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# Long-term clinical evaluation of Dyract compomer in the restoration of non-caries cervical lesions: A 20-year retrospective study

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**Objective:** The restoration of non-caries cervical lesions has long been a challenge. Until recently, compomers were the restorative materials of choice. The aim of this in-vivo study was to evaluate the long-term clinical performance of Dyract restorations in non-caries cervical lesions. **Method and Materials:** Forty-two patients with Dyract restorations of non-caries cervical lesions performed in 1995 by the same operator were included in this in-vivo retrospective study. After 20 years, restorations were evaluated by two calibrated examiners following the USPHS criteria modified by Ryge. **Results:** After 20 years, 38 of the 54 restorations included in this study remain in service (70.4%). Debonding was the cause of all failures. Marginal adaptation and marginal discoloration were the categories with poor values. **Conclusion:** Dyract restorations can be considered a treatment option for non-caries cervical lesions, because they show good long-term clinical performance for 20 years. **Clinical Relevance:** Dyract restorations continue to be an option to restore non-caries cervical lesions, due their good long-term clinical performance and the ease of the clinical procedure. The survival rate of these Dyract restorations was high after 20 years (70.4%). However, the limitations of marginal discoloration, marginal adaptation, and color match should be considered. *(Quintessence Int 201#;##:1–6; doi: 10.3290/j.qi.a38556)*

**Key words:** class V, compomer, Dyract, longevity, non-caries cervical lesion, polyacid-modified composite resin

Non-caries cervical lesions (NCCLs) are commonly diagnosed in clinical practice,[1] and how to treat them has long been a challenge.[2,3] Since the 1990s, several tooth-colored materials have been proposed to restore NCCLs, including conventional and resin-modified glass-ionomer cements (RMGICs), polyacid-modified composite resins (compomers), and composite resins.[1,2,4]

Nowadays, composites are indicated for restored NCCLs, based on their excellent esthetic properties and their good clinical performance;[4] until recently, the materials of choice for restored NCCLs were resin-modified glass-ionomers and compomers.[2,5]

Compomers are polyacid-modified composite resins, which combine the esthetics of traditional composite resins with the fluoride release and the adhesion of glass-ionomer cements.[6] Also, not all compomers have the same clinical performance, because their properties vary between products according to their formulation.[6]

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**Table 1** Clinical rating scale of the categories analyzed according the USPHS criteria modified by Ryge[7]

| Category and rating | | Criteria |
|---|---|---|
| Anatomical form | Alpha (A) | The restoration is not undercontoured, that is, the restorative material is not discontinuous with the existing anatomical form. |
| | Bravo (B) | The restoration is undercontoured, that is, the restorative material is discontinuous with the existing anatomical form, but sufficient restorative material remains so as not to expose the dentin or base. |
| | Charlie (C) | Sufficient restorative material is missing so as to expose the dentin or base. |
| Marginal adaptation | Alpha (A) | There is no visible evidence of a crevice along the margin into which the explorer will penetrate. |
| | Bravo (B) | There is visible evidence of a crevice along the margin into which the explorer will penetrate. The dentin or base is not exposed. |
| | Charlie (C) | There is visible evidence of a crevice along the margin into which the explorer will penetrate. The dentin or base is exposed. |
| | Delta (D) | The restoration is fractured or missing in part or in total. |
| Color match | Alpha (A) | There is no mismatch in color, shade, and/or translucency between the restoration and the adjacent tooth structure. |
| | Bravo (B) | There is a mismatch in color, shade, and/or translucency between the restoration and the adjacent tooth structure, but the mismatch is within the normal range of tooth color, shade, and/or translucency. |
| | Charlie (C) | The mismatch between the restoration and adjacent tooth structure is outside the normal range of tooth color, shade, and/or translucency. |
| Marginal discoloration | Alpha (A) | There is no discoloration anywhere on the margin between the restoration and the tooth structure. |
| | Bravo (B) | There is discoloration at some point on the margin between the restoration and the tooth structure, but the discoloration has not penetrated along the margin of the restorative material in the pulpal direction and can be removed by polishing. |
| | Charlie (C) | The discoloration has penetrated along the margin of the restorative material in the pulpal direction. |
| Surface texture | Alpha (A) | Surface of restoration is smooth. |
| | Bravo (B) | Surface of restoration is slightly rough or pitted, and can be refinished. |
| | Charlie (C) | Surface is deeply pitted, contains irregular grooves (not related to anatomy), and cannot be refinished. |
| | Delta (D) | Surface is fractured or flacking. |
| Secondary caries | Alpha (A) | There is no evidence of caries contiguous with the margin of the restoration. |
| | Charlie (C) | There is evidence of caries contiguous with the margin of the restoration. |

Dyract (Dentsply-DeTrey) was the first compomer, introduced in 1993. It was initially advertised with an adhesive named Dyract-PSA (Dentsply-DeTrey).

