

A short-term clinical study of
marginal bone level change around
Osstem GSIII implants

Hee-Jung Yun

The Graduate School

Yonsei University

Department of Dental Science

A short-term clinical study of
marginal bone level change around
Osstem GSIII implants

The Master's Thesis
submitted to the Department of Dental Science
and the Graduate School of Yonsei University
in partial fulfillment of the requirements for the degree of
Master of Dental Science

Hee-Jung Yun

June 2010

This certifies that the dissertation thesis
of Hee-Jung Yun is approved.

Thesis Supervisor : Kyoo-Sung Cho

Seong-Ho Choi

Chang-Sung Kim

The Graduate School

Yonsei University

June 2010

감사의 글

본 논문이 완성되기까지 부족한 저를 항상 따뜻하게 격려해 주시고 지도해 주신 조규성 교수님께 깊은 감사를 드립니다. 교수님의 훌륭한 가르침이 제게 큰 힘이 되었습니다. 그리고 귀중한 시간을 내주시어 논문을 세심히 검토해 주시고, 심사해 주신 최성호 교수님, 김창성 교수님과 관심과 조언을 아끼지 않으신 김종관 교수님, 채종규 교수님, 정의원 교수님께 깊이 감사드립니다.

치과의사로서 바르게 성장할 수 있도록 이끌어 주신 김기덕 교수님, 정복영 교수님, 박원서 교수님께도 깊이 감사드립니다.

연구 내내 많은 도움을 주신 치주과 의국원들과 언제나 큰 힘이 되어주는 친구들에게도 고마운 마음을 전합니다.

그리고 항상 제게 아낌없는 사랑을 주시는 세상에서 가장 소중한 사랑하는 부모님과 유정이, 오빠에게 사랑과 고마움의 마음을 전합니다.

2010년 7월

저자 씀

TABLE OF CONTENTS

ABSTRACT (ENGLISH)	iv
I. INTRODUCTION	1
II. MATERIALS AND METHODS	4
III. RESULTS	7
IV. DISCUSSION	8
V. CONCLUSION	13
REFERENCES	14
TABLES	18
LEGENDS	21
FIGURES	22
ABSTRACT (KOREAN)	23

LIST OF FIGURES

Figure 1.	Illustration of GSIII implant	22
Figure 2.	Illustration of GSIII implant , the reference point and the reference length and the measurement of marginal bone level with the periapical radiograph	22

LIST OF TABLES

Table 1. Distribution of implant according to patients' age & gender	18
Table 2. Distribution of implants according to position	18
Table 3. Distribution of bone quality	19
Table 4. Distribution of bone quantity	19
Table 5. Distribution of implant length	19
Table 6. Distribution of implant diameter	20
Table 7. Marginal bone level	20

ABSTRACT

A short-term clinical study of marginal bone level change around Osstem GSIII implants

Several new implant systems have been developed in recent years. As a result, dentists are now able to choose an implant that is most appropriate for the condition of each patient and has a high survival rate. The resulting marginal bone levels around implants following restoration are used as a reference for evaluating implant success and survival. Two design concepts that can reduce crestal bone resorption are the microthread and platform-switching concepts. These feature are incorporated into the Osstem GSIII implant system together with a tapered body, self-tapping ability, internal connection, and resorbable blast media (RBM) surface.

The subjects of this study were 27 patients (79 implants) undergoing treatment with Osstem GSIII implants between October 2008 and July 2009 in the Department of Periodontology, Dental Hospital of Yonsei University

The results are as follows : during the study period (average of 11.8 months after fixture installation and 7.4 months after the prosthesis delivery), (1) the short-term survival rate of GSIII implants was 100% and (2) the marginal bone loss around

GSIII implants was 0.16 ± 0.08 mm. In conclusion, this short-term clinical study has demonstrated the successful survival rates of the GSIII implant system, and that this system is associated with reduced marginal bone loss.

