implant stability for both push-in (r = 0.68) and pull-out (r = 0.48) tests, but stiffness was significantly correlated with secondary stability only for the push-in test (r = 0.72; pull-out test r = 0.40).

**Conclusions**
The push-in test appeared more sensitive than pull-out to changes in mechanical properties at bone-implant interfaces during healing in rabbit tibia model.
Quantitative Biomechanical Analysis of the Influence of the Cortical Bone and Implant Length on Primary Stability

Objective
The aim of the study was to investigate the influence of cortical bone and increasing implant fixture length on primary stability. Further investigation considered the correlation between the presence of cortical bone at the marginal bone and implant stability measured by insertion torque (IT) and resonance frequency analysis (RFA), as well as implant length, were determined.

Materials & Methods
Two different types of polyurethane bone models were compared. (Group1: with cortical and cancellous bone; Group 2: with cancellous bone only). A total of 60 external type implants (ø 4.1, Osstem, USII) with different lengths (7, 10, and 13 mm) were used. IT was recorded automatically by a computer which was connected to the Implant fixture installation device during the placement. RFA was conducted to quantify the primary implant stability quotient (ISQ). All two measurements were repeated 10 times for each group.

Results
All these differences were statistically significant between the two groups (P < 0.001) and intragroups (P < 0.001). Upon comparing the IT, cortical bone appears to have a greater influence on implant stability than implant lengths, whereas the RFA value strongly affects implant length rather than the presence of the crestal cortical bone.

Conclusions
The quantitative biomechanical evaluations clearly demonstrated that primary implant stability seems to be influenced by the presence of a cortical plate and total surface area of the implant fixture appears to be the decisive determinant for ISQ value.

Material & Methods
Sixty zirconia/alumina complex abutments (ZioCera, Osstem, Seoul, Korea) were randomized to twelve experiment groups. The abutments were connected to implant (USII, Osstem, 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 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 reduction was statistically significant at the cervical of implant (p < 0.005). In contrast, temperature difference between “with coolant” and “without coolant” during both lowspeed polishing and highspeed reduction was not statistically significant at the middle and apical part of implant (p > .05).

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

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Group</th>
<th>Coolant</th>
<th>Apical</th>
<th>Middle</th>
<th>Cervical</th>
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<tr>
<td>1</td>
<td>High</td>
<td>Yes</td>
<td>38.08</td>
<td>37.98</td>
<td>37.67</td>
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<td>37.70</td>
<td>37.47</td>
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<tr>
<td>6</td>
<td>Low</td>
<td>No</td>
<td>38.08</td>
<td>37.82</td>
<td>37.68</td>
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<tr>
<td>7</td>
<td>Low</td>
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<td>38.08</td>
<td>37.70</td>
<td>37.47</td>
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<tr>
<td>8</td>
<td>Low</td>
<td>No</td>
<td>38.08</td>
<td>37.82</td>
<td>37.68</td>
</tr>
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</table>

Table 2. Mean temperature and statistical significance of temperature difference for Zirconia/Alumina Complex Abutment

<table>
<thead>
<tr>
<th>Location</th>
<th>Coolant</th>
<th>Mean Temperature</th>
<th>SD</th>
<th>Statistical significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>Yes</td>
<td>38.08 ± 0.59</td>
<td>0.006</td>
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<tr>
<td>Middle</td>
<td>Yes</td>
<td>38.08 ± 0.67</td>
<td>0.754</td>
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</tr>
<tr>
<td>Apical</td>
<td>Yes</td>
<td>38.08 ± 0.48</td>
<td>0.004</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Mean temperature and statistical significance of temperature difference for Zirconia/Alumina Complex Abutment with highspeed contouring

<table>
<thead>
<tr>
<th>Location</th>
<th>Coolant</th>
<th>Mean Temperature</th>
<th>SD</th>
<th>Statistical significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>Yes</td>
<td>38.08 ± 0.38</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Middle</td>
<td>Yes</td>
<td>38.08 ± 0.53</td>
<td>0.245</td>
<td></td>
</tr>
<tr>
<td>Apical</td>
<td>Yes</td>
<td>38.08 ± 0.33</td>
<td>0.465</td>
<td></td>
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</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.
Fatigue Fracture of Different Dental Implant System Under Cyclic Loading

Won-Ju Park, In-Ho Cho
J Kor Acad Prosthodont 2009;47:424-34

Objective
Implant has weak mechanical properties against lateral loading compared to vertical occlusal loading, and therefore, stress analysis of implant fracture depending on its material and geometric features is needed.

