A Short Period of Maxillomandibular Fixation for Treatment of Fractures of the Mandibular Tooth-Bearing Area

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Purpose: This study was aimed to determine whether a short period of maxillomandibular fixation (MMF) followed by an arch bar splint wired to the lower jaw is a suitable alternative to conventional MMF for treatment of fractures of the mandibular tooth-bearing area.

Patients and Methods: Thirty patients with mandibular fractures associated with no other facial fractures were selected. They were randomly assigned into 2 groups for treatment with conventional MMF (group A) and MMF for a short period of 2 weeks followed by an arch bar splint wired to the lower jaw (group B). Complications were recorded and post-treatment maximum interincisal mouth opening was measured at 1 week and 3 and 6 months. Age and gender-matched control groups were randomly selected. Groups were then compared for significant differences. A value of $P < .05$ was considered significant.

Results: The 2 patient groups were not significantly different in relation to site and cause of fracture ($P = .995$ and $P = .682$, respectively), the mean time from injury to MMF ($P = .234$), and the mean time required for fracture healing ($P = .315$). Delayed union and nonunion were not encountered, and there were no significant differences in relation to postoperative infection ($P = 1$) and malocclusion ($P = .598$). When compared with group A patients, group B patients had an early significantly greater degree in mouth opening ($P = .001$); at no time was there a significant difference in the degree of mouth opening between group B patients and the control group (1 week, $P = .079$; 3 months, $P = .166$; 6 months, $P = .378$).

Conclusion: In selected cases, a short period of MMF followed by an arch bar splint wired to the lower jaw is a suitable alternative to conventional MMF for treatment of fractures of the mandibular tooth-bearing area. The method is effective and significantly reduces the potential adverse effects of long-term MMF.

Based on the statement that a simpler method should be chosen whenever it is as effective as a more invasive one,1 maxillomandibular fixation (MMF) remains the mainstay of mandible fracture stabilization.2 Traditionally, the length of MMF used for immobilization of adult mandibular fractures has been 6 weeks.3 However, prolonged MMF has been criticized for pain, poor oral hygiene, phonetic disturbance, loss of effective work time, weight loss, reduced masticatory efficiency, and reduced mouth opening.4-6 As a result, there has been a search for ways to reduce the period of MMF.7 In this regard, immobilization for a short period of 2 weeks followed by splinting the lower jaw with an arch bar or acrylic splint, or a period of soft diet, have been suggested as options available to the surgeon.8 Research studies in this direction have seldom been undertaken. Therefore, the aim of this study was to determine whether a short period of MMF followed by an arch bar splint wired to the lower jaw is a suitable alternative to conventional MMF for treatment of fractures of the mandibular tooth-bearing area.

Patients and Methods

Thirty patients with mandibular fractures associated with no other facial injuries who attended the Oral Surgery Department, Faculty of Dentistry, Mansoura University, Mansoura, Egypt, were selected for this study. The selection was based on the following...
criteria: 1) patient of either gender, aged 20 years or more, nonsmoker, nonalcoholic, and nonsubstance or intravenous drug abuser; 2) fracture involving the body or symphysis of the mandible with sufficient occluding teeth present on either side of the fracture or fracture involving the mandibular angle mesial to a functional third molar not indicated for removal; 3) fragments distracted with mobility at the superior and inferior parts of the fracture; 4) no infection at the fracture site; and 5) no systemic problems.

Patients were treated as outpatients with closed reduction and MMF using arch bars and tie wires. They were randomly assigned into 2 groups for treatment with the conventional 6 weeks of MMF (group A), and MMF for a short period of 2 weeks followed by an arch bar splint wired to the lower jaw (group B). In both groups, the end period of primary treatment was determined to be 6 weeks. Patients in group B were prescribed a soft diet for 2 weeks following release of MMF; they were also advised to refrain from strenuous physical activity during this period.9

Teeth in the fracture line involving the body or symphysis were removed when indicated, and an antibiotic was given preoperatively and for 3 days postoperatively. Patients were seen weekly during the treatment period. Fracture union was tested by manipulation for mobility at the fracture site starting at 4 weeks after fixation and continuing at weekly intervals for 6 weeks. This entailed removing the intermaxillary wires every time the test was performed in group A patients. Each patient was also asked to open the mouth against force applied at the point of the chin by the operator’s hand.10 If mobility or pain was produced at the fracture site, union was considered to be inadequate. Intermaxillary wires were replaced and the arch bar splint was maintained to the end period of treatment if union was not satisfactory. Follow-up examinations were performed within 1 week after the end period of treatment, and successive visits were made at 1, 2, 3, and 6 months. Complications in terms of infection, malocclusion (any deviation from the patient’s normal arch relationship), delayed union (mobility at the fracture site after 6 weeks of treatment), and nonunion (presence of mobility after 6 months of treatment) were recorded. Post-treatment maximum interincisal mouth opening was also recorded at 1 week and 3 and 6 months. An age and gender-matched control group with no past history of facial trauma was randomly selected. The groups were then compared for significant differences using an independent samples t test for parametric data and a chi-square analysis for nonparametric data. A value of $P < .05$ was considered statistically significant.