The aim of this in-vivo study was to evaluate the long-term clinical performance of Dyract restorations in non-caries cervical lesions.

## METHOD AND MATERIALS

### Study design and patient selection

This retrospective observational study was developed in a private dental practice in Santiago de Compostela, Spain. The Ethics Committee on Investigations Involving Human Subjects of the University of Santiago de Compostela approved the protocol of this study. At the time of the evaluation, patients signed written informed consent for inclusion in the study.

In 2015, adult patients with restorations of NCCLs performed with Dyract in 1995 were called and invited to participate in the study. Participants had to be in continuous follow-up, with at least one annual recall, and the clinical history had to include all the information related to the clinical procedure of the restorations, including photographs. No more than two restorations per patient were evaluated, to avoid the influence of patient characteristics on the results. Forty-two patients, 23 men and


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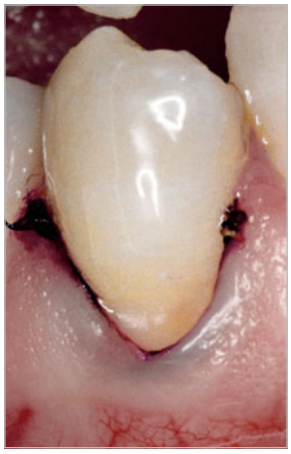

**Fig 1a** Preparation of the NCCL to be restored.

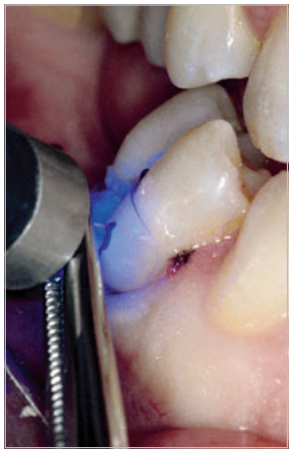

**Fig 1b** Light curing of the Dyract compomer trough the transparent cervical matrix.

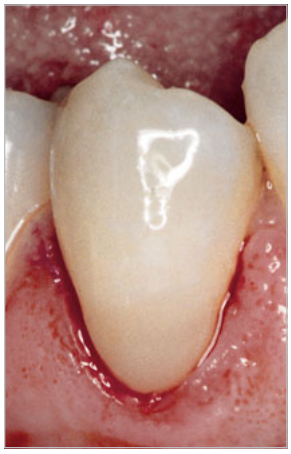

**Fig 1c** Immediate appearance of the restoration in the mandibular right first premolar.

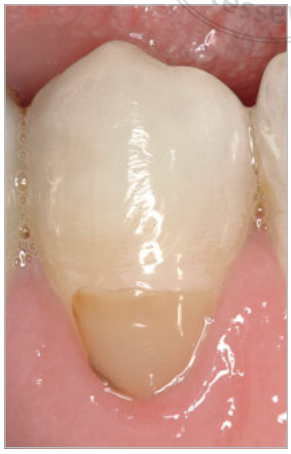

**Fig 1d** Cavosurface marginal discoloration, overcontouring, and color mismatch after 20 years.

19 women, with a mean age of 41.9 ± 12.2 years in 1995, accepted to participate.

## Clinical procedures

All restorations were performed by the same operator (VAP). NCCLs were cleaned with a rubber cup impregnated with pumice powder and water at low speed. The teeth were isolated with cotton rolls and non-impregnated retraction cord (Ultrapack 0-00, Ultradent). No mechanical preparation and no etching were performed. The Dyract-PSA adhesive was applied according to the manufacturer's instructions. The required amount of the compomer (Dyract) was placed along the transparent cervical matrix (Hawe Neos Dental) and firmly applied on the tooth. Excess was immediately removed and Dyract was light cured through the matrix. The cervical margin was finished and polished with tungsten carbide burs with a non-active tip (Komet-Brasseler H132F and H132UF), and the facial surface was polished with silicone tips (Komet-Brasseler 9523 UF). Finally, the absence of ledges at the margins was checked with a probe.