Materials & Methods
Total 28 of external hexed implants were divided into 7 of 4 groups; Group A (3i, FULL OSSEOTITE Implant), Group B (Nobelbiocare, Branemark Sytem Mk III Groovy RP), Group C (NeoBioteck, SinusQuick™ ESB), Group D (OssettM, USII). The type III gold alloy prostheses were fabricated using adequate UCLA gold abutments. Fixtuer, abutment screw, and abutment were connected and cross-sectioned vertically. Hardness test was conducted using MXT-α. For fatigue fracture test, with MTS 810, the specimens were loaded to the extent of 60 - 600 N until fracture occurred. The fracture pattern of abutment screw and fixture was observed under scanning electron microscope. A comparative study of stress distribution and fracture area of abutment screw and fixture was carried through finite element analysis.

Results
1. In Vicker's hardness test of abutment screw, the highest value was measured in group A and lowest value was measured in group D.
2. In all implant groups, implant fixture fractures occurred mainly at the 3 - 4th thread valley where tensile stress was concentrated. When the fatigue life was compared, significant difference was found between the group A, B, C, and D (p < .05).
3. The fracture patterns of group B and group D showed complex failure type, a fracture behavior including transverse and longitudinal failure patterns in both fixture and abutment screw. In group A and C, however, the transverse failure of fixture was only observed.
4. The finite element analysis infers that a fatigue crack started at the fixture surface.

Conclusions
The maximum tensile stress was found in the implant fixture at the level of cortical bone. The fatigue fracture occurred when the dead space of implant fixture coincides with jg surface where the maximum tensile stress was generated. To increase implant durability, prevention of surrounding bone resorption is important. However, if the bone resorption progresses to the level of dead space, the frequency of implant fracture would increase. Thus, proper management is needed.

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<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Journal and Volume</th>
</tr>
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<tr>
<td>1. Influences of Implant Fixture Design on Implant Primary Stability</td>
<td>Gap-Yong Oh, Sung-Hwa Park, Seok-Gyu Kim</td>
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</tr>
<tr>
<td>4. Temperature Measurement During Implant Site Preparation</td>
<td>Yong-Suk Choi, Chul-Hyun Jeong, Tae-Soo Kim, Dong-Hoon Jang, Tae-Gwan E.</td>
<td>Scientific Oral, 15th Congress of EAO 2006</td>
</tr>
<tr>
<td>5. Simulation of Abutment-Connection and Diameter on Screw Lossening</td>
<td>Chul-Yea Ha, Chul-hye Kim, Young-Jun Lim, Kyung-Soo Jang</td>
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<td>7. Fatigue Characteristics of Different Implant Fixtures on</td>
<td>MyungSeok Kim, SeokMin Ko, Young-Koak, SungKyun Kim</td>
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<td>8. The Effect of Various Designs on the Initial Stability of Taper</td>
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<tr>
<td>9. Strains of Abutment and Bones on Implant Overdentrures</td>
<td>Si-Yeob Kim, ByungKoo Bae, JangHyeon Lee</td>
<td>J Kor Acad Prosthodont 2007;45(5):396-408</td>
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<tr>
<td>10. Screw Joint Stability under Cyclic Loading of Tungsten Implants</td>
<td>Ji-Kyung Park, Chang-Mo Jeong, Young-Chan Jeon</td>
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<td>11. The Comparative Study of Thermal Inelastic Effect</td>
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<td>15. Implant Fixtures in Various Dental Implants</td>
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<tr>
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<td>19. The Accuracy of Impression Technique using the New Impression Coping</td>
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<td>21. The Comparative Study of Preclinical Implant Abutment Strength</td>
<td>Joong-Seung Lim, Sung-Chan Jang, Ji-Ho-Heo, JiYoung Lee, ChangMo Jeong</td>
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<td>22. The Comparative Study of Preclinical Implant Abutment Strength</td>
<td>Chul-Mo Jeong, Young-Chan Jeon, Jang-Saop Lim</td>
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<td>23. Temperature Measurement During Implant Site Preparation</td>
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<td>26. Temperature Measurement During Implant Site Preparation</td>
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<td>27. Simulation of Corrosion Fatigue Life on the Dental Implant</td>
<td>Min-Gun Kim, Ji-Hun Lee, Dong-Yeol Kim</td>
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<td>28. Comparing Fatigue Life on the Dental Implant</td>
<td>Min-Gun Kim, Ji-Hun Lee, Dong-Yeol Kim</td>
<td>Scientific Oral, 12th International Conference of Prosthodontists Meeting</td>
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<td>29. Simulation of Corrosion Fatigue Life on the Dental Implant</td>
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<td>Scientific Oral, 12th International Conference of Prosthodontists Meeting</td>
</tr>
</tbody>
</table>
Multicentric Retrospective Clinical Study on the Clinical Application of Mini Implant System

