Review article

Rehabilitation of severely worn teeth: A systematic review

Mauro Elias Mesko[a], Rafael Sarkis-Onofre[a], Maximiliano Sérgio Cenci[a],
Niek Johannes Opdam[b], Bas Loomans[b], Tatiana Pereira-Cenci[a,*]

[a] Graduate Program in Dentistry, Federal University of Pelotas, Pelotas, Brazil
[b] Radboud University Medical Center, Radboud Institute for Molecular Life Sciences, Department of Dentistry, Nijmegen, The Netherlands

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ABSTRACT

Objectives: The aim of this systematic review was to evaluate the treatment performance/longevity of dental materials/techniques indicated to restore teeth with severe wear.
Materials and methods: A systematic literature search was conducted to select retrospective studies (cohort and case series) and prospective studies that evaluated or compared techniques/materials to restore teeth with severe wear. A search was conducted in Medline (via Pubmed – June 2015) with no limits for publication year or language to identify clinical studies. Two reviewers independently selected studies, extracted data and assessed the risk of bias of randomized controlled trials included. The annual failure rate (AFR%) of restorations was calculated for each study.
Results: A total of 511 articles were found and 23 studies were eligible for full-text analysis; hand search included 7 more papers. From the 30 studies, 12 were eligible for the review. Most of these studies presented good performance of the restorations in teeth with severe wear. AFR ranged from 0.4% (microhybrid) to 26.3% (microfilled) for direct resin composite, 0% to 14.9% for indirect resin composite and 2.7% for porcelain veneers.
Conclusion: There is no strong evidence to suggest that any material is better than another. Direct or indirect materials may be feasible options to restore severely worn teeth.

1. Introduction

Tooth wear is loss of dental hard tissue due to non-carious processes, and can be identified as attrition, abrasion, or erosion [1]. Tooth wear may impact on an individual's perception of daily life and should be carefully considered [2,3]. Moreover, an increased incidence of tooth wear is reported in young populations, which could represent an emerging dental problem for future generations [4,5]. Irrespective of epidemiological concerns or even etiological factors, at an individual level, tooth wear may become severe and in many clinical situations, a restorative treatment has to be considered, because severe tooth wear may result in loss of vertical dimension of occlusion, tooth sensitivity, decreased oral health related quality of life and aesthetic complaints [6]. In these cases, the choice of the restorative strategy should be based on evidence-based treatment protocols. However, the most common published studies are single case reports or case series showing direct and indirect restorative techniques.

The traditional restorative treatment for greater amounts of tooth loss is the fabrication of indirect restorations and onlays instead of the use of direct approaches [6]. Recently, "minimally invasive treatment concepts" with partial covering all-ceramic restorations became also recommended [7]. However, direct resin composites have the potential for direct rehabilitation of severely worn dentitions as well, with the advantages of having relatively low cost and preservation of sound tooth tissues, once this approach is less invasive than tooth preparation for indirect restorations [8]. The current adhesive techniques allow minimal or even no preparation of teeth [9], include possibilities for repair or substitution of direct restorations in an easier way compared to indirect approaches [10,11]. Yet, quality of direct restorations is more dependent on the operator, and long-term esthetical properties of direct dental materials may be limited when compared to indirect restorations [12].

A recent systematic review investigating the performance composites used to restore severely worn anterior teeth demonstrated a good performance of this material in short/medium time of follow-up [13]. However, the focus of this review was in the use

* Corresponding author at: Graduate Program in Dentistry, Federal University of Pelotas, Brazil, R Gonçalves Chaves 457, Pelotas, RS 96015-560, Brazil.
E-mail address: Tatiana.cenci@ufpel.tche.br (T. Pereira-Cenci).

composites in the anterior teeth and there is still a lack of uniformity in guidelines and policies regarding the optimal technique and/or material to restore severely worn teeth.

