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ORIGINAL ARTICLE

Effects of metallic or translucent matrices for class II composite restorations: 4-year clinical follow-up findings

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Abstract This study evaluated the performance of composite restorations placed with two matrix and wedge systems 4 years after placement. In a split-mouth design, 23 patients were selected and received at least two class II restorations, one with metallic matrix and wooden wedge and the other with polyester matrix and reflective wedge. One dentist placed the 109 restorations, and all cavities were restored using Single Bond and P-60 (3M ESPE) according to the manufacturer's instructions. Polymerization was performed through occlusal (metallic matrices) or through the reflective wedge (polyester matrices). Restorations were evaluated and categorized as alpha (A), bravo (B), charlie (C), and delta (D; modified United States Public Health System criteria) at baseline and 4 years after placement. Both clinical aspects and interproximal radiographs were considered in the evaluation. Data were analyzed with Mann–Whitney and Friedman tests (α=0.05). Fifteen subjects (78 teeth/102 proximal surfaces) were reassessed after 4 years. Considering comparisons within matrices in different evaluation time points, no significant differences were observed (p>0.05). Comparing 4-year to baseline results, the quality of marginal adaptation (40% and 40.4 %, score A), marginal staining (31.3% and 28.8%, score A), and roughness (56% and 46.2%, score A) decreased for metallic and translucent matrices, respectively (p<0.05), while color match (9.6%, score A), occlusal contacts (75%, score A), and proximal contacts (71.7%, score A) also decreased in quality for translucent matrices (p<0.001). Although the matrix and wedge systems evaluated showed similar clinical performance, there was clinical quality loss after 4 years, with most of the restorations being still acceptable, and no intervention was necessary.

Keywords Randomized clinical trial · Composite restorations · Clinical evaluations · Longevity

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Introduction

The evolution of adhesive systems and improvement of mechanical properties of aesthetic materials [1] has placed increased emphasis on esthetics, leading to the application of tooth-colored materials in posterior teeth replacing metallic restorations. The current use of direct composite restorations in the reconstruction of partially destroyed teeth presents a more conservative approach due to the advantages these materials offer, such as preservation of sound dental structure and reinforcement of the restored tooth, which are attributed to the adhesive capacity of these materials [2, 3].

However, considering class II cavities restored with composite resin, proximal surfaces should present a well-contoured reconstruction, which is mandatory to achieve good proximal contact. Yet, the inherent polymerization shrinkage could cause the marginal adhesion to break down at the cervical margin and therefore contribute to restoration failure [4]. It is noteworthy that the main location of secondary caries in composite resin restorations is the cervical wall [5]. Secondary caries have been considered the most prevalent reason for restoration replacement [5–7],

and in class II restorations, the difficulty of adapting resin to cervical walls, as well as the correct adjustment of proximal contacts and cervical fit, are other reported problems associated with composite placement [8].

Another factor that might influence the restorations' performance is the proximal contour as it depends on the type and shape of the matrix system employed. The matrix system determines the shape of the proximal contour in the cervico-occlusal direction [9–12]. An improper restorative technique leading to a deficient proximal contour contributes to food impaction and will hamper interdental cleaning, leading to microbial biofilm accumulation at the cervical region [6, 7, 13].

Various restorative techniques have been suggested aiming to reduce the polymerization shrinkage stress at the cervical interface in composite resin class II restorations. Among these methods are the use of translucent matrix bands and reflective wedges [14]. These techniques were initially supported by the presumption that it would be possible to control the directional shrinkage of resin-based composites [15–17]. However, attaining proximal contacts could be more difficult with this technique when compared to metallic matrices [10, 11, 18], and higher amounts of proximal excesses could be expected [19]. In addition, the belief that composite resins shrink toward the light has been questioned [20].

