

# Comparison of single vs double noncompression miniplates in the management of subcondylar fracture of the mandible

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## ABSTRACT

**Purpose:** The purpose of this study was to compare the functions of the condyle and complications after fixation of a subcondylar fracture of the mandible with two noncompression miniplates and a single non-compression miniplate. **Materials and Methods:** A total of 30 patients who required open reduction of a subcondylar fracture of mandible were selected for the study. The patients were randomly divided into two groups of 15 each. Group I comprised of patients treated with a single miniplate and Group II were treated with two noncompression miniplates. The patients were assessed for malocclusion, lateral deviation on opening, infection, plate removal, facial nerve function, the time taken in the surgery, and cost of implants used, in both the groups. All the parameters were compared statistically using the chi square test. **Results:** Out of 30 patients, inadequate reduction was noticed in one patient in Group I. Screw loosening occurred in two cases; both the cases were stabilized with a single miniplate. Screw loosening was always associated with chronic infection. In these cases, hardware removal was performed. Plate bending was observed in one case that was stabilized with a single miniplate. Malocclusion and lateral deviation occurred in this case. When two miniplate were used, no plate bending or screw loosening was observed. Malocclusion was observed in Group II. **Conclusion:** Two plates for subcondylar fractures represent the best solution to obtain stable osteosynthesis in comparison to a single miniplate.

**Key words:** Miniplates, subcondylar fracture, noncompression, mandible fracture

## INTRODUCTION

There are different treatment modalities mentioned in literature for the fixation of mandibular condylar fractures, in the form of, the pin-in-groove technique,<sup>[1]</sup> wires,<sup>[2]</sup> miniplates,<sup>[3]</sup> lag screws,<sup>[4]</sup> three-dimensional plate,<sup>[5]</sup> and the trapezoid plate.<sup>[6]</sup> A single miniplate is commonly used for the fixation of a mandibular condyle following the principles of Champy *et al.*<sup>[7]</sup> However, some studies advocated the use of two plates for the fixation of a mandibular condyle.<sup>[8,9]</sup> The aim of our study is to compare the functions of condyle and complications after fixation of the mandibular condyle, with two noncompression miniplates and a single noncompression miniplate.

## MATERIALS AND METHODS

This study was a randomized clinical trial. Approval for the present study was obtained from our institution's Experimental Medical Research and Practicing Center Ethical Committee. Informed consent was obtained from all patients who were enrolled in the study, after they received an explanation of the advantages and disadvantages of open and closed reduction in vernacular language.

The study sample was derived from the population of patients who reported to the Department of Oral and Maxillofacial Surgery, Sharad Pawar Dental College (Wardha, India), between

October 2008 and June 2010. They were selected for the study. The inclusion criteria included:

- 1) Patients with a unilateral non-comminuted mandibular condyle fracture associated with symphysis and parasymphysis fractures of the mandible, and a midface fracture, reported within seven days for treatment
- 2) Patients had to be of age 18 years or older

Exclusion Criteria Include

- 1) Patients unfit for surgery under general anesthesia

**Table 1: Spiessl and Schroll classification of condylar fracture**

Type I	Fractures without displacement
Type II	Low fractures with displacement
Type III	High fractures with displacement
Type IV	Low fractures with dislocation
Type V	High fractures with dislocation
Type VI	Intracapsular fractures