As the rehabilitation of severely worn teeth usually include an extensive treatment at considerable cost, there is a need to identify the one combining the best relative cost-effective with the most acceptable longevity and with the greatest benefit to the patient, for the longest period of time, among the current available alternatives. Thus, the aim of this systematic review of clinical studies was to evaluate treatment performance of various dental materials and techniques to restore teeth with severe wear.

2. Materials and methods

This systematic review was based on the guidelines of Cochrane Handbook for Systematic Reviews of Interventions [14] and the reporting based on PRISMA Statement [15]. Medline was searched without restriction on language or publishing date (Table 1) [16]. The search was made to identify manuscripts meeting the following inclusion criteria: clinical studies that evaluated or compared techniques or materials to restore teeth with severe wear. Case reports or clinical studies that evaluated materials/techniques to restore non-carious cervical lesions were excluded.

Two researchers (MEM and RSO) carried out independently the literature search (June 2015) by first analyzing titles and abstracts for relevance and presence of the selection criteria listed above. The full text articles of included and uncertain records were obtained for further eligibility screening by the same two reviewers. In the event of an unsettled disagreement, the opinion of another co-author (TPC) was used. In case of identification of the same research in distinguished papers, the paper with the highest follow-up was included. References of all papers included were searched to identify any further relevant studies.

Two reviewers extracted all data simultaneously but independently using a standardized outline. The estimate probabilities were calculated considering the mean time of follow-up or the estimate reported in the paper. The annual failure rate (AFR) of the investigated restorations was calculated according to the formula: $(1-y)^z = (1-x)$, in which 'y' expresses the mean AFR and 'x' the total failure rate at 'z' years. Randomized clinical trials included in the review were assessed for bias using the Cochrane risk of bias tool by two researchers independently. The risk of bias of non-randomized studies was assessed with Downs and Black Scale.

3. Results

A total of 511 articles were found and 23 articles were eligible for full-text analysis. Hand searches of references of these papers resulted in 7 more papers to be included for full text reading. From the resulting 30 studies, 12 papers were included in the review. Eighteen studies were excluded for the following reasons: 7 studies were case reports, 2 studies evaluated materials/restorations in non-carious cervical lesions, 2 studies evaluated wear between material/teeth, 2 studies evaluated restorations in teeth without wear, 2 studies were technique descriptions, 1 study evaluated restorations to correct tooth form and position, 1 paper is the first follow-up publication of the study of Al-Khayatt et al. [17] and 1 paper the first follow-up publication of the study of Gulamali et al. [18] (Fig. 1).

As the selected studies showed heterogeneity in experimental designs and different clinical criteria for analysis, a *meta*-analysis was not possible. As a *meta*-analysis can only be planned if a

Table 1
Search strategy.

(((("Dental Restoration, Permanent"[Mesh] OR "Permanent Dental Restoration" OR "Restoration, Permanent Dental" OR "Restorations, Permanent Dental" OR "Dental Restorations, Permanent" OR "Permanent Dental Restorations" OR "Dental Permanent Fillings" OR "Fillings, Permanent Dental" OR "Permanent Dental Fillings" OR "Permanent Fillings, Dental" OR "Permanent Filling, Dental" OR "Dental Filling, Permanent" OR "Dental Permanent Filling" OR "Filling, Dental Permanent" OR "Filling, Permanent Dental" OR "Permanent Dental Filling" OR "Fillings, Dental Permanent" OR "Dental Fillings, Permanent"))) AND (("Tooth Wear"[Mesh] OR "Tooth Wears" OR "Wear, Tooth" OR "Wears, Tooth" OR "Dental Wear" OR "Dental Wears" OR "Wear, Dental" OR "Wears, Dental"))) AND ((randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized controlled trials[mh] OR random allocation[mh] OR double-blind method[mh] OR single-blind method[mh] OR clinical trial[pt] OR clinical trials[mh] OR ("clinical trial"[tw]) OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR ("latin square"[tw]) OR placebos[mh] OR placebo*[tw] OR random*[tw] OR research design[mh:noexp] OR follow-up studies[mh] OR prospective studies[mh] OR cross-over studies[mh] OR control*[tw] OR