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Review

Cervical margin relocation in indirect adhesive restorations: A literature review

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ABSTRACT

Purpose: The aim of this review was to summarize the existing scientific literature investigating on cervical margin relocation technique (CMR) performed prior to the adhesive cementation of the indirect restorations.

Study selection: An electronic search with no date restriction was conducted in the MEDLINE database, accessed through PubMed. The following main keywords were used: “cervical margin relocation”, “coronal margin relocation”, “deep margin elevation” and “proximal box elevation”.

Results: Seven *in vitro* studies and 5 clinical reports investigating on CMR are taken into consideration for the present review. The most frequently investigated parameter in almost all of the *in vitro* studies was the marginal adaptation of the indirect restorations. One study additionally assessed the influence of CMR on the fracture behavior of the restored teeth and one study assessed the bond strength of the indirect composite restoration to the proximal box floor. Clinical reports provided documentation with a detailed description of the treatment protocol. In the current literature no randomized controlled clinical trials or prospective or retrospective clinical studies on CMR technique could be found.

Conclusions: On the basis of the reviewed literature, it can be concluded that currently there is no strong scientific evidence that could either support or discourage the use of CMR technique prior to restoration of deep subgingival defects with indirect adhesive restorations. Randomized controlled clinical trials are necessary to provide the reliable evidence on the influence of CMR technique on the clinical performance, especially on the longevity of the restorations and the periodontal health.

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1. Introduction

Restoring large posterior defects with proximal caries extending below the cemento-enamel junction (CEJ) and cavity margins located beneath the gingival tissues represents a very common clinical situation. Due to advances in adhesive technology, development of modern materials and increasing aesthetic requests, a treatment plan in such cases often includes indirect adhesive restoration [1,2]. Unfortunately, when restoring cavities with deep cervical margins two major clinical problems may occur: problems of biological nature and technical-operative problems [3].

The biological problems refer to the possible violation of the “biological width”, a recommended distance of 3 mm or more

between the restorative margins and the alveolar crest that is considered necessary in order to avoid detrimental effects on neighboring soft and hard periodontal tissues [4]. If the principle of biologic width is not respected, it is suggested to obtain the necessary space in one of two ways: surgically, by surgical crown lengthening [5] or orthodontically, by tooth extrusion [6].

The technical-operative problems start with difficulties in tooth preparation in subgingival areas and are followed with a series of challenges in the impression taking, the adhesive cementation of the restoration and the successive phases of finishing and polishing of the margins [7]. Most of the above mentioned issues are related to inferior insight and access to the deep parts of the cavity and impossible or inadequate isolation of the operating field with a rubber dam, which leads to inappropriate moisture control and blood and/or saliva contamination throughout the clinical procedures [8].

To make the clinical procedures simpler and less fault-prone, Dietschi and Spreafico in 1998 introduced a technique named “cervical margin relocation” (CMR) [9]. In 2012 Magne and Spreafico

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referred to the same technique as “deep margin elevation” (DME) [10]. Similar names, such as “coronal margin relocation” and “proximal box elevation”, could also be heard among the practitioners and found in the literature. This technique proposes application of composite resin in the deepest parts of the proximal areas in order to reposition the cervical margin supragingivally, which is supposed to facilitate the isolation and improve impression taking and adhesive cementation of indirect restorations [9,10]. The CMR technique could be considered, to a certain extent, as a non-invasive alternative to a surgical crown lengthening.

The problem of extensive subgingival defects that still remains, regardless of the technique applied, is limited or no enamel present at deep cervical margins, leaving only dentin and cementum as the main substrates for adhesion. Adhesive bonding to the etched enamel is proved to be efficient and stable [11]. Adhesion to dentin, on the other hand, depends on numerous factors related to the substrate morphology [12], on the type of the adhesive [13] and on the sensitive application technique [14]. Therefore, adhesive bonding to deep cervical dentin and maintaining the margins of the adhesive restoration sealed throughout the time could not be considered entirely predictable and safe.

