International Journal of IT-based Public Health Management
Vol. 4, No. 1 (2017), pp. 7-12
http://dx.doi.org/10.21742/ijiphm.2017.4.1.02

The Comparison Research of the Contact Interval Testing for the Four Different Placing Methods of Implant Fixture and Abutment

Soo-chul Park[1] and Jung-Hwa Lee[2]

[1]*Department of Dental Technology, Gimcheon University,*
214 Daehakro Gimcheon City, Gyeongbuk 740-704, KOREA
remedios-1@hanmail.net
[2] *Department of Dental Hygiene, College of Nursing and Healthcare Sciences,*
Dong Eui University, 176 Eomgwangno Busan jingu, Busan City, 47340, KOREA
†*yamako93@deu.ac.kr*

Abstract

This study carried out contact interval tests for the purpose of evaluating differences of contact intervals between fixtures and abutments after fixing 4-kind implant (N=4) fixtures and abutments having different clamping methods. As a result of doing tests on 4-kind implant contact interval tests having different clamping methods, contact intervals between fixtures and abutments of Internal hexagon connection implant, and contact intervals between fixtures and abutments of Internal octagon connection implant were measured lowest.

Keywords: *Dental Implant, fixture to abutment joint, micro-gap, Implant systems*

1. Introduction

Dental prosthesis using implant was begun from prosthesis for edentulous patients in initial stage, and it has been used variously to fixing and restoring prosthesis of deficit areas in several teeth together with deficit ones of 1 tooth indebting to development of prosthesis manufacturing technology. Until now, development of prosthesis manufacturing methods utilizing implant has been performed continuously.

When manufacturing prosthesis using implant, clamping by mechanical combination of fixtures and abutments has been used generally in case of screw-fixing type implant, and assertions like clamping parts of fixtures and abutments shall not have gaps have been made [1][2]. However, Ecker said that the space was not existed because implant intervals between fixtures and abutments were fixed due to frictional force, but screw-fixing type implant got mechanical maintenance because of being fixed with screws and existence of fine space [3]. And rotational freedom between components of screw-fixing type plant was from 4° to below 10° according to research reports [4].

To manufacture implant, it is made by being processed with control technology of professional manpower together with dedicated processing equipment by using titanium material. However, processing errors between components between implants occurred from the errors come from errors from programs for implant processing equipment and abrasion differences of processing tools [5]. And when manufacturing upper structure of supporting a lot of implants among implant prosthesis manufacturing methods, getting safe adequacy is impossible in the process of manufacturing prosthesis together with mouths of patients.

Article history:
Received (September 21, 2016), Review Result (November 07, 2016), Accepted (December 28, 2016)

ISSN: 2205-8508 (Print), eISSN: 2207-3965 (Online) IJIPHM

Nonetheless, loosing torques of prosthesis supporting a lot of implants are approximately 60% levels, and are it was said that lower loosing torque value appeared than single implant prosthesis [6].

Screw-fixing type implant is divided into internal connection type and external connection type largely, and is classified to hexagon and octagon according to shapes of clamping parts [7]. In case that there is fine space on contact interval parts of fixtures and abutments, deposition of saliva and food become possible. Foods that are not removed owing to its deposition become to causes of bacterial infection because spoilage is progressed, and could be the reason of implant failure owing to bone losses of plant surroundings [8].

This study executed a research to make oral health datum utilized by evaluating differences of contact intervals between the fixture and abutment after fixing screws by clamping method between implant fixture and abutment.

2. Related researches

2.1. Test method

Implants having been used in tests objected total 4-kind implant fixtures and abutments having different clamping methods such as Internal octagon connection Implant(YI Implant, Yesbiotech, KOREA), External hexagon connection Implant(YE Implant, Yesbiotech, KOREA), Internal hexagon connection implant having morse taper of 11°(YS Implant, Yesbiotech, KOREA), and Internal hexagon connection implant having morse taper of 1.5°(A&B Implant, A&B Biomedi, KOREA), and most similar sizes with market sales were selected, and tests were executed by objecting total 16 specimens(**Table 1)**.

Each implant fixture and abutment was formatted by using self-curing resin after clamping and fixing each implant fixture and abutment by electrical torque measurer(MTT03-50, MARK-10, USA) with 30N·cm force, and its half was cut to the direction of implant length. In order to do correct contact interval test, implant fixture and clamping parts and clamping parts of implant fixture and abutment, boundary parts of contact section were manufactured so as to be classified clearly by refining the surface of cut parts through silicon carbide papers for 1.200 times. Contact intervals of left and right side of contact parts together with each implant fixture and abutment were measured by using microscope-mounted optical camera (HT-004, HIMAX, TAIWAN)(Figure 1, 2).

