Orthognathic treatment and temporomandibular disorders: a systematic review. Part 2:
Signs and symptoms and meta-analyses

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CRD summary
This review concluded that patients who suffered from temporomandibular disorders and received orthognathic
treatment for correction of their dentofacial deformities were likely to experience improved signs and symptoms rather
than deterioration; surgery was not advocated solely for treating temporomandibular disorders. In light of the limited
search, poor study quality and significant heterogeneity, the findings should be interpreted with caution.

Authors’ objectives
To assess the percentage of orthognathic patients with temporomandibular disorders (TMDs) and to establish the range
of signs and symptoms and any changes in temporomandibular disorders that resulted from orthognathic treatment.

Searching
MEDLINE was searched without language restrictions. Search terms were reported. Search dates were not reported.
Bibliographies of included studies and reviews were searched for additional studies. Experts were consulted for
unpublished studies and ongoing trials.

Study selection
Randomised controlled trials (RCTs), cohort studies with at least 10 patients and case-control studies of history of facial
fractures from trauma, orthognathic surgery for correction of temporomandibular disorders or concomitant joint disc
surgery were eligible for inclusion. Studies had to assess orthognathic treatment to correct severe jaw discrepancies
such as: maxillary advancement; superior or inferior repositioning of the maxilla; surgically assisted rapid maxillary or
palatal expansion; mandibular advancement or setback; and distraction osteogenesis (or any combination of these
treatments). Outcomes comprised: percentages of patients with temporomandibular disorder signs or symptoms (pre-
and post-treatment); and changes in temporomandibular disorder status (improvement, remained the same or
worsened). English-language studies were included.

Studies included patients with a great variety of malocclusions. Most studies did not use a validated scale to measure
temporomandibular disorders. Most studies used clinical examination with or without self-report to assess
temporomandibular disorders; fewer than half of the studies used radiological investigations or self-report alone. Most
studies were undertaken in USA and there were multiple studies from Japan, the Netherlands and Finland.

Two reviewers selected studies for inclusion in the review; disagreements were resolved by discussion.

Assessment of study quality
Two reviewers assessed study quality based upon presence or absence of various types of bias that related to selection,
performance, measurement and attrition. Each bias was defined as either low or high; where high bias was reported for
any criteria the study was given a high-bias rating. Disagreements were resolved by discussion.

Data extraction
Two reviewers independently extracted data to enable calculation of proportions and 95% confidence intervals (CI) for
the outcomes of interest. Disagreements were resolved by discussion.

Methods of synthesis
Most studies were synthesised narratively by outcome. Where appropriate, random-effects meta-analyses were used to
calculate pooled estimates for outcomes with 95% CI. Meta-analysis was undertaken only in studies that used the
Helkimo index to classify temporomandibular disorders for patients pre-surgery and post-surgery. Statistical
heterogeneity was assessed using the Q statistic.
Results of the review
Fifty-three studies were included in the review (n=8,028, range 11 to 2,074): 41 cohort studies; eight case-control studies; one case study; and three that were part of larger RCTs. There appeared to be 28 prospective studies, 21 retrospective and four in which this was unclear. All studies were considered to contain high bias.

For studies that reported both pre-surgical and post-surgical results the proportion of patients who reported temporomandibular joint pain decreased following surgery (three of three studies). The proportion of patients who reported headaches decreased (six of six studies).

The proportion of patients who reported temporomandibular joint pain on palpation decreased following surgery in most studies (14 of 18 studies), but increases in pain were also noted (three studies).

Muscle pain on palpation was a commonly reported temporomandibular disorder symptom. Decreases were noted when pre-surgical and post-surgical findings were compared (nine of 11 studies).

For joint sounds, post-surgical results varied with a tendency for percentages of patients affected by joint clicking to decrease following surgery (22 of 24 studies); higher percentages of patients with clicking were also noted following surgery (two studies).

Findings for crepitus following surgery varied. Some studies reported decreases (four studies), and others noted increases (three studies) or no change (three studies).

The meta-analyses were based on a small number of studies, were subject to considerable statistical heterogeneity and provided no definitive findings.

Authors' conclusions
Although orthognathic surgery should not be advocated solely for treating temporomandibular disorders, patients who had orthognathic treatment for correction of dentofacial deformities and who also suffered from temporomandibular disorders appeared more likely to see improvement in their signs and symptoms than deterioration.

CRD commentary
The review question and the inclusion criteria were clear. The authors searched one electronic database to identify relevant studies. There were no language restrictions, which reduced potential for language bias. There was no indication of search dates. Unpublished studies were sought, which reduced the potential for publication bias. Appropriate steps were taken to minimise bias and errors at all stages of the review process. Study quality was assessed using appropriate criteria. Most of the included trials were small and contained high levels of bias that may have impacted on the reliability of their results. A narrative synthesis was appropriate in view of the clinical heterogeneity of the included studies; given the heterogeneity between studies it was questionable whether pooling some of the data was appropriate or added much to the findings. In light of the limited search, high levels of bias in the included studies and significant heterogeneity, the findings should be interpreted with caution.

Implications of the review for practice and research
**Practice:** The authors stated that clinicians who advised patients could be told that patients who received orthognathic treatment for correction of dentofacial deformities and temporomandibular disorders were more likely to encounter improvements in their signs and symptoms. Following surgery, clicking was more likely to improve and most patients would experience restrictions in mouth opening and lateral excursions that continued to improve and most would patients regain the full range of movement after two years. Clinicians should also examine routine radiographs before and after treatment to search for signs of condylar absorption and consider associated risk factors.

**Research:** The authors stated that research in temporomandibular disorders should conform to an internationally recognised set of criteria and a universal scale with valid, reproducible and easy to use criteria for diagnosis and classification. To minimise bias, prospective longitudinal studies were required that contained strict quality-assurance protocols. Researchers should focus on reducing the effects of confounding factors to enable adequate comparisons to be made between studies.
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