Key Words: Osstem GSIII implant; survival rate; marginal bone levels; microthread; platform -switching concept

A short-term clinical study of marginal bone level change around Osstem GSIII implants

Hee-Jung Yun, D.D.S.

Department of Dental Science

Graduate School, Yonsei University

(Directed by Prof. Kyoo-Sung Cho, D.D.S., M.S.D., PhD.)

I. INTRODUCTION

Since Brånemark found that osseointegration occurred between titanium and bone in the mid-1960s (Branemark, 1983; Branemark et al., 1969), several studies have investigated titanium dental implants and their clinical applications. The functional and esthetic restoration of edentulous areas using dental implants is now considered a desirable treatment option. The advantages of implant restoration relate not only to esthetic demands but also to avoiding the involvement the adjacent teeth. In addition, implant restoration is more comfortable for the patient than conventional dentures and prevents the resorption of the remaining bone that occurs with dentures. As a result,

implant treatment has become common and several new implant systems have been developed and are now available in the marketplace. Consequently, dentists are now able to choose an implant that is most appropriate for the condition of each patient.

The ability of the dentist, as well as the quality and quantity of available bone are the primary factors for successful implant therapy. Atwood evaluated changes in the volume of bone after loss of teeth, and in 1985, Lekholm and Zarb classified the quality and quantity of remaining bone at the planned implant site. Taking these factors into account, predictable treatments can be assured if the dentist selects the implant system with a high survival rate; the design and features of the implant surface should also be considered. Although it is difficult to define survival and success of implants, success rate is currently defined as the proportion of implants that conform to the success criteria after specific period, and survival rate as the proportion of implants that do not need to be removed at certain time points (Ahlqvist et al., 1990).

The resulting crestal bone levels around implants following restoration have been a topic of discussion and used as a reference for evaluating implant success and survival for many year (Albrektsson et al., 1986; Berglundh, Persson, and Klinge, 2002). Achieving esthetically pleasing implant therapy is crucially affected by the height of the supracrestal soft-tissue portion, since this is highly relevant to the level of bony support around the fixture (Chang et al., 1999).

There are many suggested causes for early implant bone loss. Changes in crestal bone height have been attributed to implant loading and concentration of forces, the countersinking procedure during implant placement procedures, and localized soft-tissue inflammation, among others (Lazzara and Porter, 2006). Implant design can affect occlusal overload and the crestal module, which is the implant body that receives the stress from the implant after loading. The implant system should be designed so that it can best distribute stress to the peri-implant bone in a manner that supports a restoration in function and encourages osseous attachment (Schrotenboer et al., 2008). Two design concepts that can reduce crestal bone resorption are the microthread and platform-switching concepts. These features are incorporated into the Osstem GS III implant system (Osstem, Seoul, Korea), together with a tapered body, self-tapping ability, and internal connection, and a resorbable blast media (RBM) surface. The tapered body is good for ensuring initial stability and controlling the depth and path of insertion (Friberg, Grondahl, and Lekholm, 1992), and implants with an RBM surface are reportedly associated with a high success rate (Gonshor, Goveia, and Sotirakis, 2003).

The aims of this study were to analyze the placement of GS III implants and their short-term survival rate, as well as the effect of the microthread and platform-switching on the level of bone around the implants.

II. MATERIALS AND METHODS

The subjects of this study were patients undergoing treatment with Osstem GS III implants (Fig. 1) between October 2008 and July 2009 in the Department of Periodontology, Dental Hospital of Yonsei University. This study was approved by the Institutional Review Board at Yonsei Dental Hospital (deliberate number 2-2009-0025). Overall, 27 patients (15 males, 12 females) were included in this investigation. The subjects' age ranged from 19 to 77 years (mean : 58.6 years). In total, 79 implants were inserted (Table 1). The presence of systemic disease among the patients was evaluated using a questionnaire. Bone quality and quantity were evaluated during the operation in accordance with the Lekholm and Zarb index. Among the 79 implants, 30 were inserted into the maxilla and 49 were inserted into the mandible. Eleven implants were placed in the anterior teeth area and 68 were placed in the posterior teeth area. Thus, most of the implants were placed in the posterior mandible (Table 2). Hypertension was the most common general disorder in this patient group.