## Evaluation of restorations

Two calibrated examiners (MCV, ILD) evaluated the restorations following the United States Public Health Service (USPHS) criteria modified by Ryge,[7] and described by Barnes et al.[8] Anatomical form, marginal adaptation, color match, marginal discoloration, surface roughness, and secondary caries were assessed (Table 1). Examiners evaluated the restorations separately, and when disagreement occurred, an interexaminer consensus was reached. The cause of failure of the restorations that were lost prior to the evaluation visit was obtained from the patient's clinical history. The initial aspect of the restorations was evaluated with pre-, intra-, and postoperative slides taken with a digital camera (F-801, Nikon) and a macro lens (Medical Nikkor, 120 mm objective, Nikon) during the restorative appointment. Prior to the evaluation of the restorations, the slides were scanned with the SF-210 Super Coolscan 5000 ED (Nikon) and digitalized. Examples of evaluated restorations are shown in Fig 1.

## Statistical analysis

Absolute values and frequency distributions were used for illustration the results of the restorations' evaluation. The survival function was analyzed using the Kaplan-Meier estimator. The statistical software SPSS 21 (IBM) was used for statistical analysis.

**Table 2** Results of the evaluation of the restorations that survived according to USPHS criteria

| USPHS criteria category | | Result, % (n) |
|---|---|---|
| Anatomical form | A | 68.4% (26) |
| | B | 31.6% (12) |
| | C | 0.0% (0) |
| Marginal adaptation | A | 10.5% (4) |
| | B | 89.5% (34) |
| | C | 0.0% (0) |
| | D | 0.0% (0) |
| Color match | A | 58.0% (22) |
| | B | 42.0% (16) |
| | C | 0.0% (0) |
| Marginal discoloration | A | 21.0% (8) |
| | B | 78.9% (30) |
| | C | 0.0% (0) |
| Surface texture | A | 73.7% (28) |
| | B | 26.3% (10) |
| | C | 0.0% (0) |
| | D | 0.0% (0) |
| Secondary caries | A | 100% (38) |
| | C | 0.0% (0) |

A, Alpha; B, Beta; C, Charlie; D, Delta.

## RESULTS

Fifty-four NCCLs restored with Dyract were included in this study. The distribution of the restorations was: 3 in maxillary incisors, 8 in mandibular incisors, 5 in maxillary canines, 6 in mandibular canines, 12 in maxillary premolars, 10 in mandibular premolars, 4 in maxillary molars and 6 in mandibular molars. At baseline, all restorations showed Alpha values in all of the USPHS criteria.

After 20 years, 38 of the 54 restorations remain in service (70.4%). All failures were due to debonding of the restorations. The values assigned to the remaining restorations according to the USPHS criteria are shown in Table 2.

The Kaplan-Meier survival analysis (Fig 2) shows that 52 of the 54 restorations had survived 5 years (at this time, the survival rate was 96.3%); after 10 years the survival rate was 77.8% (12 restorations failed).

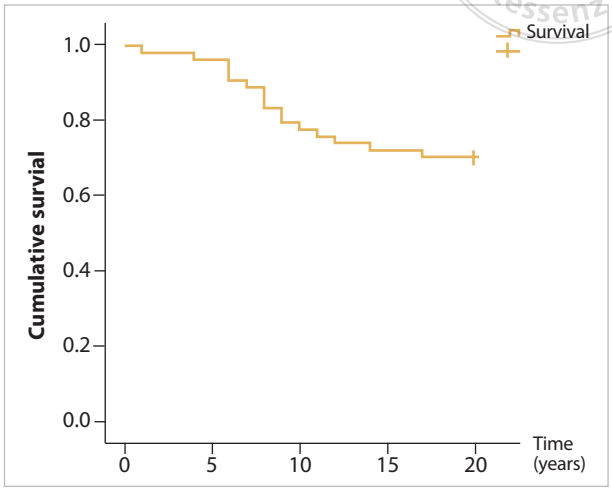


**Fig 2** Accumulated survival function using Kaplan-Meier analysis.

## DISCUSSION

The results of the present study validate the statement that compomers are suitable for use in NCCLs restorations.[6] Dyract restorations showed good long-term clinical results, with a high survival rate after 20 years.

