

Comparison of Bracket Placement Accuracy Between Direct and Indirect Bonding: A Literature Review

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Abstract This literature review aims to systematically investigate and compare the accuracy of direct and indirect bracket placement techniques, assessing whether one method demonstrates superiority over the other. A systematic search was conducted to identify all relevant randomized controlled trials across the following databases: MEDLINE (PubMed), EMBASE, and Web of Science. Results show that overall accuracy of bracket placement was not significantly different between the two techniques. Indirect bonding does not result in more accurate bracket placement compared to direct bonding.

Keywords: Orthodontics, indirect bonding, direct bonding, bracket placement accuracy

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1. Introduction

Accurate bracket placement is widely recognized as a critical determinant of effective orthodontic treatment, influencing treatment duration and minimizing adverse effects. Improper bracket positioning can result in undesired tooth movements, including rotations, incorrect tipping, intrusion, extrusion, and inappropriate torque.

Buccal bracket placement can be accomplished via two primary techniques: direct bracket bonding (DBB) and indirect bracket bonding (IBB). The conventional method, DBB, involves chairside placement of brackets on each individual tooth. Conversely, IBB, introduced by Silverman and Cohen in 1972, utilizes a prefabricated tray to bond all brackets simultaneously.

Two principal advantages of IBB over DBB have been proposed: enhanced accuracy in bracket placement and reduced chairside time. Although initial studies indicated minimal differences in positioning accuracy between the two methods, recent advancements in technology and software have further refined IBB, improving bracket placement precision and decreasing the necessity for mid-treatment repositioning or wire adjustments.

This literature review aims to systematically investigate and compare the accuracy of direct and indirect bracket placement techniques, assessing whether one method demonstrates superiority over the other.

2. Materials and Methods

This review is not registered with any organization. The

research adhered to the guidelines set forth by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (www.prisma-statement.org) [1,2].

3. Search Strategy

A systematic search was conducted to identify all relevant randomized controlled trials across the following databases: MEDLINE (via PubMed), EMBASE, CENTRAL (The Cochrane Library), and Web of Science. No restrictions were applied concerning language or year of publication. Additionally, a supplementary manual search was carried out by reviewing the reference lists of pertinent articles.

4. Selection Criteria

The following inclusion criteria were established for this review: (1) Study design: randomized controlled trials (RCTs); (2) Participants: individuals requiring orthodontic treatment involving the two different bonding techniques; (3) Outcomes: bracket placement accuracy. The exclusion criteria included case-control studies, cross-sectional studies, case reports, in vitro studies, literature reviews, conference abstracts, and letters, as well as studies involving participants with systemic diseases.

5. Results

Out of the eight included randomized clinical trials,

only two measured the accuracy of bracket placement. These two randomized clinical trials found no significant differences between direct and indirect bonding. Meta-analysis of the bracket placement accuracy was not performed due to the methodological differences and extensive heterogeneity.

Overall accuracy of bracket placement was not significantly different between the two techniques. Vertical placement errors were significantly greater than errors in the mesiodistal plane ($P < .05$). Error ranges for combined tooth types were smaller with indirect bonding (0.27mm) as compared to direct bonding (1.81mm).

Indirect bonding was on average more accurate in bracket height ($P < .05$), with no significant differences between the two techniques in terms of angulation or mesiodistal position.

6. Discussion

In a systematic review [3], eight studies were included after a broad search to identify all relevant randomized controlled trials in several databases with no restrictions on language or year of publication. Another study used a split mouth technique and enrolled 26 patients with malocclusion from the waiting list of Queens Hospital, Burton on Trent. Cases where the initial malocclusion prevented ideal bracket placement were excluded, and the accuracy of bracket placement was only studied on incisors and canines [4]. Another study asked nine orthodontists to bond 18 pretreatment models with class II malocclusion from second premolar to second premolar [5]. Each orthodontist performed direct bonding on one model and indirect bonding on another identical model. Each bonded tooth was then sectioned and photographed to measure bracket placement accuracy. Perspective: Several factors should be considered when an orthodontist decides to bond brackets directly or indirectly. These factors may include reducing chairside time, improving clinical efficiency, and reducing overhead cost of the practice. Based on the current evidence, however, achieving accurate bracket placement does not seem to be a significant factor in that decision.

The subject pool of the first two studies included people with malocclusions who required treatment with upper and lower full arch fixed appliances. The third study used pretreatment models of patients with class II malocclusion. All studies showed no significant differences in the accuracy of bracket placement between the two techniques. However, the range of vertical placement errors was less with the indirect bonding method. There are several factors to be considered when deciding between direct vs. indirect bonding in orthodontic treatment. Chairside time, treatment effectiveness and efficiency are some examples. However, accuracy of bracket placement cannot be justified as a reason to choose indirect bonding over direct bonding.

7. Conclusion

Indirect bonding does not result in more accurate bracket placement compared to direct bonding. This is supported by randomized clinical trials and an in-vitro study, in which the accuracy of bracket placement was not significantly different between the two techniques. More clinical evidence is needed to determine if the type of malocclusion has an effect on the accuracy of bracket placement in the two techniques.

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