Relationship between thickness and strength of resin base on top of root caps-Examination of using high impact resistance denture base resin-

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Abstract

Fracture of overdenture was greatly involved in thickness of resin base on top of root caps. However, it was often difficult to have thickness on top of root caps. Therefore, it was evaluate denture base strength influence of thickness of resin base on top of root caps. It was compare in two kinds of denture base resin which were high impact resistance and conventional it.

Specimens made of heat curing resin which were two kinds of denture base resin. Then each of the denture base resin was institute its thickness to 2.5, 3.0 and 3.5 mm. The bending strength of three and four point bending of the specimens were measured at a crosshead speed of 5 mm/min in a universal testing machine.

There were significant difference in thickness of specimens and in two kinds of resin. This result indicated that high impact resistance denture base resin may be useful as a material used for the overdenture.

Introduction

Fracture of overdenture was greatly involved in thickness of resin base on top of root caps. However, it was often difficult to have the thickness on top of root caps. Therefore, it was evaluate denture base strength influence of thickness of resin base on top of root caps.it was compare in two kinds of denture base resin which are high impact resistance and conventional denture base resin.

Objective

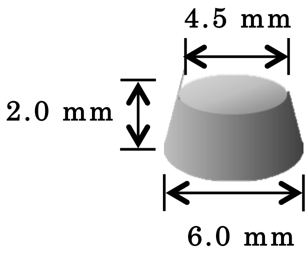
Experiments were performed using two types of bending test (modified 3-point bending test and modified 4-point bending test) to simplified overdenture models.

Materials and Methods

1. Materials

a. Coping models

Fig1 showed the coping model made of the stainless steel (TOKYO GIKEN, Inc). The coping model which shape was trapezoidal. Trapezoidal was 6.0mm in the diameter of bottom, 4.5mm in diameter of surface, and 2.0mm in height.



Trapezoidal shape coping

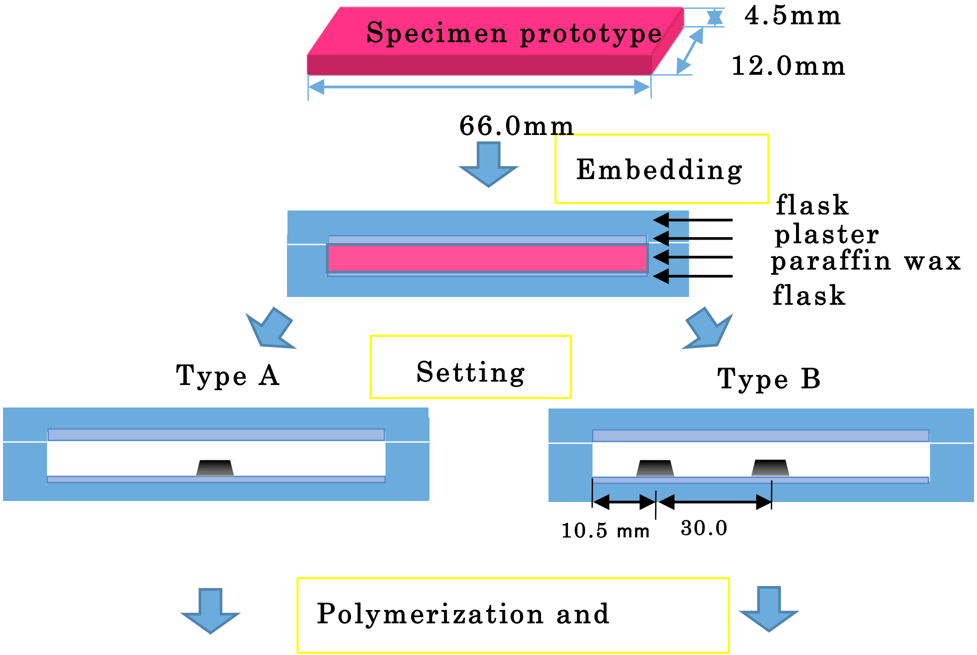
Fig1

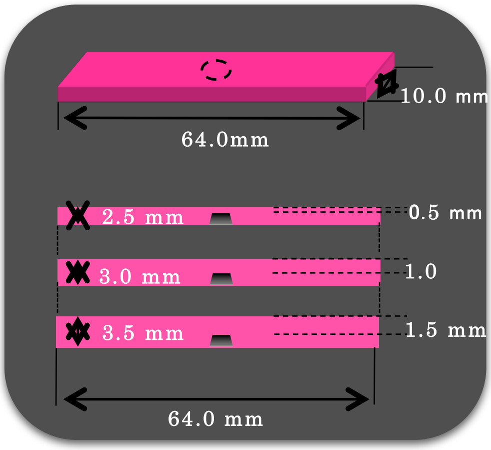
b. Bending specimens

Heat-curing resin were high impact resistance (PRO IMPACT, GC) and conventional (ACRON, GC). Rectangular solid bending specimens were fabricated by heat-curing resin. The shape of specimens was 64.0mm in width, 10.0mm in length, and 2.5, 3.0 and 3.5mm in thickness (Fig 2,3). [1)]Polymerized resin blocks were shaped by using semi-automatic polishing machine (Doctor Lap ML 180, NARUTO) and silicon carbide paper.