Results of baseline [21], 1 and 2 years follow-up [22, 23] were previously reported, and no significant differences were observed in class II composite restoration performance regardless of the matrix system used at baseline [21] and after 1 and 2 years follow-up [22, 23]. As the oral cavity represents an extremely adverse environment for restorative materials [24], evaluations on the clinical performance of these restorations longer than 2 years are mandatory since a significant increase in failure rates are observed with aging [3, 7, 25, 26]. Several studies have reported the main changes in class II restoration clinical characteristics after 4-year follow-up periods. It may be expected that characteristics such as marginal adaptation, staining, anatomy, color matching, and recurrent caries constitute the majority of clinical changes observed [26–29], which could differentiate materials and techniques at this stage.

The aim of this randomized clinical trial was to compare the performance of class II composite restorations placed with two matrix and wedge systems after 4 years of clinical service according to the modified United States Public Health System criteria (USPHS). The null hypothesis tested was that the clinical performance of posterior composite restorations would not be influenced by the matrix system used.

Materials and methods

Experimental design This prospective clinical trial involved a split-mouth, non-completely randomized, double-blinded (regarding patients and examiners) design where patients received restorations with the two experimental conditions under evaluation. Ethical approval was obtained from the Research and Ethics Committee of Federal University of Pelotas. Twenty-three patients (mean age 34.4±10.7; 82.6% female) who fulfilled inclusion criteria [21] were selected from the clinics of the Federal University of Pelotas Dental School–Pelotas, RS, Brazil and were free to withdraw from the trial, without justification, at any stage of the evaluation. Each patient received at least two class II restorations, one performed with metallic matrix and wooden wedge and the other with polyester matrix and reflective wedge. One operator (MSC) placed all restorations with the same adhesive system (Single Bond, batch no. 2HH/1FL/1FJ, 3M ESPE, St Paul, MN, USA) and composite resin (Filtek P-60, batch no. 1LG/2ME/1KL, 2PE, 3M ESPE). Restorations were evaluated using bitewing radiographs and the modified USPHS codes and criteria at baseline, 1, 2, and 4 years after placement by two calibrated examiners.

Clinical procedures Clinical procedures were conducted as previously described [21], and clinical procedures are briefly presented here. All restorations were placed using rubber dam isolation, and the cavities were prepared with a conservative design, restricted to the removal of either the carious tissue or the old restorations. In deeper cavities, a closed sandwich technique was used, and calcium hydroxide cement (Hydro C, Dentsply, Petrópolis, RJ, Brazil) plus glass ionomer cement (Vitrebond, 3M ESPE) were applied. Each patient received at least two restorations, one with metallic matrix (Sectional Retainer System, 3M ESPE) and wooden wedge (TDV, Pomerode, SC, Brazil) and another with polyester matrix and reflective wedge (Light Curing System, TDV, Pomerode, SC, Brazil).

After positioning the matrix, cavity walls were etched with 35% phosphoric acid for 30 s in enamel and 15 s in dentine, washed for 30 s, and water excess was removed with an endodontic suction cannula for 5 s. Two consecutive layers of Single Bond were applied to cavity walls with a microbrush applicator, excess was removed with a new applicator, and the product was gently air-dried for 5 s and light-cured (XL 3000, 3M ESPE) from occlusal for 20 s. Composite increment insertion (<2-mm thickness) was the same in both groups, with different light-curing techniques: In the metallic matrix and wooden wedge group, each composite increment was light-cured from occlusal for 20 s, and in the polyester matrix and reflective wedge group, the first layer was light-cured indirectly through the reflective wedge for 60 s. The second and third layers were light-cured from the buccal and lingual directions for 60 s, respectively. Additional layers were light-cured from occlusal for 20 s.

