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The Study of Compression Shear Load of Implanting in Three Different Fastening Method

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Abstract. The purpose of this study is to compare the differences between shear compression loads tester (858 Bionix, MTS, USA) with fixed screws using in three different fastening methods with implanting fixture an abutment. As a result of the experiment, the compression load of Internal morse taper type Implant was the highest as 1206.67 N • cm, that of Internal submerged type Implant was the lowest as 611.67 N • cm. The relevance of the shear compression load test which was done by three different fastening methods with implanting fixture an abutment, showed a statistically significant difference ($p < 0.05$).

Keywords: Shear compression load, Implant, fixture& abutment

1 Introduction

While periodontal ligament, which is between the natural tooth root and the alveolar bone, protects the teeth and bone by absorption of some of the load, implant is directly coupled with osseous tissue and Osseo integration, so the force that happens to masticatory and occlusal movements is directly transmitted to the maxillary. It is necessary to design a load-bearing prosthesis that should be sufficient to withstand that force [1],[2],[3]. However, implant with a locking structure has mechanical properties that it is strong to the Axial Load, but poor at the resistance to lateral loads [4], and a variety of studies on the mechanical properties of implant have been reported [5],[6],[7]. While the studies based on the different methods in from different are exist[7] there is no search based on the differences between shear compression loads with fixed screws using in three different fastening methods with implanting fixture an abutment in the same vender.

The purpose of this study is to take advantage of the data on oral health by shear compression load tests for examining the differences from fastening methods with implanting fixture and abutment after selected fixture and the abutment with the same diameter (Ø) and the same length of three different fastening methods with implanting fixture an abutment in the same vender.

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2 Research Methods

2.1 Test Methods

Currently used in clinical Internal morse taper type Implant (YI Implant, yesbiotech, KOREA) and Internal submerged type Implant (YS Implant, yesbiotech, KOREA), External submerged type Implant (YE Implant, yesbiotech, KOREA) of the fixture with all three abutment were targeted, the size of three kinds of fixture was unified into Ø 3.6 × 15mm size, that of abutment was unified into Ø 5.0 × 5.7mm. Each fixture and abutment of the implant were locked by a screw with the power of 30N • cm using the electric torque meter (MGT50E, MARK-10, USA) and then fitted the standard specimen ISO14801 (2007) to 30 ° fulfilling direction, set about 11mm from the distance to the loading point. Furthermore, the hemispherical shape of the cap of about Ø 4mm was fixed along the long axis of the implant body to match the top of the abutment, and was measured shear compression load using a compression test machine.

2.2 Analysis of test results

In this study, a statistical program SPSS ver. 18.0 was used to analyze the data on shear compression load test, and was analyzed by using Kruskal Wall test to test the 3 different types of shear compression load such as Internal morse taper type, submerged External type, and Internal submerged type.

3 Results

According to the test of the compression load of Internal morse taper type, the shear compression load of specimen 1 implant is the highest as 1251 N • cm and the specimen 2 is the lowest 1169 N • cm (Fig 1).

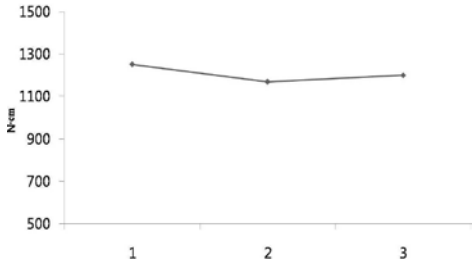

Fig 1. The result of shear compression load in Internal morse taper type Implant

According to the test of the compression load of External submerged type, the shear compression load of specimen 3 implant is the highest as 1098 N·cm and the specimen 1 is the lowest 1057 N·cm (Fig 2).

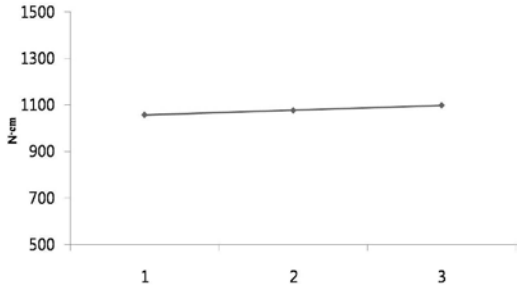

Fig 2. The result of shear compression load in External submerged type Implant

According to the test of the compression load of Internal submerged type, the shear compression load of specimen 1 implant is the highest as 620 N·cm and the specimen 2 is the lowest 599 N·cm (Fig 3).

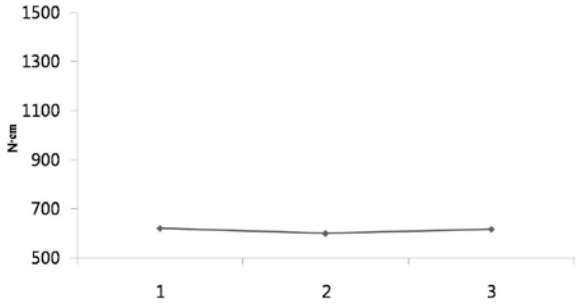

Fig 3. The result of shear compression load in Internal submerged type Implant

According to shear compression load tests for examining the differences from fastening methods with 3 different implanting fixtures and abutments, the shear compression load of Internal morse taper type is the highest as 1206.67 N • cm , that of Internal submerged type is the lowest as 611.67 N • cm. The shear compression load test by the way Implant Fixture and Abutment showed a statistically significant difference ($p < 0.05$) (Table 1).

Table 1. The relevance of three different fastening methods with implanting and shear compression load

Implant type	N	Mean	SD	X^2	p-value
Internal morse taper type	3	1206.67	41.40	7.200	0.027
External submerged type	3	1077.00	20.52		
Internal submerged type	3	611.67	11.15		
total	9	965.11	272.00		

Kruskal Wallis test.

4 Discussion and Conclusions

The results of this study on three different fastening methods with implanting fixture an abutment concluded that the shear compression load of Internal morse taper Implant is similar with that of External submerged type Implant, and twice as high as Internal submerged type Implant which has 6, 11- degrees of the inside of the shear angle. The shear compression load of External submerged type Implant is respectively 90% of Internal morse taper type Implant's.

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