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Choice of comparator in restorative trials: A network analysis

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ABSTRACT

Objectives. The choice of trial comparators might impact on the validity of the available evidence. We aimed at evaluating dental restorative trial networks and the underlying comparisons made, hypothesizing that certain comparators are disproportionally preferred or avoided.

Methods. A systematic review was performed via Medline, CENTRAL and EMBASE. Randomized controlled trials on dental restoration or adhesive materials published 2005–2015 were included. Social network analysis techniques were used to assess trial networks.

Results. 114 studies on 15 321 restorations placed in 5232 patients were included. 57 and 53 trials investigated restoration of cervical and load-bearing cavities, respectively. Four trials on non-cervical, non-load-bearing cavities did not form a network and were not evaluated. The most frequently assessed material combination was hybrid composites placed using 2-step etch-and-rinse adhesives. In cervical cavities, the majority of trials compared adhesives, not restorative materials. In load-bearing cavities, testing other restorative materials (ormocers, compomers) was common, too. In both networks, comparisons within material classes were frequent. There was significant homophily ($p < 0.001$), i.e. certain material classes were preferred as comparators, while this preference seemed to change with time. Only very few comparisons yielded significant differences between materials.

Significance. The disproportional use of certain material classes as comparator might be due to their perceived role as gold standard. Compared with other scientific disciplines, dental restorative trial networks seem less prone for bias by comparator choice. Factors underlying the network geometry should be assessed to understand drivers of the research agenda.

1. Introduction

There is increasing interest into the internal and external validity of randomized controlled trials, based on the assessment of, for example, risk of bias [1], quality of reporting [2], appropriateness of statistical evaluation, or effects of sponsorship on trial outcomes [3]. One factor which potentially impacts on the totality of available evidence and its robustness is the choice of trial comparators: Certain classes of

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procedures or products might serve as comparator more often than others, and some comparators might be avoided at all. Using placebo or less effective options for comparisons might distort the impression about the true effectiveness about treatments, and repeated chain-linked comparisons against less-than-optimal standards might in fact heavily bias the totality of evidence [4–6]. To examine the underlying agenda of clinical trials in a specific field, new methods are required.

To investigate treatment comparisons, network analysis might be used. Such analyses have been performed to demonstrate clear preferences in comparator choice in trials on mycosis [7] and myeloma [8], but have not been employed in dentistry so far. Network analysis can be used to not only graphically display the undertaken comparisons but also to statistically assess the properties of both the constructed network and therein included comparators [6,7].

One of the most prolific fields in dental research is restorative material science, with restorations still being the most frequently performed and overall most expensive treatment provided by dentists [9–11]. Evaluating restorative trial networks could help to identify and reduce bias associated with the choice of the comparator. Within the present study, we aimed at evaluating dental restorative trial networks and the underlying comparisons made. We hypothesized that certain comparators are disproportionally preferred or avoided in recent randomized controlled trials.

2. Methods

2.1. Study design

With the advent of adhesive dental restorations, an increasing number of restorative materials can be placed using different adhesive strategies. We evaluated networks formed by trials comparing different adhesive and restorative materials and their combinations. First, a systematic review was performed to identify and appraise available trials. Second, data were analyzed using network analysis, with trial networks being assessed graphically and statistically.

2.2. Selection criteria

Randomized, controlled clinical trials (RCT) comparing the survival of two or more different restorative and/or adhesive materials were included. RCTs were excluded, if they

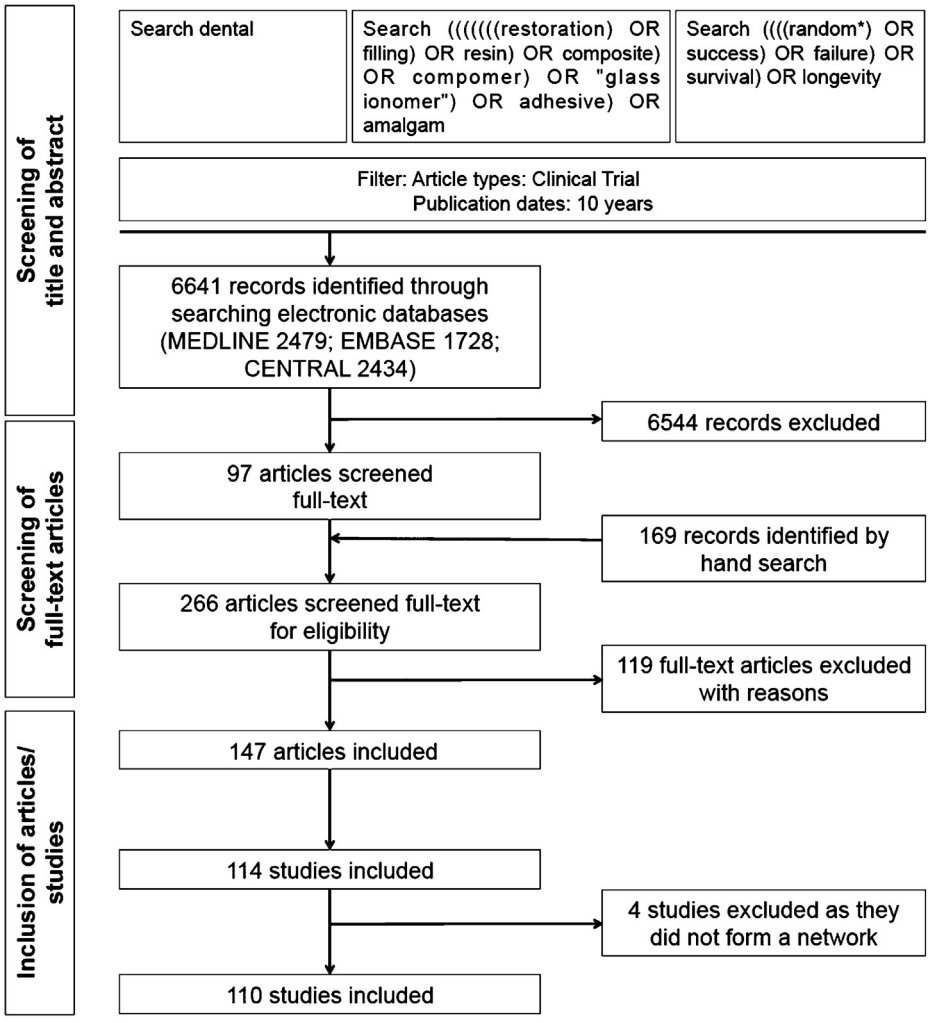

Fig. 1 – Flowchart of the search strategy and inclusion/exclusion of studies.

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