Occlusal adjustment for treating and preventing temporomandibular joint disorders

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SUMMARY To assess the effectiveness of occlusal adjustment (OA) for treating temporomandibular disorders (TMD) in adults and preventing TMD. The Cochrane Controlled Trials Register, MEDLINE and EMBASE were comprehensively searched using the Cochrane methods. Reports and review articles were retrieved. Unpublished reports or abstracts were considered from the SIGLE database. All randomized or quasi-randomized controlled trials comparing OA with placebo, reassurance or no treatment in adults with TMD. The outcomes were global measures of symptoms, pain, headache and limitation of movement. Data collection and analysis followed the Cochrane Oral Health Group’s statistical guidelines. Results showed no difference between OA and control group in symptom-based outcomes for treatment or incidence of symptoms for prevention. There is no evidence that OA treats or prevents TMD. OA cannot be recommended for the management or prevention of TMD. Future trials should use standardized diagnostic criteria and outcome measures when evaluating TMD.

KEYWORDS: occlusal adjustment, treatment, prevention, temporomandibular disorders

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Introduction

Temporomandibular disorder [TMD also known as craniomandibular joint dysfunction, temporomandibular joint (TMJ) dysfunction] is a group of disorders of the TMJ. The common signs and symptoms of TMD include pain, joint sounds (clicking, grating), limited or asymmetrical jaw movement and spasm of the chewing muscles. These symptoms can have a profound effect on health and quality of life (1).

It is a frequent problem (2). Prevalence studies have reported approximately 75% of the population having at least one sign of joint dysfunction (abnormal jaw movement, joint noises, tenderness on palpation, etc.) and approximately 33% having at least one symptom (facial pain, joint pain, etc.) (3, 4). One other constellation of symptoms historically associated with TMD is globus, which involves symptoms of choking sensations or sore throat (5).

Various theories have been put forward that relate the aetiology of TMD to organic disease of the TMJ, trauma and stress (6). TMD has been associated with occlusal factors for many years (7).

Treatment options for TMD include simple reassurance, physiotherapy (such as ultrasound, megapulse, acupuncture, short wave diathermy laser, heat exercises and biofeedback), splint therapy, drug therapy, surgical intervention and combined treatment (8–11). Cochrane reviews of some of these treatments are underway.

Occlusal adjustment (OA) is the selective adjustment of the teeth so that the upper and lower teeth occlude harmoniously in the inter-cuspal position. Adjustments can also be made to remove non-working side contacts and contacts between the posterior teeth when the mandible is moved anteriorly. OA has been used in the management of TMD for many years but the evidence of effectiveness is inconclusive (12). It is not clear if malocclusion has a causal role in TMD. OA has been evaluated in studies to prevent TMD (13) but again these studies were inconclusive.
Systematic reviews carefully search for, appraise and synthesize primary data relating to a carefully focused research question. A Cochrane Review identifies and, where possible, aggregates data from randomized controlled trials (RCTs) of effectiveness of health care interventions. They are particularly useful if the data of effectiveness arises from small and/or contradictory studies. Quantitative systematic reviews have not been reported for treatments of TMD. One qualitative systematic review has evaluated OA in treating TMD (14) but did not include a meta-analysis of the existing data. Therefore, this study aimed to establish the effectiveness of OA in reducing symptoms in patients with TMD and in preventing TMD.

Method
To be included in the review studies were to be RCTs including quasi-randomized trials that assessed OA in the management or prevention of TMD. Quasi-randomized studies are studies where the method of allocation was known but was not considered strictly random. Non-randomized trials were excluded.

In trials of treatment, participants were to be adults aged 18 years old or above with clinically diagnosed TMD. The inclusion criteria required reports to state their diagnostic criteria for TMD and for participants to exhibit two or more of the signs and/or symptoms (Table 1). There were no age restrictions for prevention trials although prevention studies focused on children. TMD was required to be clinically absent at baseline in studies on prevention.

In each trial the treatment group was to have received OA while the control group received no treatment, placebo or reassurance. Studies where splints had been used before treatment were excluded. The interval required for outcome measurement was at least 3 weeks after the intervention.

