Self-ligating brackets in orthodontics: a systematic review

Fleming PS, Johal A

CRD summary
This review concluded that there was insufficient evidence to support use of self-ligating fixed orthodontic appliances over conventional appliances or vice versa and found no advantages for self-ligating brackets for subjective pain experience. This review was generally well-conducted, but the limited body of evidence requires that the conclusions be treated with a note of caution.

Authors' objectives
To evaluate the clinical differences in the use of self-ligating brackets in orthodontics.

Searching
MEDLINE and EMBASE were searched from inception to April 2009. Cochrane Central Register of Controlled Trials (CENTRAL) regias was searched (2009). Search terms were reported. There were no language restrictions. NRR, ClinicalTrials.gov, ProQuest Digital Dissertation Abstracts and Thesis database and conference abstracts were searched to locate unpublished literature. Reference lists were screened and authors were contacted.

Study selection
Eligible studies were randomised or controlled clinical trials in patients with full-arch fixed appliance orthodontic treatment using self-ligating brackets or conventional brackets that reported on alignment efficiency, pain experience, arch dimensional changes, rate of orthodontic space closure and periodontal effects related to the appliances.

The included studies assessed Damon 2 and 3, TruStraight, SmartClip, Victory, Synthesis, In-Ovation R, MiniOvation and GAC Microarch brackets. Mean participant ages ranged from 13.1 to 17.1 years. Most studies included more females than males. Outcomes such as attachment failure rates were reported at between one and 30 weeks after treatment. Some studies were split-mouth designs where the participant received both types of bracket.

Two reviewers independently selected studies. Disagreements were resolved by discussion.

Assessment of study quality
The validity assessment covered sample size calculation, randomisation, allocation concealment, blinding of outcome assessment, reporting of withdrawals and use of intention-to-treat analysis. Studies were classed as low, medium or high risk of bias. Studies that fulfilled fewer than three criteria were considered high risk of bias, studies that fulfilled three or more were medium risk and those that fulfilled five or more were low risk. Only studies at low or medium risk of bias were included in meta-analyses.

Two reviewers independently performed the validity assessment. Disagreements were resolved by discussion.

Data extraction
Means and standard deviations were extracted for continuous outcomes. Pain intensity was measured using a visual analogue scale (VAS) at various time points. Scales that did not measure from zero to 100 were converted using an appropriate multiplication factor.

Two reviewers extracted data. Disagreements were resolved by discussion.

Methods of synthesis
Clinical heterogeneity was assessed by comparison of treatment protocols, timing of outcomes and measurement techniques between studies. Statistical heterogeneity was assessed using forest plots, $X^2$ tests and $I^2$ statistics. The authors reported that studies were pooled using random-effects meta-analysis, but forest plots were presented that used
a fixed-effect model. Mean differences with 95% confidence intervals were calculated.

**Results of the review**

Seventeen studies were included: six randomised controlled trials (n=381) and 11 controlled clinical trials (n=640). Six were classed as low risk of bias, seven as medium risk and four as high risk of bias. All studies were analysed on a per-protocol basis.

Four studies reported subjective pain after initial placement of the brackets, at different time intervals. There were no statistically significant differences between self-ligating brackets and conventional brackets at four hours, 24 hours, 72 hours and seven days (three low-risk studies).

Other outcomes such as efficiency of initial orthodontic alignment, bond failure rate, plaque retention and periodontal health, torque expression and arch dimensional change, orthodontic space closure and apical root resorption were reported in the review. Some studies failed to report standard deviations and/or were at high risk of bias so meta-analysis was not possible.

**Authors’ conclusions**

There was insufficient evidence to support use of self-ligating fixed orthodontic appliances over conventional appliances or vice versa. There were no advantages for self-ligating brackets in terms of subjective pain experience.

**CRD commentary**

This review had a clearly stated research question and specified inclusion criteria for study design, interventions, participants and outcomes. The literature search covered a number of electronic databases, there were no restrictions by language and efforts were made to locate unpublished studies. All the review methods were performed by two reviewers independently to reduce error and bias. Risk of bias was assessed using an appropriate tool and the results were reported in full. Clinical and statistical heterogeneity were assessed and results were pooled only if studies were similar. However, there were some discrepancies between the types of statistical models used to combine data as presented in the forest plots and the results reported in the text. Only a few studies were pooled for each outcome, most studies were small and not all relevant results (such as p values) were reported.

This review was generally well-conducted, but given the limited body of evidence the conclusions should be treated with a note of caution.

**Implications of the review for practice and research**

**Practice:** The authors did not make any recommendations for practice.

**Research:** The authors stated that a large well-designed, prospective study was need to investigate the effects of bracket type on pain experience. Further research that followed CONSORT guidelines was needed into the effects of increased plaque accumulation, health-related quality of life and overall treatment duration with different brackets.

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