Table 1. 4-kind implant specimen sizes **(mm)**

Implant type		Ø	length
YI Implant	Fixture	4.0	10
	Abutment	4.8	5.7
YE Implant	Fixture	4.0	10
	Abutment	4.0	5.0
YS Implant	Fixture	4.0	10
	Abutment	4.5	5.5
A&B Implant	Fixture	4.0	10
	Abutment	4.5	5.5

2.2. Analysis of test results

In order to make analyses on contact interval tests about 4-kind implant fixture and abutment having been measured in this research, SPSS ver. 18.0, a statistical program, was used, and contact intervals of specimen right and life side by each clamping method were marked by using a graph.

Figure 1. Contact interval test using microscope-mounted optical camera

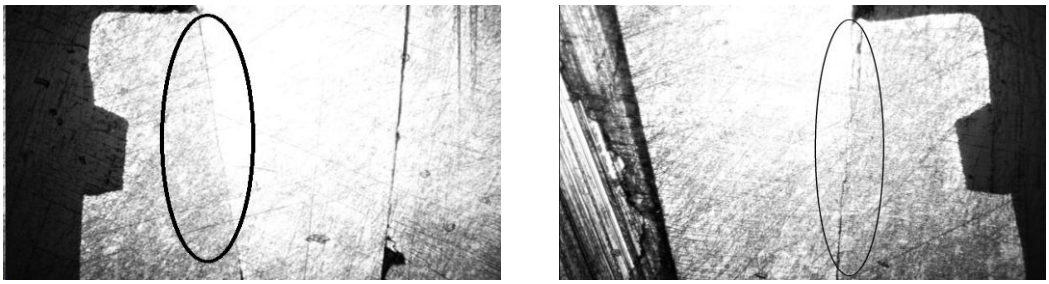

Figure 2. Left-right side contact interval test of fixture and abutment specimen

3. Results

As a result of doing contact interval tests between fixtures and abutments of Internal octagon connection implant, left-side contact interval was highest with 0.18 ㎛ in No. 1 specimen, and right-side interval was highest with 0.18 ㎛ in No.3 specimen. Left-side contact interval of No. 2 and No.4 and right-side contact interval of No.1 were measured lowest with 0 ㎛(Figure 3).

As a result of dong contact interval test between fixtures and abutments of External hexagon connection implant, contact interval of No.3 specimen was highest with left-side 1.03 ㎛ and right-side1.16 ㎛, and left-contact interval of No.2 specimen with 0 ㎛ and right-side contact interval of No.4 specimen with 0.06 ㎛ were measured lowest(Figure 4).

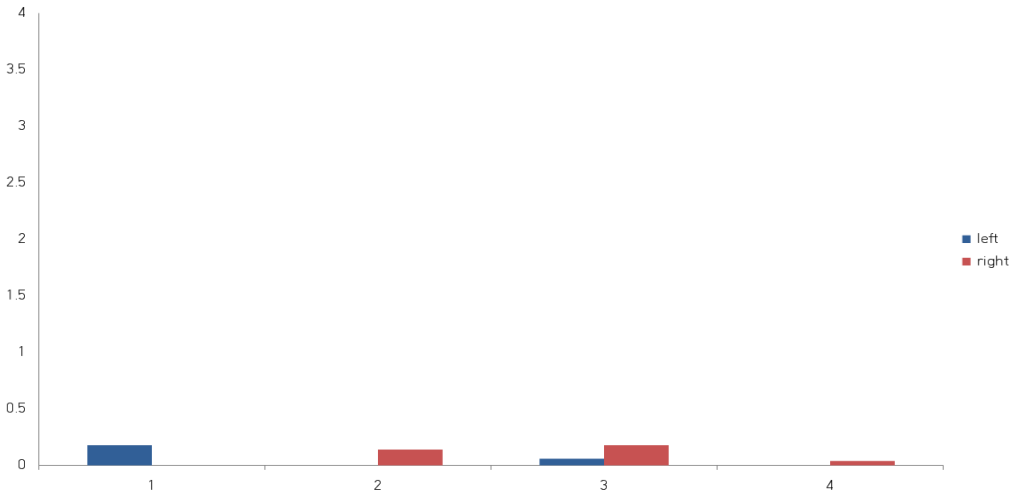

Figure 3. Internal octagon connection implant (㎛, N=4)