As the teeth were not pre-wedged, the construction of the contact between the restoration and the proximal tooth was carried out with a pre-cured composite sphere, which was firmly inserted with an amalgam condenser against an increment of non-polymerized composite and the proximal tooth while light curing was performed. In both groups, after removal of the matrix system, the restorations were additionally light-cured for 20 s from the buccal, lingual, and occlusal aspects. Utmost care was taken during the composite insertion to keep the finishing to a minimum, and all restorations were finished immediately after placement, with a sequential technique [21, 30]. Cervical overhangs were removed with a no. 12 scalpel blade and plastic finishing strips. Proximal margins were finished with Sof-Lex XT discs. The occlusal surfaces were finished with diamond finishing burs (1190F; 3195F, KG Sorensen, SP, Brazil), multilaminated carbide burs (FG 7902, Jet Beavers Inc., Ontario, Canada), and polished with aluminum oxide points (Flexicups, Cosmedent Co., Chicago, IL, USA) and a silicone brush (Ultradent South Jordan, UT, USA) with a aluminum oxide polishing paste with average abrasive size of 5 μm (Profill, SS White, RJ, Brazil) [22].

The allocation of treatments assumed two procedures. First, the matrix and wedge system to be used in the first tooth to be restored in each patient was sorted by the toss of a coin. Considering that treatment distribution would be affected by patients' demands (individual restorative needs), a second allocation procedure, the use of a randomization table, was carried out to assure that the matrix systems were symmetrically distributed in the whole experiment considering the differences in cavity size, tooth size, and tooth position in the patients' mouths. In this way, each patient had all the treatments previously assigned according to his/her demands by chance, and also the necessary adjustments in the distribution of treatments were made to ensure a similar treatment distribution. These procedures were carried out to improve treatment distribution considering the small number of subjects in the study [21, 22].

Assessment procedures The baseline evaluation was conducted at least 1 week after placement and no later than 1 month, and it included an assessment of the functional characteristics according to modified USPHS codes and criteria [31, 32] and a bitewing radiograph of each evaluated restoration (Table 1) [21, 22].

Two calibrated investigators, working independently, completed the assessment of the restorations placed at baseline, 1-, 2-, and 4-year evaluations. Radiographic examination was again carried out at 2- and 4-year evaluations. When disagreement occurred, a consensus rating was determined prior to the patient being dismissed. The mesio-occluso-distal (MOD) restorations were analyzed independently for both MO and OD surfaces, but the same tooth was always restored with the same technique. The results were analyzed using the Mann–Whitney rank sum test for comparisons between matrix systems at different evaluation times and using the Wilcoxon signed rank test for comparisons among evaluation periods for each experimental group [32]. Significance level was set at 5%.

Results

The summary of teeth and cavity types at baseline, 1, 2, and 4 years are presented in Table 2.

Baseline evaluation Of the 109 placed restorations, 75 (68.8%) were replacements of unsatisfactory amalgam or composite restorations and 34 (31.2%) were initial restorations, while 41 were MOD cavities. Nine restored cavities had the cervical margin placed in dentine/cementum (four placed with translucent matrices and reflective wedges and five placed with metallic matrices and wooden wedges); the remaining cavities had cervical margins placed in enamel. There were no significant differences between matrix systems, neither among tooth groups nor among cavity types (Table 3). Two restorations presented postoperative sensitivity (low to moderate), one placed with each matrix system, but without the need of replacement [21].

One-year evaluation Eighteen patients were able to participate in the recall. Ninety-four (86.2%) restorations were evaluated, 50 in the metal matrix group and 44 in the polyester matrix group. There were no differences between matrix systems ($p>0.05$) even when considering teeth groups or cavity designs (Table 3). Two restorations had failed after 1 year of clinical service. The causes of these failures were a caries lesion adjacent to the restoration in one tooth (MO restoration—translucent matrix system) and a pulpal necrosis in the other restoration (MOD restoration—metallic matrix system). Both restorations were replaced [21].

Two-year evaluation Fifteen patients were able to participate in the recall. Seventy-eight (71.5%) restorations were evaluated, 41 in the metal matrix group and 37 in the polyester matrix group. Some restorations could not be evaluated in the criteria's occlusal (three restorations) and proximal contacts (five restorations) due to the loss of the neighbor or antagonist teeth (Table 3). After a 2-year follow-up, there were still no differences between metallic and translucent matrices ($p>0.05$) in all criteria evaluated (Table 3).

