

# RESTORATION OF ENDODONTICALLY TREATED POSTERIOR TEETH WITH DIRECT AND INDIRECT COMPOSITE – 6-MONTH RESULTS

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## SUMMARY

Aim of the present study was to evaluate the clinical performance of direct and indirect composite restorations in endodontically treated posterior teeth for an observation period of 6 months. The study included 65 patients and 126 composite resin restorations - 41 direct (SDR, Ceram X Mono/ Dentsply) and 85 onlays (In:Joy, Dentsply). At baseline and at 6 months they were evaluated using modified USPHS - criteria. Statistical analysis was performed using the Pearson Chi square test and SPSS v.19. There was no statistically significant difference between the results obtained at baseline and after 6 months for both materials ( $P>.05$ ) The direct and indirect composites demonstrated excellent and promising clinical performance in endodontically treated posterior teeth over evaluation period of 6 months.

**Key words:** composite, restorations, endodontically treated teeth

## INTRODUCTION

Restoration of endodontically treated teeth is a major factor influencing their long-term prognosis [1]. It must provide a seal in a repetitive mechanical, thermal and chemical stresses and strengthens weakened as a result of

endodontic therapy tooth structure [2]. Since one of the main factors responsible for the increased fracture susceptibility of endodontically treated teeth is extensive tissue loss [3], reatoration technique should preserve maximum healthy structures.

Current in vitro [4-7] and in vivo studies [8] support the minimally invasive approach and the use of bonded partial restorations in endodontically treated teeth. Some authors point even out the advantages of indirect composite restorations to those of partial ceramic [9] and gold [10] in terms of marginal integrity and stress distribution. Despite the abundant literature on the subject the question of what is the ideal adhesive reconstructive procedure for the endodontically treated tooth has not been answered yet.

There is still insufficient data on the clinical performance of composite onlays in endodontically treated distal teeth. The aim of the present study was to evaluate and compare the 6-month clinical performance of direct and indirect composites in endodontically treated posterior teeth.

## MATERIALS AND METHODS

To be enrolled in the study the patients and the endodontically treated teeth covered the following requirements (Tabl. 1):

**Tabl.1.** Criteria for selection of cases

Patients	Endodontically treated teeth
✓ Aged over 18	✓ Presence of adjacent teeth
✓ No evidence of bruxism	✓ Presence of antagonists
✓ Lack of active or advanced form of periodontal disease	✓ Performed root canal treatment
✓ Written consent to participate in the study and appear for the checkups	✓ Missing at least one approximal surface

In 65 patients were placed a total of 126 composite resin restorations in endodontically treated distal teeth. Of these, 41 were direct (17 in premolars and 24 in molars) and

85 - indirect (21 in premolars and 64 in molars). For the direct restorations were applied SDR (Dentsply) for dentin replacement and Ceram X Mono (Dentsply) for the last 3mm

of the restoration in combination with adhesive Pryme & Bond NT (Dentsply). For the indirect onlay restorations (In:Joy, Dentsply) acceptable geometry of the preparation was achieved again with SDR and cementation was performed with self-adhesive resin cement (SmartCem2/ Dentsply). Both direct and indirect restorations were polished with the system Enhance (Dentsply De-Trey). The baseline and the 6-month results were evaluated using modified USPHS-criteria by two examiners not participating in the placement of the restoration. Disagreements in the

assessment were resolved by consensus. For all evaluation criteria value “Alpha” shows the best result, “Bravo” - minor changes that are clinically acceptable, “Charlie” - clinically unacceptable whether correctable or not.

Statistical analysis was performed using the Pearson Chi square test and SPSS v.19.

### RESULTS:

64 patients attended the 6 months recall. Tables 2 to 5 present the obtained baseline and recall scores.

**Tabl. 2.** Evaluation of direct restorations in premolars (n=17)

Criterion	Time	SCORE								
		alfa			bravo			charlie		
		N	%	Sp %	N	%	Sp %	N	%	Sp %
<b>Colour match</b>	baseline	17	100,0	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	17	100,0	0,00	0	0,00	0,00	0	0,00	0,00
<b>Discoloration on the composite-enamel border</b>	baseline	<b>17</b>	<b>100,00</b>	<b>0,00</b>	<b>0</b>	<b>0,00</b>	<b>0,00</b>	0	0,00	0,00
	6 month	<b>16</b>	<b>94,12</b>	<b>5,71</b>	<b>1</b>	<b>5,88</b>	<b>5,71</b>	0	0,00	0,00
<b>Anatomic form</b>	baseline	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Marginal adaptation</b>	baseline	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Surface finishing</b>	baseline	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Secondary caries</b>	baseline	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Contact point</b>	baseline	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Changes in interdental papilla</b>	baseline	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	17	100,00	0,00	0	0,00	0,00	0	0,00	0,00

Marginal staining (from Alpha to Bravo) was recorded for one of the direct restorations in premolars at the 6-month control. The other parameters remained unchanged.

**Tabl. 3.** Evaluation of indirect restorations in premolars (n=21)

Criterion	Time	SCORE								
		alfa			bravo			charlie		
		N	%	Sp %	N	%	Sp %	N	%	Sp %
<b>Colour match</b>	baseline	21	100,0	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	21	100,0	0,00	0	0,00	0,00	0	0,00	0,00
<b>Discoloration on the composite-enamel border</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Anatomic form</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Marginal adaptation</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Surface finishing</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Secondary caries</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Contact point</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Changes in interdental papilla</b>	baseline	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	21	100,00	0,00	0	0,00	0,00	0	0,00	0,00

None of the indirect restorations in premolars showed any change in the examined criteria at the 6-month recall.

