Influence of Surface Condition of used Keepers to Retentive Force

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Introduction

It has been reported that retentive force with a magnet declines as the surface condition of the keeper of a magnetic attachment becomes roughness. As a major factor for be a roughness, it was thought that denture attached and removed, abrasion and brushing. However, it is no report of the surface condition and changes in retentive force of the used keepers in clinical. The keeper were fitted in the oral cavity have being possibilities to make weviness and decline

Therefore, that is intended to explore the polishing methods for restore of retentive force in clinical.

Materials and Methods

1. Analyzed the surface condition of used Keepers

The five keepers (GIGAUSS D600, C600, GC, Tokyo, Japan) (D600, n=4) (C600, n=1) which used in the oral cavity were analyzed the surface condition. The five untreated keepers were used as a control. The surface condition was measured used laser microscope (KEYENCE CORPORATION, Osaka, Japan), and the surface roughness (Ra) and weviness (Wz) calculated. The cut off value for the Ra set up λc0.8 mm, the cut off value for the Wz was set up as λf8 mm and λc0.8 mm followed.

2. Comparison of the surface quality and retentive force caused by polishing

At first, untreated keeper D600 was analyzed Ra and Wz. The retentive force of D600 keeper and D600 magnetic assembly was measured (EZ-Test, Shimadzu, Kyoto, Japan), used a crosshead speed of 5 mm/min in a universal testing machine. After that, the surface of keepers was roughened used Alumina breasting on the assumption that used keepers Ra in the oral cavity, and the roughed keepers was calculated retentive force after roughed keepers analyzed. Next, the surface of the roughened keeper was polished either by silicone point or waterproof abrasive paper, retentive force was measured after analyzing respective surface condition, and untreated keeper was used as a control. (Fig.1)

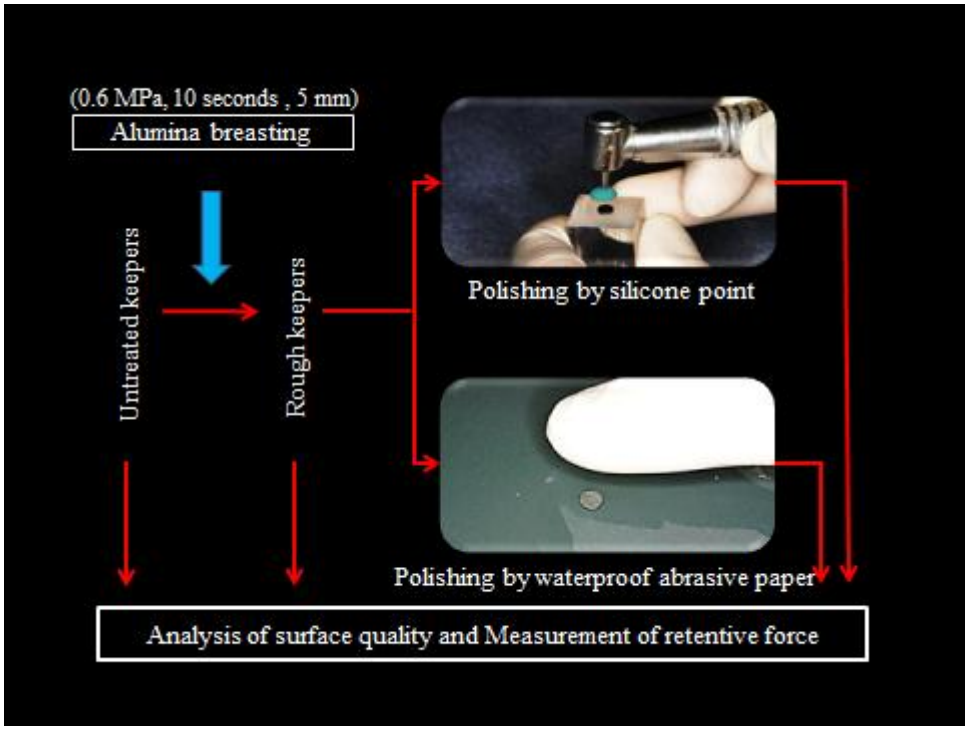

Fig.1

3. Measurement of the retentive force after polishing of used keeper.

The apparatus to polish in a parallel fashion to upper surface of the keeper was made. Using D600 and C600 keepers in the oral cavity were polished on the waterproof abrasive paper and place at the apical end of poling apparatus used by retentive force measurement. Untreated keepers were used as a control. (Fig.2)

