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Effect of cyclic loading on bond strength of fibre posts

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Introduction

The use of prefabricated posts for restoration of endodontically treated teeth is a common and well described therapy in clinical practice (1). Fibre posts are frequently used for esthetic restorations. Usually, posts are cemented in one or more prepared root canals, providing retention of the core built-up and making a final prosthetic restoration of the tooth possible (2). Furthermore, they might increase the stability of the tooth (3).The retention of root canal posts is a major factor influencing the long-term success of the final restoration. It depends on different factors like design, length and surface texture of the post as well as on the properties of the used cement (1).

Objectives

The aim of this study was to evaluate the effect of cyclic loading on the bond strength of the fibre post D.T. Light Post using different post diameters (Figure 1,2).

Fig. 1: DT Light Post System (VDW, Germany)

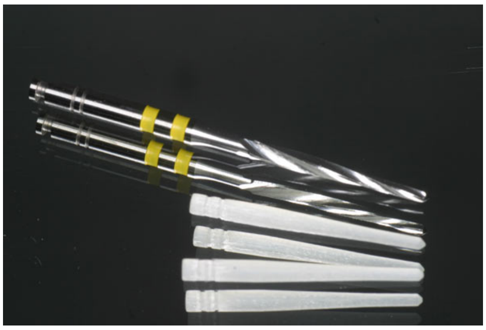

Fig. 2: DT Light Post #2 and the correponding burs.

Material and Methods

Sixty freshly extracted single rooted were included in this study. They were selected for standar size and quality. During the whole experimental period the teeth were stored in 0.9% saline. The root canals of the teeth were treated endodontically. Between each preparation step the canals were irrigated with 1% sodium hypochlorite and chlorhexidine digluconate (2% solution). root canals of the teeth were treated endodontically. Between each preparation step the canals were irrigated with 1% sodium hypochlorite and chlorhexidine digluconate (2% solution). After that, the root canals were filled with laterally condensed gutta-percha and AH Plus sealer (Dentsply DeTrey, Germany). Finally, the teeth were sectioned perpendicular to their long axes to the cementoenamel junction. All specimens were assigned to three experimental groups and post holes were prepared with the corresponding burs: A: DT Light Post ☐ 1 (A1: immediate loading, A2: 100 cycles), B: DT Light Post ☐ 2 (B1: immediate loading, B2: 100 cycles), C: DT Light Post ☐ 3 (C1: immediate loading, C2: 100 cycles). The preparation depth was adjusted to 10 mm in all groups. After evaluation of the post fitting the canal was desinfected with chlorhexidine digluconate (2% solution) und thoroughly dried with the corresponding paper points (Roeko). The posts were cleaned using 70% ethanol before cementation. Cementation was done using Panavia 2.0. After insertion of the post into the canal excess was removed. Polymerization was performed using the polymerization lamp Optilux for 60 seconds. After that, the specimens were stored dry in an incubator for 7 minutes at 37°C, followed by 24 h storage in saline. Tensile tests were carried out using a universal testing machine (Z005, Zwick; crosshead speed 1 mm) (Figure 3-5). Each group was subdivided into two subgroups (1 and 2): 1: immediate loading to maximum bond strength; 2: maximum load after 100 cycles (between 10 and 20 N). Bond strengths (N) were recorded from a personal computer and statistically analyzed using the des Tukey's Test (SPSS Inc., Chicago, USA).

A DT Light Post #1	A1 immediate loading
	A2 100 cycles
B DT Light Post #2	B1 immediate loading
	B2 100 cycles
	C1 immediate loading

C DT Light Post #3 C2 100 cycles

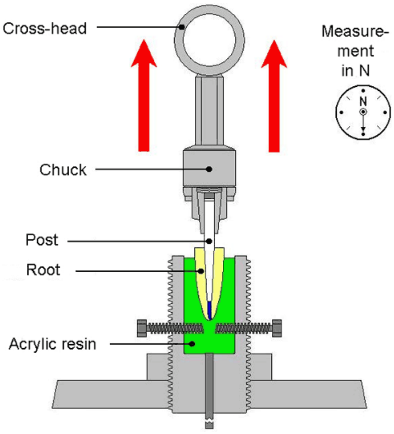

Fig. 3: Special designed experimental apparatus to test bond strength.

Fig. 4: Testing device before loading.

Fig. 5: Testing device after loading.

Results

Recorded bond strengths (in N and MPa) are shown in Table 1 and Figure 6. Analysis of variances test revealed that the post diameter did not affect the bond strengths the fibre posts of the D.T. Light Post system ($p< 0.05$, tukey's test). pairwise comparison showed that loading after 100 cycles decreased the bond strengths of the posts ($p< 0.05$, tukey's test).

		A1	A2	B1	B2	C1	C3
Mean value and standard deviation	In N	127.58 (±25.56)	98.28 (±15.77)	163.37 (±35.85)	124.39 (±26.41)	200.98 (±28.66)	161.73 (±28.29)
	In MPa (N/mm^2)	12.51 (±2.80)	9.63 (±1.54)	14.26 (±3.13)	10.86 (±2.30)	14.68 (±2.09)	11.91 (±1.90)

Tab. 1: Bond strengths within the different groups (mean value and standard deviation).

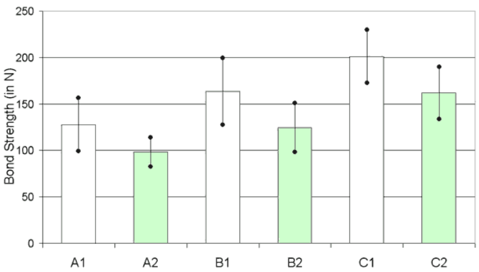

Fig. 6: Mean value and standard deviation within the different groups.

Conclusions

The D.T. light post system showed acceptable tensile bond strengths. The use of different post diameters did not affect the bond strength in MPa. Focusing on the strengths in N bigger diameters showed higher bond strengths than smaller diameters. Cyclic loading decreased the bond strengths of all diameters of fibre posts used.

Literature

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Abbreviations

MPa = Megapascals

This Poster was submitted by Dr. Katrin Bekes.

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