

# Open versus closed treatment of unilateral moderately displaced mandibular condylar fractures: a meta-analysis of randomized controlled trials

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**Purpose.** To compare the efficacy of operative and conservative treatment of displaced condylar fractures of the mandible, a meta-analysis was performed.

**Study design.** PubMed, Cochrane Controlled Trials Register, EMBASE electronic databases were searched until 10 December 2012. English studies were restricted in randomized controlled trials (RCT).

**Results.** Four RCT with 177 patients were included. No significant difference was found between the 2 groups in the maximal interincisal opening ( $P = .32$ ). However a statistically significant difference was seen that operative treatment statistically got better efficacy in lateral excursion movement, protrusion, malocclusion, and temporomandibular joint pain ( $P < .05$ ).

**Conclusions.** This meta-analysis confirms that both treatment options for unilateral displaced condylar fractures of the mandible yielded acceptable results. However, operative treatment was superior in most objective and subjective functional parameters. (Oral Surg Oral Med Oral Pathol Oral Radiol 2013;116:169-173)

About 30%-40% of all mandibular fractures are fractures of the mandibular condyle.<sup>1-3</sup> There is no general consensus regarding which fractures should be treated with an open or closed approach. It was speculated that fracture level, deviation of the fragments, and shortening of the ascending ramus may be the most important factors predicting therapeutic success.<sup>4,5</sup> The choice of closed versus open treatment of the fractures of the condylar process remains controversial. For decades closed reduction has been the preferred treatment, but closed treatment requires varying periods of maxillomandibular fixation (MMF) (about 4 weeks). In recent years trauma surgery regarding open reduction and internal fixation of displaced fractures, open surgical management has been recognized.<sup>6-8</sup>

Here, we performed a meta-analysis of published randomized controlled trials (RCT) on open versus closed treatment of unilateral displaced mandibular condylar fractures; the aim of the present study was to compare open and closed treatment of moderately displaced condylar fractures.

## MATERIALS AND METHODS

### Search strategy

Search was operated in electronic databases: PubMed, Cochrane Controlled Trials Register, and EMBASE

(the last date was updated on 10 December 2012). The following searching terms were used: mandibular condylar fractures; open reduction; closed treatment; maxillofacial surgery. The search was done on studies conducted on human subjects, restriction on English language. The reference lists of reviews and retrieved articles were handsearched at the same time. We did not consider abstracts or unpublished reports.

### Inclusion and exclusion criteria

We reviewed abstracts of all citations and retrieved studies. The following criteria were used to include published studies:

(a) The studies were to evaluate the effect of open and closed treatment of unilateral displaced condylar fractures. (b) The studies were RCT. (c) The studies had to contain sufficient raw data for weighed mean difference (WMD) with 95% confidence intervals (CIs). We excluded the articles according to the following criteria: (1) without raw data available; (2) duplicate publication; (3) no usable data reported.

### Data extraction

Data were extracted from each study by two reviewers independently according to the prespecified selection

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## Statement of Clinical Relevance

About 30%-40% of all mandibular fractures are fractures of the mandibular condyle. There is no general consensus regarding which fractures should be treated with an open or closed approach. The choice of the condylar fractures remains controversial.

criteria. Any discrepancy during screening and quality assessment were resolved by discussion.

### Statistical analysis

The statistical analysis was performed by RevMan 5.2 software (Copenhagen, Denmark), which was provided by Cochrane Collaboration.  $P < .05$  was considered statistically significant. Heterogeneity was checked by Chi-square test. If the results of the trials had heterogeneity, random effects model was used for meta-analysis. Otherwise, fixed effects model was used. The result was expressed with WMD for the categorical variable and 95% CIs.

### Assessment of study quality

Included studies were reviewed and appraised for methodological quality using the Jadad composite scale.<sup>9</sup> High-quality trials scored more than 2 out of a maximum possible score of 5.<sup>10</sup>

## RESULTS

### Study characteristics

There were 824 papers relevant to the searching words (Figure 1). Through the step of filtering the title, 213 of these articles were excluded (40 Reviews, 173 Non-Abstracts). Clinical Trials from 32 articles were reviewed and an additional 579 articles were excluded (528 Non-RCT, 51 Non-Human Studies). The study design and the method of randomization were confirmed by the local ethics committees at each of the local contributing centers.

