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Review

Clinical efficacy of composite *versus* ceramic inlays and onlays: A systematic review☆

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ABSTRACT

Objectives. Large tooth substance losses are frequent in posterior teeth because of primary caries or aging restorations. Inlays and onlays are often the minimal invasive solution in such cases, but the efficacy of the composite and ceramic materials used is unknown. We performed a systematic review of randomized controlled trials comparing the efficacy of composite and ceramic inlays or onlays.

Data sources. MEDLINE, Embase and the Cochrane Central Register of Controlled Trials were searched without any restriction on date or language, as were references of eligible studies and ClinicalTrials.gov.

Study selection. Eligible studies were randomized trials comparing the clinical efficacy of composite to ceramic inlays or onlays in adults with any clinical outcome for at least 6 months. From 172 records identified, we examined reports of 2 randomized controlled trials involving 138 inlays (no onlays evaluated) in 80 patients and exhibiting a high-risk of bias. Outcomes were clinical scores and major failures. The 3-year overall failure risk ratio was 2 [0.38–10.55] in favor of ceramic inlays although not statistically significant. The reported clinical scores (United States Public Health Services and Californian Dental Association) showed considerable heterogeneity between trials and could not be combined.

Conclusions. We have very limited evidence that ceramics perform better than composite material for inlays in the short term. However, this result may not be valid in the long term, and other trials are needed. Trials should follow Fédération dentaire internationale recommendations and enhance their methodology. Trials comparing composite and ceramic onlays are needed.

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Contents

1. Introduction

Dental caries is still a common disease worldwide and results in tooth substance loss. Inlay or onlay restorations are widely used to treat moderate Class I and II losses. Inlays and onlays can be made of alloy, composite or ceramic material. However, patients often refuse metallic restorations, so practitioners must choose between the 2 esthetic materials: ceramic and composite.

Many studies have compared these materials *in vitro*. Ceramic inlays and onlays are mainly composed of glass, with some crystals added to increase strength [1]. Composite inlays and onlays are made of a resinous matrix and fillers of different types [2]. Ceramic materials are resistant to compressive forces but are susceptible to tensile stresses and more prone to fracture than are composite materials [3,4]. However, ceramics are harder than composites and more wear-resistant but can induce more wear than usual with the opposing tooth's surface [5,6]. Furthermore, adhesive cement interfaces are made of composite material, so the wear of the interface and restoration material should be closer for composites and marginal integrity could be better [7,8]. Another disadvantage of composites is their resinous matrix and the possible monomer release if it is incompletely polymerized [9].

Although *in vitro* studies generally do not predict *in vivo* results [10–13], few clinical studies have verified these *in vitro* findings concerning the performance of composite and ceramic for inlays and onlays.

Several clinical studies have evaluated ceramic and composite materials separately [8,13–37]. Yet, we can draw no definite conclusions on the best material from these studies. In 1997, Roulet et al. concluded that "very little" was known about the longevity of esthetic inlays. The authors mentioned the difficulty in obtaining a strong bond between the restoration's surface and the tooth for composite inlays [38], but this problem has since been solved [39,40]. In 2001, Hickel and Manhart reported an annual failure rate of 2.3% (range: 0–11.8%) for composite inlays and onlays, as compared with 1.3% (range: 0–7.5%) for ceramic inlays and onlays evaluated in longitudinal studies [41]. In 2004, the same authors reported an annual failure rate of 2.9% (SD 2.6) for composite inlays, as compared with 1.9% (SD 1.8) for ceramic restorations [42]. Note that we have no evidence for linear failure rates of inlays and onlays, so the latter results can be discussed.

Finally, material knowledge has evolved, new materials have been developed, and no systematic review has answered the question posed by practitioners: Is the clinical efficacy of composite or ceramic better for inlay and onlay manufacturing?

We aimed to perform a systematic review of published reports of randomized controlled trials comparing the efficacy of composite and ceramic inlays and onlays for restoring posterior teeth of adults.

2. Methods

The review is registered, and the protocol can be accessed on the Prospero website [43].

Eligible studies were randomized controlled trials comparing the clinical efficacy of composite to ceramic inlays or onlays. Any composite or ceramic material was eligible. Patients had to be adults, treated in any dental care center or practice. The follow-up had to be 6 months or more. We searched MEDLINE, Embase and the Cochrane Central Register of Controlled Trials (Central) without any restriction on date or language. The last search was on December 24, 2012. The full electronic search strategy is in Appendix 1. We searched ClinicalTrials.gov to identify ongoing trials. The references of all eligible trials were checked for other relevant studies.

Two authors independently and in duplicate screened the titles of records retrieved by the search, then screened the selected abstracts to identify studies that potentially met the eligibility criteria. Any disagreements were resolved by discussion and the reasons for exclusion were recorded. The full text of potentially eligible studies was retrieved and assessed for