According the number of concave portion, two specimen groups were fabricated and named Type A and B. Two specimens were randomly assigned to each groups.

Type A had one concave part in center. Type B had two concave surfaces in the position of 9.5mm and 39.5mm from the left end of the major axis





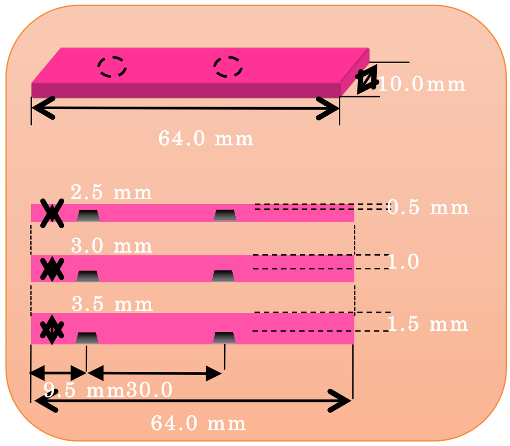


Fig2

Fig3

2. Methods

Each specimen used for the experiments was soaked in the water of 37℃ for 48 hours. The bending test utilized a universal testing machine (EZ-test, SHIMADZU). The loading plunger according to JIS T6501 was used for the experiments. [2)] The experiments were conducted on two kinds (modified three-point bending test and modified four-point bending test). The modified three-point bending test (3PB) was assumed for experiment 1, and the modified four-point bending test (4PB) was assumed to experiment 2.

a. Modified three-point bending test (3PB)

Type A was loading until fracture from both sides on a coping model. (Fig4)Coping model attached to under part in EZ-test. Type A was on top of trapezoidal model. Loading plunger attached the crossing head part in EZ-test by the distance 30.0mm between fulcrums. Bending test was done a crosshead speed of 5.0 mm/min. Bending strength of the specimen measured in the maximum loading point and energy of rupture of the specimen measured in the amount of energy until fracture. And it was calculated the average value.

Acquire data did statistical analysis by critical region 5%. It was used to one-way ANOVA and Tukey's Test for statistical analysis.

b. Modified four-point bending test (4PB)

Type B was loaded until fracture on same kind of two coping models. (Fig5)On the right coping model it loaded from both sides. On the left coping model it loaded from one side only. It was assuming unilateral free-end in this state. The bending test did at the distance between fulcrums 30.0 mm and a crosshead speed of 5.0 mm/min. The statistical analysis was similar experiment 1.

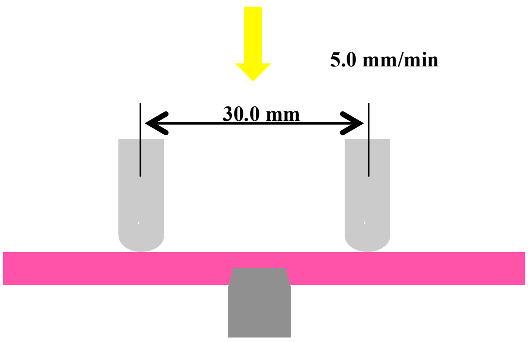


Fig4

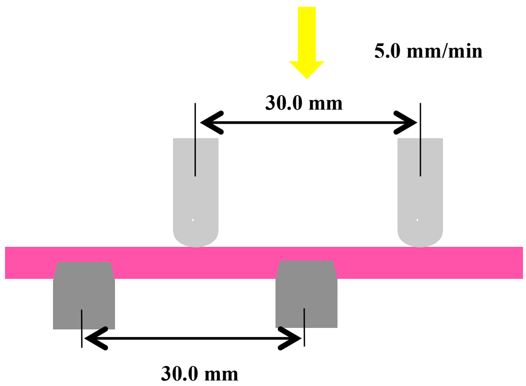


Fig5

Results

[3]Fig6 and Fig7 showed the result of experiment1. Bending strength and Energy of rupture increased intentionally in both models of ACRON and PRO IMPACT whenever the thickness of the specimen increased. As a result of Tukey's test, PRO IMPACT indicated the small value significantly more than ACRON in each thickness of 2.5 millimeters, 3 millimeters and 3.5 millimeters for bending strength. PRO IMPACT indicated the big value significantly more than ACRON in each thickness of 2.5 millimeters, 3 millimeters and 3.5 millimeters for energy of rupture.