The patients were followed up more than 6 months after the final setting of the prosthesis, at which time periapical radiographs were taken using the parallel cone technique with an Extension Cone Paralleling device. All films were developed using the same automatic processor in accordance with the manufacturer's instructions.

This study was carried out retrospectively using the patients' charts, from which the following information was collected: age, gender, distribution of the implants, general health disorder, reasons for tooth loss, bone quality and quantity, and implant diameter and length. Most of the teeth had been lost because of periodontal problems, although in some cases the cause was unknown. Type D3, B bone was common in the maxilla, and type D2, B bone in mandible, according to the Lekholm and Zarb index (Tables 3 and 4). The distributions of implant length and diameter are given in Tables 5 and 6.

Survival Rate

The survival rate was evaluated according to the criteria reported by Buser et al. (Buser, Weber, and Lang, 1990) as follows:

1. The absence of persistent subjective complaints, such as pain, foreign body sensation, and/or dysesthesia.
2. The absence of recurrent peri-implant infections with suppuration.
3. The absence of mobility.
4. The absence of continuous radiolucency around the implant.
5. The possibility for restoration.

Measurement of Changes in Marginal Bone Level

After digitization, all files were transferred to a personal computer and examined on the same monitor. The Starpacs System (Infinitt, Seoul, Korea) was used as the image-analysis software. The marginal bone level was measured (to the nearest 0.01 mm) from the reference point to the lowest observed point of contact between the marginal bone and the fixture. The reference point of the fixture was the top of the fixture (Fig. 2). The amounts of bone loss on the mesial and distal sides of the implants were measured and the average value was used. Calibration was performed with known fixture length (1.6 mm) as the reference length (Fig. 2) (Bragger et al., 1998). The radiographs were magnified to enable precise measurements. Only the amount of vertical bone loss was measured. Comparisons were made between radiographs taken at the time of fixture installation and those taken at the follow-up visit more than 6 months after final prosthesis delivery.

Statistical Analysis

The change in marginal bone level around GS III implants was analyzed using paired *t*-testing. The data are presented as mean±SD values, and the level of statistical significance was set at $p<0.05$.

III. RESULTS

Survival Rate

No implant was lost during the observation period (11.8 months on average), and none of the patients reported subjective complaints after implant installation. No peri-implant infection, implant mobility, or radiolucency around the implant was detected. Therefore, according to the survival criteria reported by Buser et al. (Buser, Weber, and Lang, 1990), the implant survival rate in our cohort was 100%.

Changes in Marginal Bone Level

The mean follow-up time was 11.8 months after fixture installation and 7.4 months after prosthesis delivery. The radiographic analysis revealed a significant marginal bone loss of 0.16 ± 0.08 mm at the follow-up visit ($p < 0.05$; Table 7). More bone was resorbed at the distal than the mesial side. In general, the marginal bone around the implants placed in patients with osteoporosis was resorbed more than in other, nonosteoporotic patients.

IV. DISCUSSION

Many recent studies have found no differences in the success and failure rates between various root-formed osseous integrated dental implant systems (Esposito et al., 2005). Implant failure is divided into early failure (occurring before loading) and late failure (destruction of osseointegration). The reported percentages of late failures have varied widely, at 2.1~11.3% (Friberg, Grondahl, and Lekholm, 1992). In the present study, the survival rate of GS III implants was 100%. However, because the study period was short, further investigation is required to evaluate the survival rate over longer durations.