The primary outcomes were global symptoms, pain and headache:
1 Relief from symptoms was assessed using global measures of symptoms.
2 Data on pain were recorded according to frequency, severity or duration. Where possible data for the frequency, severity and duration of pain were aggregated using weighted mean differences but depended on assessments of heterogeneity.
3 Similarly, data on headache were recorded according to frequency, severity or duration. Where possible data for the frequency, severity and duration of pain were aggregated using weighted mean differences but depended on assessments of heterogeneity.

The secondary outcome considered was limitation of movement. Other signs were ignored because they are neither unique to the disease nor associated with the progression or outcomes of TMD.

The search strategy for identification of studies was based on the Cochrane Oral Health Group search strategy. There was no language restriction for inclusion. Every effort was made to translate non-English articles into English for inclusion.

The Cochrane Oral Health Group Specialized Register, Cochrane Controlled Trials Register (Issue 2, 2002), MEDLINE (1966 to April 2002) and EMBASE (1980 to April 2002) were searched electronically. The Cochrane Controlled Trials Register was searched using the strategy outlined in Table 2.

The following medical subject headings (MeSH) terms were used in MEDLINE: temporomandibular disorders; temporomandibular diseases; myofascial pain; craniofacial disorders; jaw joint problems.

Table 1. Inclusion criteria (23)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Palpation tenderness of the masticatory muscles.</td>
<td></td>
</tr>
<tr>
<td>Joint sounds during jaw movements.</td>
<td></td>
</tr>
<tr>
<td>Tenderness during jaw movements.</td>
<td></td>
</tr>
<tr>
<td>Deviation of the mandible on opening and closing.</td>
<td></td>
</tr>
<tr>
<td>Reduced mandibular range of motion.</td>
<td></td>
</tr>
<tr>
<td>Presence of occlusal interference in retruded, protruded and medio- and latero-trusion positions of the mandible.</td>
<td></td>
</tr>
<tr>
<td>Wear facets.</td>
<td></td>
</tr>
</tbody>
</table>

To identify studies on occlusal treatments, the following MeSH terms were used: balanced occlusion; occlusal treatment; occlusal equilibration; occlusal adjustment; tooth grinding; bite adjustment. To identify RCTs, the search strategy combined the subject search with the Cochrane Optimal Search Strategy (see: 15). Search strategies for other databases were revised appropriately.


Additional reports were identified from the reference lists of retrieved reports and from review articles of TMD treatments. Unpublished reports or abstracts were considered from the SIGLE database (April 2002) using search strategy based on the search strategy presented above. When necessary, authors were contacted for relevant original data. Further recommendations were sought from colleagues on unpublished studies.

The title, abstract and key words of identified studies were screened independently by both reviewers for relevance to the systematic review. Studies that appeared to meet the inclusion criteria were retrieved as complete articles. Both reviewers independently extracted data from the included studies to a pre-designed data collection form. The data extraction form considered: bibliographic details, details of the study setting, characteristics of study population, frequency and course of the interventions, baseline and outcome measures, etc. The different requirements and techniques for adjustment and data on psychosocial factors were recorded as covariates for assessment as possible sources of heterogeneity. Any adverse reactions were recorded and described. Uncertainties on data extraction were resolved by discussion between the reviewers. Where necessary, the authors of the original studies were consulted by mail to obtain more information about the published study.

Both reviewers independently assessed the quality of each study according to the guidelines in the Cochrane Reviewers’ Handbook. The strengths and weaknesses of the study design of each included study were analysed. Disagreements on validity assessment were resolved by consensus and discussion.

The Cochrane Oral Health Group’s statistical guidelines were followed using RevMan 4.1. The studies were grouped according to types of control and duration of follow-up.

Cochrane’s test for heterogeneity was used to assess discrepancies in the estimates of treatment effects. A random effects model was used for assessment of any significant heterogeneity (P < 0.1) detected. The source of any statistical heterogeneity was investigated. A sensitivity analysis was carried out upon different assumptions such as quality of the studies, whether the trials were blind or not, missing data and different statistical approaches. Publication bias was estimated using the symmetry of funnel plots. The strength and generalizability of the evidence were carefully explained.