Objective
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.

Materials & Methods
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.

Table 1. Patients' characteristics (n=69)

<table>
<thead>
<tr>
<th>Variables</th>
<th>The number of cases (Implants)</th>
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</thead>
<tbody>
<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>
</tr>
<tr>
<td>40-49</td>
<td>9 (25)</td>
</tr>
<tr>
<td>50-59</td>
<td>23 (36)</td>
</tr>
<tr>
<td>60-69</td>
<td>18 (51)</td>
</tr>
<tr>
<td>70-79</td>
<td>7 (19)</td>
</tr>
<tr>
<td>Male</td>
<td>39 (59)</td>
</tr>
<tr>
<td>Female</td>
<td>30 (74)</td>
</tr>
<tr>
<td>Healthy</td>
<td>46 (69)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10 (15)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>8 (12)</td>
</tr>
<tr>
<td>Cerebrovascular attack history</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Asthma</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Alcoholism</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Smoking</td>
<td>56 (82)</td>
</tr>
<tr>
<td>Yes</td>
<td>13 (24)</td>
</tr>
<tr>
<td>Results Success</td>
<td>66 (146)</td>
</tr>
<tr>
<td>Failure</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
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<tr>
<td>Osseointegration failure</td>
<td>64 (254)</td>
</tr>
<tr>
<td>Infection</td>
<td>3 (6)</td>
</tr>
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</table>

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.

Clinical Research of Immediate Restoration Implant with Mini-Implants in Edentulous Space

Objective
The purpose of this study was to investigate the clinical effective of immediate restoration with Osstem MS mini-implant in the edentulous space of 5-6 mm.

Materials & Methods
The sample consisted of 36 consecutively treated partially edentulous patients who had a total of 36 Osstem MS mini-implants, which were 2.5 mm or 3.0 mm in diameter and placed in 5-6 mm gap. The chair-side-made or laboratory-made provisional crowns for implants were fabricated at the time of fixtures placed. The final restorations were fabricated with gold alloy-fused-porcelain crown 3 to 5 months later. During the mean 21.3 months (12-37 months) follow-up time since fixtures placement, all implants were examined clinically and radiologically.

Results
No implant failed before restoration. One implant led an adjacent tooth pulp necrosis after the implantation, but the natural tooth and implant were successfully retained by root canal therapy. 36 implants in 36 patients who were followed-up were successful and their aesthetic results were satisfactory.

Conclusions
Immediate loaded implant with Osstem MS mini-implant has good clinical prosthetic effects in the edentulous space of 5-6 mm.
MS System References

Clinical Study


2. Yong-Jin Kim, Young-Jin Park, Kyung-Tae Park. Mandibular anterior single tooth replacement using the MS implant system. Scientific Poster, Osstem Meeting 2013


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:

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