When comparing the 1-year with the 2-year follow-up, there was a statistically significant decrease in the restora-

Table 1 Codes and criteria for the clinical and radiographic assessment of the restorations

Criteria	Code	Definition
Clinical criteria		
Color match	A	Restoration matches adjacent tooth structure in color and translucency
	B	Mismatch is within an acceptable range of tooth color and translucency
	C	Mismatch is outside the acceptable range
Marginal adaptation	A	Restoration closely adapted to the tooth. No crevice visible. No explorer catch at the margins, or there was a catch in one direction
	B	Explorer catch. No visible evidence of a crevice into which the explorer could penetrate. No dentin or base visible
	C	Explorer penetrates into a crevice that is of a depth that exposes dentin or base
Anatomic form	A	Restorations continuous with existing anatomic form
	B	Restorations discontinuous with existing anatomic form but missing material not sufficient to expose dentin base
	C	Sufficient material lost to expose dentin or base
Surface roughness	A	Surface of restoration is smooth
	B	Surface of restoration is slightly rough or pitted, but can be refinished
	C	Surface deeply pitted, irregular grooves and cannot be refinished
	D	Surface is fractured or flaking
Marginal staining	A	No staining along cavosurface margin
	B	<25% of cavosurface affected by stain
	C	>25%, <50% of cavosurface affected by stain
	D	>50% of cavosurface affected by stain
Occlusal contacts	A	Normal
	B	Heavy
	C	Light
	D	Absent
Proximal contacts	A	Normal
	B	Heavy
	C	Light
	D	Open
Sensitivity	A	None
	B	Mild but bearable
	C	Uncomfortable, but no replacement is necessary
	D	Painful. Replacement of restoration is necessary
Secondary caries	A	Absent
	B	Present
Radiographic criteria		
Proximal contour	A	Proximal contour is correct, with adequate convexity and proximal contact
	B	Convexity lightly compromised
	C	Convexity moderately compromised (Tofflemaire contour)
	D	Convexity and proximal contact compromised, repair is necessary
Marginal fit	A	Marginal fit is correct
	B	Restoration marginal fit is likely overfilled
	C	Restoration marginal fit is likely underfilled or an adhesive line can be observed
	D	Restoration marginal fit is severely underfilled, or presence of "open" margins

Adapted from Wilson et al. [28]

tions' quality after 2 years with regard to marginal adaptation, marginal staining, and proximal contact aspects in both matrix systems ($p<0.05$; Table 3). Additionally, translucent matrices presented a higher degree of color mismatch ($p<0.05$; Table 3). Comparison between baseline and 2-year data showed a decline in the restorations' quality concerning color match, marginal adaptation, and marginal staining in both matrix systems ($p<0.05$), whereas translucent matrices and the reflective wedge group showed a decline in the quality of proximal contacts ($p<0.05$;

Table 2 Summary of tooth type and cavity design included in the study at baseline, 1-, 2-, and 4-year evaluations

Group	Tooth		Baseline	1 year	2 years	4 years
Metallic matrix	Molars	Maxillary	7/4	6/4	5/4	5/4
		Mandibular	13/9	9/6	8/3	8/3
	Premolars	Maxillary	11/6	11/6	9/4	9/4
		Mandibular	9/0	8/0	8/0	8/0
Translucent matrix	Molars	Maxillary	6/4	5/3	4/3	4/3
		Mandibular	8/7	7/6	7/5	7/5
	Premolars	Maxillary	9/9	8/8	6/8	6/8
		Mandibular	5/2	5/2	4/0	4/0
Total			68/41	59/35	51/27	51/27

Numbers separated by slashes represent the cavity types MO or OD/MOD, respectively

Table 3). In the radiographic examination, there was no difference between matrices after the 2-year follow-up regarding proximal contacts and cervical adaptation ($p > 0.05$). However, both radiographic aspects presented a statistically significant decrease in quality after 2 years ($p < 0.05$), which was not dependent on the matrix system (Table 3).