Albrektsson et al. (Albrektsson et al., 1986) suggested the following success criteria: (1) the change in marginal bone level in the first year should be less than 1–1.5 mm, and (2) ongoing annual bone loss should be less than 0.2 mm. In their 15-year study, Adell et al. (Adell et al., 1981) reported a crestal bone loss of 1.2 mm for Brånemark System implants for the first year. In the present study, the marginal bone loss was 0.16 ± 0.08 mm, which is lower than the previously reported data.

Two design concepts that can reduce crestal bone resorption are the microthread system and the platform-switching concept. The GS III implant system incorporates both of these design concepts. The microthread system enhances the contact area between implant and bone. A study of the mechanical properties of bone (Guo, 2001)

found it to be more resistant to compressive forces than to tensile and shear forces (its resistances to the latter were reportedly 30% and 65% lower than that to compression, respectively). The crestal module design is particularly important with regard to minimizing bone loss, because it can decrease the shear force exerted on the crestal bone (Lee et al., 2007). Therefore, it has been hypothesized that bone loss slows down at the first thread of the implant fixture when the force changes from a crestal shear force to a compressive force induced by the thread itself (Oh et al., 2002). In addition, correlations were found between the amount of bone loss and the length of the machined surface for various implant systems, thus relating bone loss to the level of the first thread (Jung, Han, and Lee, 1996).

Hansson utilized a 3D mathematical model and axisymmetric finite element analysis to determine the ideal rough surface. He hypothesized that the surface roughness or the retentive elements such as the microthread increases the resistance of marginal bone to bone loss by improving the interlocking force between the implant surface and the crestal bone (Hansson, 1999). (Abrahamsson and Berglundh, 2006) suggested that the microthread configuration offered improved conditions for osseointegration in a study using dogs. In that study, the degree of bone-implant contact within the marginal portion of the implants was significantly higher for the test (microthread) implants (81.8%) than for the control implants (72.8%).

The results of a study that used two types of Astra implants (one with the microthread on the coronal portion of the fixture and one without) suggested that the

microthread has the effect of maintaining the marginal bone loss in the presence of loading forces (Lee et al., 2007). The amount of peri-implant bone loss was significantly greater around implants without microthreads than around those with microthreads during the examination period.

The platform-switching concept was developed to control bone loss after implant placement. This refers to the use of an abutment of a smaller diameter connected to an implant neck of a larger diameter. This connection shifts the perimeter of the implant–abutment junction (IAJ) inward, toward the central axis (the middle of the implant), in order to improve the force distribution. Quirynen et al. (Quirynen et al., 1994) suggested that bacterial leakage occurs through the microgap of the IAJ. Ericsson et al. (Ericsson et al., 1995) found histologic evidence that an inflammatory cell infiltration is located 1–1.5 mm adjacent to the IAJ after implant placement. To protect the underlying bone from this inflammatory cell infiltration and microbiologic invasion, 1 mm of healthy connective tissue is needed to establish a biologic seal comparable to that around natural teeth (Ericsson et al., 1995; Waerhaug, 1977). This movement of the IAJ is also believed to shift inflammatory cell infiltration to the central axis of the implant and away from the adjacent crestal bone, which is thought to restrict crestal bone resorption (Lazzara and Porter, 2006). Indeed, Hurzeler et al. (Hurzeler et al., 2007) reported that the concept of platform switching does appear to limit crestal resorption and preserve the peri-implant bone level. They found that the amount of bone loss was significantly lower in the platform-switching group.

(Lopez-Mari et al., 2009) found that platform switching is capable of reducing or eliminating crestal bone loss to 1.56 ± 0.70 mm. It also appears to help to maintain the width and height of crestal bone and the crestal peak between adjacent implants, and reduces circumferential bone loss. It was concluded that the implant design modifications involved in platform switching offer multiple advantages and potential applications, including situations in which a larger implant is desirable but the prosthetic space is limited, and in the anterior zone where preservation of the crestal bone can lead to improved esthetics (Lopez-Mari et al., 2009).

