Int. J. Oral Maxillofac. Surg. 2015; 44: 158–179
http://dx.doi.org/10.1016/j.ijom.2014.09.024, available online at http://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Meta-Analysis

Trauma

Surgical versus non-surgical treatment of mandibular condylar fractures: a meta-analysis

B. R. Chrcanovic
Department of Prosthodontics, Faculty of Odontology, Malmö University, Malmö, Sweden

B. R. Chrcanovic: Surgical versus non-surgical treatment of mandibular condylar fractures: a meta-analysis. Int. J. Oral Maxillofac. Surg. 2015; 44: 158–179.

Abstract. The aim of the present study was to test whether there is a significant difference in the clinical outcomes between surgical and non-surgical treatment of mandibular condylar fractures. An electronic search was undertaken in February 2014. Eligibility criteria included clinical human studies, either randomized or not. The search strategy resulted in 36 publications. The estimates of an intervention were expressed as the risk ratio (RR) and mean difference (MD) in millimetres. A statistically significant effect was observed for the outcome of post-treatment malocclusion (RR 0.46, $P < 0.00001$), lateral deviation during maximum inter-incisal opening (RR 0.56, $P = 0.0001$, dichotomous; MD −0.75, $P = 0.002$, continuous), protrusion (MD 0.68, $P = 0.01$), and laterotrusion (MD 0.53, $P = 0.03$) favouring surgical treatment, and for infection (RR 3.43, $P = 0.03$) favouring non-surgical treatment. There was no statistically significant effect on temporomandibular joint pain (RR 0.81, $P = 0.46$) or noise (RR 1.44, $P = 0.24$), or maximum inter-incisal opening (MD 2.24, $P = 0.14$). The test for overall effect showed that the difference between the procedures significantly affected the incidence of post-treatment complications, favouring surgical treatment, when all dichotomous and continuous outcomes were analysed (RR 0.70, $P = 0.006$ and MD 1.17, $P = 0.0006$, respectively).

Key words: mandibular condylar fracture surgical treatment; internal fixation; non-surgical treatment; complications; meta-analysis.

Accepted for publication 26 September 2014
Available online 1 November 2014

Approximately 11–16% of all facial fractures[1–4] and 30–40% of all mandibular fractures (MFs) are fractures of the mandibular condyle.[1–3,5] Most are not caused by direct trauma, but follow indirect forces transmitted to the condyle from a blow elsewhere. Consequently, mandibular condylar fractures (MCFs) are those most commonly missed.[6] MCFs have a distinctive position in oral and maxillofacial surgery because, although in many cases good initial clinical results are achieved, serious late complications have been reported such as pain, restricted mandibular movement, muscle spasm and deviation of the mandible, malocclusion, pathological changes in the temporomandibular joint (TMJ), osteonecrosis, facial

asymmetry, and ankylosis, irrespective of treatment performed or not.[7–11]

There are two principal therapeutic modalities for these fractures: non-surgical (functional) and surgical. Historically, non-surgical treatment of MCFs by means of maxillomandibular fixation (MMF) followed by physiotherapy was the standard practice.[10]

Arguments for non-surgical treatment include reduced overall morbidity, in most cases acceptable occlusal results, avoidance of typical surgical complications, a simpler procedure, and less risk of ankylosis and avascular necrosis.[12] However, long-term complications such as pain, arthritis, open bite, deviation of the mandible on opening and closing, inadequate restoration of vertical height of the ramus leading to malocclusion, and ankylosis do occur with non-surgical treatment.[13]

With the development of improved materials for fixation and the refinement of surgical techniques, open reduction and internal fixation (ORIF) has gained higher acceptance by surgeons for the management of MCFs, especially in severely displaced and dislocated fractures, in edentulous patients, in cases of loss of ramus height, and when a closed approach with manipulation cannot re-establish the pre-trauma occlusion or excursions, i.e., the tendency to treat operatively usually increases with increasing complexity of the fracture. The ORIF technique provides stable three-dimensional reconstruction, promotes primary bone healing, shortens the treatment time, and eliminates the need for early release of the MMF. A decreased dependence on MMF improves post-treatment respiratory care, nutritional intake, and oral hygiene measures.[14] However, ORIF of MCFs is technically difficult due to the difficulty in manipulating the fragments in a small area, leaves a visible external scar, results in increased costs and hospitalization time, and carries the risk of facial nerve injury, damage to vessels such as the internal maxillary artery, and wound infection.[15,16]