Whether the CMR technique is the most optimal treatment option for the restoration of deep cavities reaching below CEJ, how the proposed advantages and possible disadvantages could affect the clinical performance of the indirect restorations and which are the most appropriate materials and techniques that should be applied in such situations are the topics extensively discussed among clinicians. Nevertheless, not much scientific support could be found in the currently available literature. Therefore, the aim of this review was to summarize the existing scientific knowledge on CMR technique performed prior to the adhesive cementation of the indirect restorations.

2. Study selection

2.1. Search strategy

For the identification of the studies to be included in this review, an electronic search with no date restriction was conducted in the MEDLINE database, accessed through PubMed. The following main keywords were used: “cervical margin relocation”; “coronal margin relocation”; “deep margin elevation” and “proximal box elevation”. A further manual search was performed as well; checking for eligible papers in the bibliographies of the initially retrieved articles and exploring the websites of the relevant journals.

2.2. Inclusion criteria

The present review sought only for articles where composite resin materials were used as materials for relocation of the cervical margin. Only articles considering indirect adhesive restoration, as a type of final restoration, were included. Because no randomized controlled clinical trials (RCTs) existed in this field, descriptive studies that made reference to the CMR clinical procedure were also included. The search was limited to the articles published in English language.

2.3. Exclusion criteria

Publications focusing on relocation of the cervical margin using glass ionomer cements were not included in the present review. Studies that used teeth without a restoration or teeth restored with a direct composite restoration with subgingival cervical margin were also excluded. Articles in any language other than English were left out.

The search and the selection process carried out by two review authors independently finished on 1st June 2017. After the screening of the titles and the abstracts, full texts of all reviewed articles were obtained and carefully read. Upon the discussion between the authors, on the basis of the reported inclusion and exclusion criteria, 7 *in vitro* studies, 1 review article with a case report and 4 articles describing the CMR technique were selected for the present literature review.

3. Results

The results of the reviewed studies were categorized and presented in two main parts: (1) review of *in vitro* studies and (2) review of clinical reports.

3.1. Review of *in vitro* studies

In the current scientific literature 7 *in vitro* studies investigating on CMR are taken into consideration for the present review [15–21]. The most frequently investigated parameter in almost all of the studies was the marginal adaptation of the indirect restorations [15–19,21]. Only one study additionally assessed the influence of CMR on the fracture behavior of the restored teeth [18] and one study assessed the bond strength of the indirect composite restoration to the proximal box floor [20]. The overview of the main characteristics, the materials employed and the designs of the reviewed studies are reported in Table 1.

3.1.1. Marginal adaptation

All 6 studies that evaluated the influence of CMR on the marginal quality of the adhesively luted restorations performed the analysis using the scanning electron microscopy (SEM), observing the margins on gold-sputtered epoxy resin replicas of the teeth at 50× [19] and 200× magnification [15–18,21]. The marginal integrity was calculated in the same way, as the percentage of continuous margin in relation to the individual assessable margin, following the well-established protocol consistent with previous studies [22]. The quality of the marginal adaptation was assessed before and after thermo-mechanical loading (TML) [15–19,21]. However, the adhesive interfaces that were observed and analyzed were not always the same in all of the studies.

Most of the studies supported the fact that no differences existed in marginal quality of the restorations placed directly on dentin, following the conventional luting procedure, or on composite restorations used for relocation of the cervical margin [15,17–19,21]. One study recorded that, only after being subjected to TML, conventional technique showed superior marginal adaptation compared to CMR technique [16]. Moreover, in most of the studies TML was found to significantly deteriorate the integration at enamel and dentin margins [15–17] and at onlay/luting composite interface [18]. But it was also recorded that TML did not result in inferior marginal quality, regardless of the materials tested [19,21].

With regard to the materials employed for CMR, one study investigated on the performance of flowable and conventional restorative composite materials when used for CMR [19]. No significant differences in the marginal integrity were found between traditional or flowable composite, before or after TML, for either ceramic or composite CAD/CAM crown [19]. The potential use of self-adhesive resin cements as material for CMR, although deviant from their original indication spectrum, has been explored due to their easy clinical manipulation that could be appealing for dental practitioners [15,16]. Based on the discouraging results obtained and significantly inferior quality of the marginal adaptation to dentin, they were not recommended for

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