From a review of the literature, Kwon et al. (2009) concluded that the marginal bone loss associated with a flat-top implant is 1.0–1.3 mm at 1 year postimplantation, even in the presence of an improved surface (Calandriello et al., 2003; Glauser et al., 2003; Vanden Bogaerde et al., 2004). In contrast, the marginal bone loss with a microthread, conical seal, and platform-switched design was found to be 0.11–0.24 mm (Lee et al., 2007; Wennstrom et al., 2005). Those authors concluded that the marginal bone levels of the subjects in their study (0.16–0.17 mm) were comparable to those of previous studies (Kwon et al., 2009). Similarly, in the present study, the mean amount of marginal bone loss was small, and it can therefore be assumed that the GS III implant has the ability to reduce marginal bone loss because of certain features of the implant design.

Adell et al. (Adell et al., 1986) stated that the success of implants should be evaluated 1 year after prosthesis installation, because by then almost all crestal bone

loss following abutment installation would have ceased. Additional long-term studies are required to confirm that the GS III implant system has considerable potential to reduce crestal bone resorption.

Radiographic analysis can lead to a false conclusions when analyzing small, peri-implant bone level changes (Bragger et al., 1998). (Siegele and Soltesz, 1989) suggested that the implant thread is a useful aid to radiograph interpretation. In the present study, calibrations were performed with the aid of a fixture with a known length. The accuracy of using the thread pitch distance as an internal reference is reported as being within 0.3 mm (Hollender and Rockler, 1980).

The findings of this study suggest that the Osstem GSIII implant system is associated with successful short -term survival rates and reduces marginal bone loss. Further long-term, postimplantation studies are required.

V. CONCLUSION

The results of analyses performed on subjects undergoing placement of GS III implants (Osstem, Seoul, Korea) between October 2008 and July 2009 in the Department of Periodontology, Dental Hospital of Yonsei University can be summarized as follows: during the study period (average of 11.8 months after fixture installation and 7.4 months after the prosthesis delivery), (1) the short-term survival rate of GSIII implants was 100% and (2) the marginal bone loss around GSIII implants was 0.16 ± 0.08 mm.

In conclusion, this short-term clinical study has demonstrated the successful survival rates of the GSIII implant system, and that this system is associated with reduced marginal bone loss.

REFERENCES

- Abrahamsson, I., Berglundh, T. 2006. "Tissue characteristics at microthreaded implants: an experimental study in dogs". *Clin Implant Dent Relat Res* 8(3): 107-113.
- Adell, R., Lekholm, U., Rockler, B., Branemark, P. I. 1981. "A 15-year study of osseointegrated implants in the treatment of the edentulous jaw". *Int J Oral Surg* 10(6): 387-416.
- Adell, R., Lekholm, U., Rockler, B., Branemark, P. I., Lindhe, J., Eriksson, B., Sbordone, L. 1986. "Marginal tissue reactions at osseointegrated titanium fixtures (I). A 3-year longitudinal prospective study". *Int J Oral Maxillofac Surg* 15(1): 39-52.
- Ahlqvist, J., Borg, K., Gunne, J., Nilson, H., Olsson, M., Astrand, P. 1990. "Osseointegrated implants in edentulous jaws: a 2-year longitudinal study". *Int J Oral Maxillofac Implants* 5(2): 155-163.
- Albrektsson, T., Zarb, G., Worthington, P., Eriksson, A. R. 1986. "The long-term efficacy of currently used dental implants: a review and proposed criteria of success". *Int J Oral Maxillofac Implants* 1(1): 11-25.
- Berglundh, T., Persson, L., Klinge, B. 2002. "A systematic review of the incidence of biological and technical complications in implant dentistry reported in prospective longitudinal studies of at least 5 years". *J Clin Periodontol* 29 Suppl 3: 197-212; discussion 232-193.
- Bragger, U., Hafeli, U., Huber, B., Hammerle, C. H., Lang, N. P. 1998. "Evaluation of postsurgical crestal bone levels adjacent to non-submerged dental implants". *Clin Oral Implants Res* 9(4): 218-224.
- Branemark, P. I. 1983. "Osseointegration and its experimental background". *J Prosthet Dent* 50(3): 399-410.
- Branemark, P. I., Adell, R., Breine, U., Hansson, B. O., Lindstrom, J., Ohlsson, A. 1969. "Intra-osseous anchorage of dental prostheses. I. Experimental studies". *Scand J Plast Reconstr Surg* 3(2): 81-100.