The inclusion criteria were:

1. Age of the patient: >18 years.
2. Unilateral condylar fracture.
3. Location of the fracture in the condylar base or condylar neck.
4. Degree of displacement of the condylar fragment in the frontal or sagittal plane:  $10^{\circ}$ - $45^{\circ}$ .

The exclusion criteria were:

1. Preexisting occlusal disturbances or skeletal malocclusions.
2. Preexisting pathological conditions of the temporomandibular joints.
3. The study protocol required an informed and active decision by the patient.

Patients who were not able to follow the information given or to make a decision themselves due to mental or other reasons were excluded from the study.

Thus, 4 papers,<sup>11-14</sup> which included 177 cases, were found to conform our inclusion criteria. Four RCT studies from Denmark, India (2), and Germany were included in this meta-analysis. The characteristics of these studies are presented in Table I.

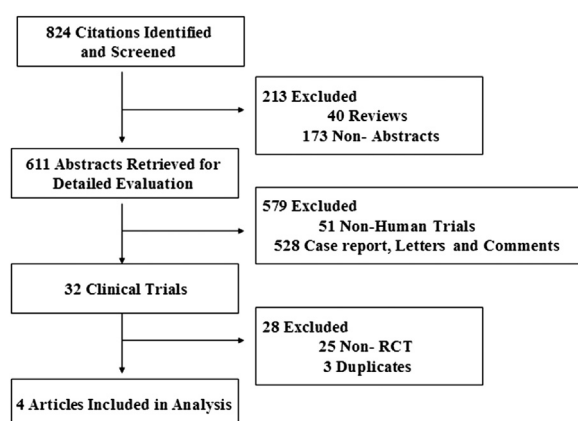


Fig. 1. Studies identification, inclusion, and exclusion.

### Quality of included studies

The four studies were RCT and all of them had a detailed description of methods for randomization, Jadad score of the included studies was more than 3 (Table I). The main studying limitations included smaller sample size and allocation concealment.

*Range of active movement of the joint.* Using the measurements maximal distance of the incisal edges, maximal extent of protrusion, and the sum of both laterotrusions (in millimeters). Four RCT studies all showed these three parameters.

Maximal distance of the incisal edges (MIO): The heterogeneity was observed among four studies ( $\text{Chi}^2 = 24.2$ ,  $P < .00001$ ,  $I^2 = 88\%$ ) (Figure 2), so the random effects model was applied. The results showed that the difference was not statistically significant (WMD =  $-2.27$ , 95% CIs =  $-6.69$  to  $2.16$ ,  $P = .32$ ) (Figure 2), suggesting that MIO was not statistically difference between closed treatment group and open reduction group.

Sum of both laterotrusions: The heterogeneity was not observed among four studies ( $\text{Chi}^2 = 1.25$ ,  $P = .74$ ,  $I^2 = 0\%$ ) (Figure 3), so the fixed effects model was applied. The results showed that the difference was statistically significant (WMD =  $-2.59$ , 95% CIs =  $-3.26$  to  $-1.92$ ,  $P < .00001$ ) (Figure 3), suggesting that laterotrusions was statistically difference between closed treatment group and open reduction group. Protrusion: however, protrusion involved active movement, and was therefore a more sensitive parameter than passive mouth opening. The heterogeneity was observed among four studies ( $\text{Chi}^2 = 11.26$ ,  $P = .74$ ,  $I^2 = 73\%$ ) (Figure 4), so the random effects model was applied. The results showed that the difference was statistically significant (WMD =  $-1.05$ , 95% CIs =  $-1.93$  to  $-0.16$ ,  $P < .05$ ) (Figure 4).

*Complications: malocclusion and temporomandibular joint (TMJ) pain.* Pain as measured with a metric visual analogue scale (VAS). The scale ranged from

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