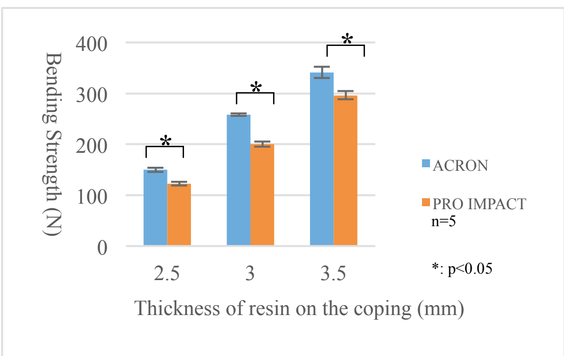


Fig6

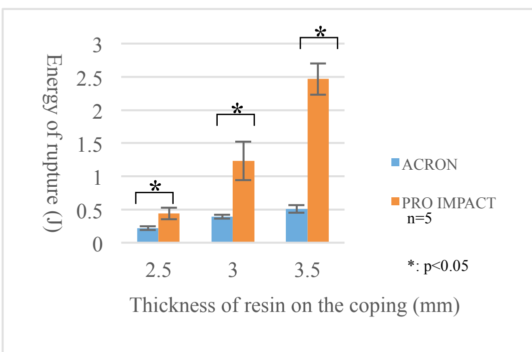


Fig7

Fig7 and Fig8 showed the result of experiment 2. It's not fractured in 3.5mm (ACRON and PRO IMPACT) in the loading areas of EZ-test. Therefore, the value was not able to calculate. Bending strength increased intentionally in both models of ACRON and PRO IMPACT whenever the thickness of the specimen increased. The significant difference wasn't admitted by bending strength of PRO IMPACT and ACRON in 2.5 millimeters and 3 millimeters and each thickness for bending strength. As a result of Tukey's test, PRO IMPACT indicated the big value significantly more than ACRON in each thickness of 2.5 millimeters, 3 millimeters for energy of rupture. Energy of rupture in ACRON increased intentionally whenever the thickness of the specimen increased, but PRO IMPACT significant difference was not observed by the thickness.

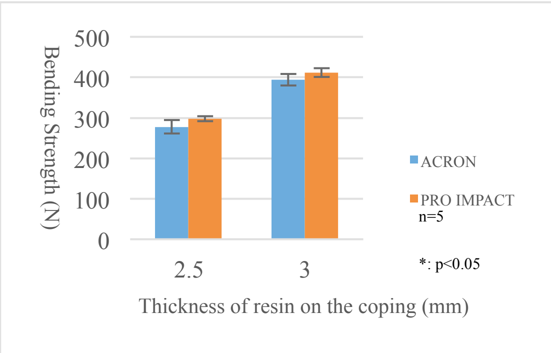


Fig6

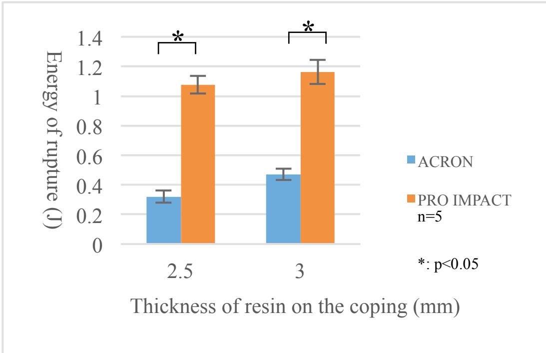


Fig7

Discussion

Bending strength was significantly smaller PRO IMPACT than ACRON for the 3PB, there was no significant difference for the ACRON and PRO IMPACT for the 4PB. For the 3PB, PRO IMPACT had the largest elastic modulus in denture base resin, so bending strength is smaller.

Conclusion

Bending strength increased intentionally in both models of ACRON and PRO IMPACT whenever the thickness of the specimen increased. Bending strength was significantly smaller PRO IMPACT than ACRON for the 3PB, there was no significant difference for the ACRON and PRO IMPACT for the 4PB. When energy of rupture compared ACRON with PRO IMPACT, the one of PRO IMPACT was big intentionally. Therefore, when compared at the same thickness, PRO IMPACT was suggested to be a difficult material fracture.

References

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