4. Data were statistically analyzed.

The using keepers in the oral cavity were statistically analyzed using a Mann-Whitney U test (α=.01), and between-group polishing differences were analyzed with Steel-Dwass test (α=.01).

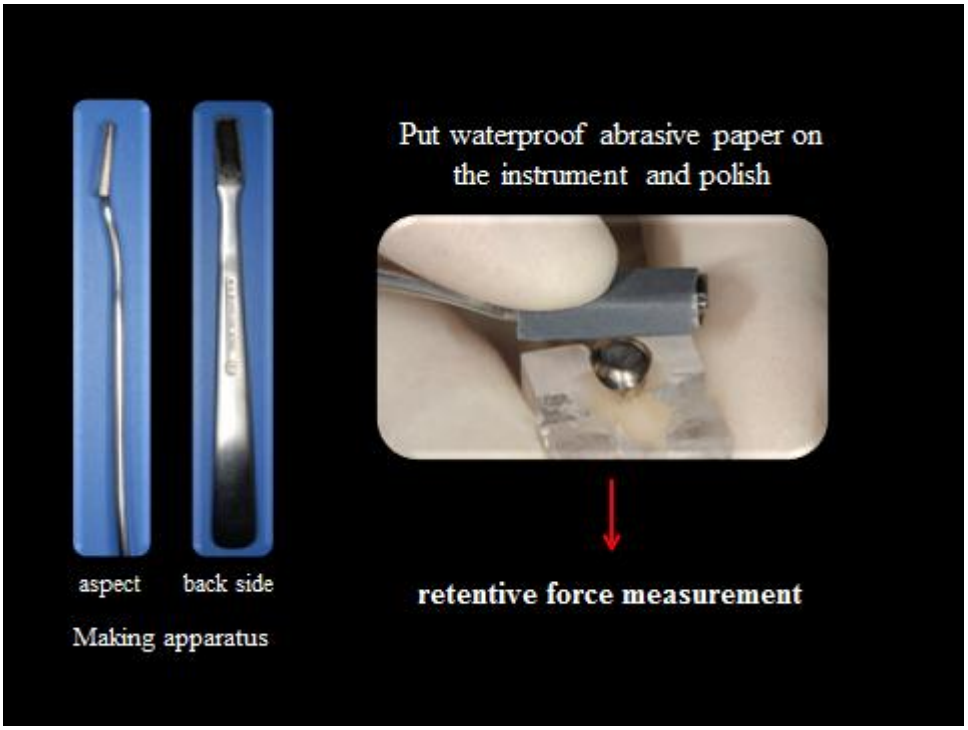

Fig.2

Results

The Ra of untreated keepers were 0.31 μm on averaged and that of used keepers were 1.01 μm on averaged In analogy with Ra, Wz of used keepers showed significantly high value as compared to that of untreated keepers. Next, the used keepers exhibited various Wz curves and its degree is also varied. However, it was confirmed that curves were declined in the marginal part near the mesiodistal, lingual or buccal side. (Fig.3)

In the case of the comparison of Ra, the untreated Ra was 0.31 μm on averaged and that of the used waterproof abrasive paper was on averaged 0.42 μm. on averaged. There was no significant difference between them. In the case of Wz comparison, Wz of used sandblast keepers were 4.97 μm on averaged and that of used silicone point was 3.46 μm on averaged. There was no significant difference between them. In the case of the retentive force comparison, the retentive force of untreated keepers was 4.93 N on averaged, waterproof abrasive paper was 4.82 N on averaged. As we can see in the comparison in Ra and Wz, there was no significant difference between them.