**Results**

Over the course of 2 years, 43 mandibular fractures were treated in 30 patients who had no other facial fractures. Patients were 27 males and 3 females ranging in age from 20 to 52 years with an average age of 35.7 years. Twenty-two fractures in 15 group A patients were treated with conventional MMF and 21 fractures in 15 group B patients were treated with MMF for a short period followed by splinting the lower jaw with an arch bar (Table 1). The 2 patient groups were not significantly different in relation to

### Table 1. SUMMARY OF RESULTS AND STATISTICAL ANALYSIS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A (n = 15)</th>
<th>Group B (n = 15)</th>
<th>Chi-Square Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site (number) of fractures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td>5 (5)</td>
<td>6 (6)</td>
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</tr>
<tr>
<td>Body and angle†</td>
<td>3 (6)</td>
<td>3 (6)</td>
<td></td>
</tr>
<tr>
<td>Bilateral body</td>
<td>1 (2)</td>
<td>1 (2)</td>
<td></td>
</tr>
<tr>
<td>Body and symphysis</td>
<td>2 (4)</td>
<td>1 (2)</td>
<td></td>
</tr>
<tr>
<td>Symphysis</td>
<td>3 (3)</td>
<td>3 (3)</td>
<td></td>
</tr>
<tr>
<td>Symphysis and angle†</td>
<td>1 (2)</td>
<td>1 (2)</td>
<td></td>
</tr>
<tr>
<td>Cause of fracture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altercations</td>
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<td>9</td>
<td>1.503</td>
</tr>
<tr>
<td>Falls</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Butted by an ox</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
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<td></td>
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<tr>
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</tr>
<tr>
<td>Malocclusion</td>
<td>1</td>
<td>3</td>
<td>1.154</td>
</tr>
</tbody>
</table>

* A value of $P < .05$ was considered significant.
† Fracture line involving the angle mesial to a functional third molar.

site and cause of fracture \((P = .995\) and \(P = .682\), respectively), mean time from injury to MMF \((P = .234)\), and mean time required for fracture healing \((P = .315)\) (Tables 1, 2).

All patients completed the follow-up periods. Complications are shown in Table 1, and measurements of post-treatment maximum interincisal mouth opening of the 2 patient groups contrasted to that of an age and gender-matched control group are shown in Table 2.

### Discussion

Treatment of mandibular fractures is one of the most frequent forms of therapy provided by oral and maxillofacial surgeons. The main goal in treatment is to restore preinjury form and function, with the least disability, smallest risk, and shortest recovery period for the patient. In this context, MMF is the safest and simplest method of treatment that stood the test of time. However, critics of long-term MMF have noted many disadvantages that led to the search for alternative ways to reduce or eliminate the period of MMF. On the other hand, there exists sufficient evidence that a more conservative approach to the management of mandibular fractures with MMF is rational. Hence, the present study was undertaken. It included 30 adult patients who had 43 fractures at the mandibular body, symphysis, and angle. Fifteen of those 30 patients (group B) had 21 fractures and were treated by immobilization of the jaw fragments at restored occlusion for a short period of 2 weeks followed by an arch bar splint wired to the lower jaw for up to the time for fracture healing. The rationale behind this combined method of fixation was to early mobilize the jaws and to have the patients eat normal diets 2 weeks after release of MMF. In agreement with a similar observation, most patients were intensely delighted to find, at the time the tie wires were released, they would not undergo continued MMF. This early jaw movement was perceived with much comfort, cooperation, and adherence to follow-up instructions. Those patients were more communicative, remembered what they had been told, and conscientious about home care than group A patients who had conventional MMF. Moreover, and in accord with other authors, early mobilization of the jaws was of significant benefit to our group B patients because the adverse effect of prolonged immobilization on mouth opening was removed. The degree of post-treatment mouth opening measured at 1 week and 3 months was significantly greater in group B patients than in group A patients \((P = .001)\). Although the final measurement at 6 months was not significantly different in the 2 patient groups \((P = .054)\), the degree of mouth opening in group A patients was significantly less than that of the control group \((P = .033)\). At no time, and in contrast to group A patients, was there a significant difference in the degree of mouth opening between group B patients and the control group (1 week, \(P = .079\); 3 months, \(P = .166\); 6 months, \(P = .378\)).
The local and systemic factors that may influence fracture healing—age and associated injuries—were considered in selection of fracture patients, and a prophylactic antibiotic was given preoperatively and postoperatively. Patients were not different in relation to the mean time from injury to MMF ($P = .234$), the mean time required for fracture healing ($P = .315$), and postoperative complications. Infection resolved with antibiotic therapy was observed in 1 group A patient (6.7%) and 2 group B patients (13.3%). This increase of more than 60% in the occurrence of infection in group B patients was not significant ($P = 1$). Malocclusion readily correctable by slight selective grinding of the teeth was diagnosed in 1 group A patient (6.7%) and 3 group B patients (20%). This increase of more than 130% in the occurrence of malocclusion in group B patients was not significant ($P = .598$). Finally, delayed union and nonunion were not encountered in any patient group.

When a mandibular fracture is treated with closed reduction and MMF, it heals in a process termed secondary bone union with callus formation. In terms of resistance to movement, the soft callus initially formed at the repair site is very weak and requires adequate protection in the form of bracing or internal fixation. Proper immobilization at the fracture site is a prerequisite for undisturbed healing and ossification of callus. Therefore, premature release of MMF is often feared as it may contribute to fibrous union. However, the most critical period of fracture healing is the first 1 to 2 weeks in which inflammation and revascularization occur. Therefore, release of MMF in our group B patients was started 2 weeks after re-establishing satisfactory occlusion, and mandibular movement was initiated while maintaining jaw support with the arch bar splint. An added advantage of this early mandibular movement would be the enhanced vascular and lymphatic circulation in the tissues around the fracture site, with this slight functional stress imposed upon the fracture site possibly accelerating consolidation.

Based on the results of this study, we can conclude that in selected cases a short period of MMF followed by an arch bar splint wired to the lower jaw is a suitable alternative to conventional MMF for treatment of fractures of the mandibular tooth-bearing area. This combined method of fixation is effective and significantly reduces the potential adverse effects of long-term MMF, and may be of particular benefit to patients with associated fractures at the condylar process.

References