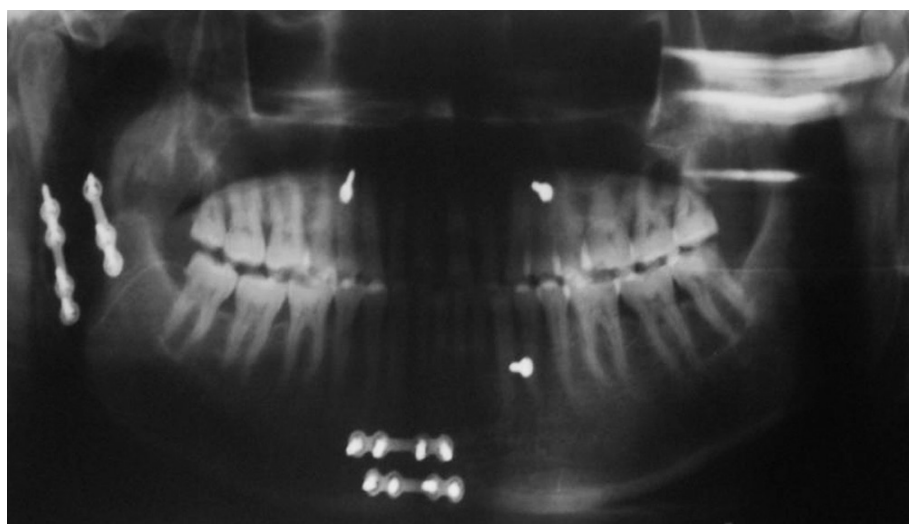
**Figure 1:** Subcondylar fracture fixation done with two miniplates

- 2) Patients with history of occlusal disturbances or skeletal malocclusion
- 3) Patients with insufficient dentition to reproduce occlusion

All fractures were classified according to Spiessl and Schroll,<sup>[10]</sup> into types I to VI [Table 1]. Six fractures were classified as type II and twenty four fractures as type III. The high condylar neck fracture was defined as a fracture with the fracture line extending over to the sigmoid notch. Low subcondylar fractures were defined as fractures of the condylar neck situated below a horizontal line drawn from the right to the left sigmoid notch on panoramic radiographs. The lowest fractures of this type are often referred to as oblique fractures of the superior ramus.<sup>[11]</sup> Twenty patients had an additional parasymphyseal, six had symphysis fracture of the mandible, and four patients had associated midface fracture.

The patients were randomly divided into two groups of 15 each. Randomization was performed by lots in closed envelopes. Group I comprised of patients treated with a single miniplate (Orthomax, Baroda, India), as suggested by Champy *et al.* Group II were treated with two noncompression miniplates, in which one plate was fixed in a similar manner to that of Group I and the other plate was fixed medial to it, at a 5 mm distance [Figures 1 and 2].

A Risdon's incision [Figure 3] was used to expose the fracture condyle and the intraoral vestibular incision, to expose the symphysis and parasymphysis fracture site. The fracture was then reduced and the jaws were placed into the intermaxillary fixation (IMF) with the help of arch bars / IMF screws. After placement of the plates, the IMF was released and the occlusion was checked. The intraoral incision was closed with resorbable sutures and the extraoral incision was closed in two layers (with 3-0 vicryl and 5-0 prolene), after securing the drain. Postoperatively, elastics were placed for one week, in every case. The patients were reviewed after surgery for six months. The elastics were removed after one week and the arch bars after the fourth week. A single surgeon performed all the surgeries. All patients, in both the groups, were given antibiotics (ampicillin 500 mg intravenously four times a



**Figure 2:** Panoramic radiograph showing patient treated with two miniplates

day, for five days postoperatively, and 1000 mg intravenously, two hours before surgery.

**Assessment**

The patients were assessed for malocclusion, lateral deviation on opening, infection, plate removal, facial nerve function, the time taken in the surgery in both the groups, as well the cost of implants used in both the groups. All the patients were assessed by a single assessor. Descriptive statistical analysis was performed with SPSS statistical software for windows, version 8.0 (SPSS, Inc, Chicago, IL).

**RESULTS**

Out of 30 patients, 22 were male and 8 female. The cause of fracture in 18 patients was road traffic accident, 9 had a fall, and 3 patients were victims of assault. The mean age of the patients in both the groups was 29.6 (age range from 22 to 50).

Postoperatively, no malocclusion was observed in Group II.



