IPS Empress Onlays Luted with Two Dual-Cured Resin Cements for Endodontically Treated Teeth: A 3-year Clinical Evaluation

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The aim of this study was to evaluate the performance of IPS Empress ceramic onlays luted with two dual-cured adhesive resin cements for endodontically treated teeth. Twenty molar teeth were restored with all-ceramic restorations luted randomly with Maxcem or Clearfil Esthetic Cement & DC Bond Kit luting systems (n = 10 each) in 20 patients. The restorations were assessed using modified US Public Health Service criteria at baseline, 6 months, and 1, 2, and 3 years. A statistically significant deterioration was found for the criteria marginal integrity, anatomical form, and surface roughness. For luting of ceramic onlays, no difference between the two luting systems was detected. *Int J Prosthodont 2011;24:40–42.*

or endodontically treated teeth, the process of Choosing the most suitable restorative technique and material may be difficult, since such teeth are highly susceptible to fracture.¹ Maxcem (Kerr) was introduced as a new class of self-etching, self-adhering resin cements that was proposed to simplify the luting procedure with only one application step. Recently, a new methacryloyloxydecyl dihydrogen phosphate (MDP)-based esthetic dual-curing composite cement system (Clearfil Esthetic Cement & DC Bond Kit, Kuraray) that includes a self-etch, single-step, dual-cure adhesive and single-component ceramic primer was introduced to the market. These singlestep luting agents contain a resin matrix packed with multifunctional acid methacrylates that should ideally interact with the porcelain substrate.²

The aim of the present study was to evaluate the clinical performance of IPS Empress Esthetics (Ivoclar Vivadent) ceramic onlays luted with two dual-cured resin cements and to compare each cement in endodontically treated badly damaged molar teeth.

Materials and Methods

Twenty patients were selected for this study and met the following inclusion criteria: (1) presence of a molar tooth with previous root canal treatment and a large defect (at least lack of one cusp) and absence of any symptoms, (2) possible application of rubber dam during luting of the restoration, (3) no further restorations planned in other posterior teeth, and (4) a high level of oral hygiene and absence of periodontal disease.

Occlusal reduction of the cusps ranged from 1.5 to 2.0 mm. The gingival margin was prepared entirely in enamel, when possible, at the cementoenamel junction and finished using 25- μ m finishing diamonds. A full-arch impression was made with a C-type polyether material (Zeta Plus, Zhermack). The IPS Empress Esthetics ceramic onlays were constructed by the same dental technician.

Prior to placement, the thickness of the onlays was measured using a pair of tactile compasses. Attention was taken to ensure that the minimum thickness of the cuspal coverage was not less than 1.5 mm. Then, the restorations were luted randomly with Maxcem (n = 10) and Clearfil Esthetic Cement & DC Bond Kit (n = 10).

After cementation, final radiographs were taken using an individualized film holder and clinical slides were made of the ceramic restorations. At the initial recall (baseline) and after 6 months and 1, 2, and 3 years, all restorations were assessed by two independent investigators using mirrors, probes, bitewing radiographs, and intraoral photographs. The

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Iable 1 Modified USPHS Criteria								
Modified criteria	Analogous USPHS criteria	Description						
Excellent	Alpha 1	Perfect						
Good	Alpha 2	Slight deviations from ideal performance correction possible without damage to tooth or restoration						
Sufficient	Bravo	Few defects; correction impossible without damage to tooth or restoration; no negative effects expected						
Insufficient	Charlie	Severe defects; prophylactic removal for prevention of severe failures						
Poor	Delta	Immediate replacement necessary						

USPHS = US Public Health Service.



Fig 1 (a) Baseline radiograph and (b) cavity preparation of an endodontically treated maxillary left first molar. The tooth was restored with an IPS Empress restoration luted with Clearfil, and excellent results were seen at both (c) 6 and (d) 36 months, with no deterioration exhibited (USPHS criteria: Alpha 1).

restorations were evaluated blindly and clinically at insertion and the subsequent review appointments according to the modified US Public Health Service (USPHS) criteria suggested by Cvar and Ryge³ (Table 1). The criteria included marginal discoloration, secondary caries, occlusal contacts, marginal integrity, anatomical form, and surface roughness.

Analysis was completed using SPSS for Windows 9 (v11, IBM). The statistical unit was one ceramic restoration; differences between groups were evaluated pairwise with the Mann-Whitney test (level of significance: .05).

Results

All patients attended the recall examinations and were subjectively satisfied with their restorations (Fig 1). All modified USPHS scores for Maxcem and Clearfil resin cements are shown in Table 2.

Statistically significant deteriorations were found for the criteria marginal integrity, anatomical form, and surface roughness after 3 years of follow-up.

Over the entire observation period, there were no statistically significant differences between the two luting systems for baseline and the 3-year recall data in relation to all criteria (P > .05).

	Baseline + 6 mo				12 mo				24 mo				36 mo			
	A1	A2	В	С	A1	A2	В	С	A1	A2	В	С	A1	A2	В	С
Maxcem																
Color match	10	-	-	-	6	4	-	-	6	4	-	-	6	4	-	-
Marginal discoloration	10	-	-	-	6	2	2	-	5	2	2	1	5	2	2	1
Secondary caries	10	-	-	-	10	-	-	-	10	-	-	-	10	-	-	-
Occlusal contacts	10	-	-	-	6	2	2	-	5	2	2	1	5	2	2	1
Marginal integrity	10	-	-	-	5	2	2	1	5	2	2	1	5	2	2	1
Anatomical form	10	-	-	-	5	2	2	1	5	2	2	1	5	2	2	1
Surface roughness	10	-	-	-	5	2	2	1	5	2	2	1	5	2	2	1
Clearfil																
Color match	10	-	-	-	8	2	-	-	8	2	-	-	8	2	-	-
Marginal discoloration	10	-	-	-	8	1	1	-	8	1	1	-	7	2	1	-
Secondary caries	10	-	-	-	10	-	-	-	10	-	-	-	10	-	-	-
Occlusal contacts	10	-	-	-	8	2	-	-	8	1	1	-	8	1	1	-
Marginal integrity	10	-	-	-	8	1	1	-	8	1	1	-	7	2	1	-
Anatomical form	10	-	-	-	8	2	-	-	8	1	1	-	8	1	1	-
Surface roughness	10	-	-	-	8	2	-	-	8	1	1	-	7	2	1	-

A1 = Alpha 1 (excellent); A2 = Alpha 2 (good); B = Bravo (sufficient); C = Charlie (insufficient).

Discussion

The results of the present study showed no differences concerning the clinical adhesive performance of both adhesive concepts in endodontically treated molar teeth with large defects in relation to followup time and sample size. For specific adhesive potentials of the materials, in vitro physical tests should be performed.

The modified USPHS criteria employed proved to be reliable for the tooth-colored restorations, as previously reported by Krämer and Frankenberger.⁴ USPHS criteria continue to be used today as part of routine clinical evaluations and as components of standard programs such as the American Dental Association acceptance program. Krämer and Frankenberger⁴ concluded that IPS Empress inlays and onlays demonstrated to be successful even in large defects. They also reported that neither absence of enamel margins nor cuspal replacement significantly affected the quality of the restorations, which was in line with the present study.

Conclusion

According to the present clinical study, when luting ceramic onlays, no differences were detected between the two self-etch adhesive luting resin cement systems.

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