

Application News

EZ Test™ Compact Table-Top Universal Tester

Three-Point Bending Test of Dental Material (Fiber Post)

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User Benefits

- ◆ The strength of fiber post with good reproducibility can be measured.
- ◆ Because the device itself is small, it can be installed anywhere.

Introduction

There are various dental treatments depending on the progress of tooth decay and periodontal disease. In particular, if the tooth decay progresses to the tooth canal, the pulp will be removed. After the pulp is removed, a base is needed to insert in the canal (see Fig. 1). Depending on the material, the base may be a metal core or a fiber post. A fiber post was developed to solve the problems of metal post/core, such as root fracture and blackening of teeth and gums caused by metal. The fiber post is suitable for metal-free treatment, it is hard to break the root, and the teeth and gums are not blackened, so it is excellent aesthetically. In the past, only metal core was covered by the Japanese Health Insurance System, but since 2016, fiber post treatment has been covered by the insurance, making it more accessible.

This paper presents an example of a bending test of a fiber post.

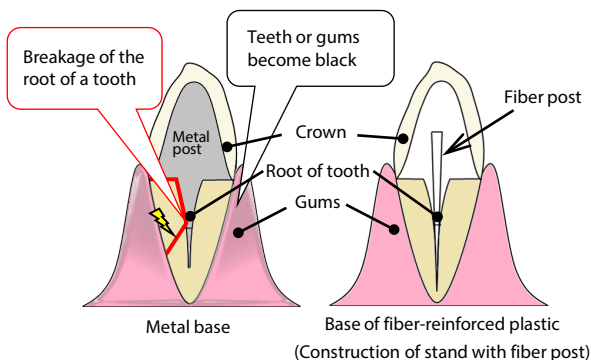


Fig. 1 Image of Dental Prosthetic Treatment

Measurement Conditions and Specimens

Table 1 shows the test configuration. This time, tests were conducted using an EZ-LX compact table-top universal tester (Fig. 2) and a 3-point bending test jig. Table 2 shows the specimen dimensions, and Fig. 3 shows a photograph of the specimen. The main part diameter indicates the diameter of the thickest part of the specimen, and the tip diameter indicates the diameter of the tip. In order to evaluate the strength of the two fiber posts* under lateral loads, a bending test was conducted. Specimen (1) and specimen (2) are selected according to the size of the root canal. In order to reduce the variation due to the test position, both the test force and the specimen dimensions were measured at the center in the long axis direction, and the stress was calculated assuming the diameter (using the diameter at the center: the broken line in Fig. 3) of a round bar, and the bending strength was calculated.

*Sample provided: Dentrade Ltd.
Brand Name: Whitepost

Table 1 Test Configuration

Compact Table-Top Universal Tester	EZ-LX
Load Cell	500 N
Test Jigs	3-point bending test jig (Support/Punch tip radius R 0.5) Jig platform
Test Speed	0.75 mm/min
Distance between Fulcrums	10 mm
Software	TRAPEZIUM™ X (Single)
Number of Test Specimens	n = 3

Table 2 Specimen Size

Specimen Type	Specimen (1)	Specimen (2)
Main Part Diameter (mm)	1.3	1.1
Tip Diameter (mm)	0.5	0.7
Total Length (mm)	15	20



Fig. 2 EZ-LX Compact Table-Top Universal Tester

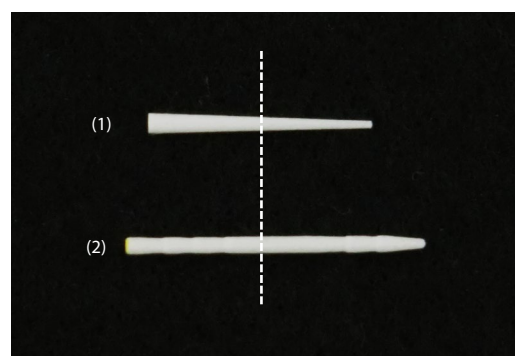


Fig. 3 Photograph of the Specimens

■ Test Results

Fig. 4 shows the test. Fig. 5 shows the test results. The red line is the result of specimen (1), and the blue line is the result of specimen (2). It can be seen that specimen (1) has a larger slope and higher bending strength. Table 3 summarizes the test results. According to the specification of fiber post (Notification of the Director of Medical Care Division, Health Insurance Bureau, MHLW 0305 No. 13), the bending strength is "700 MPa or more," and it was found that all the specimens tested this time had sufficient strength.

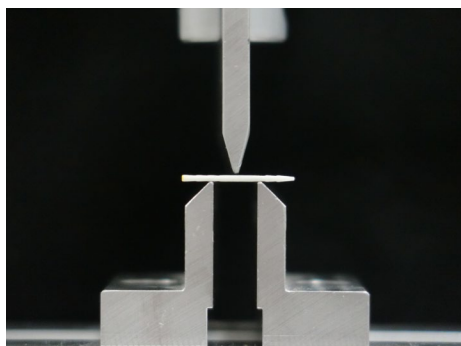


Fig. 4 Picture of 3-Point Bending Test

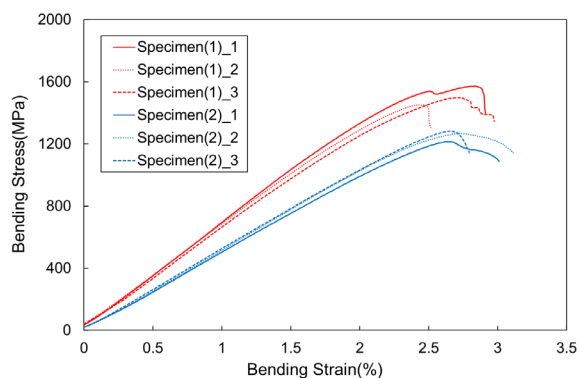


Fig. 5 Stress-Strain Curves of the Tests

Table 3 Summary of Test Results (Mean Value, n = 3)

Specimen	Bending Strength (MPa)
Specimen (1)	1508 ± 61
Specimen (2)	1255 ± 36

■ Conclusion

Bending tests of the fiber post were conducted using an EZ Test compact table-top universal tester. In these measurements, strength values were obtained that far exceeded the bending strength specified in Notification of the Director of Medical Care Division, Health Insurance Bureau, MHLW 0305 No. 13, so the fiber post has sufficient strength. EZ Test is a compact device that fits comfortably on a desk and can be used to evaluate the quality of small specimens such as fiber posts.

Using Shimadzu's equipment, the strength of various materials can be measured.

EZ Test is a trademark of Shimadzu Corporation in Japan and/or other countries.