Figure 3: Risdon's incision marking

**Table 2 : Complications in both the groups**

Complications	Single miniplate group n (%)	Two miniplates group n (%)
Inadequate reduction	1 (6.67)	0
Screw loosening	2 (13.33)	0
Plate bending	1 (6.67)	0
Malocclusion	1 (6.67)	0
Lateral deviation on opening	1 (6.67)	0
Infection	2 (13.33)	0

**Table 3: Time required in both the groups (in hours)**

Group	n	Mean
I	15	2.22 hrs
II	15	2.48 hrs

Malocclusion and lateral deviation occurred in one patient, who had plate bending after fixation. This patient underwent functional treatment that consisted of tight mandibulomaxillary fixation (MMF) with elastic for 10 days, followed by active jaw exercises. Out of 30 patients, inadequate reduction was noticed in one patient in Group I. Table 2 lists the complications encountered in both the groups.

Screw loosening [Figure 4] occurred in two cases; both the cases were stabilized with a single miniplate. Screw loosening was always associated with chronic infection. In these cases, hardware removal was performed. Plate bending [Figure 5] was observed in one case, which was stabilized with a single miniplate. When two miniplates were used, no plate bending, or screw loosening was observed. Table 3 demonstrates the time utilized for surgery in both the groups.

**DISCUSSION**

The goal of this pilot study was to identify a better method of fixation after subcondylar fracture of the mandible. Specifically, the intent was to see the efficacy of two noncompression miniplates in comparison to a single noncompression miniplate, in the fixation of a subcondylar fracture. The results of this study confirmed that two miniplates were better than a single miniplate for a fixation with less complication.

Different approaches such as preauricular incision, endaural incision, a Risdon's incision, a submandibular incision, a retromandibular incision, the rhytidectomy approach, or an intraoral incision were mentioned in the literature, for exposing the condyle.<sup>[12-14]</sup> We used the Risdon's incision, without any complication, in all our cases, to expose the fractured condyle. The advantage of this approach was that we could pull the distal segment of the mandible downward by applying the bone



Figure 4: Photograph showing screw loosening in a case of subcondyle fracture treated with single miniplate

holding forceps or a 24 gauge wire, which helped in reduction and adequate surgical access of the fractured condyle [Figure 6].

Several complications are mentioned in the literature when a single miniplate is used for fixation of a condylar fracture. According to Hammer *et al.*<sup>[8]</sup> 35% cases had plate failure or screw loosening when the fracture was stabilized, with a single miniplate. Sometimes the single plate also led to inadequate fixation [Figure 7].

We also observed plate bending (6.66%) and screw loosening (13.33%) in Group I of our study. Sargent and Green<sup>[15]</sup> also reported plate fracture in their study and they suggested that the functional forces exceeded the rigidity of one miniplate.