We compared the polishing with waterproof abrasive paper to that with silicone point, and both Ra and retentive force exhibited restore as seen in the untreated keepers. (Fig.4)

As compared to untreated Wz curve, waterproof abrasive paper, sandblast and silicone point showed significant difference. (Fig.5)

By Comparison, before and after polished the keepers of the retentive force that untreated, used and polished D600 were 4.93 N, 4.47 N and 4.63 N respectively.

In addition, retentive force of untreated, used and polished C600 was 5.47, 4.63 and 4.7 N on averaged respectively.

Both retentive force of polished D600 and C600 shows restore. (Fig.6)

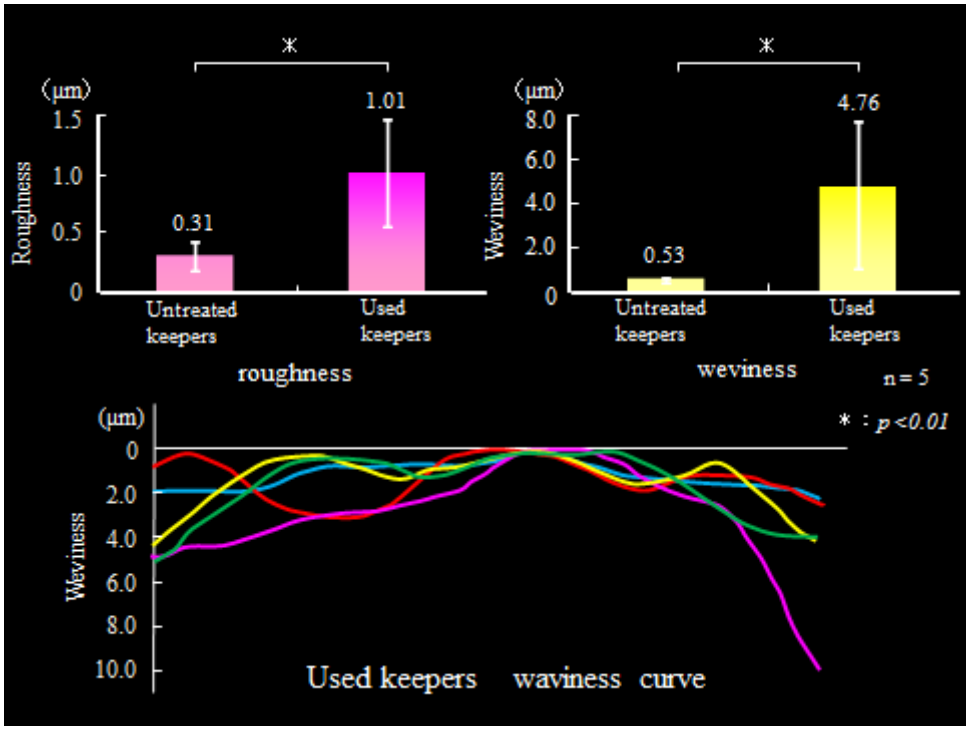

Fig.3