- Buser, D., Weber, H. P., Lang, N. P. 1990. "Tissue integration of non-submerged implants. 1-year results of a prospective study with 100 ITI hollow-cylinder and hollow-screw implants". *Clin Oral Implants Res* 1(1): 33-40.
- Calandriello, R., Tomatis, M., Vallone, R., Rangert, B., Gottlow, J. 2003. "Immediate occlusal loading of single lower molars using Branemark System Wide-Platform TiUnite implants: an interim report of a prospective open-ended clinical multicenter study". *Clin Implant Dent Relat Res* 5 Suppl 1: 74-80.
- Chang, M., Wennstrom, J. L., Odman, P., Andersson, B. 1999. "Implant supported single-tooth replacements compared to contralateral natural teeth. Crown and soft tissue dimensions". *Clin Oral Implants Res* 10(3): 185-194.
- Ericsson, I., Persson, L. G., Berglundh, T., Marinello, C. P., Lindhe, J., Klinge, B. 1995. "Different types of inflammatory reactions in peri-implant soft tissues". *J Clin Periodontol* 22(3): 255-261.
- Esposito, M., Grusovin, M. G., Coulthard, P., Thomsen, P., Worthington, H. V. 2005. "A 5-year follow-up comparative analysis of the efficacy of various osseointegrated dental implant systems: a systematic review of randomized controlled clinical trials". *Int J Oral Maxillofac Implants* 20(4): 557-568.
- Friberg, B., Grondahl, K., Lekholm, U. 1992. "A new self-tapping Branemark implant: clinical and radiographic evaluation". *Int J Oral Maxillofac Implants* 7(1): 80-85.
- Glauser, R., Lundgren, A. K., Gottlow, J., Sennerby, L., Portmann, M., Ruhstaller, P., Hammerle, C. H. 2003. "Immediate occlusal loading of Branemark TiUnite implants placed predominantly in soft bone: 1-year results of a prospective clinical study". *Clin Implant Dent Relat Res* 5 Suppl 1: 47-56.
- Gonshor, A., Goveia, G., Sotirakis, E. 2003. "A prospective, multicenter, 4-year study of the ACE Surgical resorbable blast media implant". *J Oral Implantol* 29(4): 174-180.
- Hansson, S. 1999. "The implant neck: smooth or provided with retention elements. A biomechanical approach". *Clin Oral Implants Res* 10(5): 394-405.