Four-year evaluation Fifteen patients (65% of the baseline patients) were able to participate in the recall. Seventy-eight (71.5%) restorations were evaluated, 41 in the metal matrix group and 37 in the polyester matrix group. The main reason for dropouts was moving to another city. No subject refused to participate in any of the recalls. All patients evaluated at this point had participated in all previous

Table 3 Results of clinical and radiographic evaluation according to modified USPHS codes and criteria at baseline, 1-, 2-, and 4-year evaluations

Criteria	Matrix	Baseline (n = 23/150)[a]	1 year (n = 18/129)[a]	2 years (n = 15/105)[a]	4 years (n = 15/102)[a]
Clinical evaluation					
Color match	Metallic	32/46/0A	25/39/2A	11/39/2A	7/43/0A
	Translucent	31/41/0A	25/38/0A	10/41/2A	5/47/0B
Marginal adaptation	Metallic	78/0/0A	56/10/0A	21/30/1B	20/21/9B
	Translucent	72/0/0A	53/10/0A	27/23/3B	21/25/6B
Anatomic form	Metallic	78/0/0A	63/3/0A	49/2/1A	46/4/0A
	Translucent	72/0/0A	61/2/0A	49/2/2A	49/3/0A
Surface roughness	Metallic	78/0/0A	64/2/0A	49/3/0A	28/22/0B
	Translucent	72/0/0A	57/6/0A	52/1/0A	24/26/2B
Marginal staining	Metallic	78/0/0A	51/13/2A	19/24/9B	15/31/2B
	Translucent	72/0/0A	52/10/1A	22/25/6B	15/33/4B
Occlusal contacts	Metallic	74/3/1/0A	64/1/1/0A	50/0/0/1A	42/2/0/3A
	Translucent	72/0/0/0A	63/0/0/0A	49/0/0/2A	36/10/2/0B
Proximal contacts	Metallic	56/5/7/0A	59/3/4/0A	36/7/5/2A	34/5/5/2A
	Translucent	65/2/5/0A	62/1/0/0A	39/4/6/1A	33/11/2/0B
Sensitivity	Metallic	77/1A	66/0A	52/0A	50/0A
	Translucent	71/1A	63/0A	53/0A	52/0A
Secondary caries	Metallic	78/0A	66/0A	52/0A	50/0A
	Translucent	72/0A	62/1A	53/0A	51/1A
Radiographic evaluation					
Proximal contacts	Metallic	48/26/4/0A	–	21/19/10/2A	20/19/9/2A
	Translucent	52/19/1/0A	–	26/16/9/2A	26/16/9/1A
Cervical adaptation	Metallic	65/12/1/0A	–	30/5/12/5A	28/5/12/5A
	Translucent	64/5/3/0A	–	33/4/14/2A	30/5/15/2A

[a] n refers to the number of patients/tooth surfaces evaluated, respectively. Numbers separated by slashes represent USPHS criteria A/B/C/(D). Uppercase letters represent differences among recalls, considering each matrix system separately. No statistical differences were found between metallic and translucent matrices after 4 years of clinical service or in the previous evaluations

evaluations. As in the 2-year evaluation, 11 occlusal restorations and 12 proximal contacts could not be evaluated due to the loss of the neighbor or antagonist teeth. Three restorations carried out with translucent matrix and reflective wedge failed after 4 years (two fractures, one caries—one fracture replaced before the 4-year evaluation), while two with metallic matrix and wooden wedge failed (both fractured, both replaced before the 4-year recall).

Comparison between the two matrix systems tested after 4 years showed:

- No significant differences in the clinical performance between both matrix systems in any investigated condition or clinical aspect ($p>0.05$), confirming the null hypothesis.
- When both groups were compared to their medians, no difference was observed with regard to proximal contacts ($p>0.05$).
- Additionally, in the radiographic examination, there was no difference between matrices after the 4-year follow-up regarding proximal contact and cervical adaptation ($p>0.05$; Table 3).