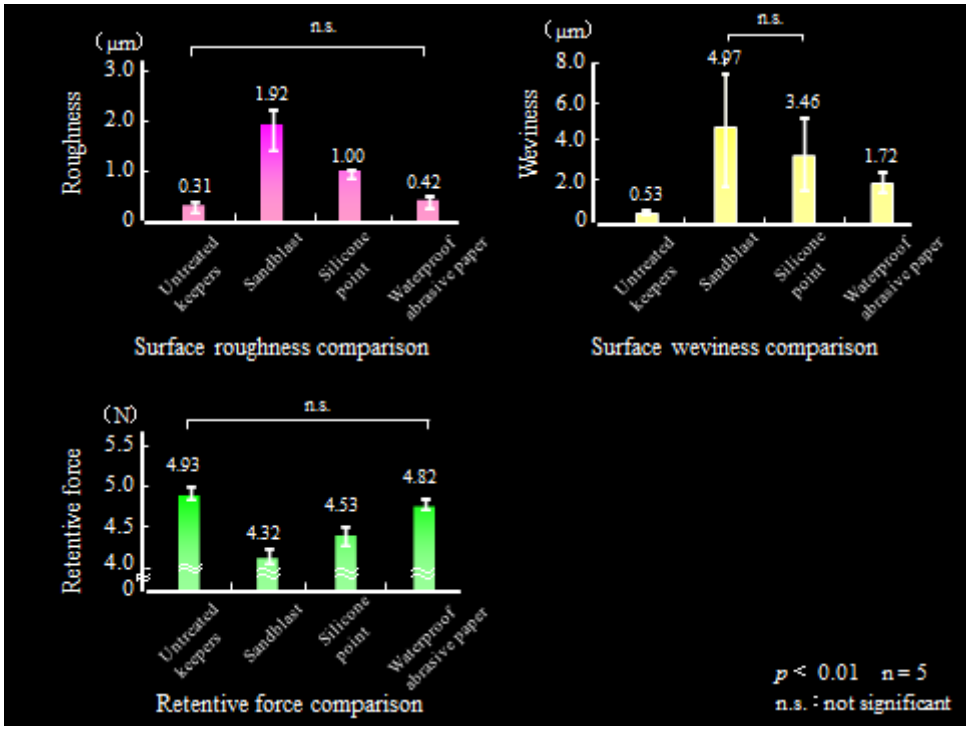
Roughness
(μm)
n.s.
3.0
2.0
1.0
0
0.31
1.92
1.00
0.42
Untreated keepers
Sandblast
Silicone point
Waterproof abrasive paper
Surface roughness comparison
Weviness
(μm)
n.s.
8.0
6.0
4.0
2.0
0
0.53
4.97
3.46
1.72
Untreated keepers
Sandblast
Silicone point
Waterproof abrasive paper
Surface weviness comparison
Retentive force
(N)
n.s.
5.5
5.0
4.5
4.0
0
4.93
4.32
4.53
4.82
Untreated keepers
Sandblast
Silicone point
Waterproof abrasive paper
Retentive force comparison
p < 0.01 n = 5
n.s. : not significant

Fig.4

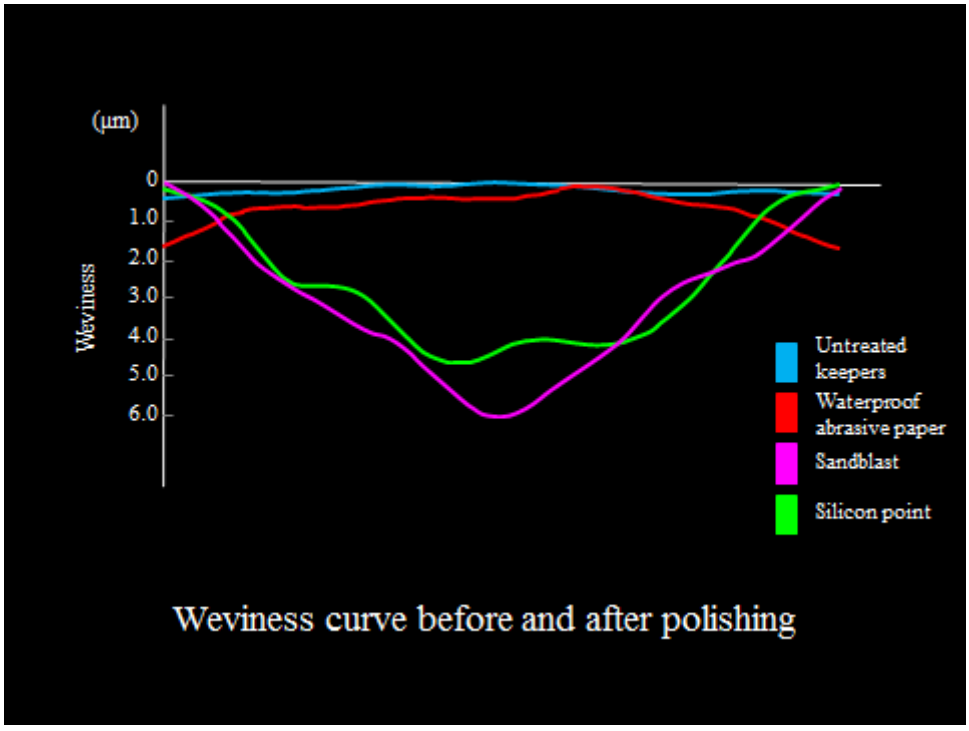
(μm)
Weviness
0
1.0
2.0
3.0
4.0
5.0
6.0
Untreated keepers
Waterproof abrasive paper
Sandblast
Silicon point
Weviness curve before and after polishing

