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ZIRCONIUM POSTS SYSTEMS ON ENDONDONTICALLY TREATED TEETH

Dentistry

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ABSTRACT

Objective The new concepts of non-metallic restoration have led to the development of modern materials and methods for postendodontic treatment of endodontically treated teeth. **Material And Methods** To investigate and analyze the retention of zirconium posts cemented with RelyX Unicem 2 Automix (RLX) cement with Pull-out test dentine. To examine the retention of zirconium posts, cemented with Multi Link Automix (MLA) cement. **Results** The largest diameter of the posts significantly increases the resistance of fractures compared to the smaller two diameters used in the experimental study. **Conclusion** The extraction force used in zirconium posts systems that were cemented with both types of cement, the best results showed the posts systems with diameter d3, compared with other diameters.

KEYWORDS

INTRODUCTION

The new concepts of non-metallic restoration have led to the development of modern materials and methods for postendodontic treatment of endodontically treated teeth (1). Endodontically treated teeth, together with non-metallic posts and superstructure, are substructures that enable the production of prosthetic structures that will allow aesthetics, resulting from normal light transmission (3,4).

Several new methods have been developed in aesthetic dentistry, including new composite materials, dentin adhesives and non-metallic superstructure systems (5 .6).

Endodontically treated roots restored by metal superstructure systems are more subjected to fractures due to the high elastic modulus compared to tooth dentine (7.8).

Prefabricated zirconium posts were examined to satisfy aesthetic needs in endodontically treated teeth (9). From this it follows that the transparency of fully ceramic crowns can be successfully satsified with the use of ceramic superstructure systems. Zirconium post systems have good mechanical properties(10). The purpose of this in vitro study is the adhesion of zirconium posts with two types of resin cements.

To investigate and analyze the retention of zirconium posts cemented with RelyX Unicem 2 Automix (RLX) cement with Pull-out test;
To examine the retention of zirconium posts, cemented with Multi Link Automix (MLA) cement and Pull-out test.

METHODOLOGY

In this study, 120 zirconium posts were used of the company ZIRIX NORDIN - Switzerland, with different diameters d1 = 1,2, were used; d2 = 1.35; d3 = 1.5. and two types of resin cements: Multilink Automix-Ivoclar (MLA), and RelyX Unicem 2 Automix (RLX) - 3 M ESPE.

I: 40 zirconium post- d1 = 1.2;
II: 40 zirconium post- d2 = 1.35
III: 40 zirconium post- d3 = 1.5;

The prepared samples were placed in unified acrylate blocks. On the prepared samples, the Pull-out test was performed on the universal testing machine Shimadzu Univerzal Testing Mashine.

RESULTS

Zirconium posts were cemented with two types of cements RelyX Unicem 2 Automix cements and Multilink Automix cement.

Analysis of zirconium posts systems of RelyX Unicem 2 Automix cement in the three diameters

The analysis of the extraction strength in the newtons (N) zirconium posts systems of RelyX Unicem 2 Automix cement in the entire sample is 577.9 ± 6.1 N.

In the subgroup I (d1 = 1.2mm) zirconium posts systems, the minimum, i.e. the maximum value of the pullout force is 575.2 vs 590.3N, with 50% of the superstructure systems with a pullout force of less than 580.8N The zirconium posts systems in Subgroup II (d2 = 1.35mm) have a minimum or a maximum value of the pulling power of 580.1 vs 582.2N. In zirconium post systems in Subgroup III (d3 = 1.5mm), the minimum or maximum value of the pull out force would be 565,2 v.s 576,4 N.

Table 1. Extraction force of zirconium posts RelyX Unicem 2 Automix cement

Subgroups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Subgroup I d = 1,2мм	20	581,59	4,62	1,03	579,43	583,75	575,25	590,34
Subgroup II d = 1,35мм	20	581,40	0,74	0,16	581,06	581,75	580,08	582,25
Subgroup III d = 1,5мм	20	570,75	3,54	0,79	569,09	572,40	565,23	576,42
Вкупно	60	577,91	6,09	0,79	576,34	579,49	565,23	590,34

One Way ANOVA: F=67,194; df=2; p=0,0001* *significant for p<0,05

Analysis of zirconium posts with three diameters of Multilink Automix cement

The analysis of the extraction force in Newton (N) zirconium superstructure systems of Multilink Automix cement in the entire sample was 466.1 ± 11.8 N. The minimum or maximum value of the extraction force in Newtons was 451.1 vs 485.4 N.