The results of the clinical evaluation of Dyract restorations in NCCLs with the USPHS criteria vary between studies (Table 3).[9-15] Also, the survival rate of NCCLs restorations with Dyract varies from 83.3%,[15] 90%,[9] 96%,[14] to 100%[10] after 2 years; 79%[13] to 89%[16] after 3 years; 78.5%[12] to 82%[11] after 5 years; 75% after 7 years;[17] and 43.4% after 13 years of follow-up.[18] Compared to the previous articles, the survival rate of the restorations included in this article (70.4%) follows the tendency of the articles up to 7 years of follow-up. Earlier evaluations of Dyract restorations of NCCLs were in the short and medium term; however, the present study is the first with a long-term follow-up, up to 20 years.

The main cause of failure of compomer restorations of NCCLs is the debonding of the restorations,[9-15,17,18] as occurred in the present study. Commonly, compomer restorations do not fail due to secondary caries,[9,11-15,17,18] owing to the intrinsic fluoride release of the material, which is cariostatic.[19]

Since the introduction of compomers, the bonding technique recommended by manufacturers has varied.


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**Table 3** USPHS criteria values of Dyract restorations in non-caries cervical lesions

| | | | Ermiş[9] | Abdalla and Alhadainy[10] | Folwaczny et al[11] | Loguercio et al[12] | Burgess et al[13] | Türkün and Celik[14] | Stojanac et al[15] |
|---|---|---|---|---|---|---|---|---|---|
| Follow-up (y) | | | 2 | 2 | 5 | 5 | 3 | 2 | 2 |
| Evaluated restorations (n) | | | 18 | 18 | 28 | 16 | 30 | 50 | 30 |
| USPHS criteria category | Anatomical form | A | 100.0% | 100.0% | 75.0% | 87.5% | 95.0% | 100.0% | 0.0% |
| | | B | 0.0% | 0.0% | 0.0% | 12.5% | 0.0% | 0.0% | 0.0% |
| | | C | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Marginal adaptation | A | 90.0% | 83.3% | 65.6%* | 38.5% | 42.0% | 96.0% | 68.0% |
| | | B | 0.0% | 16.7% | 0.0% | 61.5% | 0.0% | 4.0% | 24.0% |
| | | C | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 8.0% |
| | | D | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Color match | A | 94.0% | 88.9% | 81.3% | 81.8% | 0.0% | 98.0% | 0.0% |
| | | B | 6.0% | 11.1% | 0.0% | 18.2% | 0.0% | 2.0% | 0.0% |
| | | C | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Marginal discoloration | A | 100.0% | 100.0% | 62.5%* | 18.2% | 74.0% | 92.0% | 72.0% |
| | | B | 0.0% | 0.0% | 0.0% | 81.8% | 0.0% | 8.0% | 28.0% |
| | | C | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Surface texture | A | 0.0% | 0.0% | 93.8% | 100.0% | 94.0% | 96.0% | 92.0% |
| | | B | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 4.0% | 8.0% |
| | | C | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | | D | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Secondary caries | A | 100.0% | 0.0% | 0.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| | | C | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

A, Alpha; B, Beta; C, Charlie; D, Delta.
*Mean of values for the margins in enamel and dentin.

Several studies stated the need for prior etching in compomer class V restorations, in order to achieve strong bonding to the enamel and thus avoid poor material retention.[20-22] In the present study, the cavities were not etched and for marginal adaptation and marginal discoloration the majority of the values were Bravo. However, Stojanac et al,[15] who etched the enamel and dentin surfaces, and other authors who used self-etch adhesive systems,[9,14] obtained Alpha values in these categories. Therefore, the etching of the cavity prior to the application of the adhesive and the compomer in NCCLs is recommended.

Some studies compared composite resin and compomer restorations in NCCLs using a self-etch adhesive, and at the 3-year evaluation the retention rates were similar (86.6% for composite resin and 86.7% for compomer),[23] or better for compomer restorations in some categories of the USPHS criteria.[24] However, after 2 and 3 years of evaluation, other authors observed that the clinical performance according to the USPHS criteria was slightly worse for the compomer restorations.[13,25] Therefore, although composite resins are indicated for restored NCCLs,[5] the short-term comparisons between the materials showed that both had similar clinical performance. Also, the survival rate of composite restorations after 18 years is higher (96.5%),[26] but both materials achieve good long-term clinical results.

## CONCLUSION

The good long-term clinical results observed indicate that compomers are suited for restoration of non-caries cervical lesions. The survival rate of Dyract restorations after 20 years is high. Marginal adaptation and marginal discoloration were the categories with more Bravo values.

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