Fig.5

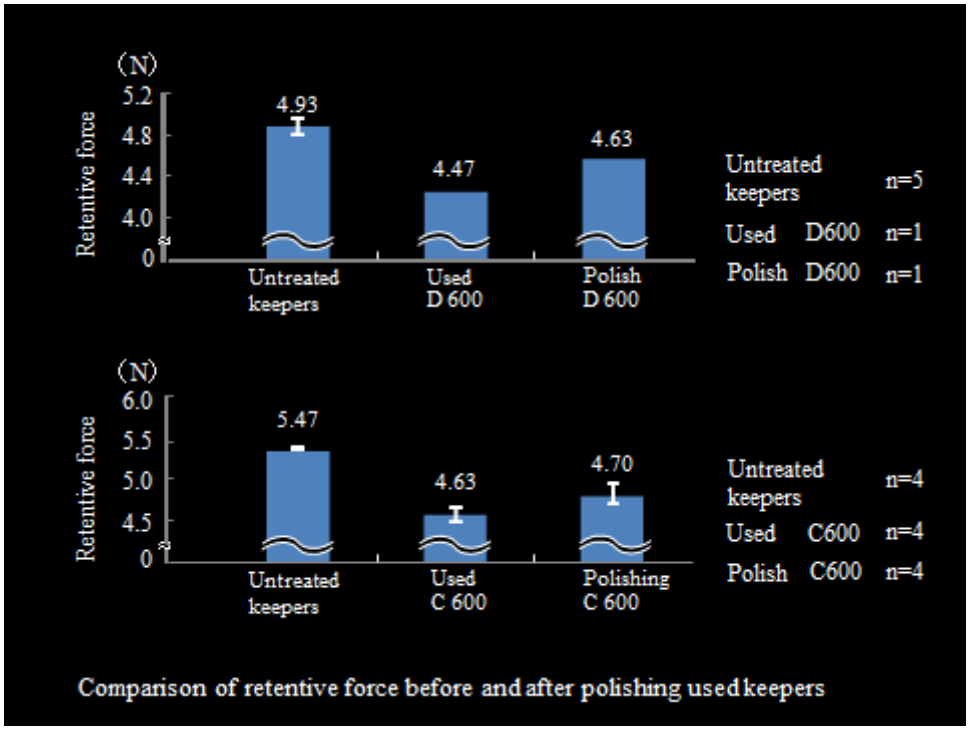

Fig.6

Conclusions

The used surface of keepers in the oral cavity exhibited Ra and Wz. It was suggested that the retentive force decreases with the increasing degree of Ra and Wz. In addition, the polishing with waterproof abrasive paper was more effective in restore of Ra and Wz as well as retentive force, compared to the polishing with silicone point.

This result indicates that the use of waterproof abrasive paper was more effective for polishing the keepers with decreased retentive force and roughed surface in the oral cavity.

Acknowledgment

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References

1. Y. Ogawa, Effect of Crosshead Speed on Magnetic Retentive Force. JJ Mag Dent 18(2):39-41, 2009.