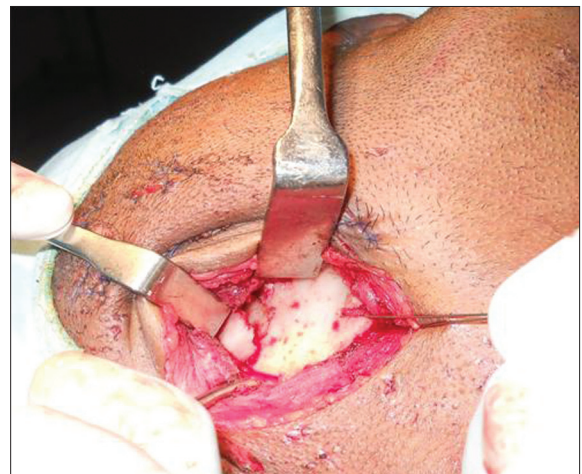


**Figure 5:** Photograph showing plate bending in a case of subcondylar fracture treated with 1 miniplate

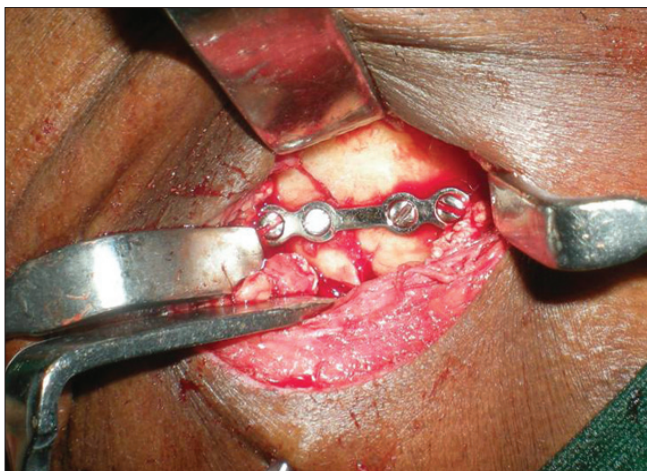
To avoid plate fracture in cases of condylar fracture Ellis and Dean<sup>[12]</sup> used minidynamic compression plates, however they also reported bending of the plate and loosening of screws. Inadequate reduction [Figure 8], lateral deviation on opening, and malocclusion occurred in one patient, in whom the plate was bent, in Group I. Infection occurred in two (13.33%) of the cases, in whom screw loosening was present.

On the other hand, inadequate stability causing either plate fracture or screw loosening was not observed when two miniplates were used, which strongly suggested that two miniplates were better than a single miniplate for fixation. The second plate protected the first plate from the damaging mechanical strains that could cause its fracture, and prevented a secondary displacement of the mandibular condylar fragment.<sup>[16]</sup>

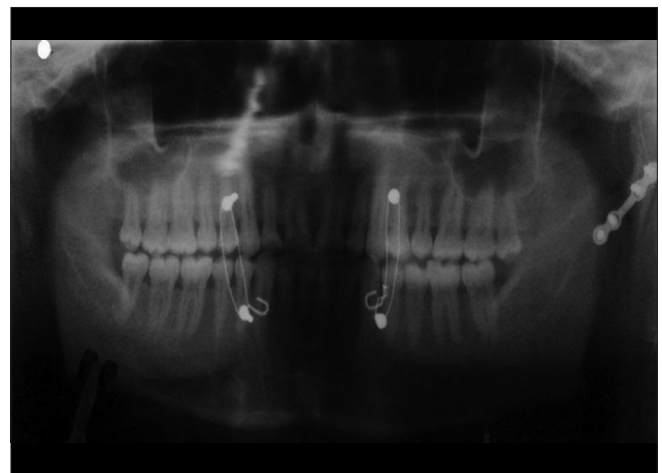
According to Choi *et al.*, the two-miniplate fixation technique provides functionally stable fixation for fractures of the condylar neck. They also suggest that application of a miniplate at the posterior and anterior borders of the condylar neck seem to have the beneficial effect of restoring tension and compression trajectories.<sup>[9]</sup> Pilling *et al.*,<sup>[17]</sup> after comparative evaluation of



**Figure 6:** Stainless steel wire used to retract the mandible downwards



**Figure 7:** Subcondylar fracture-inadequate fixation done with 1 miniplate



**Figure 8:** Photograph showing inadequate reduction and displacement of fractured condyle laterally following fixation with a single miniplate

ten different condylar base fracture osteosynthesis techniques, concluded that osteosynthesis with two miniplates would be the most stable way of treating a condylar fracture. Using an *in vitro* model, Choi *et al.*<sup>[18]</sup> demonstrated that a two-miniplate system applied to the anterior and posterior regions of the condylar neck was more stable than a single-plate system. We had no complications in our patients treated with two plates.

In our study, the mean operating time in Groups I and II was 2.22 hours and 2.48 hours, respectively, and the time required in Group II was more. Rallis *et al.*<sup>[19]</sup> also demonstrated longer operating time in patients treated with two plates and they also mentioned increase in cost when patients were treated with two miniplates, although the cost of implants in our series of patients in Group II was also more as compared to Group I.

The small sample size and limited follow-up could be considered the limitation of the study, but it is concluded from our pilot study results that the use of two plates for subcondylar fractures, represents the best solution to obtain stable osteosynthesis, in comparison to a single miniplate.

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