In the comparison between 4-year output and baseline data, the following results were observed:

- There was a significant decrease in the restorations' quality considering the percentages of A scores at the 4-year evaluation for the clinical aspects marginal adaptation (40% and 40.4%, score A), marginal staining (31.3% and 28.8%, score A), and roughness (56% and 46.2%, score A) for metallic and translucent matrices, respectively ($p<0.05$).
- There was a significant decrease in the restorations' quality only for translucent matrices considering color match (9.6%, score A, at 4-year evaluation) and occlusal and proximal contacts (75% and 71.7%, score A, at 4-year evaluation, respectively, $p<0.001$).

When comparing the matrix systems through time, there was a statistically significant difference ($p<0.001$) in the following criteria for both systems:

- Marginal adaptation and staining (4-year × baseline; 4 × 1 year; 2 years × baseline; 2 × 1 year, $p<0.001$)
- Surface roughness (4 years × baseline; 4 × 1 year; 4 × 2 years, $p<0.001$)

Discussion

In the present study, the clinical performance of two matrix and wedge systems used in class II composite resin restorations was evaluated after 4 years of clinical service. Our controlled clinical trial has been designed to reduce the possible confounding variables by controlling size and intraoral location of the restorations, operator, working environment, and patients. Hence, all the restorations were placed with both matrix systems tested in the same subject and with the same incremental technique; cavities were sized medium to large with almost all cervical margins placed in enamel. Assessment of the restorations was performed using the modified USPHS criteria, which is largely recommended for clinical comparison between materials and techniques [3, 7, 32].

After 4 years, failures were due to restoration fractures ($n=4$) followed by secondary caries ($n=2$) and pulp necrosis ($n=1$). It is important to highlight that restoration fractures occurred only after 4 years. Our findings corroborate previous clinical studies where caries and fracture of restorations were pointed out as the main reasons for replacement of direct composite resin restorations [7, 26, 33–35].

Comparison between the two matrix systems tested after 4 years showed no significant differences in the clinical performance between both systems in any investigated condition, confirming the null hypothesis. These findings follow the same trend of the baseline [21], 1-year [22], and 2-year evaluations [23] where matrix systems were not a significant factor affecting the clinical performance of class II composite restorations, which is in agreement with another clinical study [18]. However, there are several reasons why our study is important: Although previous studies have shown that fracture is the main reason for replacement of direct composite resin restorations, it is expected that this pattern changes over time where secondary caries overcome fractures [36, 37]. In addition, long-term clinical follow-up of restorations is necessary to confirm the effectiveness of the matrix and wedge systems tested. The radiographic examination showed similar results for both matrices tested, although superior proximal contacts with metallic matrix and ringer retainer device have been demonstrated in other studies [9–11]. The main clinical advantage obtained with metallic matrices is easier handling. Probably, the application of a pre-contoured composite sphere to establish proximal contacts somewhat may have affected the proximal contour, improving the translucent matrices' performance, but further studies should be conducted to clarify this hypothesis. Moreover, there was an overall reduction in proximal contact quality and marginal adaptation for all restorations without significant differences in relation to the matrix system employed. Additionally, our study showed a significant decrease in restoration quality after the evaluated period for several clinical aspects evaluated, but again, this was not statistically different in the comparison between matrix systems. As previously demonstrated, there is some evidence of a decrease in restoration quality and survival with time [3, 7,

24, 26]. This clinical finding could be related to the composite's mechanical properties more than to the difference in polymerization kinetics induced by the distinct polymerization techniques used with the matrix systems (Fig. 1).

The deterioration of color match was more noticed for the group of translucent matrices, but this statistically significant difference is probably a random effect since restorations were placed with both matrix systems in the same subject, and no differences for color match would be expected. The color alterations could be attributed to the pigment's absorption and to dietary and oral hygiene habits [24] instead of to the polishing treatment, which was the same for all restorations in the present study.