The proportion of observed and expected agreement between the reviewers for 45 variables in 17 data extraction forms was assessed using Cohen’s kappa. The test showed a high agreement between the reviewers (κ = 0.88).

Results

The search strategy identified over 660 titles and abstracts and from this we obtained 23 full reports. A total of 17 trials were considered eligible according to the defined criteria for trial design, participants, interventions and outcomes. Of the 17, 11 were excluded because of attrition bias (three trials), incomparable duration of intervention and measurement (two trials), the control groups did not have the condition (two trials), no valid control group (two trials), invalid
treatment group (one trial) and inadequate duration of measurement (one trial).

Three trials (16–18) recruited a total of 92 patients with symptoms of TMD for treatment and three trials (13, 19, 20) recruited a total of 299 healthy subjects for prevention. One prevention trial included young adults, one trial included adolescents and one study included children and adolescents.

All included trials had a randomized, parallel group study design. All six reports provided a clear description of the type and duration of intervention for both the test and control group. All but one trial (18) included a placebo control group. One trial compared adjustment and reassurance (18). One trial had an additional ‘no treatment’ control group (17) besides the test and placebo groups.

There was variation between the trials in the outcomes used. Three trials reported both signs and symptoms of TMD (16–18). Two trials (17, 18) reported data on pain and headache. Two trials presented data on globus (16, 18). Likewise, there was variation in the types of measurement used. One trial used a Visual Analogue Scale for pain and the presence or absence of headache and globus (18). One trial used the frequency and intensity of pain and headache (17). One trial used number of improvements in globus symptoms (16). The three prevention studies on (13, 19, 20) reported data on the incidence of TMD.

Additional clinical outcomes reported included range of mandibular movement (18), disclusion times (17) and the presence of an unstable occlusion (16). There were no data on psychosocial outcomes, costs or quality of life in any of the trials. There were no reports of adverse reactions.

Electronic mails were sent to authors of one trial and data was obtained from one included study (20). The information supplied was from questionnaires administered pre- and post-treatment regarding symptoms in subjects who did not request treatment.

No major differences were found in the baseline characteristics of the groups in terms of the number randomized, age, gender or the outcomes in Vallon et al. and Kirveskari et al. (18, 20). It was unclear if differences in the age and gender existed in one trial (16), age alone in one trial (19) and gender alone in two trials (13, 17). There were no major differences in the other baseline characteristics. The generation of allocation was adequate in three trials (13, 16, 20), inadequate in one trial (17) and unclear in two trials (18, 19).

All the trials were performed by dentists trained in OA and control. Adjustment for confounders was either absent or unclear in all trials. The concealment of allocation was inadequate for one of the six trials (17) and it was unclear for the remaining five.

Data were analysed on an intention to treat basis in all except two trials (16, 18). The withdrawals were adequately reported in four trials, unclear in one trial (17). One trial did not have any withdrawals (18). All but one trial (17) reported blinding during the outcome assessment.

<table>
<thead>
<tr>
<th>Comparison/ outcome</th>
<th>Number of studies</th>
<th>Number of participants</th>
<th>Effect size odds ratio (fixed) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA v. placebo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain frequency</td>
<td>1</td>
<td>18</td>
<td>0.50 (0.07–3.85)</td>
</tr>
<tr>
<td>Pain severity</td>
<td>1</td>
<td>18</td>
<td>0.50 (0.07–3.85)</td>
</tr>
<tr>
<td>Headache frequency</td>
<td>1</td>
<td>18</td>
<td>0.90 (0.13–6.08)</td>
</tr>
<tr>
<td>Headache severity</td>
<td>1</td>
<td>18</td>
<td>0.90 (0.13–6.08)</td>
</tr>
<tr>
<td>Relief of globus</td>
<td>1</td>
<td>17</td>
<td>6.00 (0.72–49.84)</td>
</tr>
<tr>
<td>OA v. reassurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain frequency</td>
<td>1</td>
<td>50</td>
<td>0.13 (0.01–2.58)</td>
</tr>
<tr>
<td>Headache frequency</td>
<td>1</td>
<td>50</td>
<td>1.40 (0.45–4.35)</td>
</tr>
<tr>
<td>Overall symptoms</td>
<td>1</td>
<td>50</td>
<td>3.12 (0.12–80.40)</td>
</tr>
<tr>
<td>OA v. no treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain frequency</td>
<td>1</td>
<td>17</td>
<td>0.10 (0.00–2.15)</td>
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</tr>
</tbody>
</table>