**Tabl. 4.** Evaluation of direct restorations on molars ( baseline n=24; 6 month n=22)

Criterion	Time	SCORE								
		alfa			bravo			charlie		
		N	%	Sp %	N	%	Sp %	N	%	Sp %
<b>Colour match</b>	baseline	24	100,0	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	22	100,0	0,00	0	0,00	0,00	0	0,00	0,00
<b>Discoloration on the composite-enamel border</b>	baseline	<b>24</b>	<b>100,00</b>	<b>0,00</b>	<b>0</b>	<b>0,00</b>	<b>0,00</b>	0	0,00	0,00
	6 month	<b>21</b>	<b>95,45</b>	<b>4,44</b>	<b>1</b>	<b>4,55</b>	<b>4,44</b>	0	0,00	0,00
<b>Anatomic form</b>	baseline	24	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	22	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Marginal adaptation</b>	baseline	24	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	22	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Surface finishing</b>	baseline	<b>24</b>	<b>100,00</b>	<b>0,00</b>	<b>0</b>	<b>0,00</b>	<b>0,00</b>	0	0,00	0,00
	6 month	<b>20</b>	<b>90,9</b>	<b>6,13</b>	<b>2</b>	<b>9,10</b>	<b>6,13</b>	0	0,00	0,00
<b>Secondary caries</b>	baseline	23	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	22	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Contact point</b>	baseline	23	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	22	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Changes in interdental papilla</b>	baseline	24	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	22	100,00	0,00	0	0,00	0,00	0	0,00	0,00

In one direct composite restoration in molars was observed marginal staining. Another two restorations have lost their surface gloss appearing slightly rougher compared

to the adjacent enamel (from Alpha to Bravo for Surface finishing).

**Tabl. 5.** Evaluation of indirect restorations on molars ( baseline n=64; 6 month n=64)

Criterion	Time	SCORE								
		alfa			bravo			charlie		
		N	%	Sp %	N	%	Sp %	N	%	Sp %
<b>Colour match</b>	baseline	64	100,0	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	64	100,0	0,00	0	0,00	0,00	0	0,00	0,00
<b>Discoloration on the composite-enamel border</b>	baseline	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	64	100,00	4,44	0	0,00	0,00	0	0,00	0,00
<b>Anatomic form</b>	baseline	65	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Marginal adaptation</b>	baseline	<b>64</b>	<b>100,00</b>	<b>0,00</b>	<b>0</b>	<b>0,00</b>	<b>0,00</b>	0	0,00	0,00
	6 month	<b>63</b>	<b>98,44</b>	<b>1,55</b>	<b>1</b>	<b>1,56</b>	<b>1,55</b>	0	0,00	0,00
<b>Surface finishing</b>	baseline	65	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	6 month	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Secondary caries</b>	baseline	65	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Contact point</b>	baseline	65	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00
<b>Changes in interdental papilla</b>	baseline	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00
	12 month	64	100,00	0,00	0	0,00	0,00	0	0,00	0,00

One indirect restoration in molars received score Bravo for marginal adaptation. The other parameters remained unchanged.

Statistical analysis revealed no statistically significant difference between results obtained at baseline and after 6 months for both the direct and indirect composites ( $P > .05$ )

### Discussion:

The present study evaluates the clinical performance of 41 direct and 85 indirect composite resin restorations in endodontically treated posterior teeth.

Two direct restorations exhibited a change in the criterion “Discoloration on the composite-enamel border” from Alpha to Bravo. This criterion aims to detect microleakage on the border of the restoration. Score Bravo is considered to be superficial change, still inconclusive for microleakage. Reason for this could be the shrinkage stress, which in large restorations can lead to enamel microfractures (11). Another potential harmful factor present finishing and polishing procedures that have the potential to disrupt the marginal integrity of the restoration.

“Marginal adaptation” is a clinical parameter that takes into account the integrity of the adhesive bond between

restoration and tooth structures. A shift from score Alpha to Bravo for this parameter was observed in one indirect restoration. The explanation in this case could be the existing, although in a small range, polymerization shrinkage of the composite cement [12].

Two direct restorations placed in molars received score Bravo for surface texture, as their surface gloss was lost and they differed visually from the appearance of the adjacent natural enamel. The reason for this could be the low abrasion resistance of the direct composite versus the indirect or specificity of the diet of both patients.

The lack of change in the other parameters is determined to some extent by the still short follow-up period. Another reason are the improved mechanical properties of dental composites. “Colour match”, “Anatomic form”, “Secondary caries”, “Contact point” and “Changes the interdental papilla” are parameters which will be of interest for a longer follow-up period.

Indirect composites are introduced to compensate for the disadvantages of the direct composite technique. Their improved mechanical, physical and biological characteristics compared with direct composites provide optimal control over occlusal anatomy, contour, interproximal contact, health of

periodontal structures and polymerization shrinkage [13].

The matrix of the ormocers as Ceram-X Mono consists of inorganic Si-O-chains in addition to the conventional organic components. The attachment of a polymerizing group to the initial derivative alkoxy silane, hydrolysis and condensation lead to formation of oligomeric Si-O-Si-nano-structure [14]. This inorganic-organic nature of their matrix gives them the advantage of more complete polymerization. The larger size of the monomer molecules can additionally reduce polymerization shrinkage, wear and the elution of monomers into the oral cavity. In support of these data ormocers perform well as a restorative material for

endodontically treated distal teeth in in vitro studies [15, 16]. Plotino G et al. [17] found no difference in the fracture resistance of endodontically treated molars restored with direct and indirect composite respectively and cuspal coverage.

### Conclusion

Indirect composite and Ormocer restorations in endodontically treated posterior teeth exhibited excellent and promising clinical performance over an evaluation period of 6-months.

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