Marginal adaptation was impaired by clinical service after 4 years. The slight crevice along the marginal interface could be the result of a fracture of overlapping fine type marginal excess, which formed a ledge that caught the explorer during the follow-up evaluation [38]. Also, the differences in polymerization kinetics caused by the different restorative techniques could have somewhat contributed to gap production and affect sealing ability of composite restorations [39], which can be better observed in long-term evaluations. Marginal staining was significantly increased after 4 years. As previously reported [23], this finding is not directly related to the matrix system but to the degradation potential of the hydrophilic adhesive system, which has been evidenced both in vivo and in vitro [40]. However, if the three-sited polymerization technique used with the translucent matrices and reflective wedges caused some attenuation of the polymerization stress, a lower gap formation could be expected with this technique, which could contribute to a lower marginal staining. Our results do not support this hypothesis since no difference was evidenced between matrix systems in any of the evaluated periods. More importantly, the presence of marginal staining is a common finding with restoration aging, but is not solely a reason for restoration replacement [3].

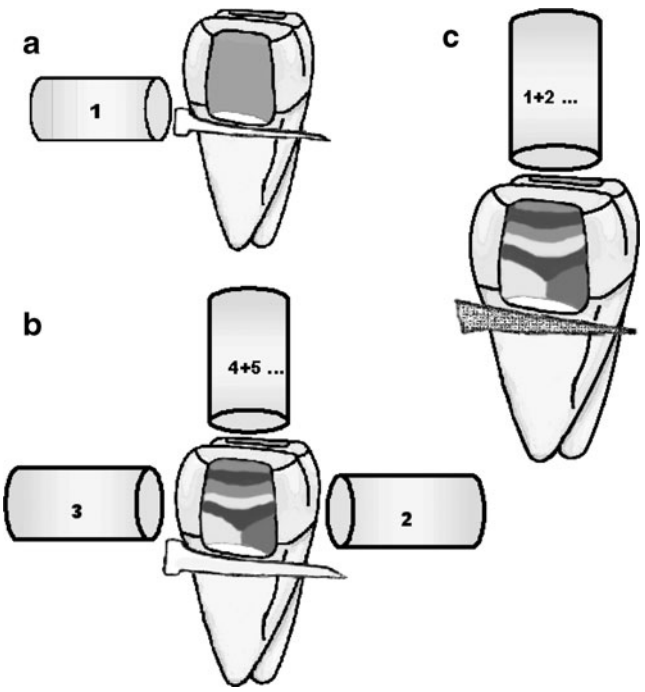

Fig. 1 Composite increment insertion in the proximal boxes and polymerization techniques in the translucent matrix and reflective wedge group (**a**, **b**) and in the metallic matrix and wooden wedge group (**c**)

The anatomic form has not suffered significant alterations during the 4 years of clinical service. The improvement in materials' technology resulted in the production of composites with better mechanical properties, such as wear resistance, which led to the maintenance of occlusal anatomy, with major deteriorations appearing after 10 years of clinical service [3]. However, restorations' surface texture decreased after 4 years of clinical service. This finding is important and should be considered as a more polished surface will provide a lesser abrasive effect of food during mastication, keeping the surface quality for longer periods and contributing to the maintenance of the anatomic form due to the reduction in wear.

Moreover, secondary caries was not a reason for failure, but it could be a significant reason for restoration replacement in periods over 5 years [26]. However, even studies with long clinical service demonstrated that in a dental clinic based on health promotion, secondary caries will not be the reason for restoration failure [3].

Although a decrease in restoration quality has been detected, all in loco assessed restorations were clinically acceptable after 4 years, confirming the adequate performance of composites in posterior teeth [7]. Considering that even restorations placed with old generation resin composites present a satisfactory performance in longer periods [2, 3], it could be hypothesized that restorations carried out with modern composites may present a better performance. Nevertheless, longer periods of evaluation are still necessary to determine if this quality decrease will result in differences of performance between matrix systems. Proximal wear is a matter of concern, and it could be a more important problem than occlusal wear when dealing with composite restorations [41].

Conclusion

No differences between matrix systems were recorded, and restorations were still acceptable after 4 years of clinical practice. However, the quality of restorations tends to decrease over time regardless of the matrix system, especially considering the observed loss of marginal

adaptation and the increase in marginal staining and surface roughness.

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Conflict of interest The authors declare that they have no conflict of interest.

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