OA, occlusal adjustment; CI, confidence interval.
In patients with TMD, OA did not significantly reduce the severity or frequency of pain or headache or relieve globus (all one study each) in comparison with placebo, reassurance or no treatment (Table 3). In three trials involving 299 patients without TMD, OA did not significantly reduce the incidence of symptoms of the condition (odds ratio 0.45, 95% confidence interval 0.15–1.37).

Heterogeneity was assessed for the incidence of symptoms in the prevention trials. The meta-analysis shows overlap in the confidence intervals and suggests that the variation in the results was not because of chance ($P = 0.05$). Publication bias was assessed for the incidence of symptoms in the prevention trials. The funnel plot is based on three studies and is insufficiently powerful for any clear indication. The other comparisons had only one trial.

Sensitivity analyses revealed no changes associated with: changing the inclusion criteria for the duration of study; using continuous rather than dichotomous outcomes; using improvement of symptoms rather than the absence; using random effects models instead of a fixed effects or vice versa; aggregating the data from the placebo, reassurance and no treatment groups or aggregating the data relating to frequency and severity of pain or headache (all $P > 0.05$).

**Discussion**

There is no evidence that OA treats or prevents TMD. Data available in the six trials indicate no significant differences between OA and placebo, reassurance or no treatment in the treatment or prevention of TMD. Based on these data OA cannot be recommended in the treatment and prevention of TMD. These conclusions will be of interest not only to clinicians but also to agencies involved in the funding of dental treatment and remuneration of dentists.

It is important to distinguish between absence of evidence and evidence of absence. There may not be evidence of an effect because there are few data regarding the effectiveness of OA for TMD. The small number of studies and participants meant that the confidence intervals were wide. An implication is that more trials on the effectiveness of OA for TMD are needed. The inclusion of future trials on prevention into the current analysis may further reduce the confidence interval and achieve statistical significance.

There are concerns of the validity and reliability of the diagnostic criteria used in the trials. Inaccurate and inconsistent diagnosis of TMD would cause misleading reporting of TMD and incomparability of results with other trials. However, these concerns extend beyond the data used in the trials to the diagnosis of TMD in general (21).

Although the sensitivity analyses do not materially change the results of the review, there are too few trials, of low quality and with few participants, for the results to be robust.

There were some limitations of the methods used in the trials. These limitations should be considered in their historical context as some of the trials were conducted some time ago and our understanding of research methods has improved since then. Guidelines, produced by the CONSORT group, have been published for reporting of RCTs in the medical literature (22). The use of such guidelines would improve the quality of trials and reports of the management of TMD. In particular, future trials of OA should consider the use of standardized diagnostic criteria and outcome measures for TMD and providing data on intra- or extra-examiner variability where appropriate. Reporting the odds ratio, relative risk, relative risk reduction, absolute risk reduction or weighted mean difference and associated 95% confidence intervals would allow a greater understanding of treatment effects and would facilitate future meta-analyses. Data on psychosocial outcomes, costs and quality of life, and on any side-effects, especially if they were directly related to the intervention would also increase our understanding of the potential benefits and harm of this treatment. Future research should also use samples of adequate size based on power calculations. The existing trials should be used as the basis of such power calculations.

In conclusion, this systematic review of RCTs carried out using the approach of the Cochrane Collaboration found no evidence that OA treats or prevents temporomandibular disorders. These findings have implications for dental treatment for patients with TMD and for researchers in this field.

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References


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