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Systematic review

# One miniplate compared with two in the fixation of isolated fractures of the mandibular angle

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**Abstract**

The purpose of this study was to compare one miniplate with two in the management of isolated fractures of the mandibular angle as regards wound healing, failure of hardware, scarring, weakness of the facial nerve, and overall morbidity, by making a systematic review with a meta-analysis. I made a comprehensive electronic search with no date or language restrictions in October 2014. The inclusion criteria were studies in humans, including randomised or quasirandomised controlled trials (RCT), controlled clinical trials (CCT), and retrospective studies that compared the morbidity after treatment of such fractures with one and two miniplates. Ten publications were included: three RCT, three CCT, and four retrospective studies. Three studies showed a low, and seven a moderate, risk of bias. There was a significant difference between one and two miniplates in the incidence of wound healing, failure of hardware, weakness of the facial nerve, and overall complications (p=0.04, p =0.05, p=0.002, and p=0.05, respectively). The result of the meta-analysis showed that one miniplate placed on the external oblique ridge provided a significant reduction in the incidence of wound infection and dehiscence, failure of hardware, and overall complications, compared with two miniplates, one placed on the external oblique ridge and one placed on to the ventral surface of mandible to fix the fracture.


*Keywords:* Mandibular angle fractures; One miniplate; Double miniplate; Wound problems; Postoperative complications; Meta-analysis

## Introduction

Fractures of the mandibular angle generate more complications than other mandibular fractures, the incidence ranging from 0-32%.[1,2] The management of such fractures is controversial, and is made difficult because of the anatomical relations and complex biomechanical aspects of the mandibular angle, including a thin cross-sectional area, abrupt change in curvature, attachment of the masticatory muscles, and the presence of third molars.[3]

Various techniques have been used for internal fixation, including wire osteosynthesis, a single miniplate on the superior border (2.0 mm), a single plate on the inferior border (2.3 or 2.7 mm), 2 plates (1 at the superior border and 1 at the inferior border), geometric plates, or lag screws.[4]

The controversy still rages between advocates of "rigid" fixation, which usually requires 2 bony plates, and those who use non-rigid but functionally stable fixation with a single miniplate. However, there are those who think that the time-honoured, non-rigid method should be preferred, using either closed or open reduction and internal fixation with a transosseous wire together with several weeks of maxillomandibular fixation (MMF).[5] Certainly if a single miniplate can provide similar or better results than 2 bony plates there will be savings both from the cost of the hardware and from the time spent in the operating theatre to insert the second plate. If the patient can return to normal daily activities sooner when using plate or screw fixation (or a combined method), the cost to society of such injuries will be minimised.[6] Some studies[7,8] have reported no

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difference in outcome when a single plate was compared with two miniplates, while Levy et al.[9] found that two plates were better than one.

I could find no full systematic review with meta-analysis that compared one with two miniplates in the management of such fractures, so have attempted to resolve the issue definitively with a meta-analysis. The null hypothesis was that two miniplates are as effective as a single miniplate in the treatment of fractures of the mandibular angle, and the specific aims of the study were to compare one miniplate to two as far as the incidence of wound healing, failure of hardware, scarring, weakness of the facial nerve, and overall morbidity in the management of these fractures were concerned.

## Methods

### *Search*

I made a comprehensive systematic review of relevant publications in the bibliographic databases PubMed (National Library of Medicine, NCBI), EMBASE, and the Cochrane Central Register of Controlled Trials from inception to October 2014. The review was made in accordance with the recommendations of the PRISMA statement.[10] I also made a manual search of journals related to oral and maxillofacial surgery, including the *Int J Oral* M*axillofac Surg, Br J Oral Maxillofac Surg, J Oral Maxillofac Surg, Oral Surg Oral Med Oral Pathol Oral Radiol Endod, J Craniomaxillofac Surg, J Craniofac Surg*, and *J Maxillofac Oral Surg*.

### *Search terms*

I used a combination of the following search terms: one miniplate compared with two in mandibular angle fractures *AND/OR* internal fixation of angle mandibular fractures *AND/OR* single compared with double miniplate in mandibular angle fractures, superior compared with inferior border miniplate in mandibular angle fractures, Champy technique, postoperative complications in mandibular angle fractures, *AND* linea oblique compared with lateral in mandibular angle fractures.

### *Selection criteria*

The following inclusion criteria were adapted using the PICOS criteria: (P) Type of patients:

those adults patients having mandibular angle fractures. (I) Type of intervention: two miniplates, one miniplate placed transorally along the external oblique ridge, and 1 miniplate placed along the lateral aspect of the superior border using transbuccal trocar instrumentation. (C) Type of comparator: one miniplate placed transorally along the external oblique ridge. (O) Type of outcomes: infection, wound dehiscence, malocclusion, paraesthesia, failure of hardware, malunion or non-union, scarring, and weakness of the facial nerve. (S) Type of study: human studies published in English: randomised or quasirandomised controlled clinical trials, controlled clinical trials, and retrospective studies the aim of which was to compare the postoperative complications after fixation of fractures of the angle with two miniplates, in which a single plate is placed onto the superior border of the mandible and the other plate to the lateral aspect of the mandible, with the standard technique of a single miniplate placed on to the superior border as described by Champy et al.[11]

### *Exclusion criteria*

Case reports, technical reports, animal or in vitro studies, review papers, uncontrolled clinical studies, studies that used bioabsorbable materials, studies that included infected or comminuted (or both) fractures, fractures in edentulous mandibles, and fractures in children were excluded.

### *Collection of data*

I carefully assessed the eligibility of all studies retrieved from the databases, and the following data were extracted from the studies included in the final analysis: author(s), year of publication, study design, number of patients, sex, mean (SD) age (years), duration of follow up, method of fixation of the fractures, postoperative MMF, mean (SD) duration of operation (minutes), surgical approach, and associated mandibular fractures. I contacted the authors if any data were missing.

### *Risk of bias in individual studies*

I rated the quality of the methods used by combining the proposed criteria of the Meta-Analysis of Observational Studies in Epidemiology statement (MOSES),[12] the Strengthening the Reporting of Observational Studies in Epidemiology statement (STROBE),[13] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[14] to verify the strength of scientific evidence used in the clinical decision-making. The classification of the potential risk of bias for each study was based on the following 5 criteria: random selection, definitions of criteria for inclusion and exclusion, report of losses to follow up, validated measurements, and statistical analysis. A study that included all the criteria mentioned above was classified as having a low risk, a study that did not include one of these criteria was classified as having a moderate risk, and when two or more criteria were missing, the study was considered to have a high risk of bias.

### *Statistical analysis*

Meta-analyses were made only if there were studies of similar comparisons, reporting the same outcome measures. For binary outcomes, we planned to calculate a standard estimation of odds ratio (OR) by the random-effects model if