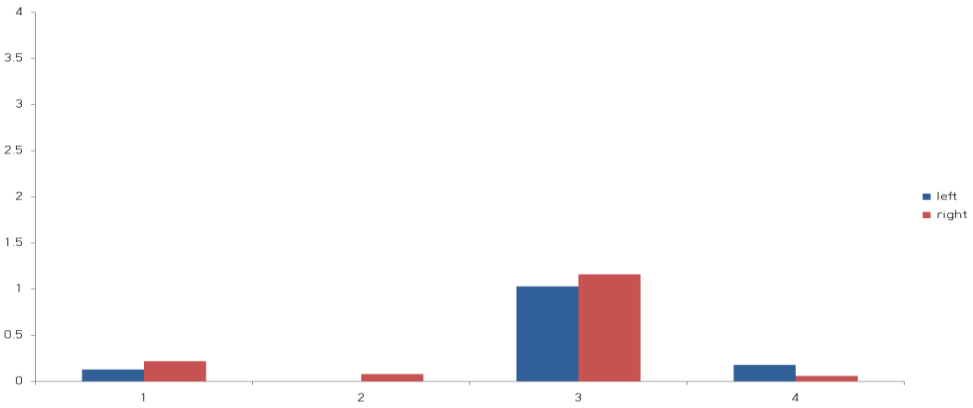

Figure 4. External hexagon connection implant (㎛, N=4)

As a result of doing contact interval tests between fixtures and abutments of Internal hexagon connection implant having morse taper of 11°, No. 1 specimen was highest with 1.09 ㎛ in No. 1 specimen, and No.3 specimen was highest with 1.23 ㎛ in right-side contact interval. Left-side contact interval of No.2 specimen and right-side contact interval of No.1 specimen were measured lowest to 0 ㎛ and 0.2 ㎛ respectively (Figure 5).

As a result of doing contact interval tests on fixtures and abutments of Internal hexagon connection implant having morse taper of 1.5°, left-side contact interval was highest with 3.13 ㎛ in No.1 specimen, and right-side contact interval was lowest with 3.06 ㎛ in No.3 specimen. Contact interval of No.4 specimen was measured lowest to left-side 1.87 ㎛ and right-side 1.26 ㎛ (Figure 6).

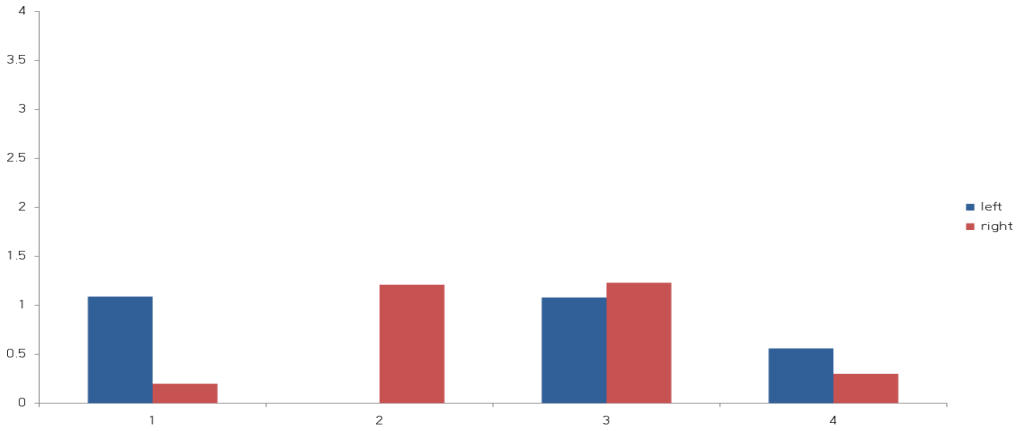

Figure 5. Internal hexagon connection implant Iinternal hexagon connection implant having morse taper of 11° (㎛, N=4)