There has been considerable controversy regarding the treatment of MCFs, in particular whether they should be treated conservatively or surgically. Moreover, an increasing number of articles in the current literature report good results for surgically treated MCFs compared with non-invasive techniques. As the philosophies on the treatment of maxillofacial trauma alter over time, a periodic review of the different concepts is necessary to refine techniques and eliminate unnecessary procedures. This would form a basis for optimum treatment. Thus, in light of all the reported advantages of the surgical treatment of MCFs, the objective of this study was to conduct a systematic review and meta-analysis of studies published in the literature up to and including February 2014 in order to verify whether there is a significant difference in the clinical outcomes and post-treatment complications between the surgical and the non-surgical treatment of unilateral or bilateral MCFs, in patients of any age or gender.

Materials and methods

This study followed the guidelines of the PRISMA statement.[17] A review protocol does not exist.

Objective

The purpose of the present review was to test the null hypothesis of no difference in the incidence of post-treatment complications for MCFs treated surgically or non-surgically, against the alternative hypothesis of a difference.

Search strategies

An electronic search without time or language restrictions was undertaken in February 2014 in the following databases: PubMed, Web of Science, and the Cochrane Oral Health Group Trials Register. The following terms were used in the search strategy: {Subject AND Adjective} {*Subject*: (condylar fracture [text words]) AND *Adjective*: (open closed OR surgical conservative OR surgical nonsurgical [text words])}.

The following terms were used in the search strategy on Web of Science, refined by the research area 'dentistry oral surgery medicine' and 'otorhinolaryngology': {Subject AND Adjective} {*Subject*: (condylar fracture [title]) AND *Adjective*: (open closed OR surgical conservative OR surgical nonsurgical [title])}.

The following terms were used in the search strategy on the Cochrane Oral Health Group Trials Register: (condylar fracture AND (open closed OR surgical conservative OR surgical nonsurgical)).

A manual search of journals on the subject was also performed, including the British Journal of Oral and Maxillofacial Surgery, International Journal of Oral and Maxillofacial Surgery, Journal of Craniofacial Surgery, Journal of Cranio-Maxillofacial Surgery, Journal of Maxillofacial and Oral Surgery, Journal of Oral and Maxillofacial Surgery, and Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontology.

The reference lists of the identified studies and relevant reviews on the subject were also scanned for possible additional studies. Moreover, online databases providing information on clinical trials in progress were checked (http://clinicaltrials.gov; http://www.centerwatch.com/clinical-trials; http://www.clinicalconnection.com).

Inclusion and exclusion criteria

Eligibility criteria included clinical human studies—randomized controlled trials (RCTs), controlled clinical trials (CCTs), or retrospective—comparing the clinical outcomes between surgical and non-surgical treatment of MCFs, and reporting the incidence of post-treatment complications. The following were excluded: case reports, technical reports, animal studies, in vitro studies, and reviews papers.

Study selection

The titles and abstracts of all reports identified through the electronic searches were assessed. The full text was obtained for studies appearing to meet the inclusion criteria and for studies for which there were insufficient data in the title and abstract to make a clear decision.

Quality assessment

The quality assessment was performed using the recommended approach for assessing the risk of bias in studies included in Cochrane reviews.[18] The classification of the risk of bias potential for each study was based on the following four criteria: sequence generation (random selection in the population), allocation concealment (steps must be taken to secure strict implementation of the schedule of random assignment by preventing foreknowledge of the forthcoming allocations), incomplete outcome data (clear explanation of withdrawals and exclusions), and blinding (measures to blind study participants and personnel from knowledge of which intervention a participant received). Incomplete outcome data was also considered addressed when there were no withdrawals and/or exclusions. A study that met all the criteria mentioned above was classified as having a low risk of bias. A study that did not meet one of these criteria was classified as having a moderate risk of bias. When two or more criteria were not met, the study was considered to have a high risk of bias.