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Retrospective evaluation of posterior direct composite restorations: 10-Year findings

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ABSTRACT

Objectives. This 10-year retrospective study investigated the differences in the changes and the longevity of Class II restorations using 4 similar microhybrid resin composites (Filtek Z250, Herculite XR, Gradia Direct Posterior, Renew).

Methods. Data were collected from patient records. Those patients who received posterior restoration between 2001 and 2003, and who still visited the clinical practice for regular check-up visits were selected. A total of 225 adult patients (86 males, 139 females) with 701 restorations were evaluated by 2 operators using the USPHS criteria. Data were analyzed with Fisher's Exact Test, Pearson's Chi-Square Test and Kaplan–Meier analysis ($p < 0.05$).

Results. A failure rate of 2.1% was detected. The reasons of failures included restoration fracture, secondary caries and endodontic treatment. Similar survival rates for Gradia Direct Posterior (91.25%) and Renew (92.19%) were observed; better performance was observed with the Filtek Z250 (99.1%) and Herculite XR (98.64%). There was a higher probability of failure in 3 surface ($n = 10$) than in 2 surface ($n = 5$) restorations ($p < 0.001$), and this rate was similar when molars ($n = 8$) and premolars ($n = 7$) were compared. The most frequent but clinically acceptable deficiency was the marginal discoloration.

Significance. All four microhybrid resin composites showed acceptable clinical durability in Class II restorations during the 10-year follow-up period, with an overall survival rate of >97.8%. Higher rates of failures and deficiencies were observed with the Renew (fracture) and Gradia Direct Posterior (color match), respectively.

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1. Introduction

In recent years, resin composite (RC) has been considered a suitable, direct posterior filling material, and it has exhibited

acceptable survival rates in clinical studies [1–3]. Hybrid RCs can be considered the best materials for posterior restorations because these materials performed the most adequately in clinical studies [4]. The latest generation of microhybrid RCs contains 0.5–1.0- μm filler particles of glass or zirconium and

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smaller amounts of colloidal silica particles (40 nm in size), resulting in lower shrinkage and improved polish retention and better esthetics.

Factors related to the material's characteristics, to the patient, operator, to the tooth and cavity size have been reported in the literature as potentially relevant for restoration failures [1,2,5–7], although evidence of high failure rates in the short- to long-term are seldom found in clinical studies investigating hybrid RCs [8–11].

Meanwhile, considerable differences exist in the properties of the commercial RCs. These differences mainly include the filler loading level, particle material, morphology, size and matrix characteristics [12–14]. The elastic modulus, wear resistance, hardness and other properties of these different types of RCs have been shown to be fairly variable in *in vitro* studies, affecting the durability of specific RC materials [13,15,16]; however, large differences in clinical behavior have not yet been demonstrated [7,17]. There are many clinical trials which investigate the differences in the longevity of RC materials with different characteristics [8,11,18], however there are only a few studies which compare the long term durability of RCs from the same class, i.e. microhybrids [19].

The dentist's choice from the wide range of RCs on the market depends on many factors. The indication area, handling, polishing ability and the price are only a few potential factors. The longevity of a RC is an important factor in material selection. To estimate how long the posterior RC restorations last, long-term studies are needed to identify the modes of failure and the possible reasons for these failures.

The most commonly published evaluations are prospective studies, and according to their results, the routine application of RCs in the molar region is relevant [3,8,10,11,20,21]. Restoration longevity may be assessed by randomized controlled clinical trials, prospective and retrospective studies, cross-sectional analysis and cohort studies. Long term studies are a real challenge to perform, as study populations wear out and recall rates tend to drop to low levels. Retrospective longitudinal studies have shown to be able to result in observation times of more than 10 years [1,2,7,19,23]. However, some problems are known in relation with the retrospective design. It results in an obvious lack of standardization of indication and treatment protocols, although if conditions are well described and performed by one or just a few operator, the potential of the restorative material may be reflected [1,2,19].

According to short- and long-term prospective and retrospective studies, the most frequent defects and failures are fractures, secondary caries and marginal leakage formation [9,22,24–28].

The purpose of this retrospective study was to investigate the longevity of Class II posterior restorations, according to the USPHS criteria, in clinical practice using 4 microhybrid RCs with slightly different filler types and resin matrix characteristics. Further aims were to evaluate the most frequent defects and determine their correlation with the size and material of the restoration and to compare the frequency of the defects in the molar and the premolar regions. The null hypothesis stated that, when placed in Class II preparations in adults, the durability of the direct placement of RC restorations from

4 microhybrid RC materials in molars and premolars with different cavity types would not be significantly different after 10 years.

2. Materials and methods

2.1. Patients' selection

For this retrospective study, 225 adult patients were selected according to pre-determined inclusion criteria from the registers of a Hungarian clinical practice (University of Pécs), from January 2001 to December 2003. The drop-out rate is presented in Fig. 1. The inclusion criteria were the following: good oral hygiene, absence of any pulpal and periodontal disease from the tooth to be restored, absence of known allergic symptoms for dental resins, being able to control the moisture during the restorative procedure. Furthermore, patients who were selected for the study had full dentition and normal occlusion, as verified by the clinical and radiographic records, and these patients had remained in continuous clinical follow-up for the last 9–11 years, including at least 1 annual recall without attending other dentists. Reasons for placement of RC were primary caries and the choice of using RC and not amalgam was requested by the patients because of esthetic or non-metallic reasons. Further requirements had to be fulfilled in order for the placement of RC: the oro-vestibular size of the cavity should not be bigger than the 1/3–2/3 of the oro-vestibular cusp-cusp distance; the margins are placed on enamel; there were no missing cusps. The restorations were placed using one of the 4 microhybrid RCs composed of slightly different material properties. Some important material data are shown in Table 1. The patients gave their written, informed consent prior to the start of the clinical evaluation, and 2 authors (EL and TF) carried out the clinical examinations. The study protocol was approved by the Regional Research Ethics Committee of University of Pécs (3410.1/2009). The patients had 701 Class II RC restorations in their permanent molars and premolars. The patient group consisted of 86 male and 139 female patients, with ages ranging from 21 to 55 years old. The type and number of restorations of the teeth included in the study are shown in Table 2.

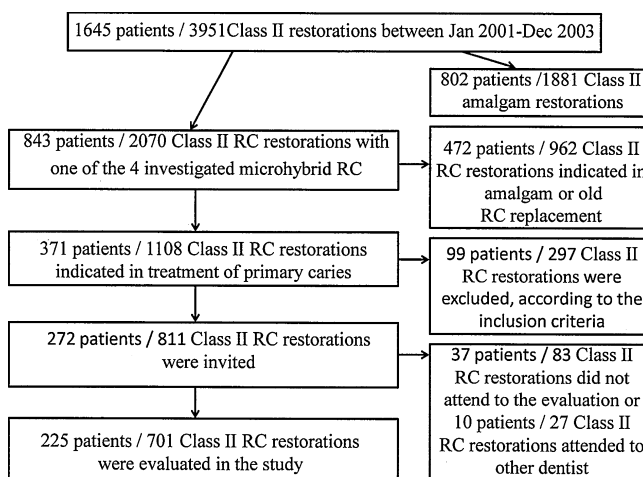


Fig. 1 – Drop-out figure.

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