- Hollender, L., Rockler, B. 1980. "Radiographic evaluation of osseointegrated implants of the jaws. Experimental study of the influence of radiographic techniques on the measurement of the relation between the implant and bone". *Dentomaxillofac Radiol* 9(2): 91-95.
- Hurzeler, M., Fickl, S., Zuhr, O., Wachtel, H. C. 2007. "Peri-implant bone level around implants with platform-switched abutments: preliminary data from a prospective study". *J Oral Maxillofac Surg* 65(7 Suppl 1): 33-39.
- Jung, Y. C., Han, C. H., Lee, K. W. 1996. "A 1-year radiographic evaluation of marginal bone around dental implants". *Int J Oral Maxillofac Implants* 11(6): 811-818.
- Kwon, H. J., Lee, D. W., Park, K. H., Kim, C. K., Moon, I. S. 2009. "Influence of the tooth- and implant-side marginal bone level on the interproximal papilla dimension in a single implant with a microthread, conical seal, and platform-switched design". *J Periodontol* 80(9): 1541-1547.
- Lazzara, R. J., Porter, S. S. 2006. "Platform switching: a new concept in implant dentistry for controlling postrestorative crestal bone levels". *Int J Periodontics Restorative Dent* 26(1): 9-17.
- Lee, D. W., Choi, Y. S., Park, K. H., Kim, C. S., Moon, I. S. 2007. "Effect of microthread on the maintenance of marginal bone level: a 3-year prospective study". *Clin Oral Implants Res* 18(4): 465-470.
- Lopez-Mari, L., Calvo-Guirado, J. L., Martin-Castellote, B., Gomez-Moreno, G., Lopez-Mari, M. 2009. "Implant platform switching concept: an updated review". *Med Oral Patol Oral Cir Bucal* 14(9): e450-454.
- Oh, T. J., Yoon, J., Misch, C. E., Wang, H. L. 2002. "The causes of early implant bone loss: myth or science?". *J Periodontol* 73(3): 322-333.
- Quirynen, M., Bollen, C. M., Eyssen, H., van Steenberghe, D. 1994. "Microbial penetration along the implant components of the Branemark system. An in vitro study". *Clin Oral Implants Res* 5(4): 239-244.
- Schrotenboer, J., Tsao, Y. P., Kinariwala, V., Wang, H. L. 2008. "Effect of microthreads and platform switching on crestal bone stress levels: a finite element analysis". *J Periodontol* 79(11): 2166-2172.

- Siegele, D., Soltesz, U. 1989. "Numerical investigations of the influence of implant shape on stress distribution in the jaw bone". *Int J Oral Maxillofac Implants* 4(4): 333-340.
- Vanden Bogaerde, L., Pedretti, G., Dellacasa, P., Mozzati, M., Rangert, B., Wendelhag, I. 2004. "Early function of splinted implants in maxillas and posterior mandibles, using Branemark System Tiunite implants: an 18-month prospective clinical multicenter study". *Clin Implant Dent Relat Res* 6(3): 121-129.
- Waerhaug, J. 1977. "Subgingival plaque and loss of attachment in periodontosis as evaluated on extracted teeth". *J Periodontol* 48(3): 125-130.
- Wennstrom, J. L., Ekestubbe, A., Grondahl, K., Karlsson, S., Lindhe, J. 2005. "Implant-supported single-tooth restorations: a 5-year prospective study". *J Clin Periodontol* 32(6): 567-574.

TABLES

Table 1. Distribution of implant according to patients' age & gender

Age (Year)	Male		Female		Total	
	Patients	Implants	Patients	Implants	Patients	Implants
19-29	1	1	0	0	1	1
30-39	1	1	0	0	1	1
40-49	3	4	0	0	3	4
50-59	4	15	4	11	8	26
60-69	3	20	4	8	8	28
>70	3	10	4	9	6	19
Total	15	51	12	28	27	79

Table 2. Distribution of implants according to position

	Maxilla	Mandible	Total
	Number of implant	Number of implant	Number of implant
Incisor	2	4	6
Canine	2	3	5
1st premolar	7	5	12
2nd premolar	3	8	11
1st molar	7	15	22
2nd molar	9	14	23
Total	30	49	79

Table 3. Distribution of bone quality

Bone quality	D1	D2	D3	D4	Unknown	Total
Maxilla	0	0	22	5	3	30
Mandible	4	24	10	1	10	49
Total	4	24	32	6	13	79

Table 4. Distribution of bone quantity

Bone quantity	A	B	C	D	Unknown	Total
Maxilla	0	19	8	0	3	30
Mandible	0	27	10	2	10	49
Total	0	46	18	2	13	79