Table 2. Force extraction of zirconium posts of Multilink Automix cement

Subgroup	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Subgroup I d = 1,2мм	20	481,29	1,99	0,44	480,37	482,23	478,23	485,43
Subgroup II d = 1,35мм	20	462,91	4,50	1,01	460,80	465,02	455,33	470,15
Subgroup III d = 1,5мм	20	454,22	2,19	0,49	453,19	455,24	451,15	458,55
Total	60	466,14	11,79	1,52	463,09	469,19	451,15	485,43

One Way ANOVA: F=394,366; df=2; p=0,0001*
*significant for p<0,05

In the Zirconium Posts Systems of Multilink Automix Cement in Subgroup I (d1 = 1.2mm), the minimum, i.e. the maximum value of the extraction force is 478.2 vs 485.4 N, with 50% of the superstructure systems where the extraction force was lower from 481.2 N.

In the zirconium posts systems of Multilink Automix cement in Subgroup III (d3 = 1.5mm), the minimum, i.e. the maximum value of the extraction force is 451.1 vs 458.5 N, with 50% of the superstructure systems in which the pulling power was lower from 453.7 N.

DISCUSSION

Zirconium posts systems have higher resistance compared to other superstructure systems. According to some authors, the failure rate of these posts systems is only 3.2% during one to six years (11). The authors concluded that these superstructure systems can be used routinely only in combination with adhesive materials. It is very important to have high potential for bonding dentine and complex resinous cements with zirconium posts. Smooth cements showed success in some micro spaces (12,13).

Significant average decrease in the extraction force by 18.39 (95% CI, 16.0-20.7) Newtons in measuring the Zirconium Upgrading Systems of Multilink Automix Cement in Subgroup II compared to Subgroup I (p = 0.0001).

For p <0.05, there is a significant average decrease in the extration force by 27.08 (95% CI, 24.7-29.4) Newtons to the Zirconium posts of Multilink Automix Cement in Subgroup III compared to Subgroup I (p = 0.0001).

The extraction force of Multilink Automix cement in Subgroup III compared to subgroup II for p <0.05 is significantly lower for 8.69 (95% CI, 6.3-11.1) newtons (p = 0.0001).

Multilink Automix Cement, the extraction force of zirconium posts systems is significantly reduced by increasing the diameter of superstructure systems. A frequent recommendation among multiple authors is not to use a post with a diameter below 1.3 mm because weaker posts can not provide sufficient stability. [14] One opinion is that the width of the post should not be greater than one third of the width of the root in its narrowest dimension, bearing in mind that the preservation of the remaining dentin is very important. [15,16]

The extraction force is significantly highest in Subgroup I with a significant reduction in the same for zirconium posts systems from Subgroup II and Subgroup III.In order to determine the significance of the differences, the Tukey honest significant difference test (HSD) was applied. The differences in the values of the average extraction force of RelyX Unicem 2 Automix cement between the subgroups of zirconium posts systems with three different diameters were analyzed in the following combinations: Subgroup I / Subgroup II; Subgroup I / Subgroup III; and Subgroup II / Subgroup III).

In concordance to Tukey (HSD), the test for p <0.05 points to a significant average reduction in pull-out force by 10.84 (95% CI, 8.2-13.4) novel when measuring the zirconium posts of RelyX Unicem 2 Automix cement in Subgroup III compared to Subgroup I (p = 0.0001). The RelyX Unicem 2 Automix cement extraction force of subgroup III compared to Subgroup II is significantly lower by 10.66 (95% CI, 8.1-13.2) newtons (p = 0.0001). For p> 0.05, there is no significant reduction in the pull-out strength of zirconium posts of RelyX Unicem 2 Automix cement between Subgroup I compared to Subgroup II, by 0.186 (95% CI, 2.4-2.8) novel (p = 0.983).

The extraction force of zirconium posts cemented with RelyX Unicem 2 Automix cement in Newtons significantly decreases with the increase in the diameter of the superstructure systems. The pullout force is significantly highest in Subgroup I, with its significance decreasing for Zirconium Upgrading Systems from Subgroup II and significant reduction of it for subgroup III zirconium posts systems. The diameter of the post and the remaining dentin also play a major role in preventing fracture of the root. This corresponds with some In Vitro studies confirming the importance of the remaining tooth structure considering the strength and resistance of the root fracture. But according to some authors, when the diameter of the post increases, the surface of the tooth that is in contact with the tooth increases. According to some studies, increasing the diameter of the post does not significantly affect the retention capacities. However, it can increase the strength of the post and thus increase the risk of a root fracture. [17]

CONCLUSION

The largest diameter of the posts significantly increases the resistance of fractures compared to the smaller two diameters used in the experimental study. The extraction force of zirconium posts systems that were cemented with both types of cement, the best results showed the posts systems with diameter d3, compared with other diameters d1 and d2.

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