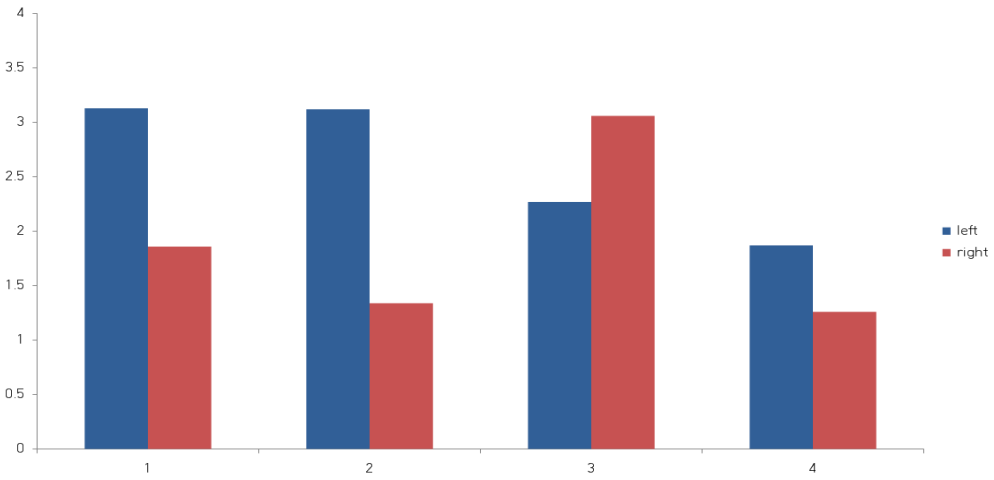

Figure 6. Internal hexagon connection implant internal hexagon connection implant having morse taper of 1.5° (㎛, N=4)

4. Discussion and conclusions

This study objected implants having 4-kind different clamping methods, and cut fixtures and abutments to the length direction after clamping and fixing them, and then measured left-side and right-side contact intervals of clamping parts in each implant fixture and abutment by using microscope-mounted optical camera (HT-004, HIMAX, TAIWAN), and thus got the following results.

All specimens having been used for contact interval tests on 4-kind implant fixtures and abutments were accorded with less than 10㎛, implant contact interval test standards for the dentist by medical device standard specification of Korea Food and Drug Administration.

References

[1] A. D. Sones, "Complications with osseo integrated implants", J. Prosthet Dent. Vol. 62, No. 5, pp. 581-585, **(1989)**
[2] E. A. Patterson, "Passive fit: Meaning, significance and assessment in relation to implant-supported prostheses. In: Naert EI. Passive fit of implant-supported superstructures: Friction or reality?" Proceedings of an international symposium. Leuven: Leuven University Press, pp. 17-28 **(1995)**
[3] E. S. Eckert, "Text book of Oral & Maxillofacial Implantology", 2nd ed. Korea, Daehan Narae Publishing Inc, Seoul **(2006)**
[4] P. P. Binon, "Evaluation of machining accuracy and consistency of selected implants, standard abutments, and laboratory analogs", International Journal of Prosthodontics, Vol. 8, No. 2, pp. 162-178 **(1995)**
[5] C.E. English, "Externally hexed implants, abutments, and transfer devices: a comprehensive overview", Implant Dentistry. Vol. 1, No. 4, pp. 273-282 **(1992)**
[6] U. Brägger, S. Aeschlimann, W. Bürgin, C.H. Hämmerle and N.P. Lang, "Biological and technical complications and failures with fixed partial dentures (FPD) on implants and teeth after four to five years of function", Clinical Oral Implants Research, Vol. 12, No. 1, pp. 26-34, **(2001)**
[7] S. C. Park, I. H. Jeong, and J.H. Kang, "The Study of Compression Shear Load of Implanting in Four Different Fastening Method", International Journal of Bio-Science and Bio-Technology, Vol. 7, No. 2, pp. 1-8, **(2015)**
[8] A. P. Ricomini Filho, F. S. Fernandes, F. G. Straioto, W. J. da Silva and A.A. Del Bel Cury, "Preload loss and bacterial penetration on different implant abutment connection systems", Brazilian Dental Journal, Vol. 21, No. 2, pp. 123-129, **(2010)**

Authors

Soo-chul Park
22 Feb. 2012 : Ph.D. degree at Yeungnam University, Korea
1 Mar. 2013 ~ recent: assistant professor**,** Department of Dental Technology Gimcheon University, Korea

Jung-Hwa Lee
14 Feb. 2008: Ph.D. degree at Inje University in Korea
3 Mar. 2005- 30 Aug.2012: Associate professor Choonhae college of health science in Korea
1 Sep. 2012 – recent: assistant professor Dong-eui University in Korea.