Table 5. Distribution of implant length

Length(mm)	Maxilla		Mandible		Total
	Anterior	Posterior	Anterior	Posterior	
7	0	0	0	5	5
8.5	0	0	0	6	6
10	0	8	0	9	17
11.5	4	16	2	21	43
13	0	2	5	1	8
Total	4	26	7	42	79

Table 6. Distribution of implant diameter

Diameter(mm)	Maxilla		Mandible		Total
	Anterior	Posterior	Anterior	Posterior	
3.5	2	0	1	2	5
4	2	3	6	11	22
4.5	0	10	0	10	20
5	0	13	0	19	32
Total	4	26	7	42	79

Table 7. Marginal bone level

	Baseline	Follow-up	Change between baseline and follow-up
Mean bone loss (mm)	0.05	0.21	0.16
Standard deviation (mm)	0.02	0.10	0.08

Baseline : At the time of Fixture installation

Follow – up : At > 6months follow-up after prosthesis delivery

LEGENDS

Figure 1. Illustration of GSIII implant

Figure 2. Illustration of GSIII implant, the reference point and the reference length and the measurement of marginal bone level with the periapical radiograph

FIGURES



Figure 1

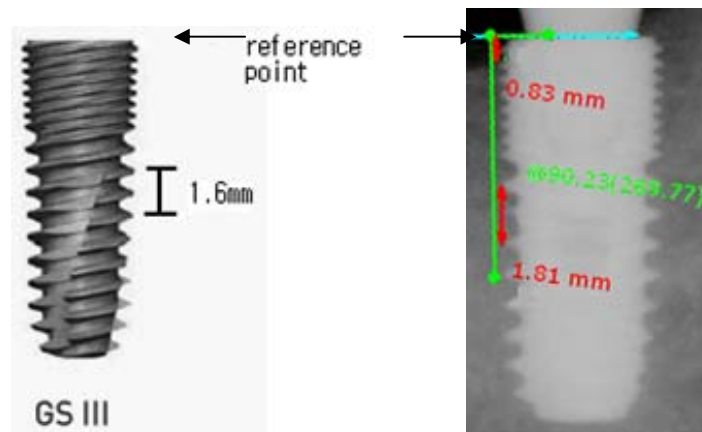


Figure 2

국문요약

Osstem GSIII 임플란트 식립 시 임플란트 주위
변연골 흡수 정도에 대한 단기 임상 연구

<지도교수 조 규 성>

연세대학교 대학원 치의학과

윤 희 정

오늘날 여러 새로운 임플란트 시스템이 개발되어 치과의사들은 높은 생존율을 갖는 바람직한 임플란트를 선택할 필요가 있다. 보철 후 임플란트 주위 변연골 높이는 임플란트의 성공과 생존을 평가하는 데 이용된다. 임플란트 주위 골소실을 줄이는 디자인으로 microthread와 platform-switching concept이 있다. Osstem GSIII 임플란트의 특징으로는 microthread, platform switching 과 함께 concept tapered body, self tapping ability, interconnection, resorbable blast media (RBM) surface가 있다.

이번 연구는 2008년 10월부터 2009년 7월 사이에 연세대학교 치과병원 치주과에서 GSIII 임플란트로 치료받은 27명의 환자들 (79개 임플란

트)을 대상으로 분석이 이루어졌다.

결과는 다음과 같다.

관찰 기간 (임플란트 식립 후 평균 11.8개월, 보철물 장착 후 평균 7.4개월) 중

1. GSIII 임플란트의 단기 생존율은 100%였다.
2. 임플란트 주위 변연골 소실 양의 평균은 $0.16 \pm 0.08\text{mm}$ 였다.

결론적으로 단기 임상 연구 결과 GSIII 임플란트 시스템은 성공적인 생존율을 가지며 적은 변연골 소실 양상을 보였다.

핵심되는 말 : Osstem GSIII 임플란트; 생존율; 임플란트 주위 변연골 높이; microthread; platform switching concept